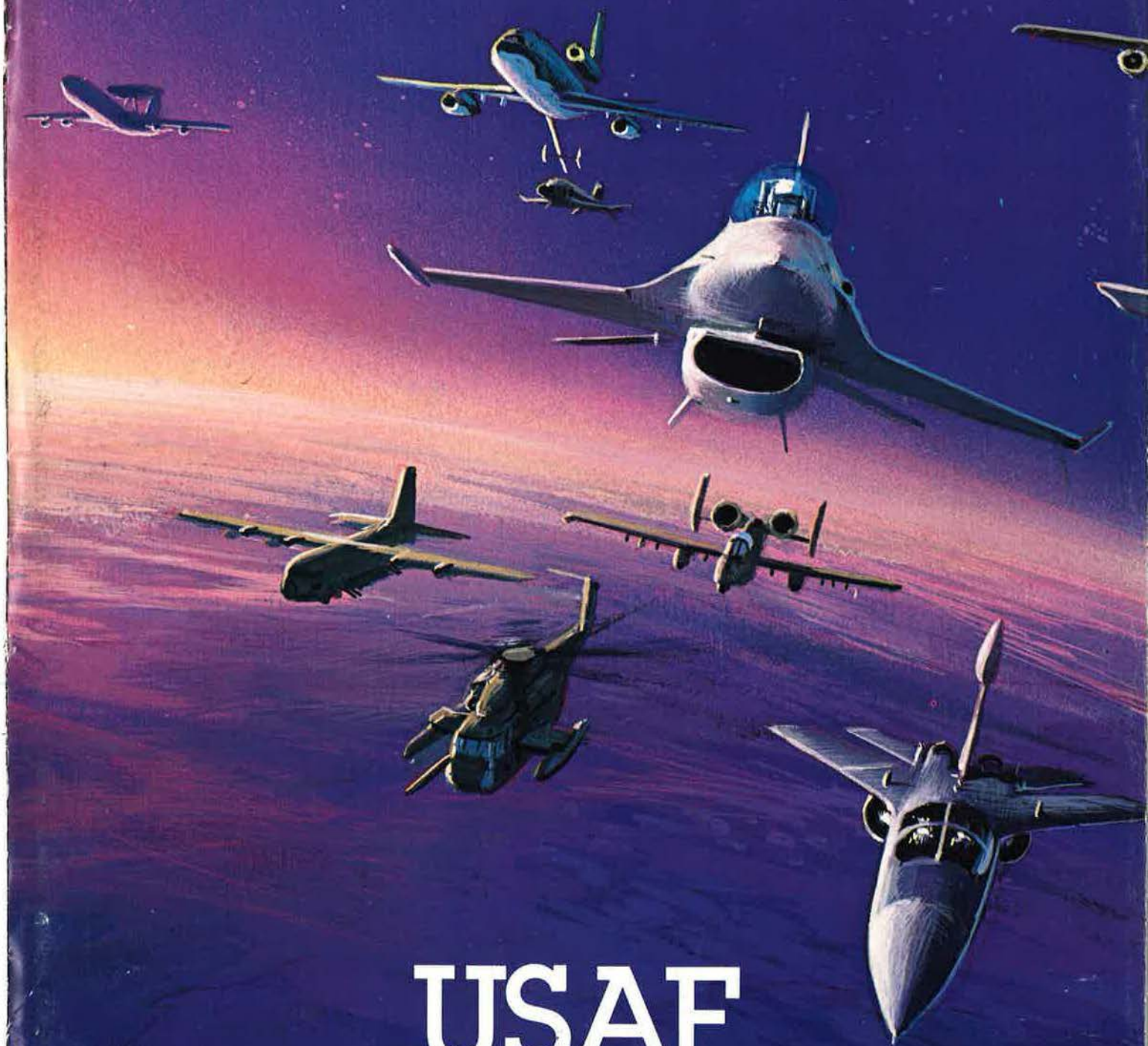
MAY 1988/$5

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION



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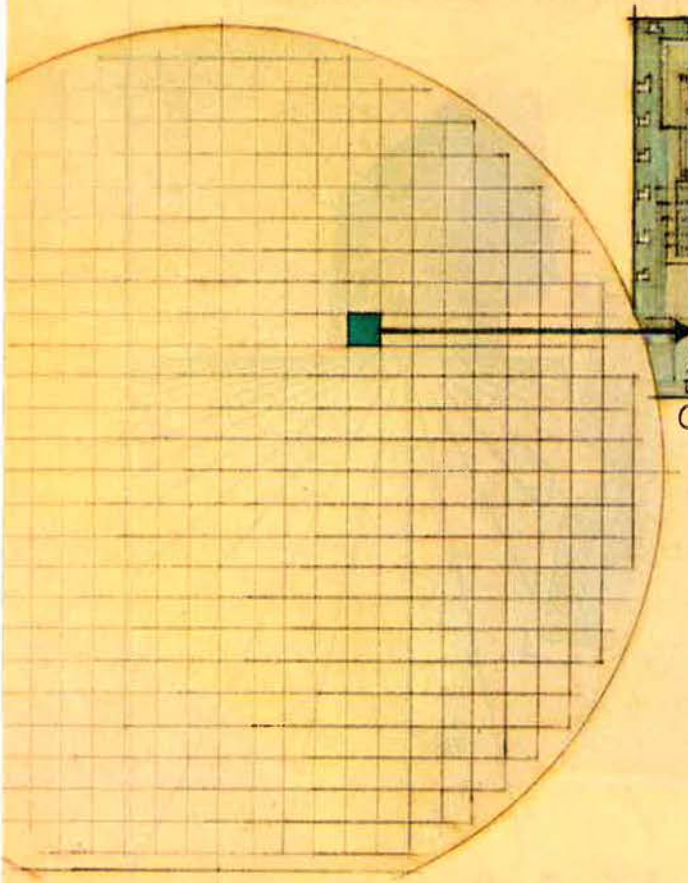
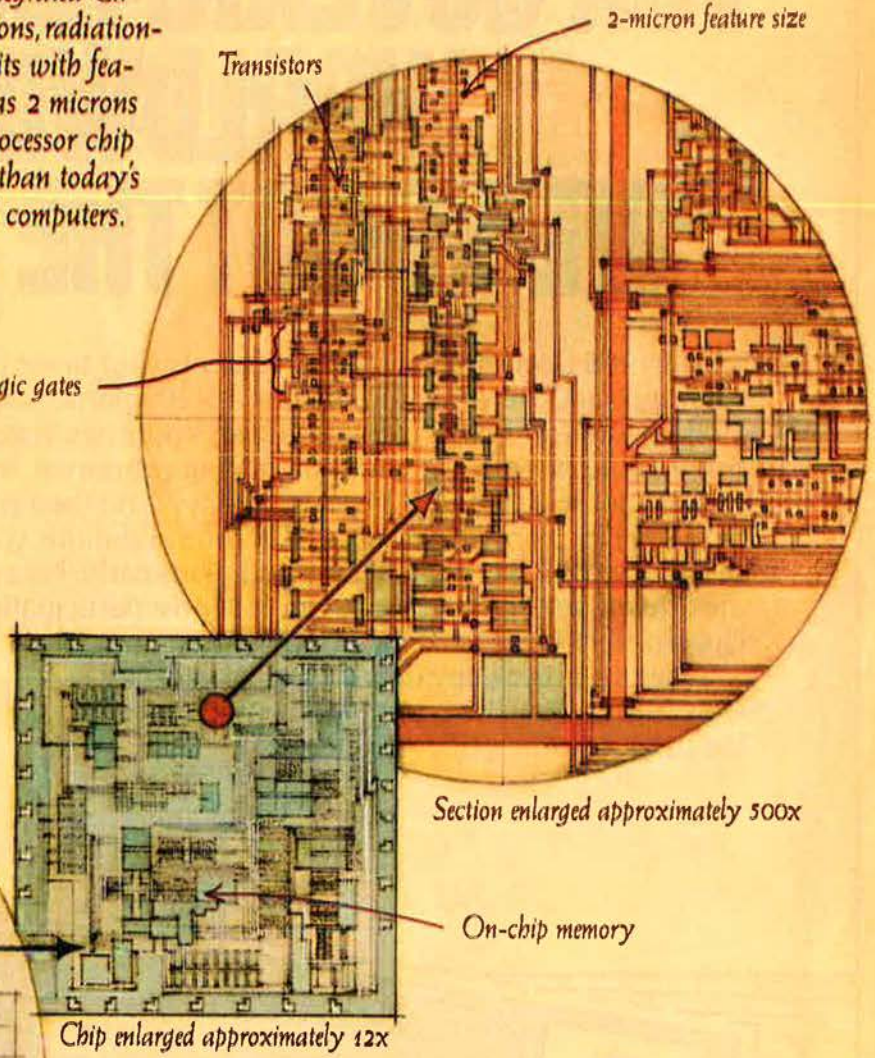


5" dia. wafer containing 430 VLSI chips



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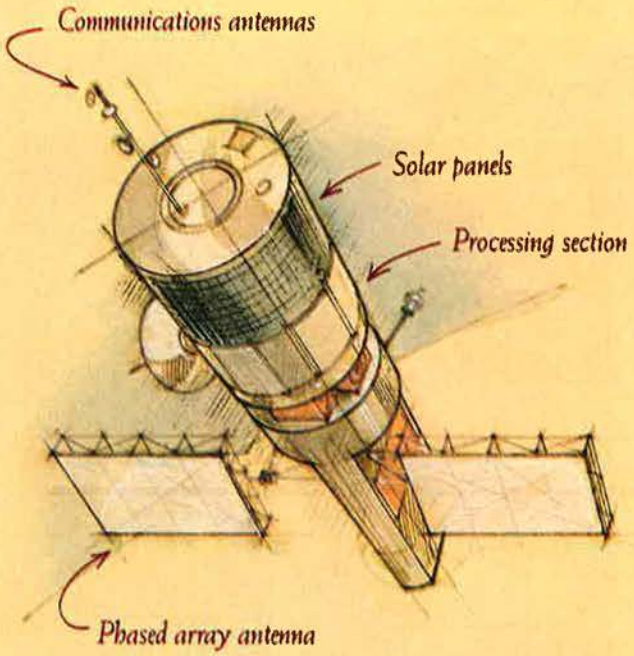

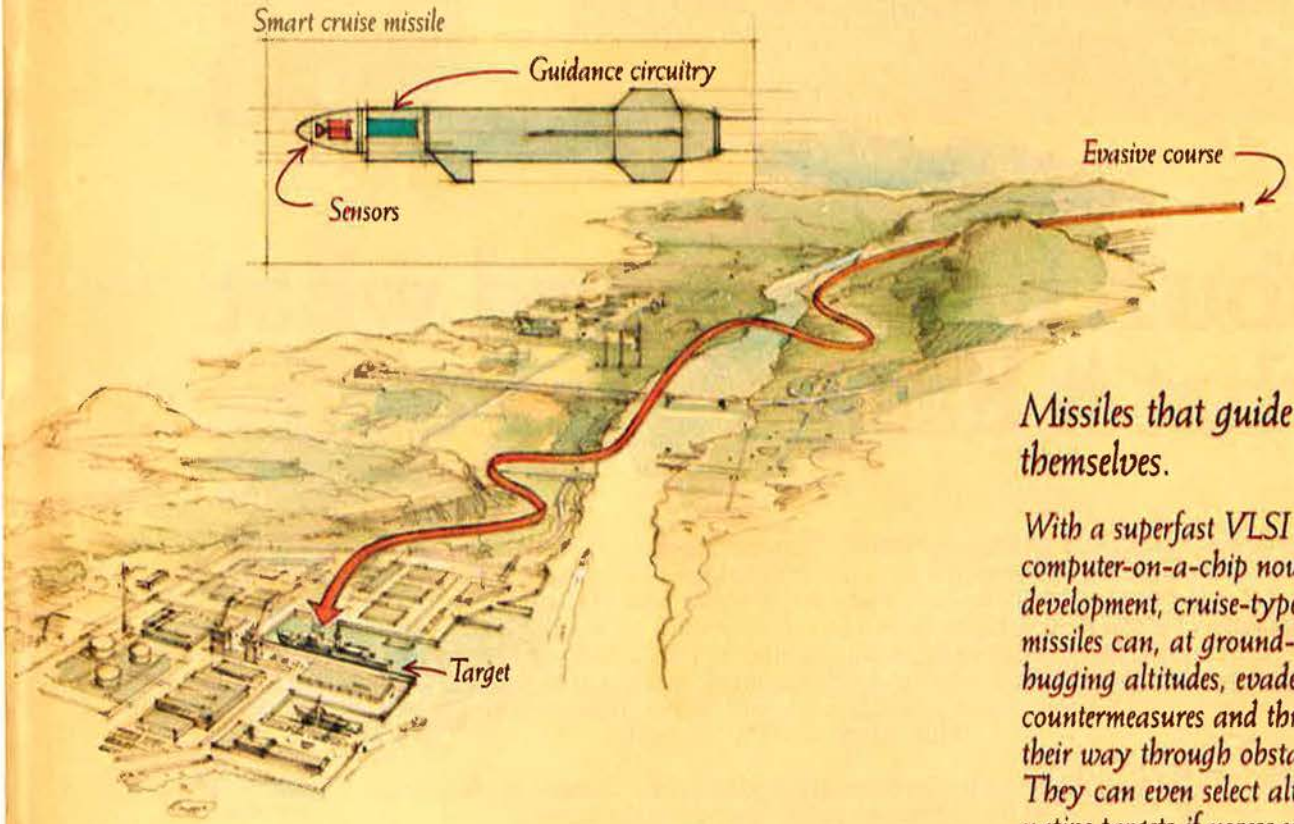

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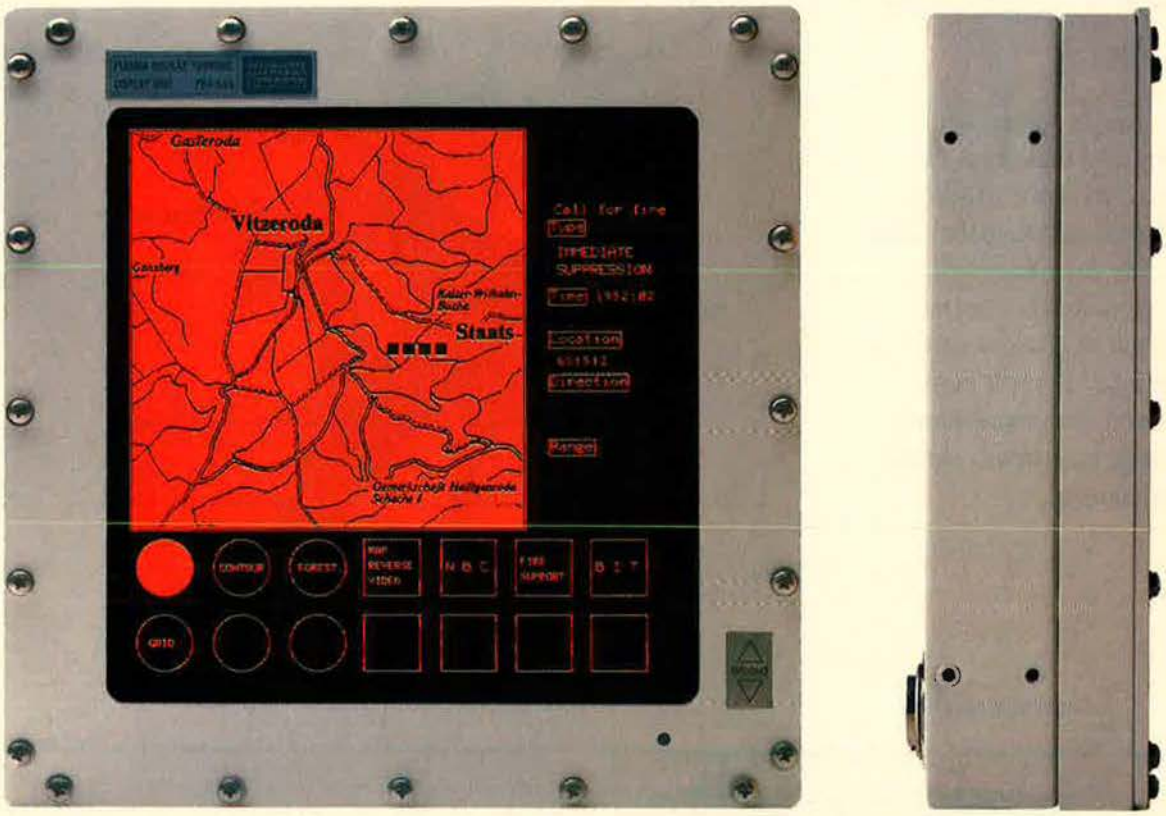

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MAY 1988
VOLUME 71, NUMBER 5

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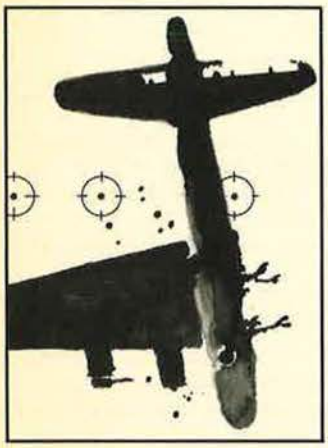

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About the cover: The onrushing armada of Air Force vehicles on our gateleg cover is the work of artist Attila Hejja. A key to what's what may be found on the opening page of "Aerospace World," p. 34.

Air Force Almanac 1988

An Air Force Almanac

Reports from the Major Commands

Reports from the SOAs and DRUs

Departments

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An Editorial

What You Can Do

By John O. Gray, AFA EXECUTIVE DIRECTOR

FOR THE past seven months, I have served as AFA's Executive Director on an interim basis while the Association searched for a highly qualified individual to be its top staff executive. It has now found that person in Charles L. Donnelly, Jr., who assumes the Executive Directorship on May 1. We are fortunate to have a man of his caliber because he—and we—have a big job ahead of us.

The relatively brief period since October 1 has been one of the most rewarding experiences of my seventy-one-plus years. It has also been one of the most frustrating. This is a function in the first instance of my pride in the impressive accomplishments of our Association and in the second of the realization that there is so much more that we could and should be doing.

I had not had time lately to think much about AFA history. Then a special reminder suddenly brought the memories flooding back. The trigger was an expression of enthusiasm from the city of Las Vegas, urging our Board of Directors to hold its midwinter meeting there next year to commemorate the thirtieth anniversary of AFA's World Congress of Flight in Las Vegas in 1959.

James H. Douglas, Jr., Secretary of the Air Force back in 1959, said the World Congress of Flight was "one of the most significant events in aviation history." Gen. Curtis LeMay called it "a formal announcement to the world of the arrival of the jet age." Fifty-one nations participated, and for a full week, AFA held center stage, informing the nation and the world about aerospace power. *Life* magazine gave it five pages of coverage, and NBC-TV broadcast an hour-long special to 40,000,000 viewers.

There have been other special moments. The April 1956 issue of AIR FORCE Magazine, carrying fifteen articles on Strategic Air Command, burst to national attention when Arthur Godfrey held up a copy on his CBS-TV "Talent Scouts" show. "Steal one, borrow one, buy one if you have to, but get a copy and read it from cover to cover!" he told his audience. The response was overwhelming. AFA hurriedly condensed the material into a twenty-four-page booklet and mailed copies free to those who wrote and called for it—all 160,000 of them.

In October 1969, another AIR FORCE Magazine article, "The Forgotten Americans of the Vietnam War," was the catalyst that brought the plight of our prisoners of war and missing in action to the nation's attention. *Reader's Digest,* with its circulation of 18,000,000, condensed our article, and between AFA and the *Digest,* some 700,000 additional copies were published in reprints. After that, the POWs and MIAs were forgotten no longer.

Spectacular achievements—such as those mentioned above and AFA's Gathering of Eagles two years ago—are highlights in our heritage, but they are by no means all of them. Since AFA was established in 1946, it has worked steadily to promote understanding of aerospace power and national defense. Some of our most effective actions have been the quieter ones, routine and regular efforts that do not command the kind of public attention attracted by the big events.

There are now nearly a quarter million of us, and our Constitution makes our objectives clear: "The Association provides an organization through which we as free people may unite to address the defense responsibilities of our nation imposed by the dramatic advance of aerospace technology; to educate the members and the public at large in what that technology can contribute to the security of free people and the betterment of mankind; and to advocate military preparedness of the United States and its allies adequate to maintain the security of the United States and the free world."

All of us would profit by rereading these lines periodically. I cannot count the times I have heard AFA members ask, "What can I do?" The Constitution tells us what we are—or should be—trying to achieve. First, each of us should ensure that our efforts, organizational and individual, are concentrated on addressing those objectives. Given that, the question then remaining is how best to go about the job.

AFA is chartered as a veterans organization, not a lobby. There are constraints on what we can do as an organization in our relations with Congress and legislators at other levels of government. There are no such restrictions on you as an individual AFA member. You are free to take on Congress as you wish—and I urge you to do so aggressively. I have lived in Washington for some thirty-seven years and can assure you that personal contacts from constituents often have far greater impact on Congress than do the daily efforts of the best and most expensive lobbyists in the city.

Have you written to your congressman lately, expressing your views on aerospace issues and national security? If not, why not? For that matter, have you been active in discussing these issues in your community? If not, don't you think that you should be?

Our monthly magazine, regular legislative reports prepared by the AFA staff, and such special products as the new series of white papers put accurate, up-to-date information on critical issues in your hands. Could you and your chapter be doing more to bring such information to the attention of your elected leaders, the news media, and your friends and neighbors?

AFA National President Sam Keith recently wrote to state and chapter presidents, asking them to find additional platforms in their localities for Air Force speakers who come to speak at Association meetings. This is a splendid idea, and in between times, we as AFA members ought to be looking for opportunities to speak out ourselves.

As I make these suggestions in response to the question "What can I do?", I know that many of you are already doing these things, and more. The fact that you are active in these ways is the greatest strength of our Association. AFA has shown itself capable of major achievements in the past. It is an effective champion of aerospace power and national defense today. I do not believe, though, that we have yet realized the full potential of our capability.

I leave the post of AFA Executive Director believing more firmly than ever that our achievements of the past can best serve us as an inspiration for what we do next. These are critical times for national security. There is more, much more, that we can do to promote public understanding and support for a strong defense.

This is the mission for which AFA was created, and the key to carrying it out is personal participation by you. Multiply that by a quarter million members, and there is no limit on what we are capable of achieving. ■

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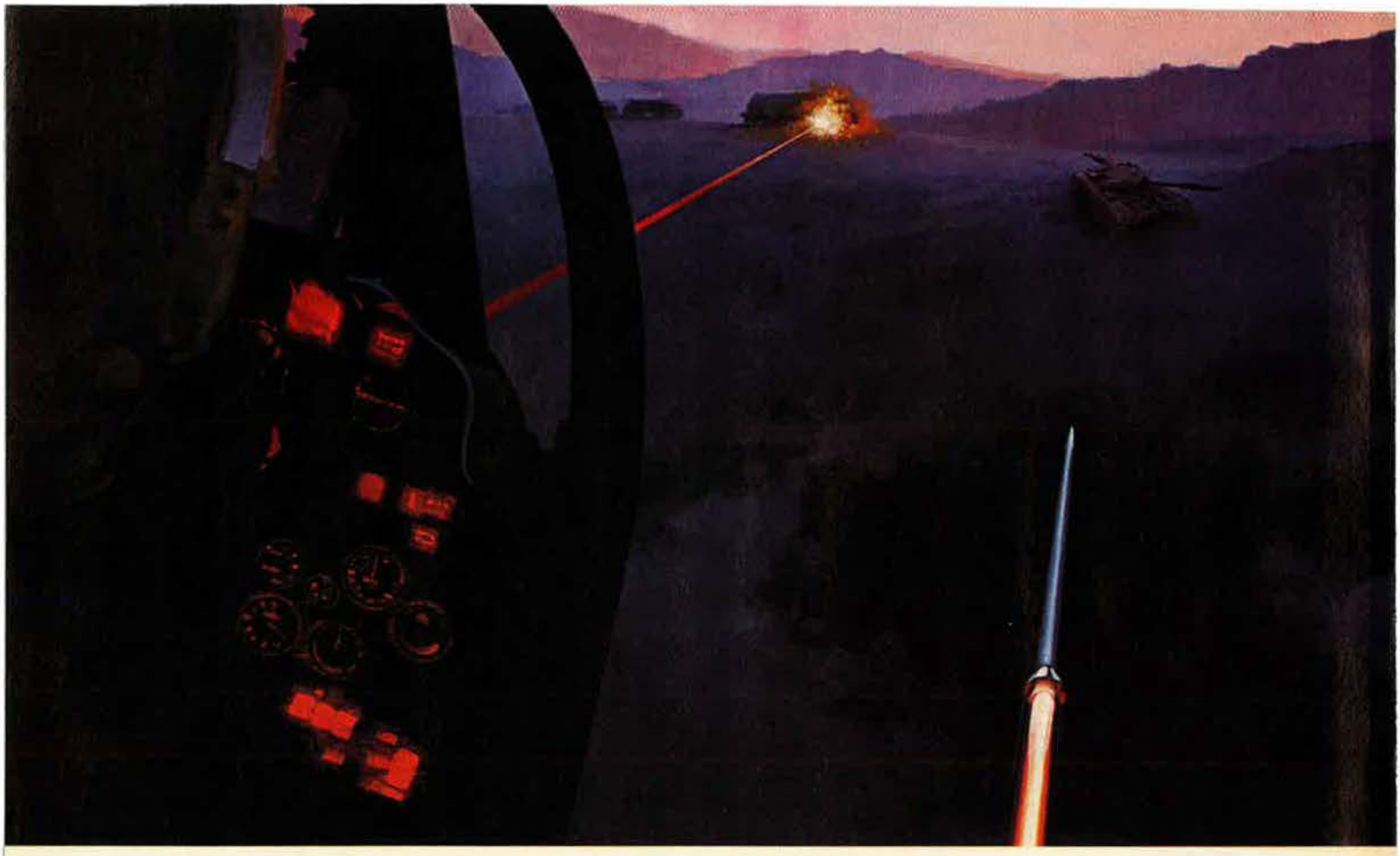

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L T V : L O O K I N G A H E A D

Airmail

Hats Off

Hats off to your "Hat-in-the-Ring" article on Lts. Douglas Campbell and Alan Winslow *(see "The First Victory," April '88 issue, p. 68).*

I have been a World War I aviation buff for more than sixty years and am a former member of the old Cross and Cockade Society and a charter member of the "Over the Front" World War I Historical Society dealing with WW I aviation history, the men who fought in that war, the planes they flew, and all that pertains to the people and the times. Your April 1988 cover was beautiful, and I must admit that it thrilled me greatly.

Congratulations on your fine article. I hope to see more on the men and machines of World War I.

Irv Distenfeld
Baltimore, Md.

Well Done!

Thank you for detailing Tactical Air Command's issues and concerns in your April 1988 edition. Well done!

May I emphasize one thing? I keep hearing how the Army and the Air Force aren't getting along when it comes to close air support. James Canan's excellent article in the April issue, "Sorting Out the AirLand Partnership," puts this issue in proper perspective. There is no real disagreement between the services on who should perform the CAS mission and what that mission will entail in the 1990s.

Thanks for a thorough and accurate piece of journalism.

Gen. Robert D. Russ, USAF
Commander, TAC
Langley AFB, Va.

A National Effort

While reading the March 1988 issue of AIR FORCE Magazine, I perused the two articles "Backlash From the R&D SuperStandard" by James Canan and "Fly by Light" by John Rhea. I am a member of the National Aerospace Plane Joint Program Office here at Wright-Patterson AFB, Ohio, so I was interested in (and generally agreed with) the comments made in both articles. However, I feel compelled to clear up a common misunderstanding that both articles innocently perpetuate.

The misunderstanding is that the National Aerospace Plane is an Air Force program. While it is true that the NASP Joint Program Office is a two-letter organization under Hq. AFSC, our charter is very much a joint one. The NASP is a national effort.

A brief review of the structure of the Joint Program Office (JPO) will illustrate this point. The JPO has seven directorates. The leadership of these is shared among the key partners in the NASP program. For example, the Director of Propulsion Development is Air Force. The Director of Airframe Development is from NASA's Ames Research Center. The Director of Experimental Vehicle Planning is from the Navy. The list goes on. The point is that the key leadership of the NASP program is exercised by a joint national team. This same trend carries down to the working level, with program managers and engineers from the Navy, NASA, and the Air Force working side by side in the JPO.

The theme of jointness carries over into the technology maturation effort in the program. The Directorate of Base Technology (headed by a NASA director) controls more than $30 million each year in research and development of critical technologies to enable the NASP program. The actual technology development is carried out by a mix of NASA, Air Force, and Navy laboratories and contractors. In fact, one of the key technical contributors to the program is a Navy consultant.

Yet another example of the "jointness" of the program can be seen in the major test facilities that the NASP program will use. The Navy, NASA, and the Air Force all are contributing unique test facilities. As examples, Arnold Engineering Development Center at Arnold AFB, Tenn., contains several key wind tunnels that are already being booked by NASP contractors. One crucial Navy contribution is the Naval Surface Weapon Center's Tunnel 9, a hypersonic facility where NASP propulsion and airframe contractors are performing integrated testing. NASA is well represented with test facilities at Ames, Langley, and Lewis Research Centers that will support both contractors and base technology development. Again, the list here is far from exhaustive.

The key point to remember is that the NASP program is a national effort with the avowed goal of proving hypersonic flight technologies that will enable low-cost, routine access to space. Such a goal cannot be reached by a single service or agency; the effort must be joint and broad-based.

Maj. Timothy K. Roberts, USAF
Wright-Patterson AFB, Ohio

• *Major Roberts points out correctly that the NASP program is a joint program, but we would have to disagree that the two authors he cites "misunderstand" that fact. The articles—neither of which focused on the NASP program—discussed only a select facet of the NASP program from the Air Force perspective and did not address program structure. For a fuller discussion of the NASP program, see James W. Canan's June 1986 cover story "Mastering the Transatmosphere."*—THE EDITORS

Fiber Optics

John Rhea's article on fiber optics in the March 1988 issue, "Fly by Light," was informative and interesting. I enjoyed it very much.

However, I am writing to point out some omissions in the article that our office found disturbing. In discussing past Air Force fiber optics experi-

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ence, the GLCM and GRC-206 radio were mentioned in connection with the statement that nonflight applications have been almost nonexistent. However, the Sacramento Air Logistics Center's Fiber Optic Technology Center built and flight-tested a prototype fiber optic chaff dispenser for the A-10 to prove that increased reliability and improved maintainability could be gained with the use of fiber optics. Although the system was never implemented into the inventory because of budget constraints, it was a well-conducted demonstration of the capabilities of fiber optics in aircraft.

In addition to this project, experiments and studies are currently being conducted to address the added benefits that fiber optics could bring to Air Force communications and aircraft systems. These projects encompass the whole spectrum of fiber optic technology, from transmitters and receivers to all-optical sensors.

One example of the ongoing projects is the replacement of an electronic intercom system in a surface-to-air simulator, the AN/MPS T-1, which has passed laboratory testing with flying colors. In the next few months, this fiber optic prototype will undergo field testing. Studies are being conducted to assess the feasibility of installing a local area network at Cheyenne Mountain and to identify electrical and mechanical sensors on various aircraft that could be replaced by fiber optics.

One last note: In the last section of "Fly by Light," the disadvantages of fiber optics are discussed. For instance, the strength of optical fiber is mentioned.

In our laboratory, we regularly demonstrate the strength of optical fiber. Two good-sized men—one on each end of a two-foot length of commercially available fiber—tug, put knots in, and hammer the fiber. Even with that abuse, the fiber keeps on working. Also, new connectors have recently come on the market that are compact and that have losses as low as 0.2 dB.

As to the argument that fiber optics requires specialized training for repair and maintenance, has anyone visited a repair shop lately? The skill level required to repair most electronics these days is pretty high. Although special tools are needed for fiber optics repair, our laboratory demonstrated that a repair kit for fiber optics could be assembled that weighs less than five pounds and contains twenty items, with no single item costing more than $150.

In conclusion, I'd just like to say that fiber optics is well and alive in the Air Force today. With technological difficulties being overcome on a monthly basis, the advantages of fiber optics will soon overwhelm the out-of-date and more unreliable electronics options available today.

Capt. Lorina Poland, USAF
Fiber Optics Technology Center
Sacramento, Calif.

• *While we thank Captain Poland for the commentary on fiber optics, we find some disturbing omissions in the Captain's discussion of the article "Fly by Light." For instance, the article did report that "most of [USAF's] experience with fiber optics has been in nonflight applications." That said, the article cited both the DIGITAC A-7D and the YC-14 STOL transport as examples of developmental fiber optic use in flight applications. In another instance, the article cited the Langley Research Center report, which discussed tensile strength of optical fibers. However, the article went on to point out that increasingly tough optical fibers are now coming on the market. Similarly, while the Langley report cited training as a problem, the article goes on to quote the report's authors as saying that "the training required for repair and maintenance is temporal, and the special tools will become commonplace."*

We agree heartily with Captain Poland's conclusion that fiber optics is well and alive in the Air Force today. While the article was not meant to exhaust the subject completely, that basic conclusion was indeed the unmistakable—or so we thought—message of the article.—THE EDITORS

Kremlin Shuffle?

Harriet Fast Scott rightly observes that Lev Zaykov is among the six most powerful figures in the Kremlin today *(see "The Politburo," March '86 issue, p. 54).*

She adds that "Zaykov will probably be giving up his post in the Secretariat as a result of his assumption of the new duties" as Moscow Party Secretary, replacing Boris Yeltsin. However, Zaykov—as of mid-March this year—continues to be described in official Soviet media as holding all three posts. This gives this official, who also oversees the defense industry, enormous power.

But the combining of these posts is not unprecedented in Soviet history. Nor does it seem likely that Zaykov might be a pro tem troubleshooter in

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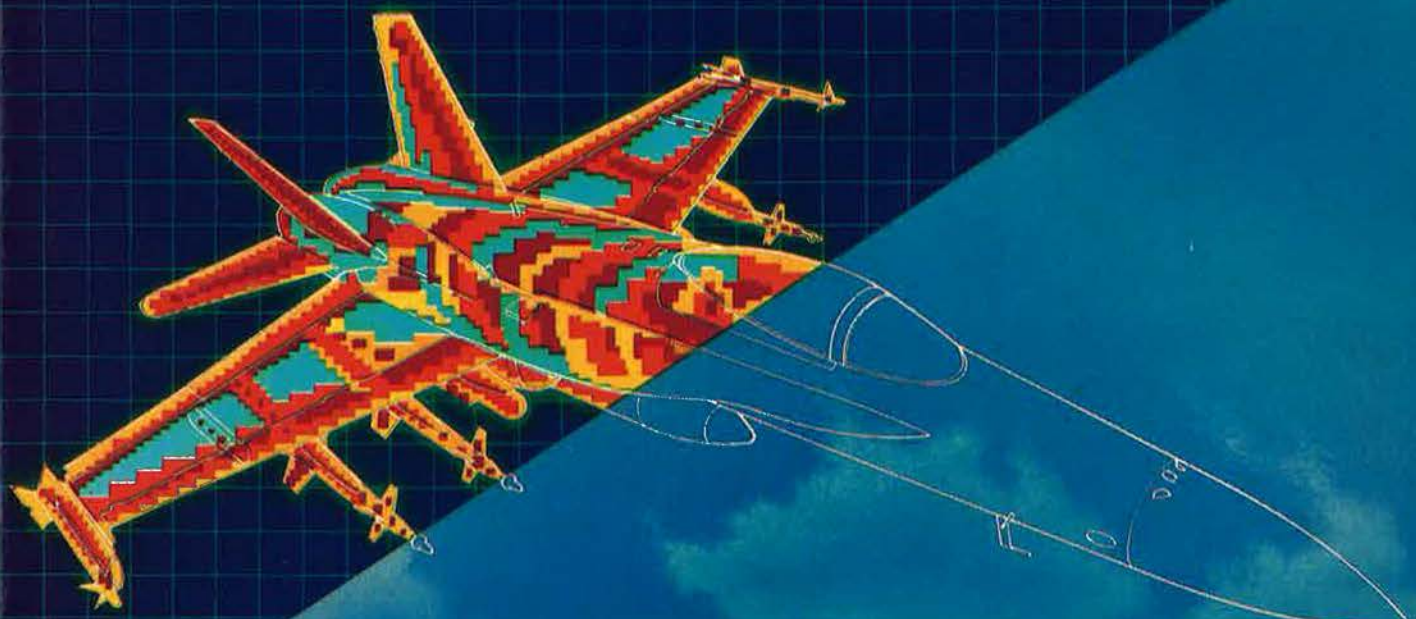

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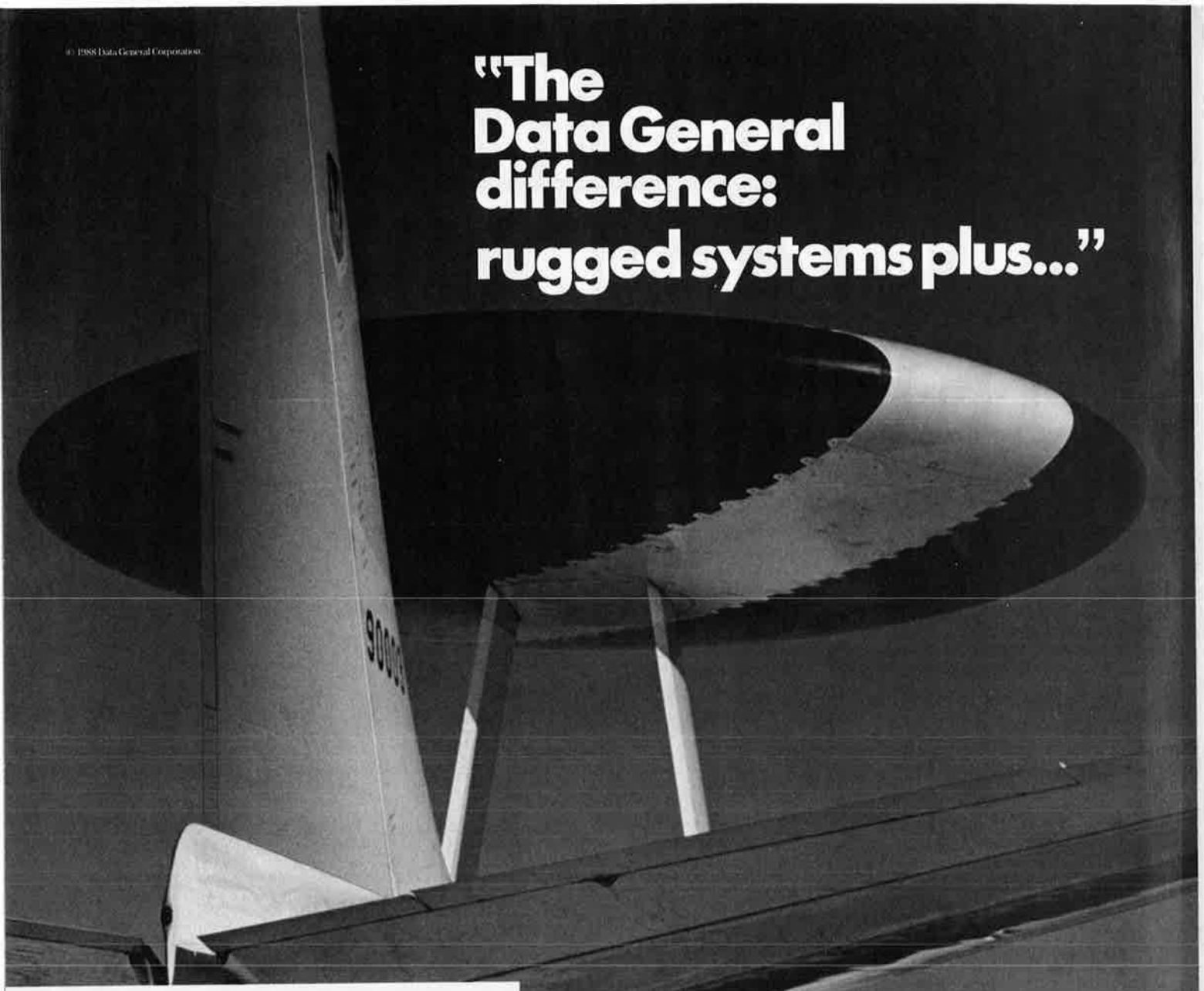

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the Moscow Party apparatus until a long-term replacement for Yeltsin is agreed on. It seems to me unlikely that Zaykov would forfeit his position within the Secretariat.

Albert L. Weeks
New York, N. Y.

Only the Best

The article "A Real Hero" in the March 1988 issue caught my eye during my regular page-by-page reading.

With all the well-deserved credits and honors bestowed on Jimmy Stewart over the years, I was privileged as a young man to have been present at a one-man tribute to him back in 1944 that to me tops all the others.

During a fighter escort mission for B-17s of Eighth Air Force, with the target fairly deep in Germany, our 474th Fighter Group of Ninth Air Force became separated and widely scattered on the way home to England because of horrendous weather conditions. Flying alone and by dint of the old time-distance-heading navigating procedure, I finally found myself over a break in the solid overcast. Through the break, I spotted an airfield.

With fuel tanks nearly empty, I dived through the hole, made one circle of the field, and landed, not knowing or caring which B-17 base I had luckily stumbled on. I taxied over to what was obviously the service area, parked near a fuel truck, and cut the engines.

Within minutes, a fairly large group of line guys surrounded me and my P-38 fighter to get a close-up look at one of their "Little Friends." A sergeant walked up to me and said, "Lieutenant, do you realize that you have landed on Col. Jimmy Stewart's field?" I answered that I did not and asked, "By the way, what sort of CO is Colonel Stewart?"

The sergeant looked me in the eye and replied, "Only the best goddamn CO in the Eighth Air Force, sir!"

I have never forgotten that. I happen to think that if General Stewart could hear the story, he just might appreciate it as much as I did more than forty years ago.

William E. Chickering, Jr.
Birmingham, Mich.

General Castle

I found your March 1988 issue interesting, as always. But one thing made me question my math in John L. Frisbee's article on Brig. Gen. Frederick W. Castle, "The Quiet Hero" *(March '88 issue, p. 107).*

The article states: "In April 1944, Castle was given command of the 4th Bombardment Wing. Ten months later he was promoted to brigadier general." Ten months later would have been in February 1945. However, General Castle was killed in action on December 24, 1944, and he was a brigadier general at the time of his death.

When was Castle promoted?

CMSgt. Robert D. Brown, USAF (Ret.)
Oak Harbor, Wash.

• *According to the* U.S. Air Force Biographical Dictionary, *Frederick Castle was promoted to brigadier general in November 1944. We regret the error.*—THE EDITORS

200-Mile Error

I call attention to a 200-mile error in the news item reported in "Aerospace World" on page 32 of the March 1988 issue.

Test Cell 4 is located at the triser-

Airmail

vice High-Energy Laser System Test Facility (HELSTF) at White Sands Missile Range, not in Albuquerque. The December 2 ceremony was a ribbon-cutting ceremony to celebrate completion of Test Cell 4 modification. EMRLD is being installed, but is not "open for business" yet.

Col. Leonard R. Sugerman, USAF (Ret.)
Las Cruces, N. M.

• *Colonel Sugerman is correct in pointing out that Test Cell 4 is located at the White Sands Missile Range, not at Kirtland AFB, N. M., as reported erroneously in the March 1988 issue. However, the item did not report that EMRLD is "open for business." The item reported correctly that Test Cell 4 had been opened for business on December 2 for installation of the initial hardware for EMRLD.*—THE EDITORS

The Trouble With SLBMs

The article "The Case for Mobile ICBMs" by Barry R. Schneider in the February 1988 issue points out some of the deficiencies of SLBMs. Launch of any MIRVed missile, including the D5, means that several targets must be available at once and that the locations of the targets must fall within the footprint of the missile. However, he failed to mention another significant shortcoming.

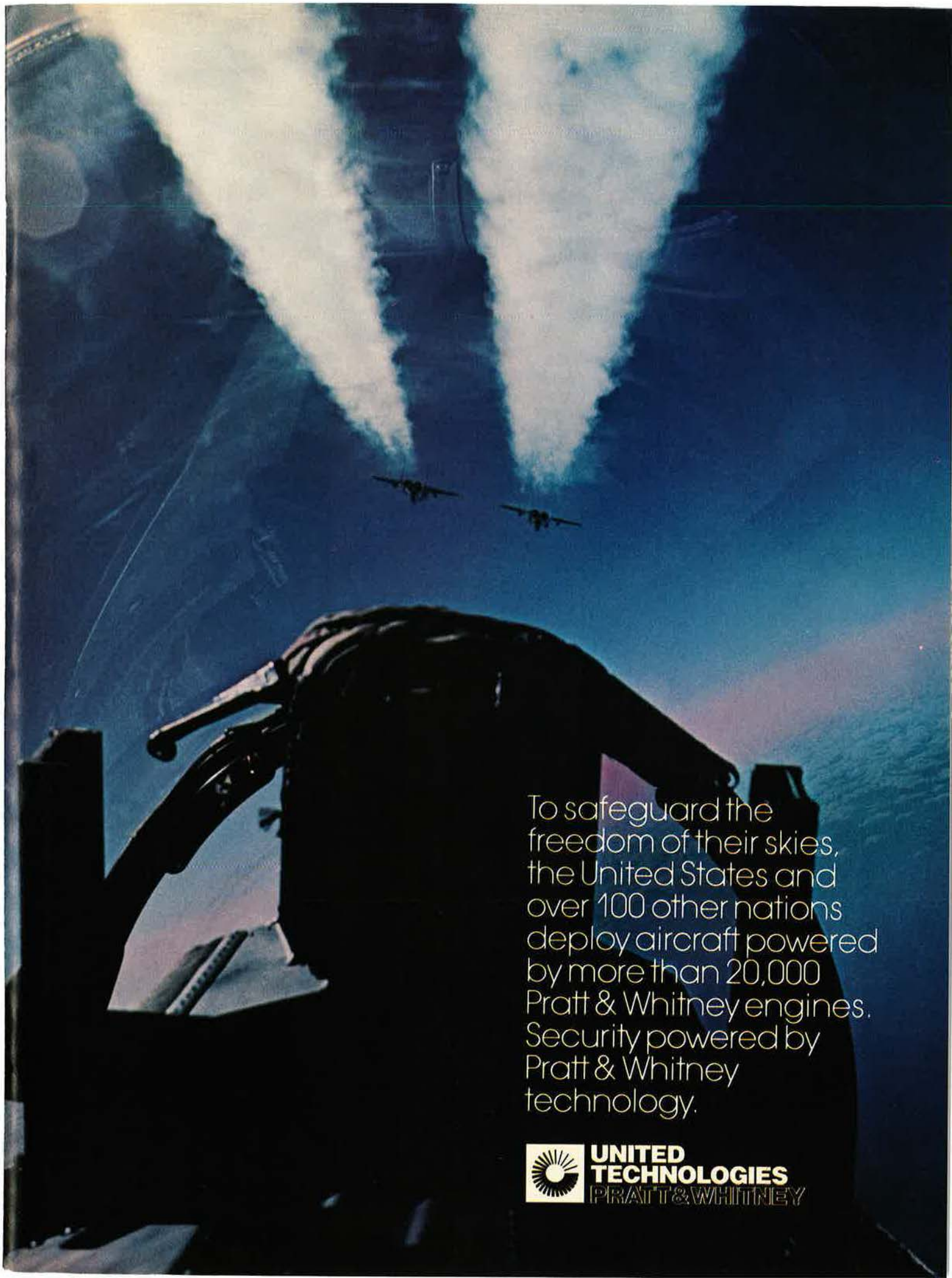
When a Trident submarine launches its SLBMs, it reveals its location to the enemy. Only if it launches its full complement of missiles at once does it cease to be a worthwhile target. So long as it has any missiles left, it is a soft and lucrative target, whose location is then known to the enemy. Thus, a Trident submarine must have seventy-two targets available before it can launch any of its missiles. In this regard, it is even worse than a MIRVed mobile missile.

For warfighting purposes, it is crucial that we have single-warhead missiles, which not only are mobile but move independently of one another. Then it becomes possible to attack individual targets without revealing the location of the rest of our missile force.

Col. Joseph P. Martino, USAF (Ret.)
Sidney, Ohio

The Doumer Bridge

Please allow me to add a short anecdote to the excellent "Valor" article, "A Place Called the Doumer Bridge," on the August 1967 strike against the Doumer Bridge in North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Vietnam *(February '88 issue, p. 100).*

Col. Bob White was a valiant warrior. He was also fiercely competitive. He was intent on destroying the long bridge to Hanoi before Col. Robin Olds, the famed MiG killer, arrived with his gang. So White led the first flight of Thuds, armed with CBUs for flak suppression. He carefully manned the four bomb flights that were to follow with sixteen of the sharpest shooters in the wing available for duty.

As leader of the last bomb flight, Scotch Flight, I had a balcony view of the strike as it unfolded below me. White sowed CBUs to keep their heads down momentarily while the bomb flights went to work. Flights 1 and 2 sowed devastation, sending trucks, cable, and steel flying, but none actually scored solid-enough hits to drop the bridge until the fourth man of the third bomb flight drew a bead on the center span.

That man was Capt. John Piowaty, a seasoned combat jock who seemed to stay cool under any barrage of SAMs, MiGs, and AAA. Fascinated, I watched the huge bridge shudder and crumble when Piowaty placed his two 3,000-pounders on the center span. Almost casually he jinked left and called, "Four's off!"

Captain Piowaty's good luck suddenly turned bad, however. His aircraft was struck by AAA forward of the left elevator and burst into roaring flame. Piowaty reported that he was hit and streaked westward for the mountains, where rescue might be possible, as the fire ate away large chunks of the fuselage and elevator.

As I raced to join him, the hydraulic fluid that was fueling the fire depleted, and the fire went out. Coolly, Piowaty flew the wounded bird all the way back to Udorn, where he safely made a no-flap, no-brake landing.

Colonel White chose his strike force well. Valor was indeed a place called the Doumer Bridge.

Col. Elmo C. Baker, USAF (Ret.)
Weatherford, Tex.

Close Air Support

As a former fighter pilot, I have followed the varying fortunes of close air support (CAS) for more than thirty years *(see "More Flak in the AirLand Battle," February '88 issue, p. 76).*

Before the advent of SAMs—and more specifically, before the appearance of shoulder-fired missiles—the use of manned aircraft along the FEBA and for battlefield interdiction made sense. Beginning with Vietnam, the picture began to change. Today, it seems to make little sense to send a $40 million aircraft into an extremely lethal environment to destroy a tank or two. There may be times when the employment of an expensive, limited resource (aircraft and pilot) would be worth the risk, but not as CAS has been employed in the past (ask the Israelis).

The use of RPVs and new-generation standoff weapons would seem to be a logical approach to filling the mission requirement. They are less costly to expend in a hostile environment where the target attacked would be a better tradeoff should a loss result from the action.

In "Washington Watch" in the same issue, the reason stated for having B-2 bombers seemed rather ludicrous: "To chase down relocatable targets, such as mobile ICBMs." After a nuclear exchange? You can't be serious.

Col. Peter Boyes, USAF (Ret.)
Sacramento, Calif.

Milton Caniff

As a charter and Life Member of AFA and a former AFA National Director, I had the honor of representing AFA (as well as the 1st Air Commandos Association) at Milton Caniff's funeral on April 6. Airmen of McGuire AFB, N. J., provided the Honor Guard, and Brig. Gen. John F. Sievertson of McGuire AFB delivered a eulogy. At the interment at Grove Cemetery in Haverstraw, N. Y., Col. Alan Shoemaker spoke on behalf of the Secretary of the Air Force.

Readers will be interested to know that Milton was an honorary member of USAF. He was the *only* honorary member of the 1st Air Commandos and a founding member of AFA's Iron Gate Chapter and through the years helped raise millions for USAF and AFA charitable undertakings.

We will all greatly miss him.

Dr. Cortez F. Enloe, Jr.
Annapolis, Md.

• *AFA was also represented at Milton Caniff's funeral by AFA National President Sam Keith and, from the national headquarters staff, Dottie Flanagan. Our tribute to Milton Caniff appears on p. 35 of this issue.*—THE EDITORS

Dick Bong

I am a sister of the late Maj. Richard I. Bong, America's "ace of aces." After Dick broke Capt. Eddie Rickenbacker's World War I record of twenty-six victories in April 1944, he was sent back to the States and appeared at various air bases around the country on a bond tour.

During this tour, his leather flight jacket was taken from the cockpit of the P-38 he was using. This jacket had the "Flying Knights" patch on the left front. As I recall, he said that it disappeared while he was at Lockheed Aircraft in California.

The Bong family would like to locate this jacket. If located, it would be placed in the Richard I. Bong Museum in his hometown of Poplar, Wis., along with other memorabilia.

Anyone who has any information about this jacket is asked to contact the address below.

Joyce Bong Erickson
Box 326
Poplar, Wis. 54864-0326

92d MMS

The 92d Munitions Maintenance Squadron is researching its history. The squadron plans to create a "Heritage Room" in our new squadron headquarters building. This room will contain a photographic display of the squadron's past, along with a bound copy of the squadron's history.

We would like to hear from any former members of the 92d MMS (formerly designated 26th Aviation Depot Squadron and 26th Munitions Maintenance Squadron) who can help us trace the history of our squadron. We would appreciate the use of any photos of maintenance activities or personnel. We will make prints and return all photos.

Please contact the address below.

1st Lt. Karen M. Myers, USAF
92d MMS
Fairchild AFB, Wash.
99011-5000

Atlantic Ferry Command

I am working on a book concerning the early years of World War II and especially the role of the Atlantic Ferry Command.

US law before US entry into the war prohibited delivery of US warplanes to any foreign country, including Great Britain, which was then facing the Axis alone. One of the subterfuges used by President Roosevelt to get around this ban was to have American pilots deliver fighters and bombers to the US side of the Canada-US border. Canadian or British pilots would then pull them across the border, using tractors, cars, and even horses and manpower, and fly them from Canada to Britain. This was in the period from mid-1940 to the end of 1942.

I am looking for photo negatives of these operations that are suitable for reproduction. Any readers knowing where I might locate such negatives are asked to contact me at the address below.

Bren Walsh
1006 Gold Crescent
Ottawa, Ontario
Canada K2B 8C5

Tet Offensive

I am an author and military historian who is presently collecting detailed, firsthand accounts of military actions associated with the 1968 Tet Offensive. These accounts will be used for a book on this subject.

Anyone who was in Vietnam between January 29, 1968, and April 1, 1968, and who has an account to offer is asked to contact me at the address below.

Eric Hammel
1149 Grand Teton Dr.
Pacifica, Calif. 94044

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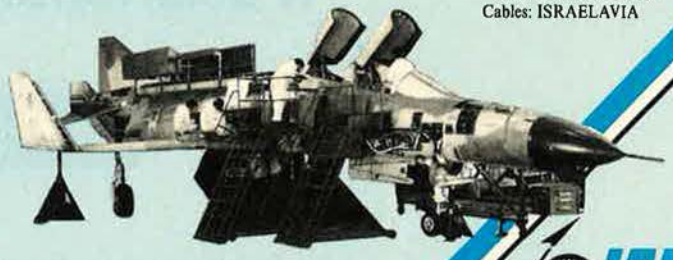

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Roll Call

I am trying to locate Palmer A. Nelson, who was last known to be a commissioned pilot stationed at Kirtland AAF, N. M., in 1942. Mr. Nelson was a graduate of the Billings, Mont., school system and an employee of Boeing prior to entering service in 1942.

Anyone knowing his whereabouts is asked to contact me at the address below.

Virgil Morgan
3225 Cedar St.
Everett, Wash. 98201
Phone: (206) 252-3163

I am preparing a history of Seventh Air Force fighter units in World War II and would like to locate Capt. Douglas V. Currey, Class 42-G, who was with the 333d Fighter Squadron, 318th Fighter Group, on Ie Shima on V-J Day 1945. He may have shot down the last Japanese aircraft of WW II.

Any information regarding the status or whereabouts of Douglas Currey should be sent to me at the address below.

John W. Lambert
1051 Marie Ave., W.
Mendota Heights, Minn. 55118
Phone: (612) 454-0607

I am trying to locate Warren van Denplas. I served with him in 1943–44 in such places as Atlantic City, Kingman, Amarillo, Pyote, and Langley, among others.

Van was from Schenectady, N. Y. I lost contact with him in 1944.

Herbert Shanker
57 Hacking Circle
Mashpee, Mass. 02649

I would like to hear from any members of B-17 crews who trained with the Shower Provisional Group at Dyersburg, Tenn., during the summer of 1943.

Of forty-two crews, thirty were shipped to England by boat and saw heated action in the fall. I flew with twelve crews in new aircraft from Grand Island to Africa via Gander, Belfast, and St. Mawgans.

Any information would be appreciated.

Col. Albert J. Shower, USAF (Ret.)
11197 McGirk Ave.
El Monte, Calif. 91731

I am trying to contact Ernest V. Rountree of Jacksonville, Tex. We were POWs together in Stalag Luft I, Barth, Germany, during 1944–45.

Any information or help will be appreciated.

Lt. Col. Albert O. Rondel, USAF (Ret.)
2006 212th Pl., N. E.
Redmond, Wash. 98053

I am trying to locate Capt. William R. Purcell, USAFR. We were stationed together at 4th Fighter Group, Kimpo, South Korea, in 1952. We operated the base exchange.

Anyone knowing his whereabouts is asked to contact me at the address below.

Ray Prozinski
6537 Golden Valley Rd.
#101
Golden Valley, Minn. 55427
Phone: (612) 544-7351

I have for a considerable time endeavored via numerous sources to locate one presumed retired USAF officer, Capt. John F. Daley. Captain Daley served on exchange in 1957 with the RAF's 111(F) Squadron here at former RAF North Weald.

Please contact me at the address below.

Reg Wyness
Treble-One House
Pike Way, North Weald
Epping CM16 6BL
United Kingdom

I am trying to locate men who were in the 485th Bomb Group at Venosa, Italy, in 1944–45. This group included the 828th, 829th, 830th, and 831st Bomb Squadrons.

Please contact me at the address or telephone number below.

Robert S. Deeds
4643 286th St.
Toledo, Ohio 43611
Phone: (419) 726-0650

I would like to hear from any personnel who were stationed at Barksdale AFB, La., from 1953 to 1957 and who were attached to the 376th PMS. B-47s and KC-97s were assigned there at that time.

Dick Waldron
702 E. Miller
Payson, Ariz. 85541
Phone: (602) 474-2887

I am trying to contact Ernest C. Rapp, formerly of Pittsburgh, Pa., whose father was lost in combat over Gelsenkirchen, Germany, on August 26, 1944.

Leon Croulebois
41, Rue Brancion
75015 Paris
France

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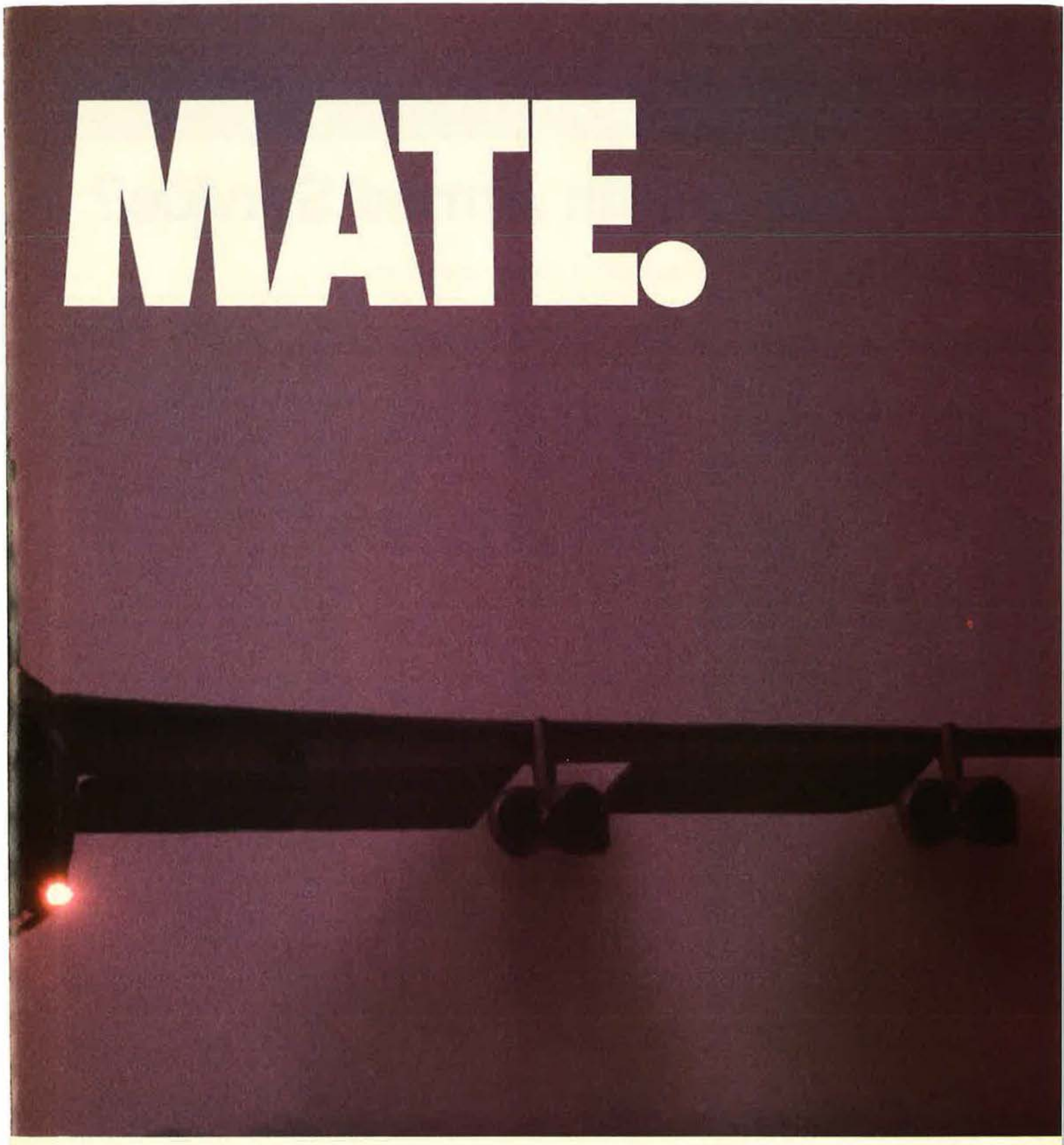

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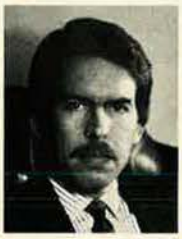
THE SENSIBLE SOLUTION

Toward a Fifth Armed Service?

By Robert S. Dudney, SENIOR EDITOR

General Lindsay says he opposes a separate service for Special Ops, but acknowledges that there are pressures to make it happen. Watch the control of budgets and manpower.



Washington, D. C. Barely one year after it launched a new "special operations" command, the nation's defense establishment may be coming face to face with a daunting question. Should Washington pursue a kind of fifth military service—prepared to fight small, brushfire wars—in addition to the four it maintains for air, land, sea, and amphibious combat?

The Pentagon has long suffered criticism that American forays into the world of special operations have been a disaster. This, it is said, made necessary the creation of the unified US Special Operations Command (USSOCOM) in April 1987 at MacDill AFB, Fla.

Proponents insist that the new command is designed mainly to coordinate the services' efforts. But whatever the original intention, some experts believe that the unit might turn out to be a first step toward the development of a separate agency.

They note that USSOCOM has already accumulated unique power over budgets for Special Operations Forces (SOF). Plans call for it to exert even greater control over SOF personnel, programs, and doctrine. The question of the hour is how far this trend can go before the new command becomes—in fact, if not in name—a separate entity.

The man at the center of this controversy is Army Gen. James J. Lindsay, USSOCOM Commander in Chief. In remarks to Washington defense writers recently, he made clear that there will be no backdoor creation of a new service on his watch. He opposes the idea. Even so, he concedes such pressures exist. "If you look at the legislation," says he, "you can see clearly a number of things that smack of my being a separate agency. There are still a number of people who have a deep and abiding interest in SOF who think I ought to be."

The overall aim is to build military tools capable of intervening in local wars, beefing up friendly forces, carrying out antiterrorist actions, or striking behind Warsaw Pact lines in a major war. Already, SOF units have bounced back from post-Vietnam days, when their funding was cut ninety-five percent and many of the SOF units were disbanded. Since 1981, the $9 billion that the Pentagon has spent on SOF has created a new Army Special Forces Group, a Ranger battalion, more SEAL strength, and additions to the Air Force SOF. Manpower, now 38,000 active and reserve, will soon rise to 41,000.

The truly major innovation, however, was creation of the 318-man command itself—but not, as is widely believed, because it will run wars. "People think of this as being a warfighting headquarters," says General Lindsay.

"I'll tell you up front, I'm not. I'm a provider. I package, prepare, and provide forces" for others.

A "small, surgical operation," General Lindsay states, could be run by the Pentagon. In a big operation, control would pass to a commander in Europe, the Mideast, Latin America, the Atlantic, or the Pacific. He would not press to run it.

The General is not shy, however, when it comes to the vital issue of acquiring resources for SOF. This is his "primary role." Upon taking command, he says, he determined that "my focus was going to be on making sure that we built a good, solid foundation" for SOF.

It is here, he claims, "the logic behind [the development of] a fifth service makes sense." How? "Very frankly," the General asserts, "if you look at the focus of the services, it tends to be on their prime mission, the conventional battle."

Now, the situation is being altered in ways that raise questions about where the command may go.

The Pentagon has created a new "Major Force Program"—its eleventh—pulling together all SOF programs that are presently executed by the services. USSOCOM is empowered to peer over the shoulders of the services and protect this program. Backing this up is a directive from the Defense Secretary's office that strips the services of authority to tamper with the money in this category.

The strength of this order was shown last December at a time of frantic budget-cutting by the services. Learning that SOF items had been cut thirty-three percent, General Lindsay went to Defense Secretary Frank Carlucci. "I laid out the program," he says. "I got everything back."

In the future, General Lindsay hopes to strengthen his hand by gaining the power to develop a SOF "Program Objective Memorandum," or long-term force plan. The POM, now restricted to the services, is a bureaucratic tool of high order.

As General Lindsay tells it, the question is not whether but only when he will receive his own POM. He has already informed the Pentagon that he will begin building an SOF budget document this October.

USSOCOM appears to be getting a grip on service SOF manpower, too. A prime case in point: the Navy's SEAL commandos.

When USSOCOM came into existence, the Navy successfully held on to the SEALs, keeping them in the embrace of the Atlantic and Pacific Fleets. General Lindsay, appealing to Pentagon civilians, won out. These forces came under operational control of USSOCOM on March 1.

General Lindsay says Secretary Carlucci has told the Navy fleets to give up important "administrative control" of the SEALs—that is, to give up authority over pay, discipline, and internal organization. Control would then be exercised by the US

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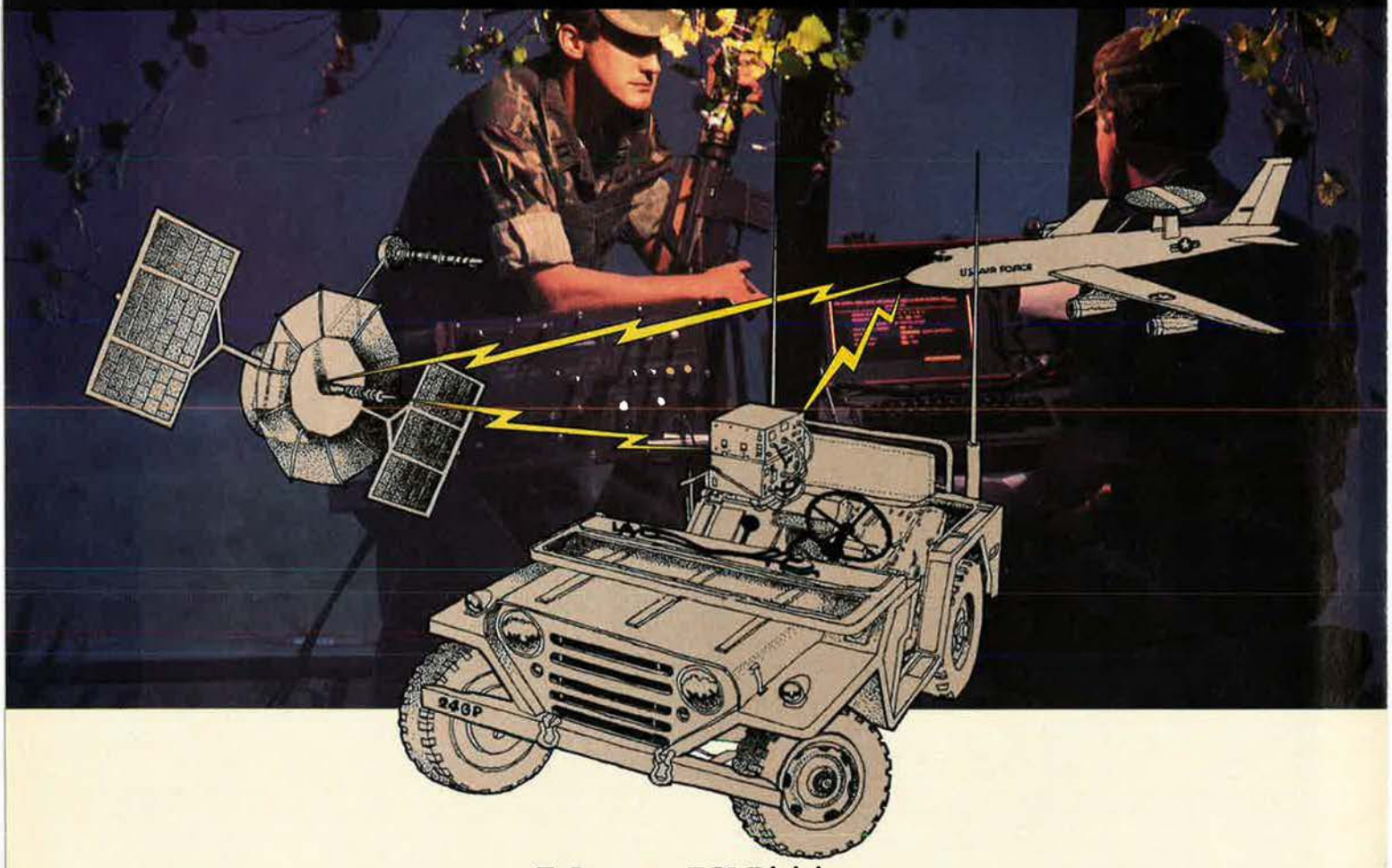

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The science of systems.

Navy component under USSOCOM.

Backed by legislative authority, General Lindsay is pressing to impose order on the services' development of SOF doctrine. His aim is to produce, by the end of this year, a new joint manual for special operations. This would establish a "framework" for further development of common tactics.

The goal, he explains, is "to make sure everybody thinks alike and works off the same sheet of music" in special operations techniques.

What's more, plans call for integration, to the extent possible, of Army, Navy, and Air Force SOF schools in a Joint Special Operations Integration Center. "Some people get very antsy when I talk about that," says the General. "But that is my ultimate goal."

Air Force Programs

For the Air Force more than the other services, the emphasis on revitalization of special operations forces carries important hardware implications. Air Force SOFs, centered at Twenty-third Air Force at Hurlburt Field, Fla., provide means of clandestine infiltration and some fire support to Army and Navy teams. Current Air Force plans are outlined in its 121-page "Air Force Acquisition Statement" issued as part of the service's 1989 budget submission.

Four SOF programs are singled out for special attention.

- *CV-22A Osprey aircraft.* This tilt-rotor craft, able to hover like a helicopter and cruise like a fixed-wing plane, is described as the "linchpin" of USAF special operations in the future. Designed for clandestine insertion and extraction of secret forces, the Osprey is currently in development, looking toward a first flight in June.

Initial operating capability of six aircraft is set for 1995. The Air Force plans to buy a total of fifty-five.

- *MC-130H aircraft.* Known as the "Combat Talon II," this aircraft also would perform long-range SOF transport missions. It has an aerial refueling system, a high-speed, low-level cargo-delivery system, and special lighting equipment. Also included are avionics for terrain-following, precision navigation, secure communications, and electronic warfare.

The Air Force says its plans call for buying twenty-four new Combat Talons. The budget includes a healthy $209.5 million for four in 1989.

- *AC-130U gunship.* This aircraft also fared well in the 1989 budget wars, with $288.3 million being allocated for six gunships. A C-130H platform armed with a 105-mm howitzer and other guns, the AC-130U is being developed to provide fire support, such as interdiction of enemy communication sites and destruction of antiaircraft positions. Deliveries are to begin in 1992.

There had been some contention over how many to buy. The Air Force announced that it would procure seven. General Lindsay, for his part, claimed he needed twelve to replace twelve aging AC-130A models.

- *MH-53J helicopter.* This helicopter, a highly modified version of the CH-53 craft, is known as the "Pave Low III, enhanced." A long-range, heavy-lift craft, it will sport integrated digital avionics for secret "black" flights into heavily defended areas. Twenty-third Air Force today possesses eight of the upgraded helicopters. Plans call for a total force of forty-one by the early 1990s.

The Air Force SOF program should be kept in perspective. Throughout the entire 1990–94 period, the Air Force and other services combined will spend a total of only $5 billion for new SOF airplanes and upgrades—less than the outlay that will be made this year alone for F-15s and F-16s and the Advanced Tactical Fighter.

The USAF S&T Effort

Of far greater significance, in the larger scheme of things, is what the Air Force plans to emphasize in the field of basic science and technology in the years ahead. The Air Force S&T effort encompasses fourteen laboratories backed by a $1.4 billion annual budget.

The acquisition report cites a dozen of the Air Force's highest-priority research efforts for the future. A look at some of them:

- Battle information management work shows promise of giving the remote commander of the future an instantaneous, three-dimensional view of an entire region and the ability to communicate with forces via voice controls and touch. Making such a revolution seem possible are advances in display technologies, sensor integration, processing, and development of computer-driven "artificial intelligence."
- Integrated photonics is being pursued vigorously to accelerate the arrival of military systems that make use of optical equipment as opposed to conventional electronics. One big payoff, in the words of the report: "Optics are invulnerable to electromagnetic interference and electromagnetic pulse, which promises to invalidate electronic warfare as we know it today."
- High-performance turbine engines are expected to make use of advanced materials and better designs, among other things, to provide powerplants with twice the thrust of today's engines with no additional weight. With such engines, "Mach 4-plus aircraft will be practical," and radically new global transport aircraft will become possible.
- Supercockpit development, expected to be employed in the Advanced Tactical Fighter, aims to improve drastically the pilot's awareness of his surroundings and to decrease his work load. What seems possible in the near term is a full head-up display with a head-aimed fire-control system. For the future: voice controls and advanced help from artificial intelligence systems.

Third-World Naval Threat

Special Operations Forces are not the only ones concerned about the prospect of having to grapple with small, "low-intensity" conflicts. The US Navy's latest worldwide threat assessment contends that the main combat fleets are now up against mounting dangers from smaller powers.

The potential for conflict with heavily armed forces in the Persian Gulf and other Third-World areas figures prominently in the seventy-page intelligence report. Prepared by Rear Adm. William O. Studeman, Director of Naval Intelligence, the assessment paints a bleak picture of "significant threats" that US warships are starting to face.

What has caused the problem, in Admiral Studeman's view, is an explosion of arms sales to Third-World nations in recent years. Says he: "[The presence of] increasingly sophisticated arms has become commonplace in virtually all regions of the globe, making the Navy's role of protecting US interests worldwide more dangerous and complex."

In a sharp departure from earlier times, current and potential Third-World enemies at sea can threaten US warships with modern submarines, advanced missiles, and high-performance aircraft.

In the Third World, he points out, the magnitude of the threat is underscored by the fact that there are:

- Forty-eight nations fielding antiship cruise missiles.
- Nineteen countries with diesel attack submarines.

• Twenty-one powers with naval mining capabilities.

That is not all. A big worry for the future, in the Navy's view, is the proliferation of chemical weapon capabilities. Admiral Studeman claims that ten countries possess chemical warfare arsenals. What's more, five Asian nations—China, Taiwan, North Korea, Vietnam, and Burma—are fast developing such capabilities. Iran is also a conspicuous contender for such weaponry.

What will be the impact of the spread of armaments? The most obvious danger is that an American warship will fall prey to the lucky shot from a Third-World adversary. With US task forces operating in confined waters, amid highly ambiguous threats and under restrictive peacetime rules of engagement, this danger remains ever present.

Other complications, however, seem to be of equal or even greater significance. One is the extent to which Third-World nations will be able to put stress, on a long-term basis, on the force structure of even a greatly expanded 600-ship, fifteen-carrier US Navy.

The problem is summed up this way by Admiral Studeman: "Greater numbers of more sophisticated submarines will tax our [antisubmarine-warfare] capability to distinguish friend from foe and increase the geographic areas in which our ASW forces may be required to operate. Expansion and improvements in [Third-World] air systems will further complicate US at-sea air defense."

The most dangerous potential adversaries, in the view of the Navy, are Libya and Iran. The Naval intelligence document claims that Tripoli's forces—armed with modern surface-to-surface missiles, hundreds of jet fighters, long-range surface-to-air missiles, and a large inventory of sea mines—pose "a considerable and increasing threat" to Navy warships operating in the Mediterranean. For its part, Iran can brandish its Chinese-made Silkworm antiship missiles and may be getting China's F-7 aircraft and Soviet-made Styx surface-to-surface missiles.

The Navy report points up a heavy irony. Even as the indigenous naval threat in the Third World grows, Soviet naval operations in these waters appear to be stagnant or even receding. This runs counter to earlier predictions that the Red Navy was bent on expanding its power-projection capability for intervention in world trouble spots.

The new Navy assessment is unequivocal on this score: "Soviet forces abroad, such as those at Cam Ranh Bay, Vietnam, or in Ethiopia, South Yemen, Cuba, or the South Atlantic, are still too few and too weak to enable the Soviets to engage in any significant power projection, particularly over a prolonged period."

What's more, Russian naval deployments overseas in 1987 declined by six percent compared to 1986, the third year in a row that this has occurred. The Soviet fleet in 1987 continued to conduct virtually all its major exercises in waters close to the Soviet mainland—a sharp departure from more aggressive maneuvers in years gone by. Moscow also appears to be deploying its fleet for home-water defense.

Why is this happening? The Navy speculates that Soviet naval restraint reflects tight defense budgets at home, increased emphasis on close-in defense of the homeland, and concern about the need to protect its nuclear-missile-carrying strategic submarines in the Arctic.

Turmoil in Latin America

If there is any one part of the world that could be viewed as the cockpit of "low-intensity" conflict, it is Latin America.

This area is the scene not only of the sputtering conflict between Nicaragua's Sandinistas and US-backed Nicaraguan guerrillas. It seethes with sporadic warfare—in El Salvador, Guatemala, Peru—and with other civil disturbances ranging from economic conflict to feuds between the heavily armed narcotics suppliers and local governments.

These dangers are much on the mind of Army Gen. Fred F. Woerner, who as Commander in Chief of US Southern Command in Panama is in charge of 10,000 American servicemen and responsible for Washington's military interests in nineteen Latin American nations.

In a recent talk with some Washington writers, the General observed that this "southern flank" of the United States historically has been insecure. Should Washington ever be compelled to make it secure, he adds, the drain on US resources "would have very, very significant impact on our worldwide commitments."

What does General Woerner think Washington should be doing to cope with the turmoil in the region? The answer, says General Woerner, does not lie in expanding the number of US fighting forces in the region. "I don't think that it's [a need for] military forces," he observes. "I think that we're in the posture that we should be, with a symbolic force regionally and a relevant force, specifically, to the security of the Panama Canal."

The first step, the General says, should be a substantial expansion of the number of US military advisors working to increase the professionalism of friendly Latin American militaries. He would like to see the US return to the days when it maintained about 800 advisors within the region. "I thought that was a very comfortable structure," he says. "So use that figure."

Presently, the number of US advisors is minimal—a total of fifty-five, all of them deployed in El Salvador. General Woerner controls another ninety-two security assistance officers scattered across the nineteen countries in his sphere of interest.

To put those figures into context, General Woerner notes the following: In Cuba alone, the Soviet Union maintains a total of 2,800 advisors. It deploys another 150 in Peru, ostensibly a nonaligned nation. "The Soviet Union," says he, "has . . . nineteen times more on one island—Cuba—than I have in nineteen countries."

Secondly, in the General's view, Washington should devote a far larger amount of security assistance aid to Latin militaries. "I believe very strongly that the security assistance program is an incredibly viable tool for the US military to maintain a positive relationship. . . . One could look at it as the foot in the door."

The US today provides only about $128 million in grant aid to Latin America's regional military establishments—about four percent of the worldwide US total. What's more, eighty-six percent of that funding goes to only two nations—El Salvador and Honduras. The rest has to be spread around to the remaining nations.

The prognosis now for General Woerner's proposal is bleak. He concedes that there is little realistic chance for any increase in his complement of military advisors, which is a most sensitive political issue in Congress. The level of security assistance, far from going up, is now being slashed in the face of budget pressures. The result, he says, is likely to be new estrangement from Latin military officers.

"I sense that the nations know what is happening to them," says General Woerner. "The reaction has been quite negative. Quite negative." ■

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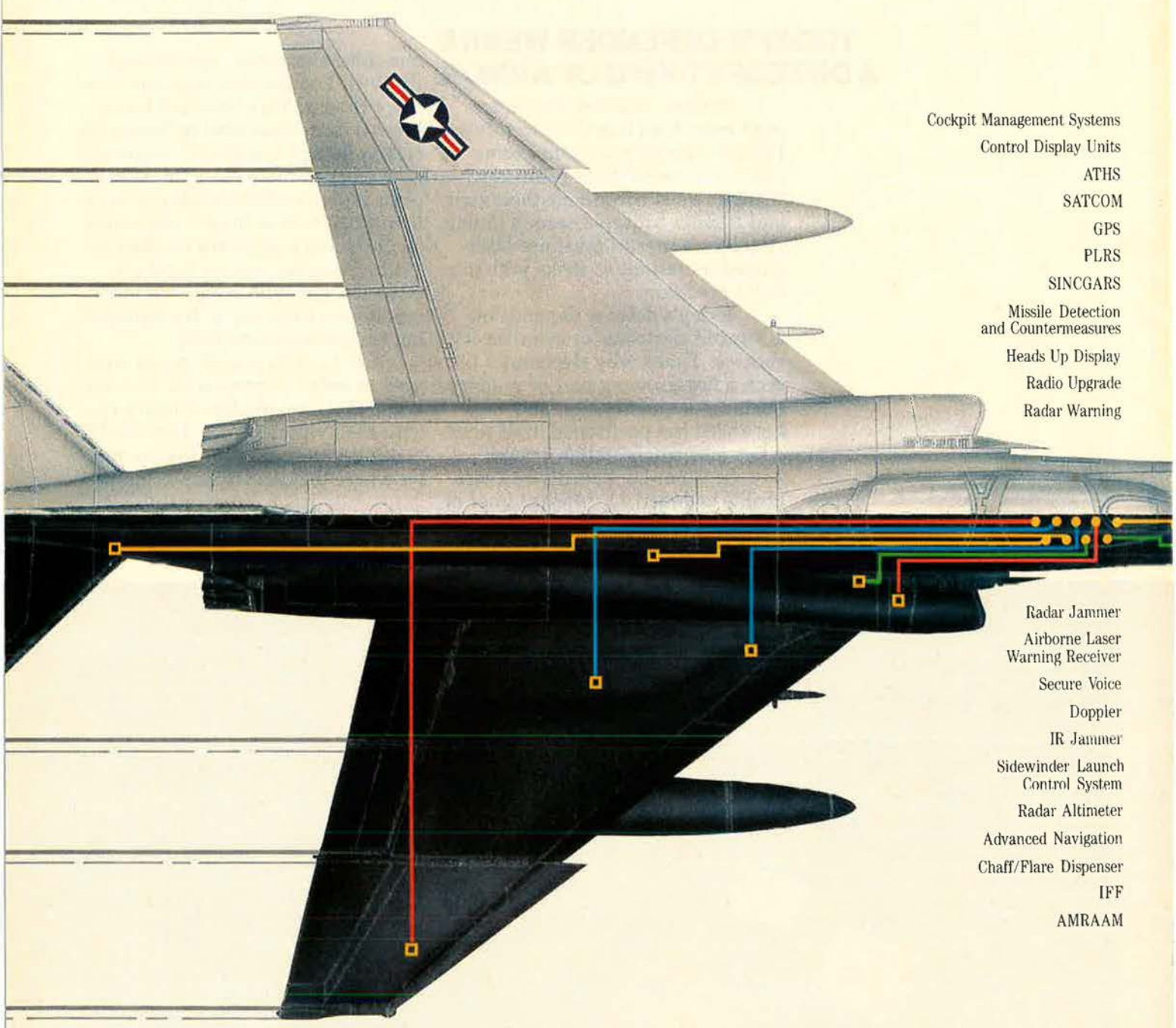

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Capitol Hill

By Brian Green, CONGRESSIONAL EDITOR

MX Hit Again

The Air Force responded strongly to a new round of criticism of the MX Peacekeeper ICBM from Chairman of the House Armed Services Committee (HASC) Rep. Les Aspin (D-Wis.).

Representative Aspin claimed that the Rail-Garrison basing mode for the MX (in which special six-car trains based on existing military reservations would each carry two missiles) "has the feel of something worked out on the back of an envelope." He argued that the public may well object to the dispersal of the missiles during times of crisis and suggested that civilian railworkers may be unreliable in crisis situations.

Air Force Chief of Staff Gen. Larry Welch responded that "the Air Force . . . experience with civilian populations near strategic nuclear forces bases gives [us] more faith in the American public's interest in deterring nuclear war than that reflected in Mr. Aspin's statement."

Representative Aspin also criticized the concurrency (between R&D and procurement) built into the program schedule. General Welch responded that "the basing mode has been subjected to a rigorous analytical and careful acquisition process" and was approved because of "its relatively low cost, low risk, high survivability, and extended endurance."

Reforms Reformed?

Two new bills reforming DoD reform legislation have been introduced. The first, introduced by Rep. Bill Nichols (D-Ala.), exempts some in the grade of O-6 from the legislated requirements for joint education and joint duty assignments prior to promotion to flag rank. These officers are so far along in their career tracks that they do not have enough time to fulfill the requirements. It also requires that the Air Force reestablish a civilian office of Assistant Secretary for Financial Management. The USAF Comptroller is now Lt. Gen. Claudius "Bud" Watts III. Representative Nichols stated a belief that the current arrangement undermines civilian control of the Air Force, a contention strongly disputed by Secretary Aldridge, among others.

The bill does not address one of the key Air Force concerns—that the joint duty and joint education requirements make officer career tracks unreasonably long. Nothing in the bill provides any relief for grades below O-6. The bill, if approved, could have the practical effect of deferring changes that the Air Force believes might be necessary.

The second, introduced by Rep. John Kasich (R-Ohio), would substantially strengthen the powers of the Under Secretary of Defense for Acquisition. The Under Secretary would have the "authority to direct" the services on all acquisition matters and would not be subject to direction by anyone in DoD except the Secretary of Defense. The Under Secretary is directed to establish within DoD "a single unified defense acquisition process. . . ."

The practical impact of this bill, if approved, would be to expand the power of the Under Secretary and reduce the power and influence of the services and their acquisition chiefs.

INF Interpretation Issue

The Senate Foreign Relations Committee (SFRC) has approved the Intermediate-range Nuclear Forces (INF) Treaty, but a fight in the full Senate is expected over a key proviso attached to the resolution of ratification. The Treaty bans US and Soviet nuclear missile forces with a range of from 500 to 5,500 kilometers.

The amendment, introduced by Sen. Joe Biden (D-Del.), provides that INF Treaty interpretation will be bound by Administration testimony before the Senate. Any subsequent Administration reinterpretation would require Senate or bicameral approval. The Administration opposes the amendment.

The issue stems from the belief by some on the SFRC that the Reagan Administration arbitrarily changed the interpretation of the 1972 Antiballistic Missile (ABM) Treaty accepted by earlier administrations. The Administration now believes that the Treaty permits wide latitude in development of certain types of ABM technology, a position rejected by many in the Senate.

Spares: Peacetime Air Force?

In testimony before the Senate Armed Services Committee, Gen. Alfred G. Hansen, Commander of Air Force Logistics Command, described a critical shortage of spares that in his judgment means "we are, in fact, a peacetime Air Force and must accept the risk to our national security that that entails." He argued that the Air Force is "ready to respond to contingency operations, [but] we may not have the staying power to sustain [operations]." War readiness spares kits that support upgraded aircraft are not funded in the FY '89 budget request because of fiscal constraints. He stated that the Air Force decision not to request funding reflected its understanding of congressional preference. Congress cut $600 million from the FY '88 Air Force spares request.

General Hansen strongly defended Air Force inventory management against accusations by the General Accounting Office (GAO, the investigative arm of Congress) that the services stockpile pipeline stocks, have too much excess material on order, and stockpile too many spares for which there is no immediate demand.

General Hansen argued that the GAO methodology was flawed. He also noted that the GAO, now attacking excess inventory, recently criticized the Air Force for discarding potentially valuable spares. General Hansen said that great progress in automation of inventory controls and physical counts should lead to extraordinary inventory accuracy.

House Approves Budget

The House of Representatives approved a budget resolution consistent with last November's so-called "budget summit" agreement. The resolution provides for $299.5 billion in budget authority for defense, the same amount that the Administration requested. ■

Aerospace World

By Jeffrey P. Rhodes, AERONAUTICS EDITOR

Washington, D. C.

★ The Navy's new fully integrated pilot training system got off to a rousing start on March 16 when the cornerstone element of the T45TS, the McDonnell Douglas/British Aerospace T-45A Goshawk, was rolled out in ceremonies at the Douglas Aircraft Co. plant in Long Beach, Calif.

Instead of parting a curtain to reveal the aircraft or towing the new aircraft to the outdoor ceremony, company pilot Fred Hamilton powered up the plane's Rolls-Royce F405-RR-400 engine and taxied the plane (Bureau Number 162787) in front of the crowd of nearly 1,000 people. Many of the technicians who built the nearly thirty-nine-foot-long and thirty-one-foot-wide Goshawk, a derivative of the successful BAe Hawk trainer, were present at the rollout.

The planned 300 production T-45A aircraft are the main part of the T45TS, which will also include thirty-two G-suit/G-seat computer generated image simulators (ten instrument flight trainers and twenty-two operational flight trainers), four mainframe computer facilities and 200 terminals for training integration (which are well along in development), and a contractor-operated Integrated Logistics System (ILS).

The first McDonnell Douglas/British Aerospace T-45A Goshawk taxied out in ceremonies at the Douglas Aircraft Co. plant in Long Beach, Calif., on March 16. The Goshawk is the aircraft portion of the Navy's T45TS integrated flight training system that will replace the T-2C/TA-4J aircraft combination now used.

FRONT COVER: Although USAF's people are the real key, the airplanes are often the stars of the show. This galaxy includes: (1) Boeing E-3A Sentry, (2) McDonnell Douglas F-4G Wild Weasel, (3) McDonnell Douglas KC-10A Extender, (4) Lockheed C-5B Galaxy, (5) Lockheed SR-71A "Blackbird," (6) Lockheed C-141B StarLifter, (7) Boeing KC-135A Stratotanker, (8) McDonnell Douglas F-15C Eagle, (9) General Dynamics F-16C Fighting Falcon, (10) Lockheed AC-130H Spectre, (11) Sikorsky HH-53B Super Jolly, (12) Fairchild A-10A Thunderbolt II, (13) Grumman EF-111A Raven, (14) LTV A-7D Corsair II, (15) Northrop T-38A Talon, (16) Rockwell B-1B, and (17) the venerable Boeing B-52H Stratofortress. The artist is Attila Hejja.

Honeywell, which is building the simulators, had the first T-45 simulator up and running at its Herndon, Va., facility several weeks prior to the aircraft rollout. Data collected during the T-45's test program will be added to the data base for the simulator to make it even more realistic.

Compared with the Navy's current T-2C/TA-4J two-aircraft system of training aviators, the T45TS is expected to require forty-two percent fewer aircraft, forty-six percent fewer personnel, and twenty-five percent fewer flight hours. The Navy will get 600 trained aviators per year (vs. 500 now) at roughly half the cost of the present system. Well over $100 million in savings a year (vs. the T-2C/TA-4J) over the life of the T45TS is expected.

The first T-45A will undergo a nineteen-month test program at the com-

pany's facility in Yuma, Ariz., and at the Naval Air Test Center at NAS Patuxent River, Md. The second Goshawk will join the test program in June.

After the first two aircraft are built, production will shift to Air Force Plant 42 in Palmdale, Calif. British Aerospace builds most of the aircraft, but Douglas will build the nose and will assemble the T-45s. Peak production of forty-eight aircraft a year is expected in 1993, and production is scheduled to be completed in 1997.

Delivery of the first aircraft (twelve T-45As and associated training equipment were funded in FY '88) will begin in 1989, and initial operational capability (IOC) is expected to be reached at the end of FY '90 at NAS Kingsville near Corpus Christi, Tex. Other training bases will be at NAS Meridian, Miss. (in 1993), and NAS Chase Field, near Beeville, Tex. (in 1995).

★ The results of the first comprehensive survey of members of the Selected Reserve indicate that morale in the units is high and that personnel are generally satisfied with major features of reserve component service. However, a significant number reported dissatisfaction with training during weekend drills, citing lack of modern equipment at drill sites for individual skill training.

More than 52,000 enlisted personnel and 12,000 officers from the seven separate reserve components participated in the poll. The nearly 65,000 respondents are a representative sampling of the more than 1,100,000 members of the Army and Air National Guards and the Army, Navy, Marine Corps, Coast Guard, and Air Force Reserves.

While weekend drills were found to be lacking, the two-week annual training was generally found to be satisfactory. Fifty-eight percent of all respondents viewed their employer's attitude toward reserve participation favorably, while fifteen percent said that their employer had a negative attitude toward reserve participation. The remainder described their employer's attitude as neutral.

In the area of retention, thirty-seven percent of the enlisted respondents and seventy percent of the officers indicate they plan to remain in the National Guard or Reserve. Retirement benefits and compensation were cited by the reservists as the two main reasons for continuing service. Fifty-five percent of all respondents, though, cited their desire to serve their country as another reason to stay in.

Among enlisted Reservists and Guardsmen, the survey indicates that

Milt Caniff based many of his characters on real people. This gallery is from our July '57 cover and includes (from top, left to right): Poteet Canyon (based on Nancy O'Neal); Dude Hennick (Frank Higgs); Col. Flip Corkin (Philip Cochran); Lt. Upton Bucket (Bill Mauldin); Col. Vince Casey (C. D. Vincent); CAP Cadet Scooter McGruder (Margaret Kennefick); Allee McDean (Alice McDermott); Maj. Gen. Claire Chennault (himself); Steve Canyon ("a composite"); Gen. Joseph W. Stilwell (himself); Lt. Taffy Tucker (Bernice Taylor); Miss Lace (Dorothy Partington); Maj. Luke Adew (William Lookadoo); Col. Soup Davey (David F. McCallister); Lt. Peter Pipper "the Piper" (John F. Kennedy); Brig. Gen. P. G. "Shanty" Town (also C. D. Vincent); and Miss Mizzou (Marilyn Monroe).

Milton Caniff and His Air Force

Milton Caniff, creator of *Terry and the Pirates* and *Steve Canyon*, died April 3. He was eighty-one. He had long since become a legend in his field, and he was a special friend of the Air Force and AFA. He was one of the founders of the Association's Iron Gate Chapter in New York. In the past, when his health was better, he served on the boards of AFA and its affiliate, the Aerospace Education Foundation. Caniff was AFA's Man of the Year in 1965.

No other artist ever came close to Caniff in his ability to capture the look, feel, and flavor of the Air Force. He made a point of knowing what he was talking—and drawing—about. If his characters seemed real, it's because they often were. Flip Corkin, for instance, was modeled on Col. Philip Cochran. Vince Casey was really Brig. Gen. C. D. Vincent, and so on *(see above)*.

The field of comic art has produced no more than a handful of leaders who rank with Caniff in influence. A 1981 biography of Caniff called him the "Rembrandt of the Comic Strip," and he was all of that. Others have been imitating his style for years. Generations of young artists have equipped themselves with No. 1 Windsor Newton brushes because that's what Caniff used to lay down those bold, wonderful lines of his.

Caniff began *Terry and the Pirates* as an adventure strip in 1934, but when World War II began, he promptly put his hero in the uniform of the Army Air Forces. For the rest of his life, Caniff would be close to flyers and military aviation. In 1946, he left *Terry*, the rights to which were owned by a syndicate, and started *Steve Canyon*, which is still running.

Everybody has a favorite Caniff strip. For many, it is the famous "Let's Take a Walk, Terry" page from 1943 that was once "read" into *The Congressional Record* and that appeared as a guest editorial in the September 1985 issue of this magazine. Caniff did several covers for AIR FORCE Magazine. The art above is from one of them, illustrating an article called "Milt Caniff's Air Force."

For nearly fifty years, he thought of it that way: Milt Caniff's Air Force. And those who have been touched by his work and his dynamic personality will always think of him as the Air Force's Milt Caniff.

—J.T.C.

the median age is 29.5 years, more than ninety percent are high school graduates, fifty-five percent are married, and forty-seven percent of the enlisted reserve members had spent an average of 4.2 years on active duty.

In the officer ranks, the survey finds that the median age is 37.9 years, eighty percent have college degrees and ninety-six percent have done some college work, seventy-six percent are married, and sixty-two percent of the officers had spent an average of five years on active duty.

★ Two days before the T-45 rollout, the Air Force's new MC-130H Combat Talon II special operations airlifter was introduced in ceremonies at E-Systems Inc.'s facility at Greenville, Tex.

The Combat Talon II is a much-improved version of the MC-130E Combat Talon I that is used by the 1st Special Operations Wing at Hurlburt Field, Fla., and other bases. They are used for troop infiltration/exfiltration and resupply behind enemy lines at night and in poor weather.

Like the earlier version, the MC-130H features an in-flight refueling system and a high-speed, low-level aerial delivery system, or HSLLADS, which permits cargo drops without having to slow the aircraft.

The new aircraft's main advance is the IBM-developed avionics suite. Originally intended for the HH-60 Night Hawk special operations/rescue helicopter, the suite features color multifunction displays, the Emerson AN/APQ-170 digital radar system, the AN/AAQ-15 infrared detecting set, a dual inertial navigation system (INS), a complete electronic warfare suite, and other advanced systems.

After shakedown flights, the MC-130H will go to Edwards AFB, Calif., for full qualification and operations testing. The Air Force plans to acquire twenty-four MC-130Hs to complement the fourteen MC-130Es worldwide.

The Combat Talon II aircraft are new-build Lockheed C-130H aircraft modified by E-Systems. IBM is the system integrator.

—Photo by Sam Fentrels

Air Force Space Command moved into its new digs earlier this year at Peterson AFB, Colo., near Colorado Springs. From this new building, AFSPACECOM manages its seven missile warning units, nine space surveillance locations, and forty satellite operations and support facilities. The command is organized into three wings with seventy-two units and is made up of more than 13,000 Air Force and contractor personnel.

The Air Force's new MC-130H Combat Talon II special operations airlifter was introduced on March 14 in ceremonies at the E-Systems plant in Greenville, Tex. At the heart of these improved Combat Talons is the IBM-developed avionics suite. The aircraft are new-build Lockheed C-130H aircraft.

★ In recent testimony before the House Appropriations Committee's Subcommittee on Defense, Gen. Fred F. Woerner, Commander in Chief of US Southern Command, revealed some startling statistics about the Soviet presence in Latin America.

General Woerner said in part: "The Soviet Union is virtually on par with the United States in terms of access to bases—land, sea, and air—and forward-based forces south of our border. Forward-deployed forces include a brigade and a 2,100-man intelligence center in Cuba."

The number of Soviet personnel of all types in the region "includes 2,800 in Cuba, 100 in Nicaragua, and 500 in Peru. There are approximately 115 Soviet military advisors in Peru alone, while the total number of US [personnel] in sixteen Latin American countries is 147. That total includes the fifty-five trainers in El Salvador."

General Woerner also noted that Soviet aid to Cuba exceeds the aid given by the Soviets to the rest of the world combined—$16.2 million in economic assistance and $1.7 million in military assistance daily, or some $6.3 billion annually.

The USSOUTHCOM chief also added that "it is important that we [as a country] be prepared to apply deterrence theory along the entire spectrum of conflict. The sooner we get involved in a situation that affects US national interests, the lower the ulti-

Pilatus Aircraft Ltd., a Swiss firm, recently brought its PC-9 turboprop trainer to the US to familiarize Air Force officials with the airplane. With the cancellation of the T-46A, the Air Force is looking at all available aircraft that can meet training requirements. This is the PC-9 demonstrator flying over the Alps.

The PC-9 on Tour

As a result of the Air Force's decision to cancel the Fairchild T-46A in March 1987, Air Training Command (ATC) was forced to reevaluate its modernization plans for the rest of the century. What emerged was a three-part plan that would be implemented over a period of fourteen years.

First, Specialized Undergraduate Pilot Training (SUPT), in which pilot candidates are split into multiengine and single-engine tracks, would be reinstituted. This would result in a Tanker, Transport, Bomber Training System (TTBTS) that would utilize an off-the-shelf business jet to teach the "heavy" drivers and that would be implemented by 1992.

The "B" in TTBTS has since been moved into the third phase of the ATC Roadmap, now called BFTS (Bomber, Fighter Training System), in which a new supersonic training aircraft will be developed and the system put into place by 2005.

The second phase, the Primary Aircraft Training System (PATS), is where a great deal of the attention from contractors is focused now. To be in place by 1999, acquisition of the aircraft and training system (simulators and associated materials) needs to begin in the 1995 timeframe, and thus PATS has to be in the Program Objective Memorandum (POM) in 1994.

Under the Next Generation Trainer (NGT) program that resulted in the T-46A, the requirements called for side-by-side seating, twin jet engines, and a pressurized cockpit. With the current unfavorable budget climate, the Air Force is not now limiting itself to a new development effort, and in the last eighteen months, the service has opened its mind to all aircraft that meet the training requirements.

With that thought in mind, Pilatus Aircraft Ltd., a Swiss firm, brought its PC-9 tandem-seat turboprop to America for a second demonstration tour. Officials at ATC Headquarters at Randolph AFB, Tex., Air Force Systems Command's Aeronautical Systems Division at Wright-Patterson AFB, Ohio, the Pentagon, and at AFSC Headquarters at Andrews AFB, Md., had their chance to fly the PC-9 in February and March.

In between officials, AIR FORCE Magazine was given the opportunity to fly in the aircraft, and it was quite a ride.

The PC-9 is generally regarded as the top of the line in the turboprop world (although Shorts would dispute that claim), but the PC-9 is also at the top end of the price range—in the neighborhood of $2 million each. However, the aircraft, like almost all high-performance turboprops, is very affordable to fly. The PC-9 is also built with wide safety margins.

The demonstrator aircraft at Andrews had the high-technology cockpit avionics option installed. It featured Bendix color displays for the attitude and horizontal situation indicators and liquid crystal displays for the engine and secondary instruments. The LCD readouts were surprisingly clear and easy to read, even heading into the sun. The other instruments had standard analog dials.

Pilatus Chief Test Pilot Hans Galli sat in the front cockpit and put the aircraft through its paces. After a 250-meter takeoff roll and once at altitude, the aircraft easily nosed over in a stall and lost very little airspeed through a four-G loop. The plane's performance was very jet-like, with its Pratt & Whitney-Canada PT6A-62 turboprop developing 950 shaft horsepower and a maneuvering speed of 210 knots.

In fact, except for a slight right torque, after engine start, it is easy to forget one is not in a jet. The plane responds quickly to inputs, although more than a slight touch is needed on the stick in simple steep banks. The PC-9 is very forgiving and is easy to keep straight and level. It is also very honest in terms of entering and exiting a spin.

The aircraft is also easy to maintain. Ninety percent of the line replaceable units (LRUs) are accessible from the ground, and there is also a computerized built-in test system for the engine.

Burma, Saudi Arabia, and Australia currently fly the PC-9. Pilatus sent two PC-9 kits to Hawker-de Havilland for final assembly, and the company is building the remainder of Australia's sixty-seven aircraft under license.

Down the road, if the Air Force should decide to buy the PC-9, Pilatus would not mass-produce the airplane for USAF. Instead, a US manufacturer would be sought to build the plane under a teaming or licensing arrangement. The PC-9 is mostly American anyway. Sixty percent of the aircraft, including all of the aluminum that goes into it, comes from the US.

So far as other parts of the training system approach are concerned, Pilatus does provide simulators and cockpit procedures trainers. It would then be a question of whether or not the Air Force wanted a complete training system or a separate aircraft and systems buy.

—J.P.R.

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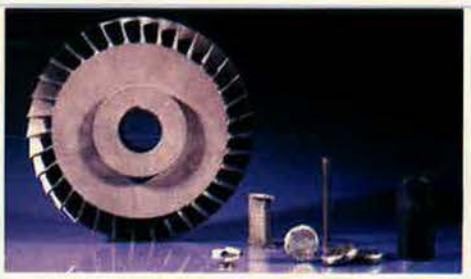

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mate costs will be and the greater will be the range of low-cost tailored force options available for countering the threats."

★ After slipping to third place in FY '86, McDonnell Douglas, with nearly $7 billion worth of prime contracts and approximately $894 million in contracts to its divisions and subsidiaries, regained first place in the Department of Defense's annual tally of its top 100 contractors. McDonnell Douglas, headquartered in St. Louis, Mo., held the number-one ranking in both FY '84 and FY '85.

The biggest movers at the top of the rankings were Martin Marietta (from approximately $2.9 billion in contracts to $3.7 billion in FY '87), McDonnell Douglas (from roughly $6.6 billion to $7.7 billion), and Lockheed (from nearly $4.9 billion to $5.6 billion). Rockwell International, which finished contracts on the B-1B bomber last year, fell from fourth place to eleventh in the listing. Rockwell did $2.2 billion worth of business with DoD in FY '87.

The top ten firms in FY '87, with dollar values of all contracts awarded to the parent company and its divisions and that firm's FY '86 rank, are shown in the accompanying box.

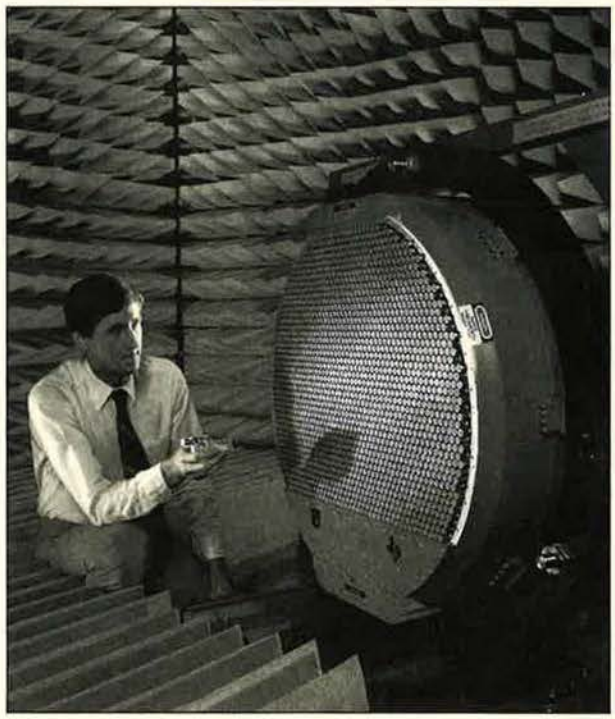
The total value of FY '87 DoD contract awards was $142,482,708,000, or about three percent less than the total awarded in FY '86. Of that total, $95,354,393,000 was awarded to the top 100 firms, or about four percent less than the $98,621,062,000 awarded to the top 100 concerns in FY '86.

Five companies in the top ten did less defense business volume in FY '87 than in FY '86, including General Motors, even though that company retained fifth place in the survey. For the second consecutive year, the value of Grumman's contracts increased, but the company did not move up in the ranking.

As in FY '86, twenty-three firms did more than $1 billion worth of defense business in FY '87. The 100th-ranked company, Sundstrand Corp., received contracts that totaled $122,390,000.

The Top Ten

Firm	Contract Values (000s)	FY '86 Rank
1. McDonnell Douglas Corp.	$7,715,243	3
2. General Dynamics Corp.	7,040,956	1
3. General Electric Co.	5,801,795	2
4. Lockheed Corp.	5,573,547	6
5. General Motors Corp.	4,081,723	5
6. Raytheon Co.	3,819,984	7
7. Martin Marietta Corp.	3,726,483	11
8. United Technologies Corp.	3,587,022	9
9. The Boeing Co.	3,547,343	8
10. Grumman Corp.	3,392,714	10



A Texas Instruments engineer compares the size of one of the small, low-power, solid-state transmit/receive modules with a completed airborne solid-state phased array (SSPA) developed for the Air Force's Wright Aeronautical Laboratories at Wright-Patterson AFB, Ohio. These modules replace mechanically scanned antennas and high-voltage transmitters in conventional radars.

This is the new Prisoner of War medal recently authorized by Congress. As many as 142,000 people may be entitled to the award.

★ A Prisoner of War Medal, newly authorized by Congress, will be issued free to all persons taken prisoner of war after April 5, 1917, the date of US entry into World War I. Defense Department records estimate that as many as 142,000 may be entitled to the medal. "An individual must have been taken prisoner during an armed conflict, *i.e.*, World War I, World War II, Korea, and Vietnam, and must have rendered honorable service during the period of captivity," DoD's announcement said.

To request an application form for the medal, call toll-free 1-800-873-3768. Forms are also available from various veterans organizations and public service agencies. Former POWs or their legal next of kin may apply for the medal by writing to the appropriate address:

Former Army POWs: US Army Reserve Personnel Center, Attn.: DARP-PAS-EAW, 9700 Page Blvd., St. Louis, Mo. 63132-5200.

Former Navy, Marine Corps, or Coast Guard POWs: US Navy Liaison Office, National Personnel Records Center, 9700 Page Blvd., St. Louis, Mo. 63132-5199.

Former USAF or Army Air Forces POWs: Air Force Reference Branch, National Personnel Records Center, 9700 Page Blvd., St. Louis, Mo. 63132-5199.

Applicants must provide full name, service number, Social Security number, any VA claim number, date

and place of birth, branch of service, unit of assignment when captured, and dates of confinement.

Processing of applications may take as much as three months because of the need to verify military records, the Pentagon said.

★ After a brief recess, the AIM-120A Advanced Medium-Range Air-to-Air Missile (AMRAAM) test program got back into gear with two direct hits in three recent attempts. The missile's Initial Operational Test and Evaluation (IOT&E) launches are scheduled to continue until late fall.

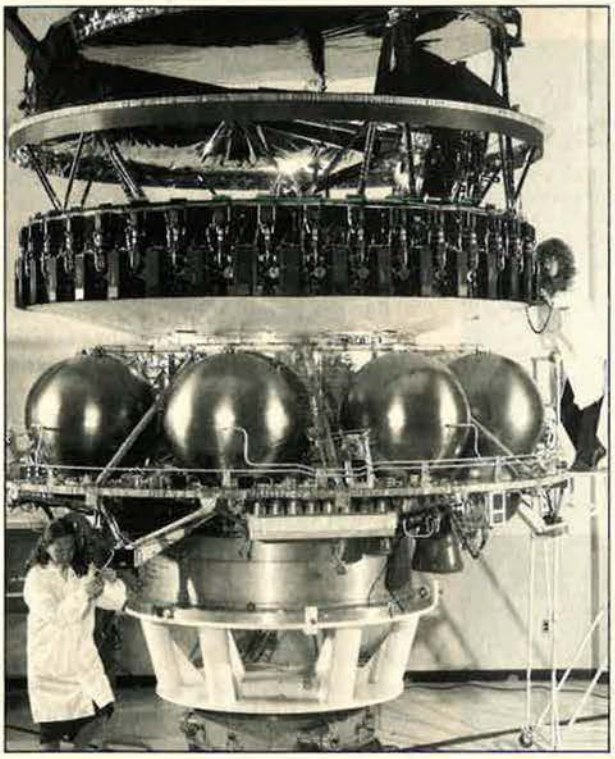
An AMRAAM containing enhanced electronic counter-countermeasures (ECCM) software was fired from a Navy F/A-18 Hornet over the Pacific Missile Test Center at Point Mugu, Calif., on February 9. The shot, which was not described in detail, scored a direct hit against a QF-86 drone. The ECCM update will be incorporated into the second production lot, which is now being contracted out.

Two AIM-120s were fired from an F-15 against two QF-100 drones over the White Sands Missile Range in New Mexico on February 22. One missile scored a direct hit on its target drone, while the other AMRAAM missed by a wide margin. The cause of the miss is under investigation. These launches were also not described in detail.

The two-for-three performance in February brings the AMRAAM scoreboard up to forty-five successes in fifty-four attempts, a success rate of eighty-three percent. One-third of the successes have been direct hits.

Hughes is the prime contractor for the nearly twelve-foot-long, 335-pound AMRAAM, and Raytheon is the second-source manufacturer. Total AIM-120 production is expected to be 24,000 missiles for the Air Force and Navy. West Germany and Britain will also buy the missiles.

Maj. Gen. William L. Doyle (right), Deputy Chief of Staff for Intelligence at Strategic Air Command headquarters, was recently presented the 1987 Eugene M. Zuckert Management Award by Secretary of the Air Force Edward C. Aldridge, Jr. The award is given annually to recognize management achievements by an Air Force general or civilian Air Force manager.

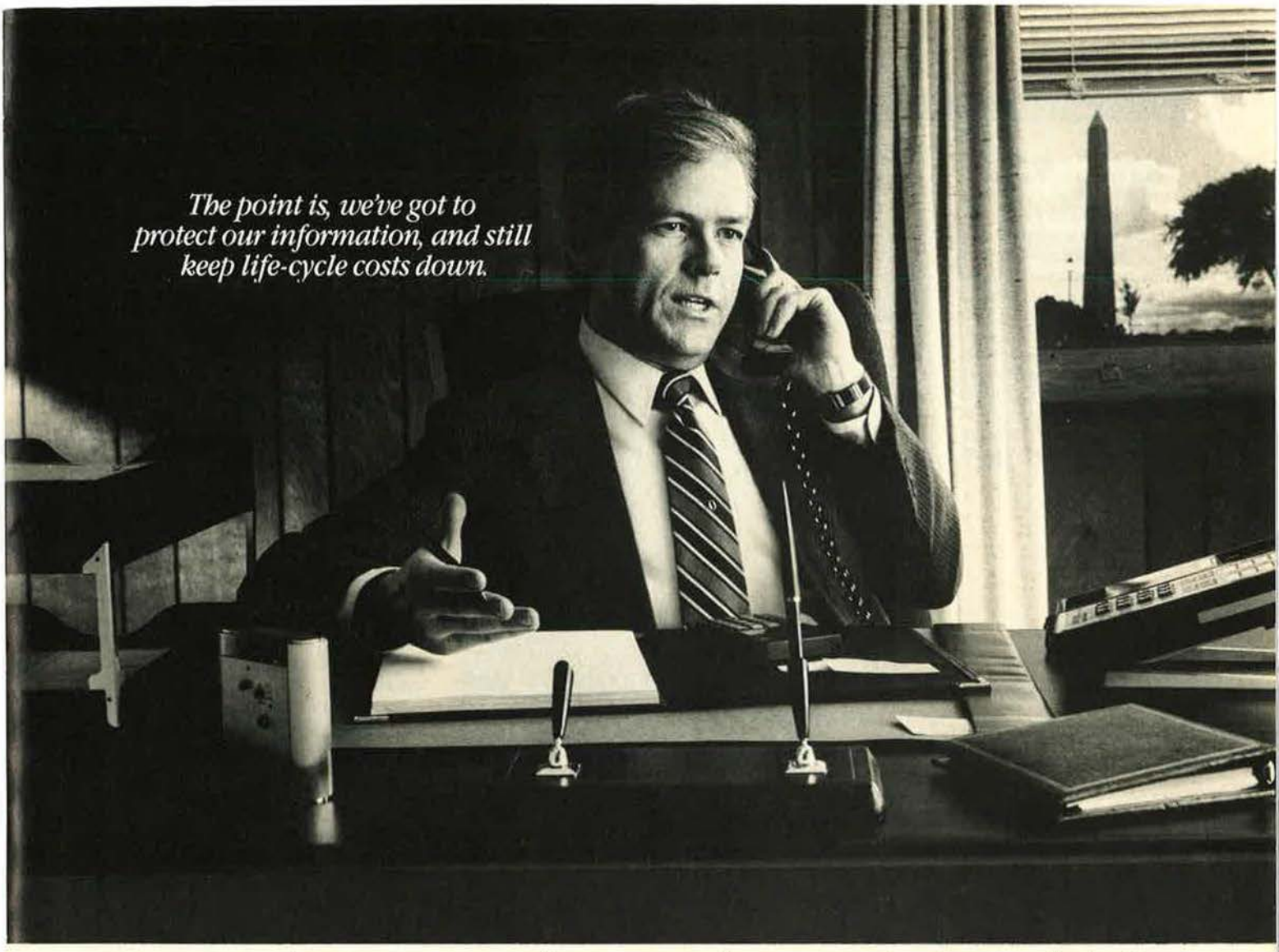


Japan's first commercial communications satellite, a Hughes JCSAT, is undergoing final checks by Hughes engineers Lorraine Swalley (left) and Bridget Goodney (right) after the upper half (the antenna shelf) and the lower half (the propulsion unit) were mated at the company's plant in El Segundo, Calif. Two HS 393 satellites are being built for the Japan Communications Satellite Co.

★ **APPOINTED—Raymond S. Colladay** has been appointed as the **new director of the Defense Advanced Research Projects Agency** (DARPA). Dr. Colladay will be responsible for the organization, direction, and management of the Department of Defense's central research and development agency. Beginning his career at the National Aeronautics and Space Administration's Lewis Research Center near Cleveland, Ohio, in 1969, Dr. Colladay later became NASA's Associate Administrator for Aeronautics and Space Technology.

Air Chief Marshal Sir David Craig, chief of the Royal Air Force Air Staff, has been appointed as Britain's **new chief of the Defence Staff,** a position analogous to that of the Chairman of the Joint Chiefs of Staff in the US. Sir David will assume the post in December upon the retirement of Admiral of the Fleet Sir John Fieldhouse. Air Chief Marshal Sir Peter Harding will become the new chief of the Air Staff.

★ **AWARDED—The 5th Defense Space Communications Squadron** at Woomera Air Station, Australia, has been named as the **first recipient of the Air Force Space Command Commander's Trophy.** The trophy symbolizes the overall winner of the command's unit competition program. Twenty-three AFSPACECOM units were judged in areas that included standardization and evaluation, operational efficiency, logistics and support, safety, and several other areas. The 5th DSCS was also the winner of the communications category of the competition.



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Unlike 2.4 Kb/s equipment, AT&T's 4.8 Kb/s transmission offers a major advantage: improved voice quality/voice recognition levels. This provides extra assurance that you are connected with the right party and reduces the strain of a lengthy secure conversation.

The AT&T Security-Plus Communications Terminal (STU-III): right for today, ready for tomorrow.

By doubling transmission speed, the 4.8 data rate moves sensitive information faster, decreases long distance transmission charges, even reduces set-up time.

AT&T's feature-rich STU-III gives you one-button access to its functions: Clear Data or Clear Voice; Secure Data or Secure Voice. It accommodates up to four independent identities and levels of security —and up to 32 crypto-ignition keys. It offers a remote interface to access its functions.

Also, physical security is engineered into its design, preventing tampering.

But the most reassuring feature of the AT&T Security-Plus Communications Terminal is the credibility of the company that builds it. A company with more than a century of quality communications experience.

For more information, call AT&T at **1 800 262-3787**. (NC residents call collect: **919 279-3411**.)

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No job in the Air Force is finished until the paperwork is done. A1C Angie Oxley has to keep tabs on K-9 Bo's weight, as a sudden gain or loss could indicate trouble. Bo, a mixture of German shepherd and Doberman pinscher, is a fourteen-month-old narcotics detection dog assigned to the 432d Security Police Squadron at Misawa AB, Japan (where Airman Oxley is also assigned).

May Anniversaries

- *May 30, 1913:* Approximate date the Massachusetts Institute of Technology begins teaching aerodynamics. Assistant Naval Constructor Jerome C. Hunsaker is the first professor.
- *May 15, 1918:* The Aviation Section of the Signal Corps begins regular air mail service from Washington, D. C., to New York City.
- *May 2–3, 1923:* Lt. Oakley G. Kelly and Lt. James A. Macready complete the first nonstop transcontinental flight. The trip from New York to San Diego takes twenty-six hours, fifty minutes, and three seconds in the Fokker T-2. (Today's five-plus-hour commercial cross-country flights only *seem* to take as long as the T-2's pioneering flight.)
- *May 12, 1928:* Lt. Julian S. Dexter of the Air Corps Reserve completes a 3,000-square-mile aerial mapping assignment over the Florida Everglades. The project takes sixty-five hours of flying spread over two months.
- *May 15, 1938:* US Secretary of the Interior Harold L. Ickes announces his refusal to allow inert helium gas to be exported to Germany for use in the Zeppelin airships. Secretary Ickes feels that the quantity of gas asked for indicates that a portion of it could be diverted for military purposes.
- *May 30, 1943:* All organized Japanese resistance ceases on Attu Island in the Aleutians.
- *May 12, 1953:* Secretary of Defense Charles E. Wilson reveals that projected Air Force strength has been revised downward to 120 wings, instead of the 143 previously planned.
- *May 7, 1958:* Maj. Howard C. Johnson sets a new world altitude record of 91,243 feet in a Lockheed F-104 Starfighter. Eighteen days later, Capt. Walter F. Irwin sets a world speed record of 1,404.09 mph, also in an F-104.
- *May 13, 1958:* Trans World Airlines becomes the first air carrier to hire a black stewardess.
- *May 27, 1958:* First flight of the McDonnell F4H-1 (F-4) Phantom II. On May 20, 1978, McDonnell Douglas delivers the 5,000th F-4 built.
- *May 15, 1963:* The first American to orbit earth for more than a day, Air Force Maj. L. Gordon "Gordo" Cooper, is launched from Cape Canaveral, Fla. The thirty-four-hour, twenty-two-orbit flight is made in the MA-9 *Faith-7* Mercury capsule.
- *May 18, 1968:* In response to a massive flood, the Air Force airlifts 88.5 tons of food and related materials to Ethiopia.

MSgt. Richard L. Taylor, branch production supervisor with the 509th Organizational Maintenance Squadron at Pease AFB, N. H., and **Lt. Col. James C. Havard,** formerly of the 366th Aircraft Generation Squadron at Mountain Home AFB, Idaho, have been named as **the winners of the Gen. Lew Allen, Jr., Award** for 1986–87. The award is presented annually to the Air Force's top people in aircraft sortie generation.

Under Sergeant Taylor's leadership, the 100-person 509th OMS was able to produce more than 7,600 flying hours, actual sorties flown exceeded scheduled sorties by 169 missions, a maintenance cancellation rate of under five percent was recorded, and the unit had an on-time takeoff rate of nearly ninety-two percent. Colonel Havard, now at Osan AB, Korea, was cited for "superior leadership and innovative management of resources" and for contributing to "extraordinary, positive strides in all maintenance management areas."

Capt. Richard Von Berckefeldt, an F-15 pilot assigned to the 54th Tactical Fighter Squadron at Elmendorf AFB, Alaska, **recently received the Sustained Activity Air Medal** for his actions in becoming Alaskan Air Command's leading intercept "ace." During an eleven-month period, Captain Von Berckefeldt intercepted and escorted ten Soviet aircraft, mostly Bear-H bombers, off the Alaskan coast. Since the first intercept off Alaska in 1961, there have been ten intercept aces. Behind Captain Von Berckefeldt are two pilots with seven intercepts, one with six, and six pilots with five intercepts each. Last year, F-15 pilots flying alert missions from King Salmon and Galena Airports identified fifty-six aircraft on thirty-one intercepts.

★ **MILESTONES**—In early March, two orders for new **Boeing 737** aircraft marked the first time a jet airliner has ever **passed the 2,000 mark in sales.** The orders for four 737-300 aircraft for Transavia, a Dutch charter line, and fifty 737s of various models for USAir bring total sales to 2,001 aircraft since the type's first flight in 1967. Boeing already holds the commercial jetliner record with 1,831 deliveries of 727 aircraft. The Air Force uses the 737-200 as the T-43A navigator trainer and the 727 as the C-22B operational support airlifter.

The first **Rockwell B-1B bomber to be modified to better withstand birdstrikes was cleared for low-level flight training** on March 9. This al-

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lowed the Air Force to conduct low-altitude training with the B-1B for the first time since the crash of one of the planes last September. *(For more details on the mishap and the Birdstrike Vulnerability Reduction Program, see "Aerospace World," April 1988 issue.)* The modified aircraft is assigned to the 96th Bomb Wing at Dyess AFB, Tex.

★ **PURCHASES**—The **Israeli Air Force has decided to buy the Sikorsky S-70A,** the export version of the UH-60A Black Hawk helicopter, to replace its aging Bell 212s (UH-1Ns). The purchase of twenty S-70As (with options for forty more) will likely be made with Foreign Military Sales (FMS) credits. The IAF evaluation of the Black Hawk began in 1983 when one of the aircraft was sent to Israel. Since then, IAF pilots have flown UH-60s in the US.

The **Royal Jordanian Air Force** has decided to **buy eight Panavia Tornado IDS** (Interdictor Strike) combat aircraft, with options on additional aircraft. The Tornados will be delivered in 1990. The sale will be on a government-to-government basis and will be financed by credit supplied from Britain. The deal, with related ground equipment, is thought to be worth more than $300 million. The RJAF picked the Tornado IDS over the Soviet MiG-29 Fulcrum. Orders for the Tornado IDS, ADV (Air Defense Variant), and ECR (Electronic Combat and Reconnaissance) versions now total 941 aircraft.

NASA has ordered **a second Boeing 747-100** aircraft to be used **to transport Space Shuttle Orbiters** piggyback from landing sites to the

Senior Staff Changes

PROMOTIONS: To be **General:** Merrill A. **McPeak;** John A. **Shaud.**

To be **Lieutenant General:** Jimmie V. **Adams;** Peter T. **Kempf;** Monte B. **Miller.**

To be **Major General:** David C. **Morehouse.**

RETIREMENTS: M/G Schuyler **Bissell;** B/G Denis M. **Brown;** B/G James E. **Freytag;** M/G Cornelius **Nugteren.**

CHANGES: M/G (L/G selectee) Jimmie V. Adams, from Cmdr., 1st AF, and Cmdr., CONUS NORAD Region, Hq. TAC, Langley AFB, Va., to Vice Cmdr., Hq. TAC, and Vice CINC, USAFLANT, USLANTCOM, Langley AFB, Va., replacing retiring L/G James R. Brown . . . **M/G Marcus A. Anderson,** from DCS/Ops., Hq. TAC, and Dep. Dir., Ops., TACOS, Langley AFB, Va., to Cmdr., 3d AF, USAFE, RAF Mildenhall, United Kingdom, replacing M/G William K. James . . . **M/G Joseph W. Ashy,** from DCS/Plans, Hq. TAC; Dep. Dir., Plans, TACOS; and DCS/Plans, USAFLANT, USLANTCOM, Langley AFB, Va., to Cmdr., USAFTFWC, TAC, Nellis AFB, Nev., replacing M/G (L/G selectee) Peter T. Kempf.

M/G Charles G. Boyd, from Vice Cmdr., 8th AF, SAC, Barksdale AFB, La., to Dir., Plans, DCS/P&O, Hq. USAF, Washington, D. C., replacing retiring M/G Albert L. Logan . . . **Col. (B/G selectee) Edward N. Brya,** from Cmdr., 317th TAW, MAC, Pope AFB, N. C., to Dep. Cmdr., Joint Special Ops. Command, USSOCOM, Ft. Bragg, N. C., replacing B/G (M/G selectee) Frank J. Kelly, Jr.

B/G Robert E. Dempsey, from Ass't, P&P, DCS/Plans, Hq. SAC, and Dep. Dir., Analysis, Concepts, and Sys., JSTPS, Offutt AFB, Neb., to DCS/Strategic Planning and Analysis, Hq. SAC; Dep. Dir., Force Employment Plans, JSTPS; and Dep. Dir., Strategic Planning and Analysis, STRACOS, Offutt AFB, Neb., replacing B/G (M/G selectee) Alan V. Rogers . . . **M/G William J. Grove, Jr.,** from DCS/Tech. Training, Hq. ATC, Randolph AFB, Tex., to Cmdr., TUSLOG, USAFE, Ankara, Turkey, replacing M/G John C. Scheidt.

Col. (B/G selectee) Kenneth L. Hagemann, Sr., from Exec. Officer to CINC, Hq. SAC, Offutt AFB, Neb., to Ass't, P&P, DCS/Plans, Hq. SAC, and Dep. Dir., Analysis, Concepts, and Sys., JSTPS, Offutt AFB, Neb., replacing B/G Robert E. Dempsey . . . **M/G William K. James,** from Cmdr., 3d AF, USAFE, RAF Mildenhall, United Kingdom, to DCS/Ops., Hq. TAC, and Dep. Dir., Ops., TACOS, Langley AFB, Va., replacing M/G Marcus A. Anderson . . . **B/G James M. Johnston III,** from IG, Hq. TAC, Langley AFB, Va., to Dir., Aerospace Safety, Hq. AFISC, Norton AFB, Calif., replacing B/G Joseph K. Stapleton.

Col. (B/G selectee) Roger A. Jones, from Staff Judge Advocate, Hq. TAC, Langley AFB, Va., to Staff Judge Advocate, Hq. SAC, Offutt AFB, Neb., replacing B/G (M/G selectee) David C. Morehouse . . . **M/G (L/G selectee) Peter T. Kempf,** from Cmdr., USAFTFWC, TAC, Nellis AFB, Nev., to Cmdr., 12th AF, TAC, and Cmdr., USSAF, USSOUTHCOM, Bergstrom AFB, Tex., replacing L/G (Gen. selectee) Merrill A. McPeak . . . **B/G (M/G selectee) Charles A. May, Jr.,** from Dep. Dir., Advanced Prgms., OSAF/Acquisitions, Washington, D. C., to DCS/Requirements, Hq. SAC, Offutt AFB, Neb.

L/G Thomas G. McInerney, from Vice CINC, Hq. USAFE, and Dir., EACOS, Ramstein AB, Germany, to Cmdr., Hq. AAC, and Cmdr., Alaskan NORAD Region, Elmendorf AFB, Alaska, replacing retiring L/G David L. Nichols . . . **L/G (Gen. selectee) Merrill A. McPeak,** from Cmdr., 12th AF, TAC, and Cmdr., USSAF, USSOUTHCOM, Bergstrom AFB, Tex., to CINC, Hq. PACAF, Hickam AFB, Hawaii, replacing retiring Gen. Jack I. Gregory.

M/G (L/G selectee) Monte B. Miller, from Command Surgeon, Hq. USEUCOM, Vaihingen, Germany, to Surgeon General, Hq. USAF, Washington, D. C., replacing retiring L/G Murphy A. Chesney . . . **B/G (M/G selectee) David C. Morehouse,** from Staff Judge Advocate, Hq. SAC, Offutt AFB, Neb., to Dep. JAG, Hq. USAF, Washington, D. C., replacing M/G Keithe E. Nelson . . . **M/G Keithe E. Nelson,** from Dep. JAG, Hq. USAF, Washington, D. C., to JAG, Hq. USAF, and Cmdr., Hq. AFLSC, Washington, D. C., replacing retiring M/G Robert W. Norris . . . **M/G Richard A. Pierson,** from Chief, JUSMAG, Athens, Greece, to Cmdr., 1st AF, and Cmdr., CONUS NORAD Region, Hq. TAC, Langley AFB, Va., replacing M/G (L/G selectee) Jimmie V. Adams . . . **B/G (M/G selectee) Donald A. Rigg,** from Dep. IG, Hq. USAF, Washington, D. C., to DCS/Tech. Training, Hq. ATC, Randolph AFB, Tex., replacing M/G William J. Grove, Jr.

B/G (M/G selectee) Alan V. Rogers, from DCS/Strategic Planning and Analysis, Hq. SAC; Dep. Dir., Force Employment Plans, JSTPS; and Dep. Dir., Strategic Plans and Analysis, STRACOS, Offutt AFB, Neb., to DCS/Ops., Hq. SAC, and Dep. Dir., Ops., STRACOS, Offutt AFB, Neb., replacing M/G (L/G selectee) Ellie G. Shuler, Jr. . . . **M/G Martin J. Ryan, Jr.,** from Dir., Force Structure, Resources, and Assessment (J-8), OJCS, Washington, D. C., to Vice Cmdr., 8th AF, SAC, Barksdale AFB, La., replacing M/G Charles G. Boyd.

Col. (B/G selectee) Michael E. Ryan, from Exec. Officer to C/S, Hq. USAF, Washington, D. C., to DCS/Plans, Hq. TAC; Dep. Dir., Plans, TACOS; and DCS/Plans, USAFLANT, USLANTCOM, Langley AFB, Va., replacing M/G Joseph W. Ashy . . . **M/G John C. Scheidt, Jr.,** from Cmdr., TUSLOG, USAFE, Ankara, Turkey, to Dir., Ops., DNA, Washington, D. C., replacing retiring M/G James P. Smothermon . . . **B/G Joseph K. Stapleton,** from Dir., Aerospace Safety, Hq. AFISC, Norton AFB, Calif., to Dep. IG, Hq. USAF, Washington, D. C., replacing B/G (M/G selectee) Donald A. Rigg. ■

Kennedy Space Center in Florida. The aircraft will be similar to the one that the space agency has used since 1977 for transporting the 122-foot-long, seventy-eight-foot-wide Shuttle Orbiters that weigh 150,000 pounds empty. The 747 aircraft will be modified at Boeing Military Airplane Co.'s facility in Wichita, Kan.

★ **NEWS NOTES**—Even after the Advanced Technology Bomber is flying, the aircraft will still be under wraps. Part ($79.5 million) of the Air Force's FY '89 **construction budget request** calls for thirty-four **individual, enclosed parking spaces for the B-2s** at Whiteman AFB, Mo., because of special maintenance and security requirements for the planes. In all, fourteen construction projects are needed at Whiteman (which has not had a flying mission since the 1960s) in order to bed down the new bombers. Congress has already approved $84.8 million in construction funds for the base, and an additional $40 million is expected to be requested for FY '90. Depot work will be done on the B-2s at the Oklahoma City Air Logistics Center at Tinker AFB, Okla., and an additional $57.4 million is being requested for B-2 support construction there.

The **Army and Air Force Exchange Service** (AAFES) recently announced **record sales** of $5.9 billion **and earnings** of $260 million in 1987, which are increases of thirteen and fourteen percent, respectively, over 1986. The AAFES dividend paid to morale, welfare, and recreation (MWR) programs will be $130 million, or $85.59 per active-duty Army and Air Force member. Incidentally, AAFES customers consumed 3,600,000 pounds of potato chips and bought 10,350,940 rolls of film (228,000,000 photographs) in 1987.

A three-phase **testing program** began in March at four Tactical Air Command bases **to see if aircrews will be allowed to wear soft contact lenses during flight operations.** In Phase I, one crew member will wear contacts in dual-seat aircraft, and in Phase II, pilots of single-seat aircraft will be tested. Phase III will be the medical evaluation and follow-up. The decision to approve contacts for TAC aircrews will be made after Phase II. Participation in the tests is voluntary.

The Air Force has exercised a contract option, valued at $16.1 million, with **Lockheed Aeronautical Systems Company-Georgia** (formerly Lockheed-Georgia) **to perform a center wing structural improvement modification on ten additional C-141B aircraft.** This brings the total number of aircraft to be modified to thirty-three aircraft. As of March 19, twelve aircraft had already been modified and redelivered under the program, which is called Pacer Center. The center wing modification helps extend the useful life of a StarLifter to 60,000 hours. Airframe hours for the Air Force's C-141 fleet currently range from 12,000 to 35,000 hours. The utilization rate is roughly 1,000 hours per year.

You have to wonder sometimes how long the engineers and program managers who work in secluded offices in the Pentagon think about things like this: **Two programs with quite possibly the best names ever devised** recently surfaced. The first is **Senior Citizen,** the latest in the Air Force's "Senior" line of classified reconnaissance programs, and the second great name is **SOCRATES,** the Special Operations Command Research, Analysis, and Target Evaluation System.

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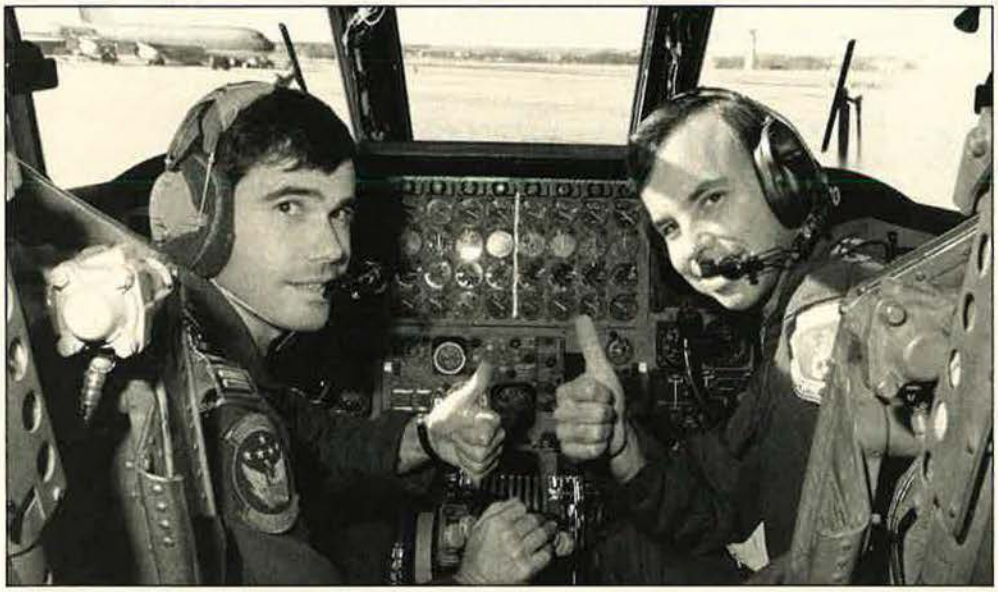

Air Force Logistics Command's flight test branches were recently redesignated as test squadrons and will be divided into four sections (flight operations, flight engineering, flight preparation, and administrative support) at each of AFLC's five air logistics centers. Here, B-52 test pilot Capt. Guy DeGiola (left) and Maj. Larry Lopez (right), commander of the new 2871st Flight Test Squadron, give a "thumbs-up" after a test flight out of the Oklahoma City Air Logistics Center.

Index to Advertisers

The Chart Page

The Defense Budget

Edited by Colleen A. Bollard, STAFF EDITOR

It isn't easy to understand the defense budget. One source of confusion is that funding levels can be expressed in various ways. Totals are most frequently cited as *budget authority* (value of new obligations, including some in later years, the government is authorized to incur) or *outlays* (actual expenditures, some of which are funded by budget authority in previous years). The Pentagon, alone among federal agencies, sometimes presents numbers as *Total Obligational Authority* (TOA), which differs from budget authority mainly in that offsetting receipts have not been deducted.

Another difference depends on whether the numbers have been adjusted for inflation. When funding is described as *constant* or *real dollars*, the effect of inflation has been factored out to make possible direct comparisons between budget years. A specific year, often the present one, is chosen as a baseline for constant dollars. When funding is described as *current* or *then-year dollars*, no adjustment has taken place. This is the actual amount that has either been spent or budgeted or forecast.

Finally, the grand total given as "the defense budget" will vary by $8.7 billion, depending on which of two combinations it refers to. The entire *defense program* ($299.5 billion in budget authority for FY '89) includes activities in the Department of Energy and other federal agencies. The *direct program* ($290.8 billion in budget authority) means Department of Defense activities only.

In some instances, numbers on the following charts may not add exactly to totals shown because of rounding.

Where the Money Goes

(Budget authority in $ billions)

	FY '83	FY '84	FY '85	FY '86	FY '87	FY '88	FY '89
Current Dollars							
Military Personnel/ Retired Pay	61.8	64.9	67.8	67.9	74.0	76.1	78.4
Operation & Maintenance	66.5	71.0	77.8	74.9	79.6	80.7	85.6
Procurement	80.4	86.2	96.8	92.5	80.2	81.0	80.0
Research, Development, Test & Evaluation	22.8	26.9	31.3	33.6	35.6	36.7	38.2
Military Construction	4.5	4.5	5.5	5.3	5.1	5.4	5.7
Family Housing/ Homeowners Assistance	2.7	2.7	2.9	2.8	3.1	3.1	3.3
Revolving & Management Funds	1.1	2.8	5.1	5.2	2.6	0.8	0.8
Trust Funds, Receipts & Deductions	−0.4	−0.7	−0.4	−1.1	−0.8	−0.7	−1.2
Totals	**239.5**	**258.2**	**286.8**	**281.1**	**279.5**	**283.2**	**290.8**
Constant FY '89 Dollars							
Military Personnel/ Retired Pay	76.6	77.0	75.3	73.2	78.8	78.5	78.4
Operation & Maintenance	78.8	82.8	88.7	85.2	87.8	83.6	85.6
Procurement	97.9	101.6	110.7	102.4	85.8	83.7	80.0
Research, Development, Test & Evaluation	27.9	31.7	35.8	37.4	38.4	38.0	38.2
Military Construction	5.5	5.3	6.3	5.9	5.5	5.5	5.7
Family Housing/ Homeowners Assistance	3.3	3.1	3.3	3.1	3.3	3.3	3.3
Revolving & Management Funds	1.3	3.3	5.8	5.8	2.8	0.9	0.8
Trust Funds, Receipts & Deductions	−0.4	−0.8	−0.5	−1.2	−0.9	−0.8	−1.2
Totals	**290.7**	**303.9**	**325.5**	**311.9**	**301.6**	**292.8**	**290.8**

The constant dollar (adjusted for inflation) portion of this chart makes it possible to compare the real gains and losses. Defense purchasing power has declined steadily since 1985, and the proposed budget for FY '89 would take it back to the 1983 levels. Not included in these tabulations are relatively small amounts for the Special Foreign Currency Program, which averages about $3 million for each of the years shown.

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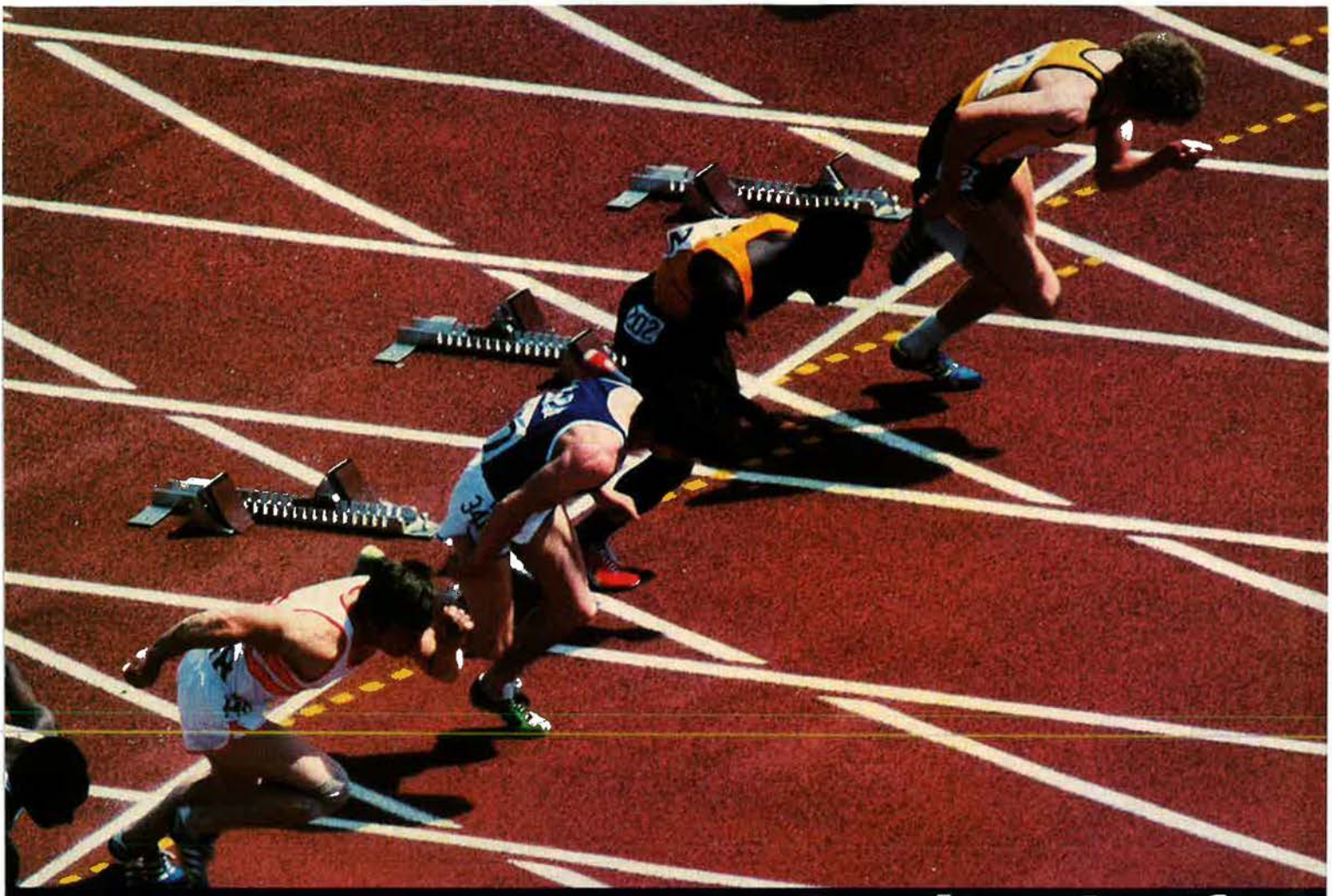

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The $227.9 Billion Drop

(Defense budget authority in current $ billions)

	January 1987 Budget Proposal	Cuts	Amended Budget Plan
1988	312.0	−20.6	291.4
1989	332.4	−32.9	299.5
1990	353.5	−37.1	316.4
1991	375.0	−41.3	333.7
1992	396.9	−45.3	351.6
1993	420.9	−50.7	370.2

Congress, acting on a "budget summit" agreement with the Administration, cut defense by $20.6 billion in FY '88. The Defense Department, bowing to fiscal "reality," proposes to reduce its spending plans drastically over the next five years. All the cuts shown here total $227.9 billion.

The Air Force Budget

(TOA in then-year $ billions)

	FY '88	FY '89
Aircraft Procurement	12.9	16.6
Missile Procurement	7.4	8.2
Other Procurement	8.0	8.4
RDT&E	15.2	14.9
Military Construction		
USAF	1.3	1.3
Air Force Reserve	0.1	0.1
Air National Guard	0.2	0.1
Operation & Maintenance		
USAF	19.9	22.0
Air Force Reserve	1.0	1.0
Air National Guard	2.0	2.0
Military Personnel		
USAF	19.8	20.1
Air Force Reserve	0.6	0.7
Air National Guard	1.0	1.0
Stock Fund	0.2	0.2
Family Housing	0.8	0.9
Totals	**90.4**	**97.5**

The Air Force gain for FY '89 looks better in this comparison than it actually is, because USAF's 1988 budget took an exceptionally heavy hit. See "Service Shares" chart for trend.

Service Shares

(Budget authority in $ billions)

	FY '83	FY '84	FY '85	FY '86	FY '87	FY '88	FY '89
Current Dollars							
Army	57.5	62.2	74.3	73.1	74.0	75.8	77.8
Navy/Marine Corps	81.9	82.1	99.0	96.1	93.5	100.1	96.4
Air Force	74.1	86.1	99.4	94.9	91.6	88.2	97.2
Defense Agencies	9.3	10.7	13.1	15.5	19.2	17.0	18.6
Defense-wide activities	16.8	17.0	1.0	1.4	1.2	2.1	0.7
Totals	**239.5**	**258.2**	**286.8**	**281.1**	**279.5**	**283.2**	**290.8**
Constant FY '89 Dollars							
Army	71.0	73.9	84.6	81.1	79.8	78.3	77.8
Navy/Marine Corps	99.2	96.5	112.3	106.6	100.8	103.5	96.4
Air Force	88.6	100.5	112.3	105.1	98.9	91.2	97.2
Defense Agencies	11.5	12.9	15.2	17.5	20.8	17.6	18.6
Defense-wide activities	20.5	20.1	1.1	1.6	1.3	2.1	0.7
Totals	**290.8**	**303.9**	**325.5**	**311.9**	**301.6**	**292.8**	**290.8**

The bulge in the Navy budget for 1988 reflects funding for two supercarriers. From FY '85 on, budgets of the individual services include retired pay accrual.

Allocating the Cuts

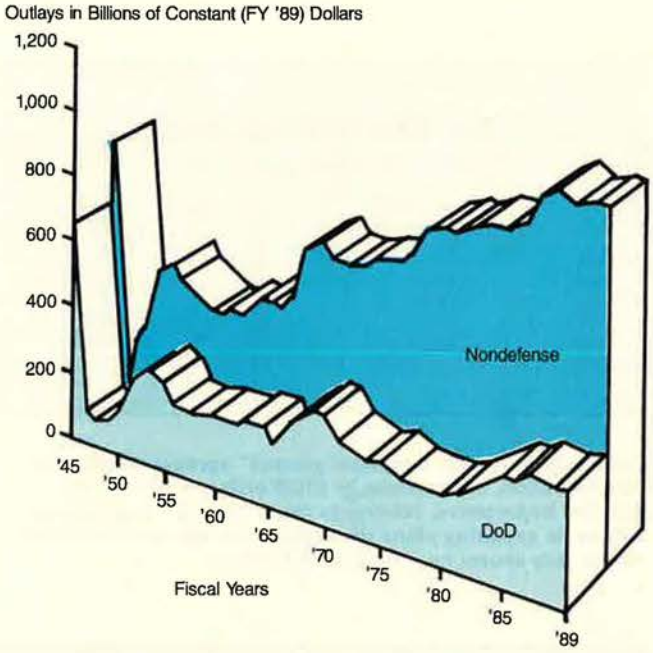
(Budget authority in current $ billions)

By Program Account	FY '89 Proposal	Cut	FY '89 Revised
Military Personnel	81.6	−3.2	78.4
Operation & Maintenance	91.5	−5.9	85.6
Procurement	94.6	−14.5	80.0
Research, Development, Test & Evaluation	44.3	−6.2	38.2
Military Construction/Family Housing	10.7	−1.7	9.0

By Service Component	FY '89 Proposal	Cut	FY '89 Revised
Army	84.7	−6.9	77.8
Navy/Marine Corps	108.7	−12.3	96.4
Air Force	107.2	−10.0	97.2
Defense Agencies	20.9	−2.6	18.3
Defense-wide activities	1.7	−0.7	1.0

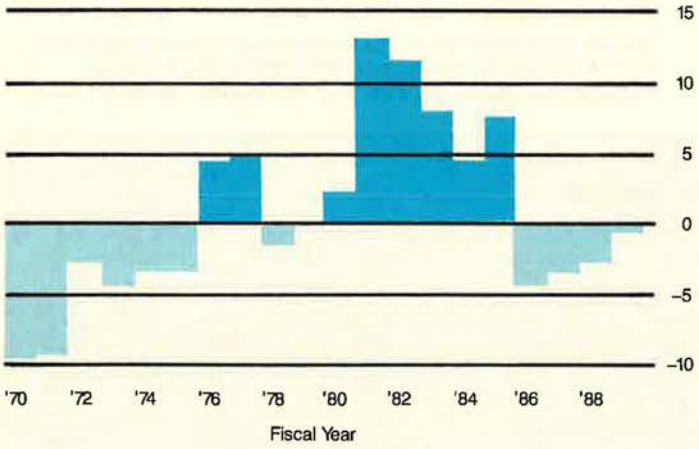
This chart does not include the $8.7 billion portion of the defense budget that goes to activities in the Department of Energy and other agencies. The program breakout at left shows how the reductions were applied to the five major accounts of the direct Defense Department budget. Small "miscellaneous" categories are omitted from this breakout.

Federal Spending Profile



Funding Ups and Downs

Defense spending has not grown in real (after inflation) terms for more than six years at a stretch since World War II. This chart traces the unstable trend in defense authority since 1970. Such fluctuation confounds efforts to plan and spend funds efficiently.



The Relative Burden of Defense

Fiscal Year	Federal Outlays as % of GNP	DoD Outlays as % of Federal Outlays	DoD Outlays as % of GNP	Non-DoD Outlays as % of Fed'l Outlays	Non-DoD Outlays as % of GNP
1950	16.0	27.5	4.4	72.5	11.6
1955	17.6	51.5	9.1	48.5	8.6
1960	18.2	45.0	8.2	55.0	10.0
1965	17.5	38.8	6.8	61.2	10.7
1970	19.8	39.4	7.8	60.6	12.0
1971	19.9	35.4	7.0	64.6	12.8
1972	20.0	32.6	6.5	67.4	13.5
1973	19.1	29.8	5.7	70.2	13.4
1974	19.0	28.8	5.5	71.2	13.5
1975	21.8	25.5	5.6	74.5	16.2
1976	21.9	23.6	5.2	76.4	16.7
1977	21.1	23.4	4.9	76.6	16.2
1978	21.1	22.5	4.7	77.5	16.4
1979	20.5	22.8	4.7	77.2	15.8
1980	22.2	22.5	5.0	77.5	17.2
1981	22.7	23.0	5.2	77.0	17.5
1982	23.7	24.5	5.8	75.5	17.9
1983	24.3	25.4	6.2	74.6	18.2
1984	23.1	25.9	6.0	74.1	17.1
1985	24.0	25.9	6.2	74.1	17.8
1986	23.6	26.8	6.3	73.2	17.3
1987	22.8	27.3	6.2	72.7	16.6
1988	22.4	26.2	5.9	73.8	16.5
1989	21.7	26.1	5.7	73.9	16.0

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The Soviets have caught up in some areas, but they're still behind in computers—and that's vital to all else.

Red vs. Blue: Technology Matchup

BY JAMES W. CANAN
SENIOR EDITOR

THE potentially life-or-death competition between the United States and the Soviet Union for primacy in military technology is more complicated for both sides than it used to be.

In many ways, each superpower is as much in a race with itself as with the other, given the contemporary difficulties confronting both.

The USSR has caught up with or is closing on the US in many military technology arenas. But it remains well behind in computers, which are vital to all else, and must do better at bringing them along.

Moreover, the steam that the Soviets have built up on the military technology front in recent years may dissipate somewhat in the years ahead.

With an eye to foreign trade and domestic tranquillity, the Kremlin seems intent on restructuring the Soviet economy to the greater gain of the commercial sector. This implies that the disproportionate resources customarily devoted to military technologies and machines will have to be distributed more evenly among nonmilitary laboratories and plants.

The US also has problems with allocating resources. If it doesn't watch out, its military technology base and its new-technology systems programs may be strangled by the chokehold that the defense budget is now applying to the Pentagon.

This would compound a problem that the Pentagon has always had—that of incorporating advanced technologies in operational systems at affordable costs before too many years go by.

These perspectives and others on ramifications of the US-USSR military technology rivalry were provided by panelists who took part in an Aerospace Education Foundation Roundtable discussion last February.

Entitled "Technology Matchup," the Roundtable was moderated by Gen. Robert T. Marsh, USAF (Ret.), former Commander of Air Force Systems Command. Panelists included G. Kent Bankus, a retired Air Force colonel who specializes in industrial and technological matters as a staff member of the Senate Armed Services Committee; Robert R. Everett, Chairman of the Defense Science Board; Dr. John R. Thomas, special assistant for Soviet Science and Technology with the

Defense Technology Security Administration; and John J. Welch, Jr., Assistant Secretary of the Air Force for Acquisition.

Relying on Technology

Setting the stage for the discussion, General Marsh noted that the US has always relied on its superior technology, particularly in conventional weapons, to offset the USSR's numerical advantages in fielded weapons and forces.

"But even while the Soviets retain their numerical edge," said General Marsh, "we now see a steady stream of technically very sophisticated Soviet systems that challenge our assumption of Western technological superiority."

Among such systems, the moderator enumerated those for surveillance and intelligence, fighter aircraft, missiles, tanks, submarines, and command control and communications (C^3).

Calling this "a cause for serious concern," General Marsh said that the situation is exacerbated by recent arms-control developments that make conventional weapons all the more important. "The Soviet technical challenge could worsen an already tenuous balance in the European theater. Furthermore, very tight budget constraints will make the commitment of additional funds to our science and technology programs difficult at best."

Mr. Everett expressed the consensus of the panel that the Soviets have indeed come a long way in military technology. "I think the technology gap has narrowed significantly, and in some cases it has disappeared," he said. "We do have a large problem on our hands of maintaining a gap of some sort. But I think we still have a significant technological advantage in some critical areas."

Mr. Everett also cautioned, however, that the US must pay close attention to "whether our technology is getting into the field and represents capability that our [forces] can use."

Dr. Thomas said that "the answers are never simple" in assessing the differences between US and Soviet technologies. "They certainly have closed the gap in many areas," he said, "but we have to recognize that they have also accumulated a lot of problems along the way. . . .

—Photo by Arthur Hyland

Aerospace Education Foundation panelists analyze US and USSR progress and obstacles in the race to develop and apply advanced military technologies in difficult times. Clockwise from left: G. Kent Bankus, John J. Welch, Moderator Gen. Robert T. Marsh, USAF (Ret.), Robert R. Everett, and Dr. John R. Thomas.

"The reason they closed the gap in the military area was because they've had unbalanced economic development. They devoted tremendous resources to the military area at tremendous expense to the civilian economy—and it's catching up with them."

Approaching Limits

Mr. Bankus made a corollary point, questioning whether the US and the Soviet Union—and Europe and Japan as well—are approaching "some technological limit that we can't go much beyond" because of the expenditures required to maintain the pace.

On this point, the panelists by and large agreed that greater selectivity in the pursuit of military technologies has become increasingly imperative.

Said Mr. Everett: "There are always technologies that are improving rapidly or changing rapidly, and part of the problem is to find out what those are and what they mean to us in military terms—and to pursue those and not pour our limited resources into trying to stay ahead in areas that we've essentially saturated."

Secretary Welch noted that "there is an erosion" of the value of dollars spent on military science and technology because of increasing overhead costs. Moreover, the competition among and within the services for funding is ever fiercer.

"So the question becomes one of more effectively using our dollars," Mr. Welch declared.

He characterized current funding for the Air Force technology base, which includes advanced development programs, as "running at about a billion and a half dollars per year." He said he expects it to hold steady this year, adding: "I think there may be a little bit of sliding off of that in the first few years of the upcoming five-year budget, but I think we see a positive slope beyond that time."

Mr. Welch said that the Air Force has accorded "priority recognition" to science and technology as being "the foundation for the Air Force's future" and that "even though we remain financially limited, I believe we will slowly work our way up that curve in terms of real dollars spent" on science and technology.

He made it clear that he is not an unqualified optimist, however, in

noting that, "at best, we are holding our own in many areas."

From the Capitol Hill perspective, Mr. Bankus had some words of encouragement. "Support for the defense tech base is very good on the Hill," he said, "especially in times of relatively flat overall defense budgets.

"And that's because it's the seed money for the future."

In terms of inflation-discounted dollars, funding for the defense technology base has steadily declined over the past twenty-five years, Mr. Bankus said.

As he sees it, the Senate Armed Services Committee, for one, takes the view that "the tech base certainly didn't participate in the defense buildup of the last eight years, so why should it now participate in the builddown that's occurring?

"The feeling is that it should be increased now—not decreased—because it's what's going to keep us going ten or fifteen years from now."

Noting that such fine operational systems as the F-15 and F-16 fighters originated at a time of relatively high tech-base funding, Mr. Bankus said that unless such funding is amply provided now and in the future, "the young captains who will be the generals fifteen years from now will not have the technology" needed for systems "like the F-15s and F-16s" of the current era.

In the context of systems and their elements in the offing, Mr. Welch cited the Advanced Tactical Fighter, the National Aerospace Plane, very-high-speed integrated circuits (VHSICs), and manufacturing technology as embodying technologies deserving of Air Force tender loving care.

He also expressed the wish that the other services would not just talk about how important manufacturing technology is to their futures, but would ante up money for it, as the Air Force has done.

Computers Hold the Key

Computers hold the key to all such programs, to the US staying on top technologically, and to the ability of both superpowers to turn military technology into military products, the panelists agreed.

"Data-processing technology is not mature," said Mr. Everett. "It is changing as rapidly today as it was twenty or thirty years ago, and in some ways it's changing more rapidly. And that's where the United States still has the lead and should continue to maintain it. . . .

"I think our ability to build data-processing systems and signal-processing systems for intelligent weapons and standoff weapons and things of that sort is a very definite advantage that we have.

"It's important to us to take proper care of that advantage and to recognize that it won't last forever and that at some time in the future we will have to think of other things as well."

According to Dr. Thomas, the Soviets acknowledge their relative backwardness in computer technology and themselves raise "the question of whether they will indeed be able to keep up with us."

In this regard, he noted, the Soviet government is introducing special programs in schools and universities "in order to have the Soviet children and students get ready for this information revolution. . . . The Soviet kids today, unlike our kids, have no access—no hands-on opportunities. They're practicing with cardboard keyboards instead of actual computers. . . .

"Their problem is the perennial one—the production problem. They cannot produce the computers."

Dr. Thomas said that Soviet computers represent the third generation of such machines, in contrast to those of the fourth and fifth generations in use by the US.

"I'm always amazed when we walk through . . . Soviet computing centers," Dr. Thomas declared. "They look very primitive. To be sure, the [Soviet] military must have something better. But a balanced [Soviet] economy has got to produce better ones across the system, and I think Gorbachev recognizes that."

Declaring that the Soviets "have bought, borrowed, begged, and stolen computer technology" from other nations, Dr. Thomas said that so long as they continue to resort to such secondary methods, "they'll be somewhat behind" the US.

"The question is: Do they have their own inherent talent to start producing the technology on their own? They've had a lively battle in the recent past wherein some of the Soviet scientific leaders have berated the Soviet scientists for not being able to produce world-class [computer] technology."

Picking up on this, Mr. Welch declared: "From what we see, it will be some period of time before they have an independent capability. But to turn it around a little bit from whether we have a problem vis-à-vis the Soviets catching up, I think the challenge—particularly in the computer world and in software—is *ourselves* right now.

"We can't keep up with our own needs with our own software."

Our Own Biggest Challenge

Software, said Mr. Welch, is "probably our highest-priority technology," because its insufficiencies are "drawing out the introduction and implementation of our new systems. So we are kind of our own biggest challenge."

If the US military and civil sectors meet the software challenge, said Mr. Welch, "I think we will open up a lead over the Soviets faster than—frankly—if we just worry about the Soviets, other than protecting our technology."

The Roundtable participants agreed, however, that if the Soviets bear down on computer technologies and bring off the modernization that they seek, big trouble could be in store for the US.

Said Mr. Everett: "There is a great difference between the Soviet commercial sector and our commercial sector. Ours is flourishing, and worldwide competition is driving the basic art that we're using. But that difference is not so great in the military sectors. We do have a centrally planned economy in the military sector, which carries somewhat the same burdens that the Russian system does.

"It does raise problems about how to spend money and how to do things, which I think are our fundamental difficulties. They're not technology. We have technology running out of our ears. There are just all kinds.

"The problem is not only to apply it but to get it built and out into the field and used."

Low-observables, or stealth, technologies and those of "brilliant" weapons came in for some Roundta-

ble discussion of US-USSR technology matchups.

General Marsh noted that "any comparison of relative technological status must consider stealth" and that "much of this information is classified and rightfully so."

Even so, he asked Mr. Welch whether the US has "a commanding lead" in stealth technologies and, if so, whether it will be "an enduring lead or, if you will, a passing, flash-in-the-pan type of lead."

In a humorous vein, Mr. Welch replied that "the answer should be, 'Yes and hush up.' "

He added, however, that the US lead "certainly is" a commanding one and that, "if we go about managing ourselves and our products, it can be an enduring one too."

Mr. Bankus observed that "when we build a technology and eventually field it, the Russians tend to do the same thing about ten years behind. One would hope that, given the secrecy with which we've approached this, maybe that gap will have widened.

"But one has to assume that the Russians are very actively pursuing [stealth] with all the vigor that they possibly can, knowing how much we're investing in it."

In this connection, he referred to the Pentagon having publicized its award of a $2 billion contract to Northrop for the stealthy B-2 bomber.

General Marsh cited a number of studies of defense technologies in recent years that "emphasized in one way or another the need for what I'll call 'brilliant' weapons." His question to the panel was: "How close are we to them, and is the technology here to support brilliant weapons at affordable costs?"

Well Within Reach

There was general agreement that such weapons are well within reach but that their costs will be high and must be weighed against the uses to which they will be put.

"I think that smart weapons—standoff weapons—are the wave of the future," Mr. Everett declared. "We're going to have to pursue them. But they tend to be expensive—a lot more expensive than iron bombs. And if they allow the [aircraft] platform to stand off where it belongs, where it's less likely to get shot, that platform can use up a lot of those weapons in very short order.

"And if you don't watch out, you'll find that the standoff weapons cost more than the platforms."

The Defense Science Board Chairman warned of difficult choices ahead for the Pentagon with regard to standoff weapons and aircraft.

"If the budget is fixed—and I think it is—then the cost of getting those weapons will have to come out of the platforms. And that's going to be harder to do than developing the technology."

Mr. Welch advocated "balance" in tackling the question of manned aircraft vs. standoff weapons. "I think that if you cannot have enough platforms so that they survive and are sustained during the course of the war to deliver these weapons, it doesn't make much sense in having the weapons.

"I have little trouble with brilliant weapons and all. They might be representative of a technology that we can take in hand. The question is: Has the user really defined how he's going to use them? Or are they just available out there and we have not yet found the best way to use them?

"We should think that problem through, rather than just charging out and spending ourselves down a slippery slope."

Judicious spending on prime technologies is the key to the US staying ahead of the USSR, the panelists agreed.

Concluding that "in a macro sense, we've seen our lead narrowing across most technologies," General Marsh asked the panel: "Are we doomed to this trend? Or are there some things that can be done to regain or widen our lead once again?"

Said Mr. Everett: "There's a lot of room to improve the efficiency with which we spend the technology dollars that are available to us. . . . I think the ways we do it now are not very good. The ways we're organized, the way we think about it, the way we put out money—all of that could stand improvement.

"But I wouldn't trade our set of problems for the Russians' set of problems."

Agreeing with that, Dr. Thomas declared that "the ability of the Soviets to spend their rubles efficiently" will have a lot to do with "whether they're going to keep up with us or fall behind." ■

—Photo by Arthur Hyland

Entitled "Technology Matchup," the AEF Roundtable discussion dealt extensively with the relative strengths and weaknesses of US and Soviet computer technologies. Here, the panelists explore the idea that each superpower is as much in a race with itself as it is with the other in mastering the computer world.

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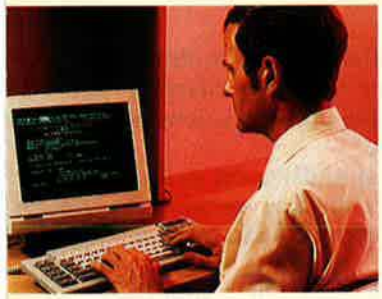

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REVOLT OF THE ADMIRALS

Overtly, the 1949 "rebellion" pitted the flush-deck supercarrier against the B-36 bomber, but the real struggle was about roles and missions.

BY HERMAN S. WOLK

FORTY years ago, one of the most spectacular public interservice clashes in American military history boiled over and in effect set the framework for the discussion of strategic issues for decades. Although the so-called "Revolt of the Admirals" in 1949 primarily pitted the US Navy against the fledgling United States Air Force, the roots of this titanic struggle can be traced back to the period between the world wars.

Following Brig. Gen. William (Billy) Mitchell's destruction of warships off the Virginia capes in 1922 in a planned demonstration of the power of land-based aviation, the Navy began building a carrier fleet that would project its power to places far from America's shores. The Navy, in the 1920s and 1930s, attempted to restrict

Secretary of Defense James Forrestal presides at a March 25, 1949, meeting of service leaders amid the historic bombers-vs.-carriers clash between the Air Force and the Navy. Clockwise from left: Acting Secretary of the Navy W. J. Kenney, Secretary of the Air Force Stuart Symington, Secretary of the Army Kenneth Royall, Secretary Forrestal, Army Chief of Staff Gen. Omar Bradley, Chief of Naval Operations Adm. Louis Denfield, and Air Force Chief of Staff Gen. Hoyt Vandenberg.

development of the Army's land-based aviation and tried to limit the range that Army aircraft could patrol off the coast. Also, between the wars, the Army Air Corps evolved a strategic bombing concept that would be the foundation for its bombing doctrine on the eve of the nation's entry into World War II. The development of the Air Corps concept and the building of its forces were helped by the evolution of advanced bomber aircraft—the B-17 first flew in 1935—and the creation in March 1935 of the General Headquarters (GHQ) Air Force under Brig. Gen. Frank M. Andrews.

World War II demonstrated the effectiveness of the Navy's fast carrier forces in the Pacific theater. The Army Air Forces (AAF), built and led by Gen. Henry H. (Hap) Arnold, projected its power on a global scale. Japan's surrender in 1945 without being invaded vindicated Arnold's contention that land-based strategic airpower could play a decisive role in modern warfare.

Generals Arnold and Carl A. (Tooey) Spaatz, Commanding General of the United States Army Strategic Air Forces, underscored the destructive power of the B-29 conventional bombing campaign against Japan. Arnold emphasized that the dropping of the atomic bombs in August 1945 "did not cause the defeat of Japan, however large a part they may have played in assisting the Japanese decision to surrender." Japan capitulated, noted General Arnold, "because air attacks, both actual and potential, had made possible the destruction of their capability and will for further resistance. . . . These . . . attacks . . . had as a primary objective the defeat of Japan without invasion."

Arnold's Advice on the A-Bomb

In the summer of 1945, Arnold was so convinced that Japan could be knocked out by the B-29 hammer blows prior to the scheduled invasion of the home islands in November 1945 that he recommended to President Harry S. Truman at the Potsdam conference in July that the atomic bomb not be dropped, the only member of the Joint Chiefs of Staff (JCS) to do so. Strangely, in the years since the end of the war, given the controversy over dropping the bomb, Arnold's opinion and advice have received comparatively little attention. After the war, the AAF commander remained sensitive to the issue of the atomic bomb. He wrote Spaatz: "I am afraid that from now on there will be certain people who will forget the part we have played." Critics were already writing that strategic bombing had proved excessively costly in relation to the results achieved.

The war laid the foundation for future interservice confrontations. The leadership of the Navy stressed self-sufficiency and argued that the Navy needed everything it had asked for in terms of personnel, equipment, and weapons to carry out its mission, including long-range reconnaissance, antisubmarine warfare, and support of amphibious operations. Gen. Dwight D. Eisenhower, who replaced Gen. George C. Marshall as Army Chief of Staff in November 1945, argued that the nation could not afford this naval self-sufficiency. The major lesson of World War II, Eisenhower emphasized to Congress during postwar unification hearings, was the crucial importance of unified command and unified theater actions, the mutual dependence of the services. The idea of separate ground, sea, and air operations, Eisenhower said, "was gone forever."

The Army Air Forces came out of the war determined to achieve independence and to claim a preeminent role in the defense establishment. The basis of this postwar drive was the demonstrated wartime effectiveness of the AAF's strategic air forces. The precedent was the formation of Twentieth Air Force in April 1944, under direct command of Arnold in Washington, as executive agent of the Joint Chiefs. In June 1945, Maj. Gen. Laurence S. Kuter, Deputy Commanding General, AAF, Pacific Ocean Areas, stressed to Arnold the importance of the Strategic Air Forces to the drive for independence. Twentieth Air Force became the predecessor of the postwar Strategic Air Command, which in December 1946 was in effect made a JCS specified command under the Unified Command Plan signed by President Truman.

Navy Opposition to Unification

The Navy, led by Secretary of the Navy James V. Forrestal, opposed unification legislation and the creation of a separate Air Force. Fearful of losing its aviation arm and perhaps the Marines, the Navy held that carrier-based aviation could best ensure the country's security. The AAF and the War Department, under Eisenhower, countered that the national security could best be ensured by unification and the formation of the United States Air Force.

The immediate result of the defense unification battle during 1945–47 was a compromise. The National Security Act of 1947, which brought USAF into being, created a National Military Establishment consisting of Departments of the Army, Navy, and Air Force (each headed by a civilian Secretary) under the civilian Secretary of Defense. None of the services was completely satisfied with this legislation. Lt. Gen. Ira C. Eaker, AAF's Deputy Commander, noted that the legislation legitimized

Secretary Symington, center, and General Vandenberg, right, were central figures in the interservice clash that culminated in the "revolt of the admirals." Here, in 1948, they salute retiring Air Force Chief of Staff Gen. Carl (Tooey) Spaatz.

four military air forces, a fact that some in the AAF were quite upset about, including the retired General Arnold.

The Navy attempted to have service roles and missions written into the Act, but lost on this issue. Eisenhower had successfully countered the Navy's position by emphasizing that in legislation of this kind, one sticks to general principles rather than specific points of contention. The National Security Act created a federated military establishment that featured coordination as opposed to administration, a point that would subsequently be stressed by the first Secretary of the Air Force, Stuart Symington. According to one observer, the Army and the Air Force saw the Act as a first step, the Navy considered it a holding action, and President Truman thought it a necessary compromise.

The Act left unresolved the crucial question of roles and missions. Although the 1947 Act was undoubtedly the best that could be agreed on at the time—and Truman insisted that the Navy get behind it—it set the stage for a monumental struggle between the Air Force and the Navy.

Judge Robert P. Patterson, who succeeded Henry Stimson as Secretary of War, was Truman's choice to be the first Secretary of Defense. However, Patterson declined, citing the need to return to private life for financial reasons. The President then appointed Forrestal, despite the Navy Secretary's intense opposition to the creation of the Air Force.

Before the National Military Establishment had operated for long, a major problem became evident to Secretary of the Air Force Symington and to General Spaatz, first Air Force Chief of Staff. Forrestal had staffed the Office of the Secretary of Defense almost entirely with naval personnel. He had simply moved his people from the Navy Department to OSD. W. Barton Leach, a professor at the Harvard Law School (formerly Chief of the AAF Operations Analysis Division and in 1947 a colonel in the Air Force Reserve) who was an advisor to Symington, noted:

"These civilian officials are not prejudiced against the Air Force, nor are they unwilling to learn. But an instinctive understanding of Air Force problems is not in their blood . . . . When the chips are down, it too often happens that the Air Force gets the short end of these very important decisions. . . .

"For the most part, OSD has been staffed with able men. But ability is not enough. A Supreme Court comprising the nine ablest lawyers in the country would not be acceptable if it turned out that all nine came from Wall Street firms."

The Real Issue: The Strategic Atomic Mission

The real issue between the Air Force and the Navy in 1947–48 was responsibility for the strategic atomic mission, the key to the prime share of the defense budget. Symington was well aware that the Air Force would have "to prevent Navy encroachment on the Air Force responsibility for strategic bombing operations." The Navy's postwar leadership was dominated by aviators who were determined to build forces capable of delivering the atomic bomb.

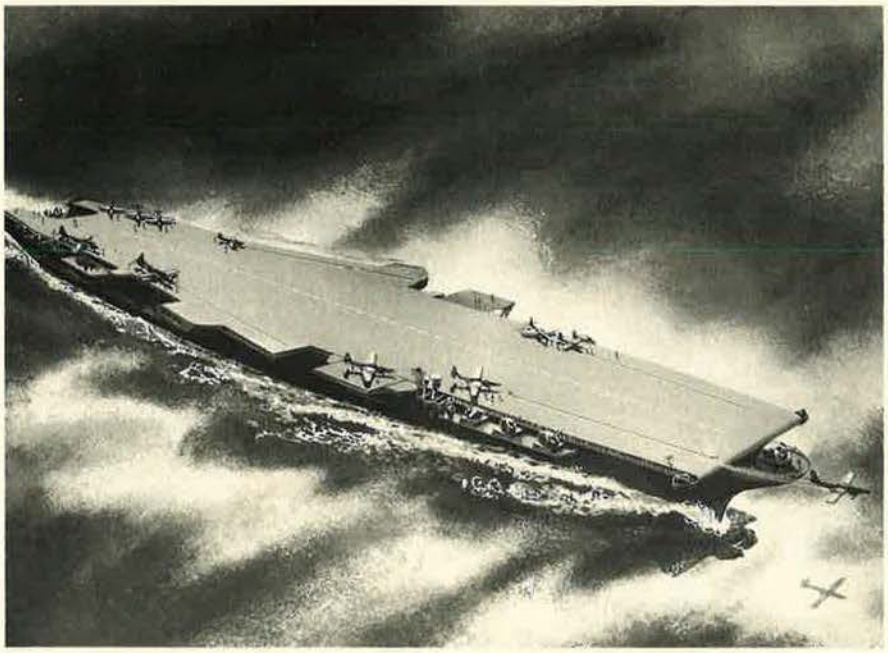
In early 1948, President Truman's Air Policy Commission, headed by Thomas K. Finletter (who would succeed Symington in 1950), and the Congressional Aviation Policy Board supported the seventy-group Air Force objective. The Finletter group predicted that the Soviet Union would develop an atomic capability by January 1953. These reports, however, failed to address roles and missions, and the Navy charged that the Finletter report ignored naval aviation. Forrestal himself continued to advocate what he termed "balanced forces" as opposed to the seventy-group Air Force.

Meanwhile, Secretary of the Navy John L. Sullivan announced in early February 1948 that the Navy planned to build a flush-deck supercarrier. Although Sullivan insisted the Navy had no intention of usurping the strategic mission, Symington and Spaatz thought that the Navy was in the process of building a strategic air force with the planned supercarrier and its long-range patrol bombers.

With interservice acrimony increasing, Forrestal convened the Joint Chiefs for two major roles-and-missions conclaves during 1948. In March, at a Key West, Fla., meeting held, according to Forrestal, to decide "who does what with what weapons," the JCS agreed that strategic bombing was the Air Force's responsibility. The Navy could develop its own essential weapons, but not a strategic air force. A new executive order signed by Truman confirmed this agreement.

However, the budget policy of the Truman Administration remained basically an almost three-way split among the services. Forrestal's balanced-force concept remained intact. And though in April 1948 the House Appropriations Committee voted an $822 million supplemental appropriation to be used toward achieving the Air Force's seventy-group force objective, the Administration refused to spend it.

The second roles-and-missions conference, held at Newport, R. I., in August 1948, saw Forrestal and the Joint Chiefs in agreement that USAF would have primary responsibility for strategic bombing, but during war



An artist's drawing of the 65,000-ton carrier that was scrubbed in a Defense Department decision to assign naval airpower a secondary role and build up the Air Force's bomber force instead. This stirred up fierce Navy opposition to USAF's fledgling B-36 bomber and caused the admirals to dig in their heels.

Vice Adm. Arthur Radford, commander of the Pacific Fleet, testifies against the B-36 at a 1949 congressional hearing. He called the bomber "a bad gamble."

would be supplemented by the use of naval forces. The agreement stated that "the service having the primary function must determine the requirements, but . . . must take into account the contributions which may be made by forces from other services." The JCS also decided that the Chief of the Armed Forces Special Weapons Project would report to Gen. Hoyt S. Vandenberg (who had succeeded Spaatz as Air Force Chief of Staff), in effect giving the Air Force operational control of the atomic bomb, something it had long desired.

These high-level conferences solved little and confirmed the weakness of Forrestal's position. The irony was that the AAF and the War Department, during 1946–47, fought for legislation to structure a strong OSD while Forrestal and the Navy succeeded in arguing the case for a military establishment that was essentially a federation headed by a coordinator as Secretary of Defense.

USAF pressed ahead in the building of its atomic deterrent force. The Berlin blockade had stunned the world in 1948, and in October, General Vandenberg directed Lt. Gen. Curtis E. LeMay to head the Strategic Air Command, replacing Gen. George C. Kenney. Vandenberg, with the backing of Symington and LeMay, supported production of the B-36 long-range strategic bomber. In December 1948, Vandenberg and top Air Force commanders met at Maxwell AFB, Ala., and decided that the structuring of SAC's atomic force should be their highest priority.

Throwing Meat to the Lions

Thus, the confluence of events at home and abroad increased the pressure on the services to claim high-priority missions and to gain a larger share of the military budget. Much greater pressure was about to build. In January 1949, Truman held the Fiscal 1950 defense budget to a $14 billion ceiling—an almost equal split among the services that in effect limited the Air Force to forty-eight groups. Symington, visibly upset and aware that the seventy-group goal again would not be met, declared the Administration's action to be the equivalent of throwing meat to the lions and having them fight over it.

The pressure also told on Forrestal, who, exhausted and frustrated, became erratic and indecisive. Some observers described Forrestal as suffering from "battle fatigue." Truman asked for his resignation in March 1949. The former Navy Secretary was replaced by Louis Johnson, a former Assistant Secretary of War who had been Truman's fund-raiser for the 1948 Presidential campaign. Forrestal was subsequently hospitalized at the Bethesda Naval Hospital, where in May 1949 he took his own life.

Secretary Johnson took office at the end of March 1949 and immediately went into action. Believing that construction of the flush-deck supercarrier was unnecessary, wasteful of funds, and a duplication of the Air Force's mission, he polled the Joint Chiefs (Adm. Louis E. Denfeld was the lone vote for construction) and then obtained Truman's approval to stop construction. Gen. Omar Bradley, Army Chief of Staff, and Air Force Chief Vandenberg believed that the function of the supercarrier was actually a primary function of the Air Force and that the use of carrier aircraft against land targets should be limited. Naval air should be used as a reinforcement to USAF action and not for sustained operations against land objectives. Also opposed to construction were General Eisenhower (then President of Columbia University and an advisor to Truman) and the chairmen of the Armed Services Committees of both the House and Senate.

An irate Secretary of the Navy Sullivan immediately resigned. He wrote Johnson that this action "represented the first attempt ever made in this country to prevent

The B-36 in flight, oblivious to the political storm. The bomber's opponents charged that it was a "billion-dollar blunder" and that the Air Force was rewarding the B-36 contractor, Consolidated Vultee, for past favors rendered. Led by Secretary Symington and General Vandenberg, USAF refuted the charges and persuasively argued that the B-36 would be essential to strategic bombing, a concept that had been proved out in World War II and a mission that the JCS had assigned exclusively to USAF after the war.

the development of a power weapon. The conviction that this will result in a renewed effort to abolish the Marine Corps and to transfer all naval and Marine aviation elsewhere adds to my anxiety." The battle had been joined.

Organized under the Deputy Chief of Naval Operations (Administration), a research group, Op-23, headed by Capt. Arleigh A. Burke, a crack destroyer commander during the war and a future CNO, began to gather material critical of the B-36's performance and capabilities. In April and May 1949, rumors of fraud surfaced in connection with B-36 contracts. Secretary of Defense Johnson once had been a member of the board of directors of Consolidated Vultee, manufacturer of the bomber. Also, an "anonymous document" circulated in Washington, claiming that the B-36 was a "billion-dollar blunder" and that Johnson and Symington had a personal interest in its production because they owed favors to Floyd Odlum, whose company manufactured the plane.

As press coverage critical of the B-36 and the Air Force increased in May, it was divulged that the author of the so-called "anonymous document" was Cedric R. Worth, civilian assistant to Under Secretary of the Navy Dan A. Kimball. Subsequently, a Navy court of inquiry determined that Worth, a former commander in the Naval Reserve and a professional writer, had been aided by Cmdr. Thomas D. Davies, assistant head of Op-23. Glenn L. Martin, an aircraft manufacturer who had recently lost a contract when funds were diverted to the B-36, provided information to Worth. After Congressman James E. Van Zandt (R-Pa.) of the House Armed Services Committee called for a special panel to investigate charges against Johnson and Symington, the House authorized the Armed Services Committee to conduct a comprehensive investigation of the B-36 matter as well as the decision to cancel the supercarrier and the overall issue of roles and missions.

These charges and the attendant congressional hearings received national attention and a great deal of coverage in the press. The hearings were held in two parts: During August 9–25, 1949, the House Armed Services Committee deliberated over the B-36, and in October, twelve days of hearings were conducted on "Unification and Strategy."

Secretary Symington, his integrity impugned and perceiving a direct threat against the fledgling Air Force, called on USAF Reserve Col. W. Barton Leach of the Harvard Law School to organize and plan the Air Force case for the B-36 hearings. Leach put together a team to analyze all statements against the Air Force and to answer these charges.

"Not One Iota, Not One Scintilla . . ."

With Chairman Carl Vinson of Georgia presiding, the House committee found no evidence to substantiate the charges and cleared all USAF officials. The committee recommended that Cedric Worth be fired. There was "not one iota, not one scintilla of evidence," emphasized Vinson, "that would support charges that collusion, fraud, corruption, influence, or favoritism played any part whatsoever in the procurement of the B-36 bomber." Following a naval court of inquiry, Worth was dismissed. Although Commander Davies of Op-23 admitted helping Worth, the court found that the Op-23 personnel had not realized that Worth intended to disseminate the material.

The unification and strategy hearings in October were the most spectacular and comprehensive postwar public investigation of the subject of roles and missions. For the Navy, Secretary Francis P. Matthews, Sullivan's successor, Vice Adm. Arthur W. Radford, Capt. Arleigh Burke, and Adm. Louis E. Denfeld, CNO, were among those who testified. They claimed that the B-36 was an inferior plane that could not accomplish the strategic

bombing mission against the Soviet Union, that the entire concept of strategic bombing was unsound, and that the decision not to construct the supercarrier weakened the Navy and was itself a threat to the national security.

Radford termed the B-36 a "bad gamble" and indicted what he called the "atomic blitz," the land-based strategic deterrent. Burke trumpeted that carrier aviation was more versatile than land-based airpower, and Denfeld declared himself "gravely concerned" about the Navy's ability to carry out its mission without such a weapon as the supercarrier.

The heart of the Air Force testimony came from Secretary Symington, who proved to be a masterful witness. In clear, factual testimony, he refuted the B-36 charges and emphasized that the concept of strategic bombing had been approved by the Joint Chiefs and assigned to the Air Force. The attacks against USAF, declared Symington, "imperiled the security of the United States. It was bad enough to have given a possible aggressor technical and operating details of our newest and latest equipment. . . . It is far worse to have opened up to him in such detail the military doctrines of how this country would be defended." The B-36 intercontinental bomber, noted Symington, was under attack by naval officials because it was seen as a threat to the Navy. These attacks had always increased when the military budget was under consideration.

Air Force Chief of Staff Vandenberg basically reiterated Symington's points. He stressed the effectiveness of strategic bombing in World War II and stated that the B-36 could accomplish its mission. As for the supercarrier, Vandenberg noted: "I accept the military capability of this ship as stated by the Chief of Naval Operations. My opposition to building it comes from the fact that I can see no necessity for a ship with those capabilities in any strategic plan against the one possible enemy."

Army Gen. Omar Bradley, Chairman of the Joint Chiefs of Staff, clinched the case against the Navy. Given the Soviet threat, distinguished by preponderant land forces, Bradley said that the JCS had given first priority to the Air Force's strategic nuclear deterrent. The United States could not attempt to match the USSR in ground forces. He supported production of the B-36 bomber. However, the B-36 was not really the issue. The Navy, he observed, was terribly upset over the supercarrier decision. The Navy was in "open rebellion against the civilian control." Naval officials exposed themselves as " 'fancy dans' who won't hit the line with all they have on every play unless they can call the signals." The Navy, said Chairman Bradley, refused "in spirit as well as deed" to accept unification.

The fact, of course, was that Forrestal and the Navy had opposed unification. The great irony was that Secretary of Defense Forrestal, eventually the man in the middle, subsequently recanted his opposition to the 1947 Act, admitted it was a weak piece of legislation, and ended by strongly advocating the August 1949 amendments to the National Security Act. These amendments strengthened the Office of the Secretary of Defense and downgraded the authority of the service Secretaries. As for the weakness of the 1947 Act, Symington had observed: "Ninety percent of the military problems could be licked if only someone would make a decision."

Adm. Arleigh Burke, later to be CNO, spoke out against the B-36 as a captain in 1949 on the grounds that it was an inferior aircraft, that it would not be capable of accomplishing the strategic bombing mission, and that the mission itself was unsound.

The great roles-and-missions uproar of the late 1940s could perhaps be seen as a step forward in that it had the effect of lancing the Navy's boil and removing at least temporarily the poison from its system. The debate had exposed a basic disagreement over strategy, weapons, and how to fight future wars.

Secretary Symington subsequently resigned, frustrated over the Air Force's inability to reach seventy groups under the limits of the Truman Administration's budget ceiling. The outbreak in June 1950 of the Korean War, however, busted the budget, and the Air Force was authorized a great increase in forces. Once again, external events intervened, and in a real sense Symington's advocacy of the need for air strength and preparedness had been vindicated.

The United States was not going to build a large Army and Navy immediately after World War II. The most effective force to fit the country's need after the great war was the Strategic Air Force. Despite the Navy's argument to the contrary, land-based strategic airpower was about to assume paramountcy during peacetime in the nation's defense phalanx, a situation unprecedented in American history.

The forty years that have passed since these events have demonstrated the persistence and importance of the lessons derived from this great debate: the need for clarity of roles and missions, the importance of the far reach of land-based airpower, and the necessity of strength and vigilance to the nation's well-being. ■

Herman S. Wolk is Chief, General Histories Branch, Office of Air Force History. He is the author of Planning and Organizing the Postwar Air Force, 1943–1947 *(Office of Air Force History, 1984). His assessment of Gen. George C. Kenney will be published in* We Shall Return! MacArthur's Commanders and the Defeat of Japan *(University Press of Kentucky, 1988).*

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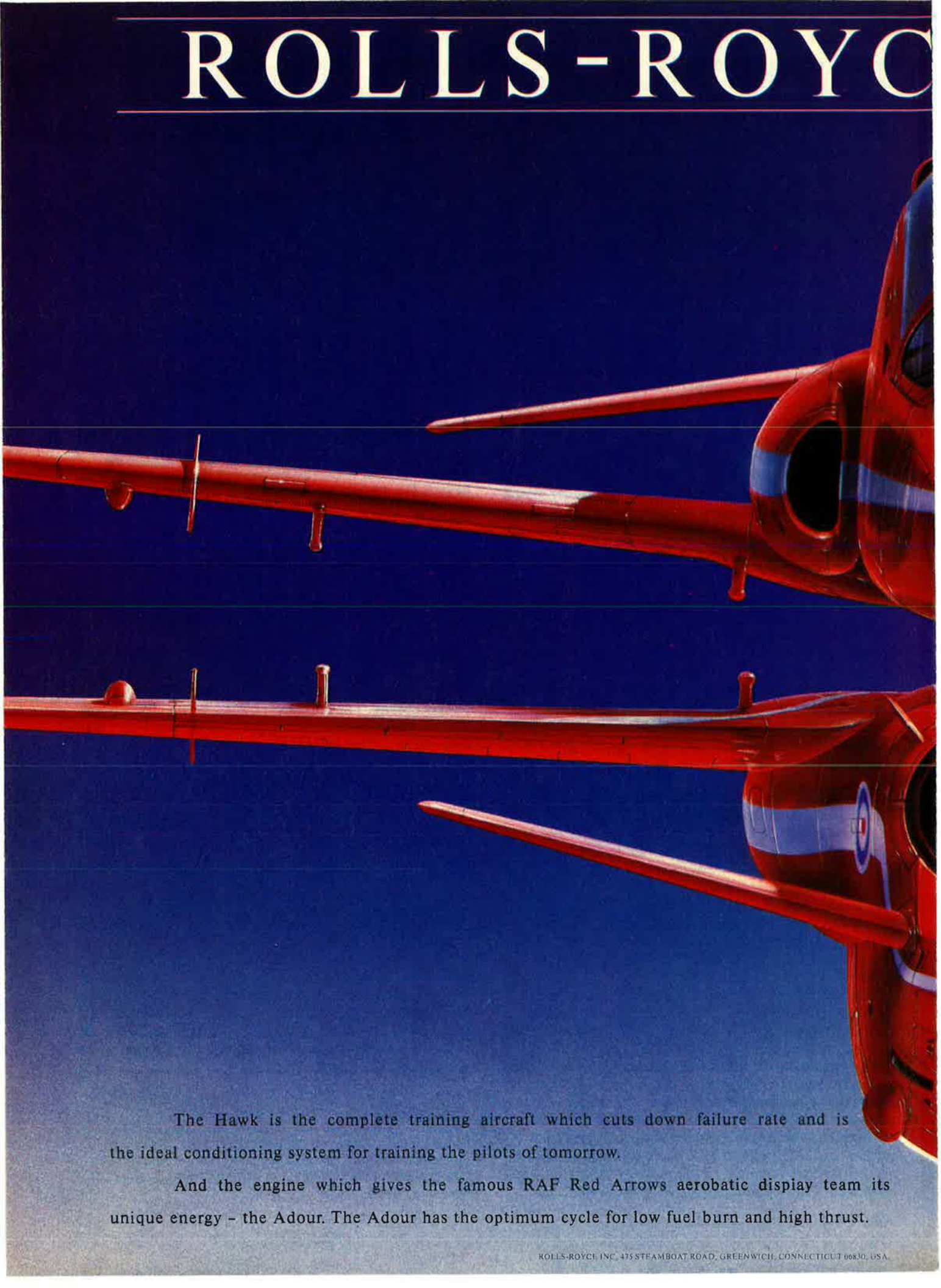

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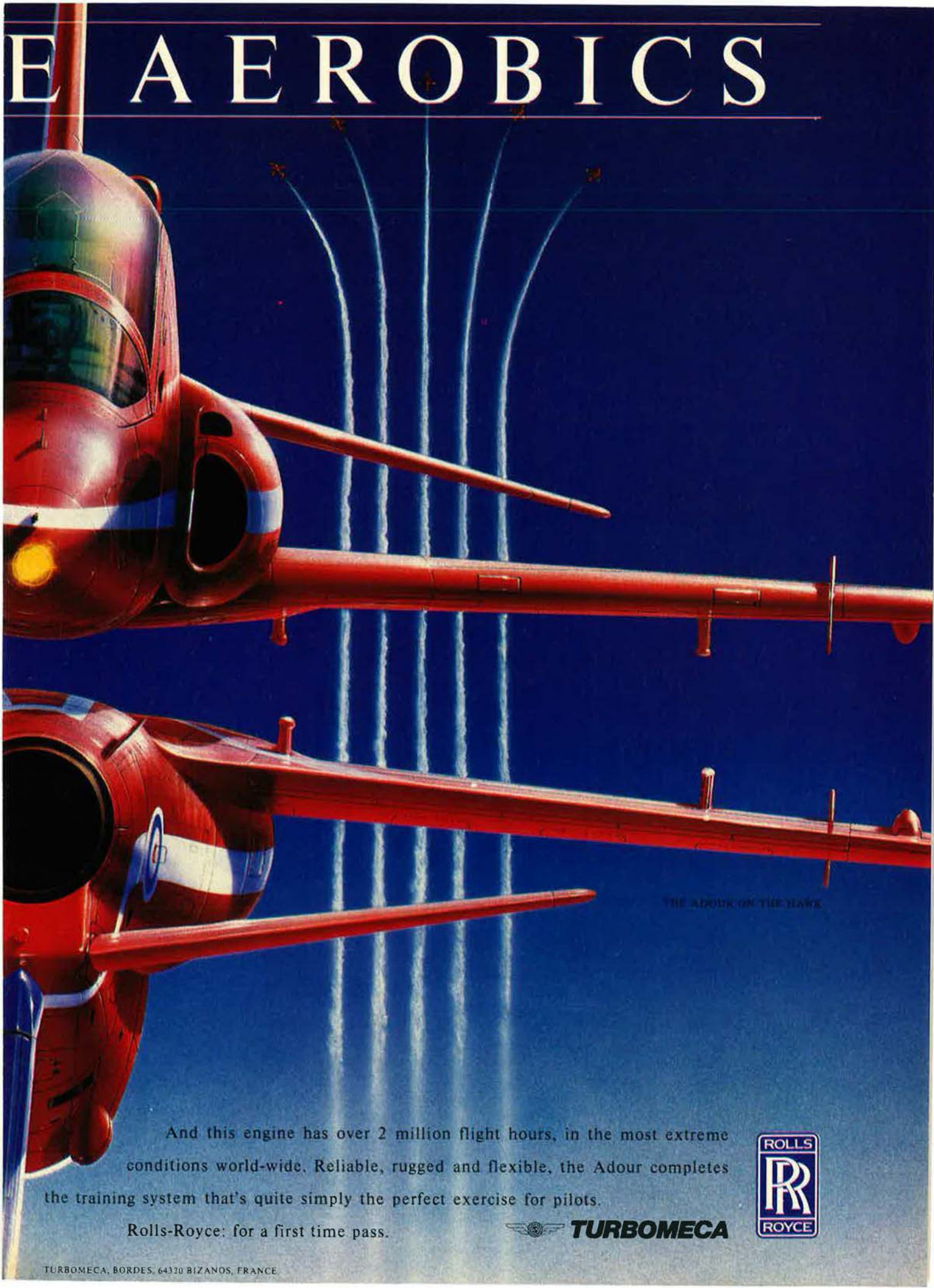

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That first mission taught me a lesson that helped carry me through the next year of war.

CONTROLLING FEAR

BY MAJ. GEN. DALE O. SMITH, USAF (RET.)

You might as well go to sleep, I told myself, because no matter how scared you get, you sure as hell *are* going on that B-17 mission over Germany tomorrow. I turned and tossed on my rock-hard British cot and tried to purge my mind of what seemed my almost certain demise. I had heard too many gory tales about the Eighth. Visions of a fiery death in a screaming dive tormented me.

Again and again I tried to reason with myself: You deliberately chose the profession of arms. And now this is the payoff. You're not going to back down now! No! This is what it's all about. And you're a professional. A regular. If you're shot down tomorrow, so be it. You've taken the Queen's shilling.

But sleep never came. Over and over I argued with myself. I wasn't prepared to die. I was thirty-two years old with a wife and two fine kids. But what a fatuous argument! How many thousands of others had loving wives and kids at home? Nine years of military flying hadn't yet made me a fatalist. I regretted that I had been so gung-ho as to get myself into this fix when I could have remained in the States and trained others to go to war. And yet I didn't regret it at all. This was what I really wanted to do.

I wanted to fight with the Eighth in Europe, the "Big League" of combat aviation. I wanted to share in the direct attack on Hitler's *Festung Europa*. I had worked all kinds of angles to get assigned as a group commander, and here I was. Ready for my first mission and probably my last.

The loss rate in the Eighth Air Force was high in the fall of 1943—something like four or five percent per mission. The odds seemed unfairly tipped in favor of extinction. And during that terrifying night, I knew for sure that my luck had run out. It was a premonition, I told myself. Nevertheless, I *was* committed, and I *would* fly.

My flying days had not been without moments of terror. I had survived three crackups and lucked out on several hairy mishaps. But I had

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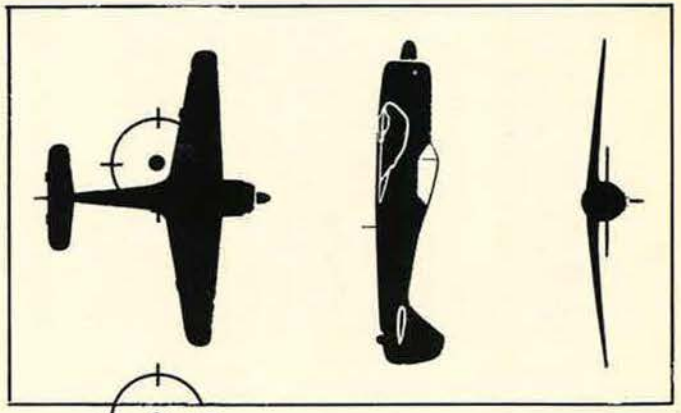

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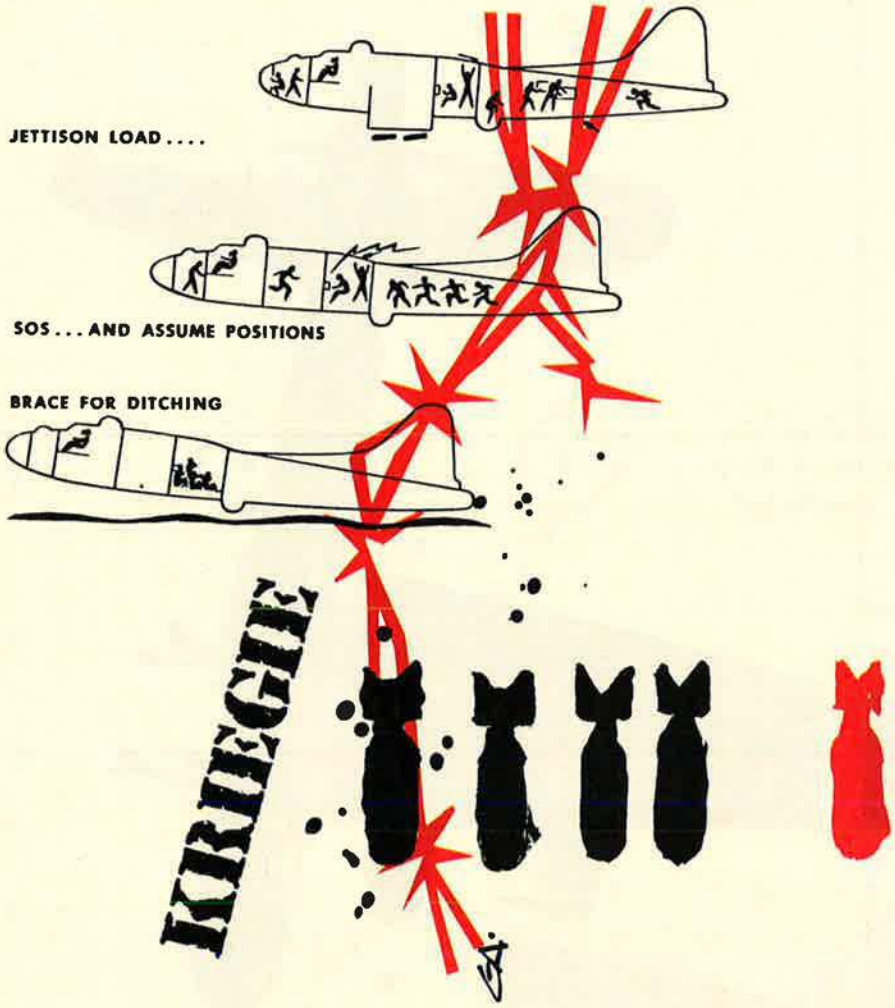


always held a lingering doubt. Did I possess the same cool courage that some of my contemporaries had demonstrated in moments of crisis? What was their secret? Had they been born without fear?

One group commander in the Eighth Air Force had advised his crews to consider themselves to be dead already. Perhaps if one could do this, there would be no fear, but I couldn't bring myself to accept such a final solution.

Where the Action Was

My friend Bob Williams had been my group commander at Langley Field two years earlier. There, we had been assigned the very first B-17s, and I knew the airplane like the back of my hand. When the war started, I had been ordered to hunt submarines, and although this duty had its perils, there hadn't been much shooting. The Eighth's great battles over Europe—St.-Nazaire, Schweinfurt, Regensburg, Villacoublay—were where the real action was. That air campaign seemed the most dangerous, if not the most important, of the whole American effort at that time. At least, I reasoned, those who survived in this theater would be beholden to no other combat flyers. So when it appeared that the Navy would assume control of air antisubmarine operations in the Atlantic, I managed a flight to England and sought out Bob Williams, who then commanded the 1st Air Division.

Bob had lost an eye during the Battle of Britain, and when he looked at you, his glass eye was focused elsewhere. But his voice was low and firm. "If you get yourself sprung from the Antisubmarine Command, I'll give you a group," Bob had promised. At that time, one of his groups consisted of about thirty-six Flying Fortresses and crews with supporting personnel of up to 3,000 on one air base. Command of an air group was the prized goal of most flying colonels.

A week before that sleepless night, I had reported to Bob, reminding him of his promise. He and his staff briefed me at length on the manifold problems I would encounter. Attrition of group commanders was high, and Bob had some vacancies.

He offered me the unlucky and badly shot-up 384th Group. Morale and discipline in that outfit, he told me, were so low he had considered disbanding the group altogether and sending the crews to more successful outfits. With naïve overconfidence, I was convinced I could whip the 384th into shape. I had done it before with the 20th Bomb Squadron. A group composed of four squadrons would be just a little tougher job.

A Few Days With the 351st

"First," Bob said, "I want you to spend a few days with Willie Hatcher's group, the 351st. That's one of my best, and you can learn a lot from Willie." Bob didn't tell me to go on missions with the 351st, but I knew he expected me to. There was some talk around division headquarters about replacement group commanders (I was one) needing to be "blooded." I didn't appreciate the term, but realized what it meant. A group commander had to understand just what the cutting edge of a group was meant to do over enemy country, and he couldn't lead from a desk chair.

Finding my way to Polebrook in East Anglia, I reported to the debonair Willie Hatcher, a superb leader and a friendly teacher. I followed him like a shadow, determined to learn all I could. Willie was always dressed for parade, and he carried doeskin gloves. VIPs were frequently sent to Willie's group to see how the air war was being fought. Clark Gable flew a few missions from that base as a gunner. And Lana Turner had visited to raise morale. Willie showed me the hallowed sleeping bag Lana had slept in and allowed me to smell the heady perfume that still lingered there.

Willie's officers had a wild party one night, and my older brother, Thor, came up from London. He was on Ike's planning staff. After the party, Thor and I sat on a bunk in a cold hut and talked and shivered almost all night. We both knew that it might be our last visit.

All of this was exciting and dramatic, but I knew the real action was

in the air over Germany, and I asked Willie to schedule me for a mission. It turned out to be an attack on the port of Wilhelmshaven. The date was November 3, 1943.

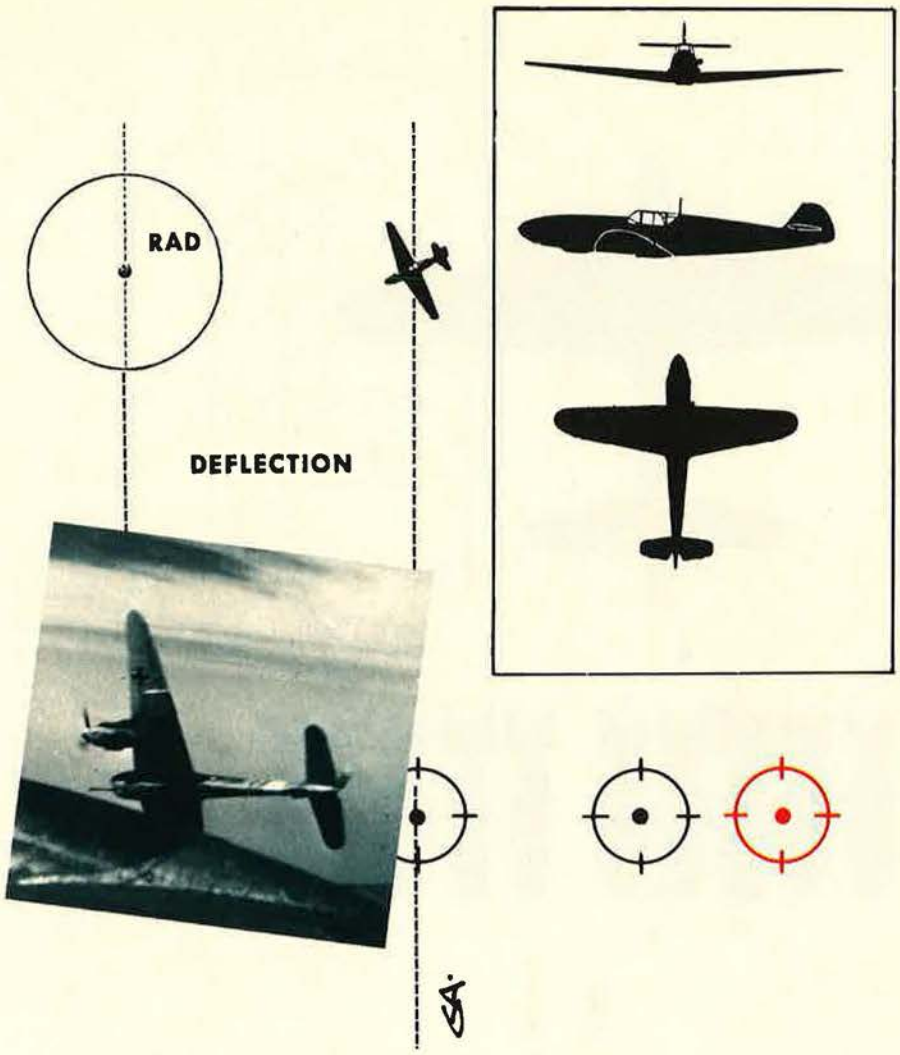
Years later, Bob Williams told me that my sojourn with Willie was a test to see if I would volunteer for missions and that, had I not done so, he would have relegated me to a staff job. Some group commanders were doing too little combat flying, he said, and he was looking for aggressive leaders.

I would have no responsibilities on the mission to Wilhelmshaven. Just sandbag in the lead aircraft piloted by a veteran survivor of ten missions, Clint Ball. I could sit on a jump seat between the pilot and copilot or move around the aircraft to various positions, provided I didn't interfere with the duties of the crewmen. I chose to ride in the Plexiglas nose, called the greenhouse, for there I could man one of the two flexible .50-caliber machine guns sticking out of the cheeks on either side of the nose. (The chin turret had not yet been incorporated into B-17 armament.) Neither the bombardier nor the navigator would have much time to shoot as they computed the track and bomb run.

It was good to leave that torturous bed where I had thrashed all night. I didn't feel a bit groggy from lack of sleep. If the gut fear hadn't kept me alert, the frigid air and icy floor of the Nissen hut did. I vaguely recall the delicious breakfast in Willie's excellent mess that did little to melt the hard rocks that seemed to have grown in my stomach.

The briefing that followed indicated the numerous enemy gun emplacements and Luftwaffe fighters we would likely encounter. It did little to alleviate my churning anxiety. I looked around at the sea of sober faces. How could I hope to command one of these magnificent groups when I was so deficient in courage? It wouldn't be fair to the brave men who were fighting the war so nobly and taking their chances without a whimper.

Perhaps I should go to Bob Williams and tell him honestly that I just didn't have the guts to lead a combat group. Yes, that's what I'd do. But not until after this mission to Wilhelmshaven—if by chance I survived.



The air was crystal clear and bitterly cold as we crossed the North Sea. During penetration of the German coast, I flinched inwardly at each flak burst that dirtied the air around us with ugly "whumpfs." Trying my best not to reveal my fear to the bombardier and navigator, I busied myself charging the guns and firing warming bursts.

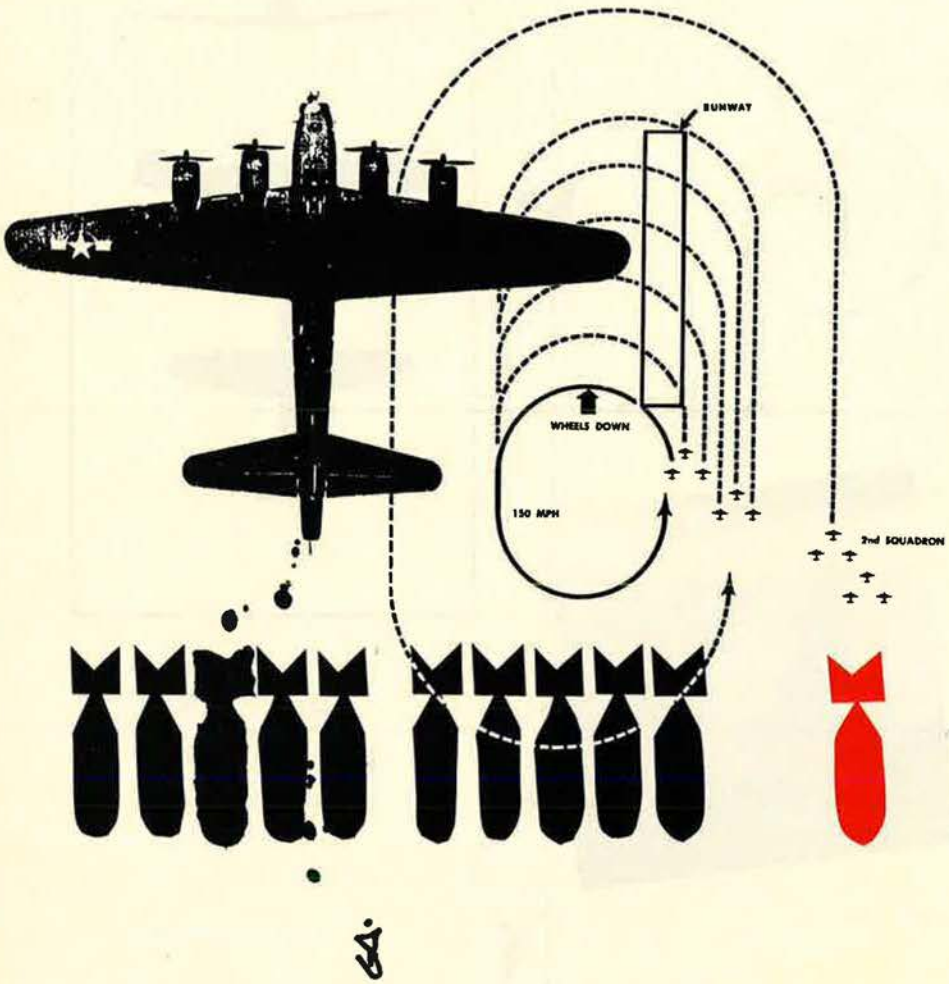
Soon our eighteen-plane groups took interval at the Initial Point for the bomb run, and here we became more vulnerable. Mutual supporting fire was diminished, and we had to fly straight and level, taking no evasive action, in order to drop our bombs accurately. Of course the enemy knew this.

The Fear Evaporates

Flak peppered us unmercifully, bumping our craft with close explosions and rattling metal fragments against the fuselage. I imagined jagged steel slicing into my body. Then the flak stopped as enemy fighters charged in. I saw two Forts from other groups go down. One cripple from our group broke formation and surged erratically out in front of our lead ship. I could only imagine what had happened in the cockpit. Three crewmen dropped from the open bomb bay, and their chutes blossomed. Then enemy fighters began following the big cripple to give it the *coup de grâce*. Hanging on their props, they pumped streams of hot fire into it.

My fear evaporated. Seething with anger, I fired my .50 at the little jackals, but they were out of range. Suddenly the crippled Fort majestically rolled belly-up like a dead fish, dove, and burst into a ball of orange flame. As the fire cleared, the debris fell in a cloud of smoke with pieces so small it seemed that none was large enough to be a man. The great bomber simply disintegrated into dust as we passed over.

The harbor and the shipping and U-boat docks at Wilhelmshaven, our target, stood out clearly under the glare of the bright sun. "Bombs away," called the bombardier as the ship lurched up. The job was done,



and Clint Ball banked sharply, diving some to throw off the flak gunners. A sense of relief spread through me. We were on our way home. But my relief was short-lived. The macabre fun was only beginning.

Great formations of enemy fighters appeared off our right wing. They queued up in single file, flying our way but out of range of our guns. Me-109s mostly, but a few FW-190s as well. The butterflies again fluttered in my stomach as I felt awed by this threatening foe.

The line of enemy fighters passed us, and when each was about a mile or two ahead, he would reverse his course and fly directly at our noses, firing his guns all the way. Just when it seemed we would collide, he would flip over on his back and dive in a half loop, then work his way back to the queue for another pass.

We had no friendly fighter escort that I could see, but with something like 300 heavy .50-caliber guns tracking him, it was no free ride for the enemy. This kind of frontal attack with a half roll was a popular Luftwaffe tactic in those days, but it proved costly to the Jerries. They faced a massive concentration of gunfire focused on each attack as all the Forts in the assembled combat box of fifty-four aimed at each individual fighter making its head-on attack.

I could actually see the cone of fire with the enemy at its apex, and I marveled at the courage of those German pilots who could drive home their attacks against such a hail of death. The fire came not only from the flexible nose guns (one of which I was wildly shooting) but also from the twin .50s in the upper turrets and other pairs of .50s in the ball turrets.

Strangely, I was no longer frightened during these encounters. The bucking .50 in my hands was comforting. It kept me busy. I didn't fire short bursts as we had been taught to do. I held the trigger down with my thumbs and sprayed the fast-closing fighters with all I had.

One fighter I was tracking in began to smoke. No doubt dozens of guns were firing at it. But he passed under us before I could tell if he were mortally hit. Besides, I was busy firing at the next little bastard who came charging in, spitting his lethal metal.

Familiarity With Danger

And so I was "blooded." And because I survived that first mission, I learned that premonitions were simply a reflection of fear and that perhaps I just might beat the odds and live through the war.

I flew another mission with Willie's group to Knaben, Norway, where we bombed a heavy-water plant to slow Germany's atomic-bomb development. There was little opposition—a piece of cake. So I decided against informing Bob Williams of my faintheartedness. Perhaps I could learn to control my emotions after all. Moreover, I never again allowed myself the luxury of idly lying awake at night. When I hit the sack, I was almost too tired to stand. By working every waking moment, there was no time to be frightened.

One's mind simply can't attend to more than one subject at the same time. So if I didn't think about the danger, the fear diminished. Moreover, familiarity with the danger after surviving a number of missions tended to give me the fatalism I needed—that sense of living a charmed life. If I took all necessary precautions and drilled my group in flying a tight defensive formation while emphasizing gunnery training, then whatever happened was in the lap of the gods.

That first mission had taught me one major lesson, however, that would help to carry me through the next year of bloody warfare: To blanket fear, *keep busy*. ■

Dale O. Smith is a regular contributor to this magazine. His last offering for us was "Harry Allen's Arctic Survival School" in the June '87 issue. A 1934 graduate of West Point, General Smith commanded a bomb group in England during World War II. After the war, he commanded several air divisions and served in high-level assignments at the Pentagon before his 1964 retirement. He now lives in Reno, Nev., and enjoys his second career as a writer.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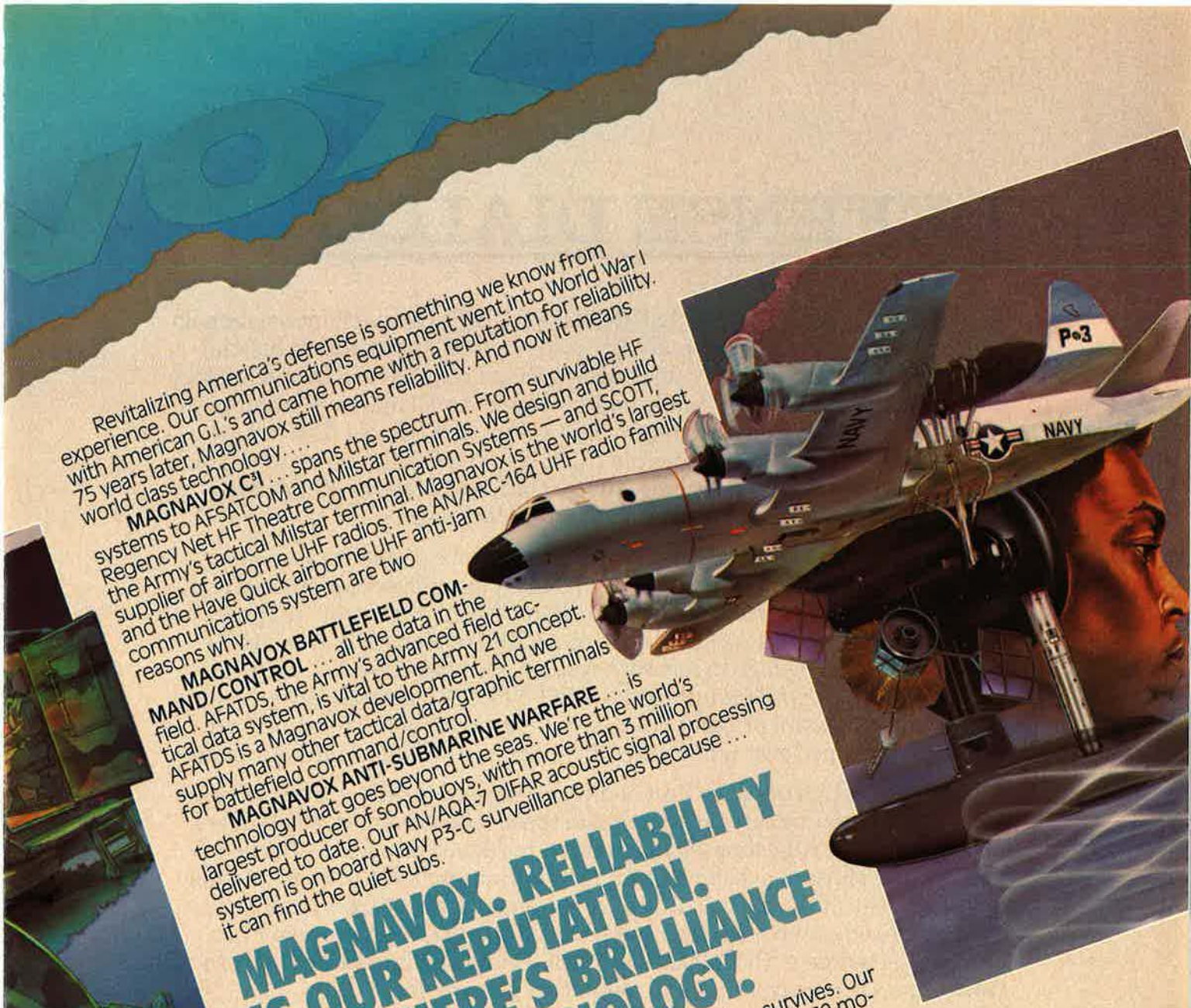

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An Air Force Almanac

On the following pages appears a variety of information and statistical material about the US Air Force—its people, organization, equipment, funding, activities, bases, and heroes. This "Almanac" section was compiled by the staff of AIR FORCE Magazine. We especially acknowledge the help of the Secretary of the Air Force Office of Public Affairs in its role as liaison with Air Staff agencies in bringing up to date the comparable data from last year's "Almanac."

A word of caution: Personnel figures that appear in this section in different forms will not agree (nor will they always agree with figures in command and separate operating agency reports or in the "Guide to Major Air Force Installations") because of different cutoff dates, rounding off, differing methods of reporting, or categories of personnel that are excluded in some cases. These figures do illustrate trends, however, and may be helpful in placing force fluctuations in perspective.

—THE EDITORS

USAF—EVOLUTION OF THE NAME AND THE SERVICE'S LEADERS THROUGH THE YEARS*

DESIGNATION	FROM	TO	COMMANDER (at highest rank)	TITLE	FROM	TO
Aeronautical Div., US Signal Corps	Aug. 1, 1907	July 18, 1914	Brig. Gen. James Allen	Chief Signal Officer	Aug. 1, 1907	Feb. 13, 1913
			Brig. Gen. George P. Scriven	Chief Signal Officer	Feb. 13, 1913	July 18, 1914
Aviation Section, US Signal Corps	July 18, 1914	May 24, 1918	Brig. Gen. George P. Scriven	Chief Signal Officer	July 18, 1914	Feb. 13, 1917
			Maj. Gen. George O. Squier	Chief Signal Officer	Feb. 14, 1917	May 20, 1918
Army Air Service (AAS)	May 24, 1918	July 2, 1926	Maj. Gen. William L. Kenly	Chief, Div. of Military Aeronautics	May 20, 1918	Dec. 22, 1918
			Maj. Gen. Charles T. Menoher	Chief of the Air Service	Dec. 23, 1918	Oct. 4, 1921
			Maj. Gen. Mason M. Patrick	Chief of the Air Service	Oct. 5, 1921	July 1, 1926
Army Air Corps (AAC)	July 2, 1926	June 20, 1941	Maj. Gen. Mason M. Patrick	Chief of the Air Corps	July 2, 1926	Dec. 12, 1927
			Maj. Gen. James E. Fechet	Chief of the Air Corps	Dec. 13, 1927	Dec. 18, 1931
			Maj. Gen. Benjamin D. Foulois	Chief of the Air Corps	Dec. 19, 1931	Dec. 21, 1935
			Maj. Gen. Oscar Westover	Chief of the Air Corps	Dec. 22, 1935	Sept. 21, 1938
			Gen. H. H. Arnold	Chief of the Air Corps	Sept. 29, 1938	June 29, 1941
Army Air Forces (AAF)	June 20, 1941	Sept. 18, 1947	Gen. H. H. Arnold	Chief of the AAF	June 30, 1941	Mar. 8, 1942
			Gen. of the Army H.H. Arnold	Commanding General, AAF	Mar. 9, 1942	Feb. 9, 1946
			Gen. Carl A. Spaatz	Commanding General, AAF	Feb. 10, 1946	Sept. 25, 1947
United States Air Force (USAF)*	Sept. 18, 1947		Gen. Carl A. Spaatz	Chief of Staff, USAF	Sept. 26, 1947	Apr. 29, 1948

*For USAF leaders since 1948, see p. 92.

UNITED STATES AIR FORCE PERSONNEL STRENGTH—1907 THROUGH 1989

YEAR	STRENGTH	YEAR	STRENGTH
1907	3	1949	419,347
1908	13	1950	411,277
1909	27	1951	788,381
1910	11	1952	973,474
1911	23	1953	977,593
1912	51	1954	947,918
1913	114	1955	959,946
1914	122	1956	909,958
1915	208	1957	919,835
1916	311	1958	871,156
1917	1,218	1959	840,028
1918	195,023	1960	814,213
1919	25,603	1961	820,490
1920	9,050	1962	883,330
1921	11,649	1963	868,644
1922	9,642	1964	855,802
1923	9,441	1965	823,633
1924	10,547	1966	886,350
1925	9,670	1967	897,426
1926	9,674	1968	904,759
1927	10,078	1969	862,062
1928	10,549	1970	791,078
1929	12,131	1971	755,107
1930	13,531	1972	725,635
1931	14,780	1973	690,999
1932	15,028	1974	643,795
1933	15,099	1975	612,551
1934	15,861	1976	585,207
1935	16,247	1977	570,479
1936	17,233	1978	569,491
1937	19,147	1979	559,450
1938	21,089	1980	557,969
1939	23,455	1981	570,302
1940	51,165	1982	582,845
1941	152,125	1983	592,044
1942	764,415	1984	597,125
1943	2,197,114	1985	601,515
1944	2,372,292	1986	608,199
1945	2,282,259	1987	607,035
1946	455,515	1988	575,603*
1947	305,827	1989	575,600*
1948	387,730		

*Programmed

USAF TOTAL ACTIVE-DUTY STRENGTH BY GRADE

(As of September 30, 1987)

OFFICERS

GRADE	NUMBER
GENERAL	13
LIEUTENANT GENERAL	38
MAJOR GENERAL	115
BRIGADIER GENERAL	166
COLONEL	5,617
LIEUTENANT COLONEL	12,519
MAJOR	19,925
CAPTAIN	42,689
FIRST LIEUTENANT	15,099
SECOND LIEUTENANT	11,157
TOTAL	**107,338**

AIRMEN

GRADE	NUMBER
CHIEF MASTER SERGEANT	4,935
SENIOR MASTER SERGEANT	9,884
MASTER SERGEANT	39,180
TECHNICAL SERGEANT	59,451
STAFF SERGEANT	114,451
SERGEANT/SENIOR AIRMAN	119,996
AIRMAN FIRST CLASS	97,028
AIRMAN	31,803
AIRMAN BASIC	18,516
TOTAL	**495,244**

OFFICERS	107,338
CADETS	4,453
AIRMEN	495,244
TOTAL STRENGTH	**607,035**

USAF AND AIR RESERVE FORCES PERSONNEL BY CATEGORIES

CATEGORY	FY '84	FY '85	FY '86	FY '87	FY '88	FY '89[1]
AIR FORCE MILITARY						
Officers	106,200	108,400	109,000	107,300	105,538	105,538
Airmen	486,400	488,600	494,700	495,200	465,648	465,645
Cadets	4,500	4,500	4,500	4,400	4,400	4,400
TOTAL, AIR FORCE MILITARY	**597,100**	**601,500**	**608,200**	**606,900**	**575,603**	**575,600**
Career Reenlistments (Second Term)	38,000	36,000	38,900	41,500	40,400	37,100
Rate	90%	89%	88%	89%	89%	89%
First-Term Reenlistments	24,700	25,700	23,500	25,700	23,000	25,300
Rate	62%	54%	58%	58%	65%	65%
CIVILIAN PERSONNEL						
Direct Hire (Including Technicians)	239,800	250,400	249,604	251,771	252,188	250,416
Indirect Hire—Foreign Nationals	13,000	13,468	13,644	12,559	13,237	13,340
TOTAL, CIVILIAN PERSONNEL	**252,800**	**263,868**	**263,248**	**264,330**	**265,425**	**263,756**
TOTAL, MILITARY AND CIVILIAN[2]	**849,900**	**865,368**	**871,448**	**870,562**	**841,028**	**839,356**
Technicians (included above as Direct Hire Civilians)						
AFRES Technicians	7,973	8,064	8,348	8,772	9,994	10,004
ANG Technicians	22,160	22,671	22,497	23,221	23,530	23,613
AIR RESERVE FORCES						
Air National Guard, Selected Reserve	105,012	109,398	112,592	114,600	115,900	115,200
Air Force Reserve, Paid	70,318	75,214	78,519	80,415	82,400	83,600
Air Force Reserve, Nonpaid[3]	37,230	42,317	44,568	43,783	49,920	31,255
TOTAL, READY RESERVE[3]	**212,560**	**226,929**	**235,679**	**238,798**	**248,220**	**230,055**
Standby	29,543	28,321	25,823	24,479	26,200	26,200
TOTAL, AIR RESERVE FORCES[4]	**242,103**	**255,250**	**261,502**	**263,295**	**274,420**	**256,255**

[1]President's Budget Request.
[2]FY '84–87 are actual figures; FY '88–89 are estimates; excludes nonchargeable personnel.
[3]Excludes training/pay categories J, K, and L.
[4]Excludes Retired Air Force Reserve.

NOTE: Totals may not add because of rounding.

NUMBER OF OFFICERS IN EACH MAJOR CAREER FIELD*

CODE	UTILIZATION FIELD TITLE	ASSIGNED
00**	Commanders and Directors	3,258
02	International-Politico-Military Affairs	289
05	Disaster Preparedness	193
09	Special Duty	1,763
10–14	Pilot	20,833
15 & 22	Navigator	8,804
16	Air Traffic Control	413
17	Air Weapons Director	2,211
18	Missile Operations	2,974
19	Operations Management	878
20	Space Operations	1,584
23	Visual Information	106
25	Weather	1,386
26	Scientific	1,654
27	Acquisition Program Management	2,545
28	Development Engineering	5,997
29	Program Management	229
31	Missile Maintenance	463
40	Aircraft Maintenance & Munitions	3,882
49	Communications-Computer Systems	6,855
55	Civil Engineering	2,214
57	Cartography	95
60	Transportation	978
62	Services	445
64	Supply Management	1,279
65	Acquisition Contracting/Manufacturing	1,660
66	Logistics Plans & Programs	1,108
67	Financial	1,533
70	Administration	2,300
73	Personnel	1,757
74	Manpower Management	567
75	Education & Training	584
79	Public Affairs	559
80	Intelligence	3,412
81	Security Police	1,130
82	Special Investigations	574
87	Band	33
88	Legal	1,319
89	Chaplain	823
90	Health Services Management	1,250
91 & 92	Biomedical Sciences	2,339
93–96	Physician	3,986
97	Nurse	5,184
98	Dental	1,573
99	Biomedical Sciences	18

*These figures do not include general officers or UPT/UNT/medical/law students.
**Commanders and director specialties in various career fields, *e.g.*, operations, logistics, programming, etc.

NUMBER OF ENLISTED IN EACH MAJOR CAREER FIELD

CODE	CAREER FIELD TITLE	ASSIGNED
10	First Sergeant	1,716
11	Aircrew Operations	9,234
12	Aircrew Protection	3,120
20	Intelligence	13,015
22	Photomapping	123
23	Audiovisual	3,087
24	Safety	1,440
25	Weather	3,204
27	Command Control Systems Operations	16,885
30	Communications-Electronics Systems	25,746
31	Missile Electronic Maintenance	654
32	Avionics Systems	20,473
34	Training Devices	1,180
36	Wire Communications Systems Maintenance	4,415
39	Maintenance Management Systems	3,330
40	Intricate Equipment Maintenance	331
41	Missile Systems Maintenance	5,631
42	Aircraft Systems Maintenance	46,103
43	Aircraft Maintenance	46,144
45	Manned Aerospace Maintenance	10,089
46	Munitions & Weapons Maintenance	25,729
47	Vehicle Maintenance	5,965
49	Information Systems	20,266
54	Mechanical/Electrical	10,510
55	Structural/Pavements	12,379
56	Sanitation	1,749
57	Fire Protection	6,472
59	Marine	65
60	Transportation	14,668
61	Supply Services	3,121
62	Food Services	4,575
63	Fuels	6,879
64	Supply	25,545
65	Procurement	1,744
66	Logistics Plans	1,162
67	Accounting & Finance and Auditing	6,450
70	Administration	24,953
73	Personnel	14,671
74	Morale, Welfare & Recreation	1,864
75	Education & Training	3,925
79	Public Affairs	1,319
81	Security Police	40,063
82	Special Investigations & Counterintelligence	930
87	Band	1,116
90–92	Medical	25,677
98	Dental	3,676
99	Miscellaneous (Special Duty, Patients, Unclassified, etc.)	13,851

AIR FORCE MILITARY PERSONNEL DISTRIBUTION BY GEOGRAPHIC AREA

(As of September 30, 1987)

TOTAL MILITARY PERSONNEL	**607,035**		
US TERRITORY AND SPECIAL LOCATIONS	**475,073**		
TOTAL IN FOREIGN COUNTRIES	**131,962**		
Western and Southern Europe (Major concentrations in Germany—40,703, UK—25,024, Spain—5,062, Italy—5,906, Turkey—3,743)	90,177	Africa, Near East, S. Asia (Major concentrations in Egypt—67, Saudi Arabia—204)	395
East Asia and Pacific (Major concentrations in Japan/Okinawa—17,172, Philippines—9,461, South Korea—11,512)	38,470	Western Hemisphere (Major concentrations in Canada—121, Panama [Republic]—2,689)	2,902
		Eastern Europe	18

USAF PERSONNEL STRENGTH BY COMMANDS, SOAs, AND DRUs

MAJOR COMMANDS	**MILITARY**	**CIVILIAN**	**TOTAL**
Air Force Communications Command (AFCC)	49,657	8,683	58,340
Air Force Logistics Command (AFLC)	11,901	86,028	97,929
Air Force Space Command (AFSPACECOM)	5,979	1,411	7,390
Air Force Systems Command (AFSC)	24,894	28,465	53,359
Air Training Command (ATC)	69,477	14,035	83,512
Air University (AU)	6,210	1,601	7,811
Alaskan Air Command (AAC)	7,641	1,373	9,014
Electronic Security Command (ESC)	12,764	1,199	13,963
Military Airlift Command (MAC)	78,321	15,499	93,820
Pacific Air Forces (PACAF)	29,161	10,106	39,267
Strategic Air Command (SAC)	108,728	12,368	121,096
Tactical Air Command (TAC)	101,734	12,251	113,985
United States Air Forces in Europe (USAFE)	64,600	10,732	75,332
TOTALS	**571,067**	**203,751**	**774,818**

SEPARATE OPERATING AGENCIES (SOAs)	**MILITARY**	**CIVILIAN**	**TOTAL**
Air Force Accounting and Finance Center (AFAFC)	230	2,265	2,495
Air Force Audit Agency (AFAA)	233	733	966
Air Force Commissary Service (AFCOMS)	1,128	8,713	9,841
Air Force Engineering and Services Center (AFESC)	389	556	945
Air Force Inspection and Safety Center (AFISC)	342	113	455
Air Force Intelligence Service (AFIS)	654	218	872
Air Force Legal Services Center (AFLSC)	456	150	606
Air Force Management Engineering Agency (AFMEA)	213	88	301
Air Force Military Personnel Center (AFMPC)	1,513	596	2,109
Air Force Office of Medical Support (AFOMS)	108	194	302
Air Force Office of Security Police (AFOSP)	71	63	134
Air Force Office of Special Investigations (AFOSI)	1,944	515	2,459
Air Force Operational Test and Evaluation Center (AFOTEC)	533	165	698
Air Force Reserve (AFRES)	302	12,960	13,262
Air Force Service Information and News Center (AFSINC)	714	173	887
Air Reserve Personnel Center (ARPC)	123	600	723
DIRECT REPORTING UNITS (DRUs)			
Air Force Civilian Personnel Management Center (AFCPMC)	4	1,279*	1,283
Air Force District of Washington (AFDW)	1,431	997	2,428
Air Force Technical Applications Center (AFTAC)	1,274	92	1,366
Office of the Secretary of the Air Force/Air Staff/ Air National Guard Support Center	1,745	1,090	2,835
United States Air Force Academy (USAFA)**	2,622	1,655	4,277
USAF Historical Research Center (USAFHRC)	23	78	101
Other Reporting Units			
Air Force Center for Studies and Analyses (AFCSA)	102	42	144
Air Force Combat Operations Staff (AFCOS)	242	18	260
Air Force Cost Center	16	18	34
Air Force Review Boards Office (AFRBO)	16	55	71
Air Force Space Elements USSPACECOM/NORAD (AFESP)	505	0	505
Other	10,772	27,171	37,943
TOTALS, SOAs and DRUs	**27,705**	**60,597**	**88,302**
TOTALS, COMMANDS, SOAs, and DRUs	**598,772**	**264,348**	**863,120**

*Includes Palace Acquire interns assigned to various major commands.
**4,453 cadets not included.

USAF PERSONNEL BY GRADE, RACE, AND SEX

(As of September 30, 1987)

OFFICERS

GRADE	FORCE	BLACK	OTHER	WOMEN
GENERAL	332	4	1	2
COLONEL	5,617	129	78	108
LIEUTENANT COLONEL	12,519	245	195	466
MAJOR	19,925	814	272	1,490
CAPTAIN	42,689	3,205	902	5,847
FIRST LIEUTENANT	15,099	827	401	2,546
SECOND LIEUTENANT	11,157	553	395	2,183
TOTALS	**107,338**	**5,777**	**2,244**	**12,642**

AIRMEN

GRADE	FORCE	BLACK	OTHER	WOMEN
CHIEF MASTER SERGEANT	4,935	633	67	23
SENIOR MASTER SERGEANT	9,884	1,393	149	132
MASTER SERGEANT	39,180	6,706	903	1,267
TECHNICAL SERGEANT	59,451	10,980	1,763	4,680
STAFF SERGEANT	114,451	21,350	4,258	15,155
SERGEANT/SENIOR AIRMAN	119,996	22,119	5,231	16,400
AIRMAN FIRST CLASS	97,028	16,141	5,956	16,136
AIRMAN	31,803	4,528	1,483	5,399
AIRMAN BASIC	18,516	2,277	892	3,474
TOTALS	**495,244**	**86,127**	**20,702**	**62,666**
TOTALS, INCLUDING OFFICERS	**602,582**	**91,904***	**22,946****	**75,308*****

*Includes 16,161 women.
**Includes 2,967 women.
***Includes women from black and other categories.

AVERAGE AGES OF MILITARY PERSONNEL

(As of September 30, 1987)

Officers	Average 34 years of age
Airmen	Average 27 years of age

MONTHLY MILITARY BASIC RATES OF PAY

(Effective January 1, 1988)

PAY GRADE	UNDER 2	2	3	4	6	8	10	12	14	16	18	20	22	26
						YEARS OF SERVICE								
						COMMISSIONED OFFICERS*								
O-10	$5,485	$5,679	$5,679	$5,679	$5,679	$5,896	$5,896	$6,041	$6,041	$6,041	$6,041	$6,041	$6,041	$6,041
O-9	4,862	4,989	5,095	5,095	5,095	5,225	5,225	5,442	5,442	5,896	5,896	6,041	6,041	6,041
O-8	4,403	4,535	4,643	4,643	4,643	4,989	4,989	5,225	5,225	5,442	5,679	5,896	6,041	6,041
O-7	3,659	3,907	3,907	3,907	4,083	4,083	4,319	4,319	4,535	4,989	5,332	5,332	5,332	5,332
O-6	2,712	2,979	3,174	3,174	3,174	3,174	3,174	3,174	3,282	3,801	3,996	4,083	4,319	4,685
O-5	2,169	2,547	2,723	2,723	2,723	2,723	2,805	2,956	3,154	3,390	3,585	3,693	3,822	3,822
O-4	1,828	2,226	2,374	2,374	2,418	2,525	2,697	2,849	2,979	3,110	3,196	3,196	3,196	3,196
O-3	1,699	1,899	2,030	2,247	2,354	2,439	2,571	2,697	2,764	2,764	2,764	2,764	2,764	2,764
O-2	1,481	1,618	1,943	2,009	2,051	2,051	2,051	2,051	2,051	2,051	2,051	2,051	2,051	2,051
O-1	1,286	1,339	1,618	1,618	1,618	1,618	1,618	1,618	1,618	1,618	1,618	1,618	1,618	1,618
						COMMISSIONED OFFICERS WITH MORE THAN 4 YEARS OF ACTIVE ENLISTED OR WARRANT OFFICER SERVICE									
O-3E	—	—	—	2,247	2,354	2,439	2,571	2,697	2,805	2,805	2,805	2,805	2,805	2,805
O-2E	—	—	—	2,009	2,051	2,116	2,226	2,311	2,374	2,374	2,374	2,374	2,374	2,374
O-1E	—	—	—	1,618	1,728	1,792	1,857	1,921	2,009	2,009	2,009	2,009	2,009	2,009
						ENLISTED MEMBERS								
E-9	—	—	—	—	—	—	2,013	2,059	2,105	2,154	2,202	2,244	2,362	2,592
E-8	—	—	—	—	—	1,688	1,737	1,782	1,829	1,877	1,920	1,967	2,083	2,315
E-7	1,179	1,272	1,320	1,365	1,412	1,457	1,504	1,551	1,621	1,667	1,713	1,736	1,852	2,083
E-6	1,014	1,105	1,151	1,200	1,245	1,290	1,338	1,407	1,451	1,497	1,520	1,520	1,520	1,520
E-5	890	969	1,015	1,060	1,129	1,175	1,222	1,267	1,290	1,290	1,290	1,290	1,290	1,290
E-4	830	876	928	1,000	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039
E-3	782	825	858	892	892	892	892	892	892	892	892	892	892	892
E-2	752	752	752	752	752	752	752	752	752	752	752	752	752	752
E-1**	671	671	671	671	671	671	671	671	671	671	671	671	671	671

NOTE: Amounts less than $1 have been omitted.
*Basic pay is limited to $6,041.70, regardless of cumulative years of service.
**Basic pay for E-1s with less than four months of service is $620.70.
Basic pay while serving as Chairman of the Joint Chiefs of Staff or as Chief of Staff of the Air Force is $6,041.70, regardless of cumulative years of service.
Basic pay while serving as Chief Master Sergeant of the Air Force is $3,151.20, regardless of cumulative years of service.

MONTHLY BASIC ALLOWANCE FOR QUARTERS (BAQ)

(Effective January 1, 1988)

Pay Grade	Without Dependents		With Dependents
	Full[1]	Partial[2]	
O-10	$581.40	$50.70	$715.20
O-9	581.40	50.70	715.20
O-8	581.40	50.70	715.20
O-7	581.40	50.70	715.20
O-6	533.70	39.60	648.60
O-5	503.70	33.00	597.60
O-4	461.70	26.70	546.30
O-3	373.80	22.20	455.40
O-2	301.20	17.70	390.60
O-1	258.30	13.20	350.10
E-9	341.10	18.60	465.00
E-8	316.20	15.30	433.20
E-7	270.00	12.00	402.90
E-6	239.70	9.90	365.70
E-5	221.40	8.70	324.90
E-4	192.30	8.10	280.80
E-3	186.60	7.80	258.30
E-2	158.40	7.20	258.30
E-1	144.30	6.90	258.30

[1]Payment of the full rate of basic allowance for quarters at these rates to members of the uniformed services without dependents is authorized by 37 U.S.C. 403 and Part IV of Executive Order 12622, as amended.

[2]Payment of the partial rate of basic allowance for quarters at these rates to members of the uniformed services without dependents who, under 37 U.S.C. 403(b) or 403(c), are not entitled to the full rate of basic allowance for quarters is authorized by 37 U.S.C. 1009(c)(2) and Part IV of Executive Order 11157, as amended.

AVIATION CAREER INCENTIVE PAY RATES*

PHASE I

Monthly Rate	Years of Aviation Service as an Officer *(including flight training)*
$125	2 or less
$156	more than 2
$188	more than 3
$206	more than 4
$400	more than 6

PHASE II

Monthly Rate	Years of Service as an Officer
$370	more than 18
$340	more than 20
$310	more than 22
$280	more than 24
$250	more than 25 (O-6 and below)

*For rated officers, flight surgeons, and other designated medical officers except as noted.

NOTE: An officer in pay grade O-7 may not be paid at a rate greater than $200 a month. An officer in pay grade O-8 or above may not be paid at a rate greater than $206 a month. Officers with more than 18 years of commissioned service and less than 6 years of aviation service are entitled to Phase I rates.

BASIC ALLOWANCE FOR SUBSISTENCE (BAS)

Officers (Monthly)	Enlisted (Daily)		
	Separate Rations	Rations in Kind Not Available	Emergency Rations
$114.90	$5.48 $5.06*	$6.19 $5.72*	$8.19 $7.58*

*Applies to E-1s with less than four months of active-duty service.

EDUCATIONAL LEVELS—USAF LINE OFFICERS

Level	End of September 1987 Number	Percent
Below baccalaureate/unknown	73	0.08
Baccalaureate, no master's degree	51,812	57.20
Master's degree, no doctorate	37,403	41.29
Doctoral and professional degrees	1,296	1.43
TOTALS	**90,584**	**100.00**

HAZARDOUS DUTY INCENTIVE PAY (HDIP)*

Pay Grade	Monthly Rate	Pay Grade	Monthly Rate
O-10	$110	E-9	$200
O-9	$110	E-8	$200
O-8	$110	E-7	$200
O-7	$110	E-6	$175
O-6	$250	E-5	$150
O-5	$250	E-4	$125
O-4	$225	E-3	$110
O-3	$175	E-2	$110
O-2	$150	E-1	$110
O-1	$125		

NOTE: Hazardous duty incentive pay for nonrated personnel is $110 a month.
*Excepting AWACS crew members.

EDUCATIONAL LEVELS—USAF ENLISTED FORCE

Level	End of September 1987 Number	Percent
Below high school	434	0.08
High school	237,397	47.94
Some college (less than two years)	172,187	34.77
AA/AS degree	27,933	5.64
Two to three years of college	42,344	8.55
Baccalaureate, no master's	13,624	2.75
Master's or higher	1,325	0.27
TOTALS	**495,244**	**100.00**

FEDERAL CIVILIAN PAY SCALE

General Schedule
(Effective January 1, 1988)

GRADE	1	2	3	4	5	6	7	8	9	10
GS-1	$ 9,811	$10,139	$10,465	$10,791	$11,117	$11,309	$11,631	$11,955	$11,970	$12,275
GS-2	11,032	11,294	11,659	11,970	12,103	12,459	12,815	13,171	13,527	13,883
GS-3	12,038	12,439	12,840	13,241	13,642	14,043	14,444	14,845	15,246	15,647
GS-4	13,513	13,963	14,413	14,863	15,313	15,763	16,213	16,663	17,113	17,563
GS-5	15,118	15,622	16,126	16,630	17,134	17,638	18,142	18,646	19,150	19,654
GS-6	16,851	17,413	17,975	18,537	19,099	19,661	20,223	20,785	21,347	21,909
GS-7	18,726	19,350	19,974	20,598	21,222	21,846	22,470	23,094	23,718	24,342
GS-8	20,739	21,430	22,121	22,812	23,503	24,194	24,885	25,576	26,267	26,958
GS-9	22,907	23,671	24,435	25,199	25,963	26,727	27,491	28,255	29,019	29,783
GS-10	25,226	26,067	26,908	27,749	28,590	29,431	30,272	31,113	31,954	32,795
GS-11	27,716	28,640	29,564	30,488	31,412	32,336	33,260	34,184	35,108	36,032
GS-12	33,218	34,325	35,432	36,539	37,646	38,753	39,860	40,967	42,074	43,181
GS-13	39,501	40,818	42,135	43,452	44,769	46,086	47,403	48,720	50,037	51,354
GS-14	46,679	48,235	49,791	51,347	52,903	54,459	56,015	57,571	59,127	60,683
GS-15	54,907	56,737	58,567	60,397	62,227	64,057	65,887	67,717	69,547	71,377
GS-16	64,397	66,544	68,691	70,838	72,985*	75,132*	77,279*	79,426*	81,573*	
GS-17	75,437*	77,952*	80,467*	82,982*	85,497*					
GS-18	88,416*									

Senior Executive Service**

LEVEL	1	2	3	4	5	6
	$65,994	$68,952	$71,910	$73,400	$75,500	$77,500

*Pay limited to Level V of the Executive Schedule, $72,500.
**Basic pay for employees at these rates is limited to $77,500, in accordance with Title 5, US Code, Section 5382 (b).

AIR FORCE FULL-TIME CIVILIAN EMPLOYMENT BY GRADE

(As of September 30, 1987)

GS/OTHER		WG		WL		WS	
GR	POP	GR	POP	GR	POP	GR	POP
1	300	1	145	1	0	1	43
2	772	2	1,253	2	38	2	32
3	8,028	3	774	3	2	3	127
4	17,115	4	1,197	4	41	4	221
5	24,392	5	4,029	5	57	5	327
6	9,353	6	4,033	6	42	6	487
7	15,172	7	5,713	7	67	7	807
8	2,215	8	6,854	8	144	8	972
9	19,212	9	6,954	9	245	9	1,365
10	911	10	19,702	10	988	10	1,796
11	18,972	11	5,714	11	128	11	621
12	19,326	12	1,961	12	17	12	352
13	9,283	13	361	13	0	13	234
14	3,590	14	131	14	1	14	327
15	1,145	15	2	15	0	15	207
16	1					16	126
17	0					17	55
18	1					18	10
ST	5					19	0
SES	204						
TOTALS	**149,997**		**58,823**		**1,770**		**8,109**

GR = Grade
GS = General Schedule
POP = Population
SES = Senior Executive Service
ST = Scientific and Professional
WG = Wage Grade Positions
WL = Wage Grade Leader Positions
WS = Wage Grade Supervisory Positions

NOTE: Table does not include ANG technicians, local national employees, or non-appropriated fund employees.

AIR FORCE CIVILIAN PERSONNEL AVERAGE AGE AND LENGTH OF SERVICE

(As of October 31, 1987)

Average age	43 years
Average length of service (overall)	14 years
General Schedule	14 years
Federal Wage System	15 years

DoD BUDGET AUTHORITY BY COMPONENT FOR FY 1987–89*

(Billions of Current Dollars)

Component	FY 1987 Dollars	FY 1987 Share	FY 1988 Dollars	FY 1988 Share	FY 1989 Dollars	FY 1989 Share
Army	$ 74.0	26.5%	$ 75.8	26.8%	$ 77.8	26.8%
Navy/Marine Corps	93.5	33.5%	100.1	35.4%	96.4	33.2%
Air Force	91.6	32.8%	88.2	31.1%	97.2	33.4%
Defense Agencies/Defense-wide	20.4	7.2%	19.1	6.7%	19.3	6.6%
TOTALS	**$279.5**		**$283.2**		**$290.8**	

*Totals may not add because of rounding.

DoD BUDGET MISSION CATEGORIES FOR FY 1986–89

(Billions of Dollars)

Military Program	Total Budget Authority in Current Dollars (1986–87 figures actual; 1988–89 estimates) 1986	1987	1988	1989	Change FY 1988–89
Strategic Forces[1]	$ 24.2	$ 21.1	$ 21.0	$ 23.4	+2.4
General-Purpose Forces	116.2	114.9	110.7	114.1	+3.4
Intelligence and Communications	26.4	27.7	28.0	28.1	+0.1
Airlift and Sealift	7.6	7.1	5.6	5.9	+0.3
Guard and Reserve Forces	15.6	15.7	16.2	16.6	+0.4
Research and Development[2]	25.7	27.5	32.5	32.6	+0.1
Central Supply and Maintenance	24.4	22.7	24.1	24.1	0.0
Training, Medical, and Other General Personnel Activities	33.6	35.5	35.9	36.6	+0.7
Administrative and Associated Activities	7.1	6.6	5.8	6.0	+0.2
Special Operations Forces	—	—	2.6	2.6	0.0
Support of Other Nations	0.5	0.7	0.8	0.8	0.0
TOTAL BUDGET AUTHORITY	**$281.4**	**$279.5**	**$283.2**	**$290.8**	**+7.6**
(Prior-year funds and other financial adjustments)	−0.9	4.0	5.8	0.8	−5.0
TOTAL OBLIGATIONAL AUTHORITY	**$280.5**	**$283.5**	**$289.0**	**$291.6**	**+2.6**

NOTE: Totals may not add because of rounding.

[1]Excludes strategic systems development included in the research and development category.
[2]Excludes research and development in other program areas on systems approved for production.

INSTALLATIONS OF THE US AIR FORCE

During 1986, the Air Force undertook a major project to redefine and categorize all Air Force properties and activities to reflect more accurately actual installation posture. The new definitions reclassify all Air Force activities into one of four categories: major installations, minor installations, support sites, and other activities. For an installation to be categorized as "major," it must be operated by an active, Guard, or Reserve unit of group size or larger and have all the organic support to accomplish the unit's mission. Minor installations are facilities operated by active, Guard, or Reserve units of at least squadron size that do not satisfy all of the criteria for a major installation. Examples of minor installations are Guard and Reserve flying operations that are located at civilian-owned airports. A support site is a detached piece of real property that provides general support to the Air Force mission as opposed to supporting a particular installation. Examples of support sites are missile tracking sites, radar bomb-scoring sites, and radio relay sites. The fourth classification category, other activities, includes Air Force units that have little or no real-property accountability over the real estate that they occupy. Examples include units that are located on installations belonging to other services or in leased office space that supports recruiting detachments, Civil Air Patrol, etc. The new Air Force classification system is designed to describe accurately the Air Force installation posture. Previously, the Air Force reported more than 2,800 installations worldwide. In reality, the number of independent installations totals only 262: 140 major and 122 minor.

Major Installations	
US and Possessions*	101
Foreign	39
Worldwide	**140**
Minor Installations	
US and Possessions*	108
Foreign	14
Worldwide	**122**
Support Sites	
US and Possessions*	128
Foreign	112
Worldwide	**240**
Other Activities	
US and Possessions**	917
Foreign	863
Worldwide	**1,780**

*Includes Air Force Reserve and Air National Guard.
**Includes USAF presence at non-USAF installations and other sites.

AIR FORCE BUDGET AND FINANCE—FISCAL YEARS 1980–89

(Figures in millions of dollars)

	FY '80	FY '85	FY '86	FY '87*	FY '88*	FY '89*
Gross National Product	$2,671,000	$3,944,000	$4,192,000	$4,408,000	$4,705,000	$5,023,000
Federal Budget, Outlays (Current $)	591,000	946,000	990,000	1,005,000	1,056,000	1,094,000
DoD Budget, Outlays (Current $)	132,840	245,370	265,636	274,007	277,275	285,500
DoD Percent of: GNP	5.0%	6.2%	6.3%	6.2%	5.9%	5.7%
Federal Budget	22.5%	25.9%	26.8%	27.3%	26.3%	26.1%
Air Force Budget Outlays						
Current Dollars	38,976	81,988	91,188	91,144	92,269	94,549
Constant FY '89 Dollars	60,034	92,012	100,778	98,593	95,617	94,549
AF Percent of: GNP	1.5%	2.1%	2.2%	2.1%	2.0%	1.9%
Federal Budget	6.6%	8.7%	9.2%	9.1%	8.7%	8.6%
Total Obligational Authority						
DoD—Current Dollars	141,983	277,544	280,266	283,475	289,025	291,566
Constant FY '89 Dollars	212,496	314,898	310,838	305,849	298,827	291,566
AF—Current Dollars	41,554	96,501	94,276	94,355	90,363	97,472
Constant FY '89 Dollars	61,561	108,928	103,775	101,317	93,542	97,472
(Current Dollars)						
Aircraft Procurement	7,901	23,720	21,109	16,650	12,929	16,630
Missile Procurement	2,149	6,600	7,219	7,954	7,350	8,158
Other Procurement	2,652	8,617	7,946	9,252	8,012	8,394
Procurement Subtotal	12,702	38,937	36,274	33,856	28,291	33,182
Military Construction—USAF	567	1,540	1,539	1,254	1,279	1,301
Military Construction—AFRES	12	66	58	59	79	59
Military Construction—ANG	36	109	112	149	151	148
Military Construction Subtotal	615	1,715	1,709	1,462	1,509	1,508
RDT&E	5,001	13,108	13,111	15,051	15,165	14,932
Family Housing Construction	–	172	161	111	161	181
Stock Fund	–	549	396	140	226	207
TOTAL, INVESTMENT	**18,318**	**54,481**	**51,651**	**50,620**	**45,352**	**50,010**
Military Personnel—USAF	8,496	17,962	18,863	19,693	19,816	20,094
Reserve Personnel—USAF	226	568	603	569	615	655
National Guard Personnel—USAF	299	885	974	948	988	1,027
Military Personnel Subtotal	9,021	19,415	20,440	21,210	21,419	21,776
Operation & Maintenance—USAF	12,421	19,227	18,988	19,082	19,907	21,950
Operation & Maintenance—AFRES	511	878	857	925	1,001	1,029
Operation & Maintenance—ANG	1,283	1,825	1,723	1,788	1,958	1,965
Operating Subtotal	14,215	21,930	21,568	21,795	22,866	24,944
Family Housing Operations & Debt	–	675	617	730	726	742
TOTAL, OPERATING	**23,236**	**42,020**	**42,625**	**43,735**	**45,011**	**47,462**
Programs, FY '89 Budget (Current $)						
I Strategic Forces	6,620	20,600	18,011	14,933	13,453	15,560
II General-Purpose Forces	11,602	24,044	23,929	24,438	22,262	24,079
III Intelligence & Communications	4,670	13,994	14,724	16,278	16,567	17,820
IV Airlift & Sealift	2,215	5,986	6,746	6,078	3,901	4,767
V Guard & Reserve Forces	3,073	5,224	4,978	4,939	5,341	5,437
VI Research & Development	4,174	9,641	8,813	9,694	9,934	9,652
VII Central Supply & Maintenance	4,508	7,470	7,506	8,116	7,850	8,260
VIII Training, Medical, & Other General Personnel Activities	3,882	8,074	8,251	8,541	8,602	9,114
IX Administration & Associated Activities	529	1,380	1,229	1,229	1,330	1,293
X Support of Other Nations	281	88	89	93	98	103
XI Special Operations Forces	0	0	0	16	1,025	1,387

NOTE: Totals may not add because of rounding.
*Figures based on the President's FY '89 budget (amended).

USAF AIRCRAFT PROCUREMENT—FY '81–89

CATEGORY	FY '81	FY '82	FY '83	FY '84	FY '85	FY '86	FY '87	FY '88	FY '89
Fixed-Wing Aircraft									
Total Units Budgeted	313	200	197	241	286	273	259	231	237
Accepted/Scheduled Acceptances	396	370	302	218	240	240	343	276	237
Helicopters									
Total Units Budgeted	5	6	0	0	0	9	0	0	6
Accepted/Scheduled Acceptances	0	0	11	0	0	0	9	0	0

NOTE: FY '81–87 columns are actual; FY '88–89 columns are planned.

USAF'S AIRCRAFT—HOW MANY OF EACH TYPE AND HOW OLD?*

(Current as of September 30, 1987)

	0–3 yrs.	3–6 yrs.	6–9 yrs.	9–12 yrs.	12–15 yrs.	15–18 yrs.	18–21 yrs.	21–24 yrs.	24+ yrs.	TOTAL NUMBER	AVERAGE AGE
A-7	–	–	2	1	1	24	3	–	–	31	15.9 years
A-10	–	169	188	92	2	–	–	–	–	451	6.9 years
A-37	–	–	–	7	8	7	–	–	–	22	13.8 years
B-1	58	–	1	1	–	–	–	–	–	60	0.8 years
B-52	–	–	–	–	–	–	–	–	263	263	27.0 years
FB-111	–	–	–	–	–	59	3	–	–	62	17.1 years
C-5	19	–	–	–	14	41	2	–	–	76	12.1 years
C-9	–	–	–	–	3	12	8	–	–	23	16.5 years
C-10	32	19	5	–	–	–	–	–	–	56	2.9 years
C-12	16	30	1	26	2	–	–	–	–	75	6.2 years
C-18	–	7	–	–	–	–	–	–	–	7	5.4 years
C-20	10	3	–	–	–	–	–	–	–	13	1.1 years
C-21	52	27	–	–	–	–	–	–	–	79	2.7 years
C-22	–	1	–	–	–	–	–	–	–	1	3.6 years
C-23	18	–	–	–	–	–	–	–	–	18	2.4 years
C-130	11	–	–	33	40	39	25	174	32	354	19.3 years
C-131	–	–	–	–	–	–	–	–	1	1	32.5 years
C-135	–	–	–	–	–	–	–	118	490	608	26.2 years
C-137	2	–	–	–	1	–	–	–	4	7	18.3 years
C-140	–	–	–	–	–	–	–	–	5	5	24.7 years
C-141	–	–	–	–	–	–	128	126	1	255	21.0 years
E-3	3	8	14	8	–	–	–	–	–	33	7.9 years
E-4	–	–	–	1	3	–	–	–	–	4	13.3 years
F-4	–	–	–	89	67	165	238	36	1	596	17.1 years
F-5	2	5	2	65	22	–	–	–	–	96	11.7 years
F-15	115	127	263	218	9	–	–	–	–	732	6.9 years
F-16	402	332	203	6	–	–	–	–	–	943	3.7 years
F-100	–	–	–	–	–	–	–	–	10	10	29.4 years
F-106	–	–	–	–	–	–	–	–	5	5	28.1 years
F-111	–	2	–	9	58	175	90	–	–	334	16.4 years
H-1	–	–	–	–	22	71	4	3	–	100	16.5 years
H-3	–	–	–	–	–	8	21	21	1	51	20.5 years
H-53	–	–	–	–	2	25	13	–	–	40	17.4 years
H-60	–	9	–	–	–	–	–	–	–	9	4.5 years
OV-10	–	–	–	–	–	–	77	–	–	77	18.5 years
T-33	–	–	–	–	–	–	–	–	54	54	29.4 years
T-37	–	–	–	–	–	8	145	43	413	609	25.3 years
T-38	–	–	–	–	–	75	219	339	177	810	21.5 years
T-39	–	–	–	–	–	–	–	–	12	12	25.8 years
T-41	–	–	–	–	–	6	72	22	–	100	20.3 years
T-43	–	–	–	–	14	–	–	–	–	14	13.6 years
T-46	3	–	–	–	–	–	–	–	–	3	0.6 years
TR-1	13	6	1	–	–	–	–	–	–	20	2.8 years
TG-7	–	6	–	–	–	–	–	–	–	6	4.2 years
U-6	–	–	1	–	–	–	–	–	–	1	6.0 years
UV-18	–	–	–	2	–	–	–	–	–	2	10.0 years
U-26	–	1	–	–	–	–	–	–	–	1	3.0 years
TOTALS	**756**	**752**	**681**	**558**	**268**	**715**	**1,048**	**882**	**1.469**	**7,129**	**13.9 years**
PERCENT	**11%**	**10%**	**9%**	**8%**	**4%**	**10%**	**15%**	**12%**	**21%**		

Less than 9 years old: 2,189 aircraft (31%).
More than 9 years old: 4,940 aircraft (69%).
*Aircraft age measured in quarters.

NOTE: ARF not included in calendar age.

AIR NATIONAL GUARD AIRCRAFT—HOW MANY, HOW OLD?

(Current as of September 30, 1987)

	0–3 yrs.	3–6 yrs.	6–9 yrs.	9–12 yrs.	12–15 yrs.	15–18 yrs.	18–21 yrs.	21–24 yrs.	24+ yrs.	TOTAL NUMBER	AVERAGE AGE
A-7	1	17	10	26	121	167	–	–	–	342	14.1 years
A-10	–	–	100	6	–	–	–	–	–	106	8.0 years
OA-37	–	–	–	11	21	23	5	–	–	60	14.7 years
C-5	–	–	–	–	–	5	–	–	–	5	16.9 years
C-12	6	–	–	–	–	–	–	–	–	6	1.9 years
C-21	3	–	–	–	–	–	–	–	–	3	0.1 years
C-22	4	–	–	–	–	–	–	–	–	4	2.7 years
C-130	31	15	19	–	–	–	3	12	130	210	19.8 years
C-131	–	–	–	–	–	–	–	–	16	16	32.2 years
KC-135	–	–	–	–	–	–	–	–	104	104	28.6 years
C-141	–	–	–	–	–	–	4	4	–	8	21.3 years
F-4	–	–	–	–	–	50	311	241	–	602	20.5 years
F-15	–	–	–	46	20	–	–	–	–	66	11.4 years
F-16	–	96	36	–	–	–	–	–	–	132	5.5 years
F-106	–	–	–	–	–	–	–	–	33	33	27.9 years
H-3	–	–	–	–	–	3	1	6	–	10	20.2 years
T-33	–	–	–	–	–	–	–	–	21	21	31.7 years
T-43	–	–	–	–	4	–	–	–	–	4	13.5 years
TOTALS	**45**	**128**	**165**	**89**	**166**	**248**	**324**	**263**	**304**	**1,732**	**17.4 years**
PERCENT	**3%**	**7%**	**10%**	**5%**	**10%**	**14%**	**19%**	**15%**	**18%**		

Less than 9 years old: 338 aircraft (20%).
More than 9 years old: 1,394 aircraft (80%).

AIR FORCE RESERVE AIRCRAFT—HOW MANY, HOW OLD?

(Current as of December 15, 1987)

	0–3 yrs.	3–6 yrs.	6–9 yrs.	9–12 yrs.	12–15 yrs.	15–18 yrs.	18–21 yrs.	21–24 yrs.	24+ yrs.	TOTAL NUMBER	AVERAGE AGE
A-10	–	–	72	25	–	–	–	–	–	97	9.0 years
AC-130A	–	–	–	–	–	–	–	–	10	10	32.0 years
C-130A	–	–	–	–	–	–	–	–	30	30	32.0 years
C-130B	–	–	–	–	–	–	–	–	37	37	27.0 years
C-130E	–	–	–	–	–	–	–	–	41	41	25.0 years
C-130H	16	2	6	–	–	–	–	–	–	24	2.0 years
HC-130H	–	–	–	–	–	–	–	10	–	10	23.0 years
HC-130N	–	–	–	–	–	4	–	–	–	4	18.0 years
WC-130E	–	–	–	–	–	–	–	–	2	2	26.0 years
WC-130H	–	–	–	–	–	–	–	10	–	10	23.0 years
C-141B	–	–	–	–	–	–	–	8	–	8	22.0 years
C-5A	–	–	–	–	–	1	14	–	–	15	17.0 years
KC-135	–	–	–	–	–	–	–	–	24	24	29.0 years
F-4	–	–	–	–	–	1	117	1	–	119	21.0 years
F-16	23	–	26	–	–	–	–	–	–	49	5.0 years
H-1	–	–	–	–	–	5	–	–	–	5	15.0 years
H-3	–	–	–	–	–	–	12	5	1	18	21.0 years
TOTALS	**39**	**2**	**104**	**25**	**0**	**11**	**143**	**34**	**145**	**503**	**18.0 years**
PERCENT	**8%**	**0%**	**21%**	**20%**	**0%**	**4%**	**26%**	**7%**	**29%**		

Less than 9 years old: 145 aircraft (29%).
More than 9 years old: 358 aircraft (71%).

ACTIVE-DUTY MILITARY PERSONNEL, RESERVE COMPONENT MILITARY PERSONNEL, AND CIVILIAN PERSONNEL STRENGTH

(Figures in thousands)

	FY '83	FY '84	FY '85	FY '86	FY '87	FY '88*	FY '89*
Active-Duty Military							
Army	780	780	781	781	781	772	772
Navy	558	565	571	581	587	593	593
Marine Corps	194	196	198	199	200	197	197
Air Force	592	597	602	608	607	576	576
Total	**2,123**	**2,138**	**2,151**	**2,169**	**2,174**	**2,138**	**2,138**
Reserve Components (Selected Reserve)							
Army National Guard	417	434	440	446	453	457	465
Army Reserve	266	275	292	310	319	324	339
Naval Reserve	109	121	130	142	149	153	162
Marine Corps Reserve	43	41	42	42	43	44	45
Air National Guard	102	105	109	113	113	116	118
Air Force Reserve	67	70	75	79	80	82	86
Total	**1,005**	**1,046**	**1,088**	**1,130**	**1,157**	**1,176**	**1,213**
Direct Hire Civilian							
Army**	332	344	359	354	357	340	340
Navy	328	332	342	332	343	337	329
Air Force**	238	240	250	250	252	252	250
Defense Agencies	81	85	91	92	96	97	97
Total**	**980**	**1,000**	**1,043**	**1,027**	**1,049**	**1,027**	**1,016**

NOTE: Totals may not add because of rounding.

*Programmed.
**These totals include Army and Air National Guard Technicians, who were converted from State to Federal employees in FY '79.

USAF FLYING SQUADRONS BY MISSION TYPE[1]

ACTIVE FORCES	FY '84	FY '85	FY '86	FY '87	FY '88*	FY '89*
Strategic Bomber	22	22	20	22	24	25
Air Refueling	35	35	36	36	35	35
Strategic Command and Control	6	6	6	6	6	6
Intelligence	3	3	3	3	3	3
Strategic Reconnaissance	1	1	1	1	1	1
Strategic Interceptor	5	4	4	3	2	2
Fighter	77	78	78	81	79	79
Tactical Reconnaissance	8	8	8	7	7	5
Tactical Electronic Warfare	3	3	3	4	4	4
Special Operations Forces	5	5	5	5	5	5
Tactical Air Command Control Systems[2]	3	3	3	3	3	3
Tactical Air Control Systems[2]	7	7	7	7	7	7
Weather	2	2	2	2	1	1
Rescue	8	8	9	9	7	7
Tactical Airlift	14	14	14	13	12	12
Strategic Airlift	17	17	17	17	17	18
Special Mission	1	1	1	1	1	1
Aeromedical Airlift	3	3	3	3	3	3
GLCM	2	3	4	6	6	**
ICBM	24	23	22	20	20	20
TOTAL	**246**	**246**	**246**	**249**	**243**	**237**
RESERVE FORCES						
ANG Selected Reserve	91	91	91	91	91	91
Air Force Reserve[3]	56	56	57	57	58	58
TOTAL	**147**	**147**	**148**	**148**	**149**	**149**
GRAND TOTAL	**393**	**393**	**394**	**397**	**392**	**386**

*Estimate.
**Decision pending INF Treaty ratification.
[1]Excludes training, support, and OT&E units.
[2]Includes consolidation of certain functional groups.
[3]Includes Associate squadrons.

NUMBER OF AIRCRAFT PER ACTIVE-DUTY USAF SQUADRON

Aircraft Type	Number* (End FY '87)
A-10	18 or 24
B-1	16
B-52	13, 14, 15, 16, or 19
C-5	15 or 16**
C-9	3 or 11
C-130	16
AC-130	10
KC-10	19
KC-135	13 to 25
C-141	13 to 17
E-3	2, 4, or 16
F-4	12 or 24
RF-4	18
F-5	11, 18, or 20
F-15	15, 18, or 24
F-16	18 or 24
F-106	15
F-111	12, 18, or 24
FB-111	8 or 11

*For some types of aircraft, squadrons vary in size as shown here. HC-130, WC-130, T-39, and T-38 aircraft are counted as Total Unit Equipment, not by squadrons.
**Reflects ongoing transfer of assets to Air Reserve Forces.

THE NUMBER OF ACTIVE AIRCRAFT AND FLYING HOURS

TYPE OF AIRCRAFT	FY '83	FY '84	FY '85	FY '86	FY '87	FY '88	FY '89
Bomber, Strategic	338	328	330	346	393	421	420
Tanker	546	556	559	572	576	568	566
Fighter/Interceptor/Attack	2,997	3,019	3,057	3,046	3,033	2,966	2,998
Reconnaissance/Electronic Warfare	385	404	418	394	432	435	438
Cargo/Transport	827	863	859	855	848	840	852
Search & Rescue (Fixed Wing)	35	35	37	37	35	34	31
Helicopter (includes Rescue)	236	237	234	232	191	182	171
Trainer	1,624	1,622	1,613	1,643	1,595	1,533	1,515
Utility/Observation/Other	206	191	180	120	110	113	112
TOTAL, USAF	**7,194**	**7,255**	**7,287**	**7,245**	**7,213**	**7,092**	**7,103**
Air National Guard total	1,703	1,688	1,688	1,782	1,732	1,732	1,736
Air Force Reserve total	458	458	468	467	502	505	514
TOTAL, ACTIVE AIRCRAFT, USAF, ANG, AFRES	**9,355**	**9,401**	**9,443**	**9,494**	**9,447**	**9,329**	**9,353**
Active aircraft including foreign government owned	(9,445)	(9,489)	(9,529)	(9,578)	(9,501)	(9,413)	(9,437)
FLYING HOURS (000)							
USAF	2,843	2,870	2,914	2,888	2,837	2,792	2,770
Air National Guard	414	416	423	412	435	443	447
Air Force Reserve	132	136	140	141	153	152	156
TOTAL FLYING HOURS	**3,389**	**3,422**	**3,477**	**3,441**	**3,425**	**3,387**	**3,373**

NOTE: FY '83–87 columns are actual; FY '88 and FY '89 columns are estimated.

USAF AIRCRAFT TAIL MARKINGS

Code	Aircraft	Unit, location, and command
AD	Various	Armament Division, Eglin AFB, Fla. (AFSC)
AK	F-15	21st TFW, Elmendorf AFB, Alaska (AAC)
AK	A-10A	343d TFW, Eielson AFB, Alaska (AAC)
AL	F-4D (F-16)*	187th TFG, Dannelly Field, Ala. (ANG)
AR	F-5E, A-10	10th TFW, RAF Alconbury, UK (USAFE)
AZ	A-7D, F-16	162d TFW, Tucson IAP, Ariz. (ANG)
BA	RF-4C	67th TRW, Bergstrom AFB, Tex. (TAC)
BC	OA-37	110th TASG, Battle Creek ANGB, Mich. (ANG)
BD	A-10A	917th TFG, Barksdale AFB, La. (AFRES)
BT	F-15	36th TFW, Bitburg AB, Germany (USAFE)
CC	F-111D	27th TFW, Cannon AFB, N. M. (TAC)
CM	F-15	159th TFG, New Orleans NAS, La. (ANG)
CO	A-7D	140th TFW, Buckley ANGB, Colo. (ANG)
CR	F-15	32d TFS, Soesterberg AB, Netherlands (USAFE)
CT	A-10A	103d TFG, Bradley ANGB, Conn. (ANG)
DC	F-4D	113th TFW, Andrews AFB, Md. (ANG)
DM	A-10A	355th TTW, Davis-Monthan AFB, Ariz. (TAC)
DO	F-4D	906th TFG, Wright-Patterson AFB, Ohio (AFRES)
ED	Various	Air Force Flight Test Center, Edwards AFB, Calif. (AFSC)
EG	F-15	33d TFW, Eglin AFB, Fla. (TAC)
EL	A-10A	23d TFW, England AFB, La. (TAC)
FF	F-15	1st TFW, Langley AFB, Va. (TAC)
FL	OV-10	549th TASTG, Patrick AFB, Fla. (TAC)
FM	F-4D	482d TFW, Homestead AFB, Fla. (AFRES)
FW	F-4E	122d TFW, Fort Wayne MAP, Ind. (ANG)
GA	F-4E	35th TFW, George AFB, Calif. (TAC)
GU	F-4E	497th TFS, Taegu AB, Korea (PACAF)
HA	A-7D	185th TFG, Sioux City, Iowa (ANG)
HF	F-4E	181st TFG, Hulman RAP, Ind. (ANG)
HI	F-16	419th TFW, Hill AFB, Utah (AFRES)
HL	F-16	388th TFW, Hill AFB, Utah (TAC)
HM	AT-38A	479th TTW, Holloman AFB, N. M. (TAC)
HO	F-15	49th TFW, Holloman AFB, N. M. (TAC)
HR	F-16	50th TFW, Hahn AB, Germany (USAFE)
HS	F-16	31st TTW, Homestead AFB, Fla. (TAC)
HW	OA-37	24th COMPW, Howard AFB, Panama (TAC)
IA	A-7D	132d TFW, Des Moines MAP, Iowa (ANG)
ID	A-10A	46th TFS, Grissom AFB, Ind. (AFRES)
IL	OA-37	182d TASG, Greater Peoria Airport, Ill. (ANG)
IN	A-10A	434th TFW, Grissom AFB, Ind. (AFRES)
IS	F-15	57th FIS, Keflavik NAS, Iceland (TAC)
KC	A-10A	442d TFW, Richards-Gebaur AFB, Mo. (AFRES)
KE	RF-4C	186th TRG, Key Field, Miss. (ANG)
KS	EC-130	7th ACCS, Keesler AFB, Miss. (TAC)
KY	RF-4C	123d TRW, Standiford Field, Ky. (ANG)
LA	F-15	405th TTW, Luke AFB, Ariz. (TAC)
LF	F-16	58th TTW, Luke AFB, Ariz. (TAC)
LH	CH-3	302d SOS, Luke AFB, Ariz. (AFRES)
LN	F-111F	48th TFW, RAF Lakenheath, UK (USAFE)
LR	F-16	944th TFG, Luke AFB, Ariz. (AFRES)
LV	A-7D	4450th TACG, Nellis AFB, Nev. (TAC)
MA	A-10A	104th TFG, Barnes MAP, Mass. (ANG)
MB	A-10A	354th TFW, Myrtle Beach AFB, S. C. (TAC)
MC	F-16	56th TTW, MacDill AFB, Fla. (TAC)
MD	A-10A	175th TFG, Martin Airport, Md. (ANG)
MI	A-7D	127th TFW, Selfridge ANGB, Mich. (ANG)
MJ	F-16	432d TFW, Misawa AB, Japan (PACAF)
MO	F-111, EF-111A	366th TFW, Mountain Home AFB, Idaho (TAC)
MY	F-16	347th TFW, Moody AFB, Ga. (TAC)
NA	F-16	474th TFW, Nellis AFB, Nev. (TAC)
NF	OA-37	602d TAIRCW, Davis-Monthan AFB, Ariz. (TAC)
NJ	F-4E	108th TFW, McGuire AFB, N. J. (ANG)
NM	A-7D	150th TFG, Kirtland AFB, N. M. (ANG)
NO	A-10A	926th TFG, New Orleans NAS, La. (AFRES)
NY	A-10A	174th TFW, Hancock Field, N. Y. (ANG)
OH	A-7D	121st TFW, Rickenbacker ANGB; 178th TFG, Springfield; 180th TFG, Toledo, Ohio (ANG)
OK	A-7D	138th TFG, Tulsa IAP, Okla. (ANG)
OS	F-4E, OV-10	51st TFW, Osan AB, Korea (PACAF)
OT	Various	TAWC, Eglin AFB, Fla. (TAC)
PA	OA-37	111th TASG, Willow Grove ARF, Pa. (ANG)
PA	EC-130H	193d SOG, Harrisburg IAP, Pa. (ANG)
PN	F-4E/G, F-5	3d TFW, Clark AB, Philippines (PACAF)
PR	A-7D	156th TFG, Muniz ANGB, Puerto Rico (ANG)
PT	A-7D	112th TFG, Greater Pittsburgh IAP, Pa. (ANG)
RG	Various	Warner Robins ALC, Robins AFB, Ga. (AFLC)
RS	F-16	86th TFW, Ramstein AB, Germany (USAFE)
SA	F-16	149th TFG, Kelly AFB, Tex. (ANG)
SC	F-16	169th TFG, McEntire ANGB, S. C. (ANG)
SD	A-7D	114th TFG, Joe Foss Field, S. D. (ANG)
SH	F-4D	507th TFG, Tinker AFB, Okla. (AFRES)
SI	F-4D	183d TFG, Capitol MAP, Ill. (ANG)
SJ	F-4E	4th TFW, Seymour Johnson AFB, N. C. (TAC)
SL	F-4E	131st TFW, Bridgeton, Mo. (ANG)
SP	F-4E/G	52d TFW, Spangdahlem AB, Germany (USAFE)
SU	A-10A	51st TFW, Suwon AB, Korea (PACAF)
SW	F-16, RF-4C	363d TFW, Shaw AFB, S. C. (TAC)
TH	F-4E	301st TFW, Carswell AFB, Tex. (AFRES)
TJ	F-16	401st TFW, Torrejon AB, Spain (USAFE)
TX	F-4D	924th TFG, Bergstrom AFB, Tex. (AFRES)
TY	F-15, T-33	325th TTW, Tyndall AFB, Fla. (TAC)
UH	F-111E, EF-111A	20th TFW, RAF Upper Heyford, UK (USAFE)
VA	A-7D	192d TFG, Byrd Field, Va. (ANG)
VT	F-16	158th TFG, Burlington IAP, Vt. (ANG)
VV	OV-10	27th TASS, George AFB, Calif. (TAC)
WA	Various	57th FWW, Nellis AFB, Nev. (TAC)
WH	OV-10	22d TASS, Wheeler AFB, Hawaii (PACAF)
WI	A-10A	128th TFW, Truax ANGB, Wis. (ANG)
WP	F-16	8th TFW, Kunsan AB, Korea (PACAF)
WR	A-10A	81st TFW, RAF Bentwaters, UK (USAFE)
WW	F-4E/G	37th TFW, George AFB, Calif. (TAC)
ZR	RF-4C	26th TRW, Zweibrücken AB, Germany (USAFE)
ZZ	F-15, RF-4C	18th TFW, Kadena AB, Okinawa (PACAF)

*Converting to F-16s.

AIR DEFENSE UNIT FIN FLASHES

Color code	Aircraft	Unit and location
Active Duty*		
Gold lightning bolt on dark-blue border	F-15, T-33	5th FIS, Minot AFB, N. D.
Blue/white stripes	F-15, T-33	48th FIS, Langley AFB, Va.
White/green eagle	F-106	49th FIS, Griffiss AFB, N. Y.
Dark blue/light blue/white star	F-15, T-33	318th FIS, McChord AFB, Wash.
Air National Guard Units		
Sea-blue wedge	F-15A	102d FIW, Otis ANGB, Mass.
Rainbow	F-4D	107th FIG, Niagara Falls IAP, N. Y.
Red stripe with "Happy Hooligans" logo	F-4D	119th FIG, Hector Field, N. D.
Blue triangle and two blue stripes bearing "Montana" and "Big Sky Country" logos	F-16	120th FIG, Great Falls IAP, Mont.
Red hawk	F-4C	123d FIS (142d FIG), Portland IAP, Ore.
Blue/white lightning bolt	F-16	125th FIG, Jacksonville IAP, Fla.
Blue stripe with "California" logo	F-4D	144th FIW, Fresno Air Terminal, Calif.
Texas star on red/white jagged stripes	F-4D	147th FIG, Ellington ANGB, Tex.
Stars of Little Dipper constellation	F-4D	148th FIG, Duluth IAP, Minn.
Red dart	F-106	177th FIG, Atlantic City Airport, N. J.
Yellow and black checkerboard	F-4D	191st FIG, Selfridge ANGB, Mich.
Air Defense Training Units (ANG)		
Black hawk	F-4C	114th TFTS (142d FIG), Kingsley Field, Ore.

*The F-15 aircraft assigned to the 57th FIS, Keflavik NAS, Iceland, carries the letter tail code IS and is listed in the chart above.

UNITED STATES AIR FORCE MEDAL OF HONOR RECIPIENTS—1918–1988

NAMES, ALPHABETICALLY BY WARS, AND RANK AT TIME OF ACTION	HOME TOWN	DATE AND PLACE OF ACTION	PRESENT ADDRESS OR DATE OF DEATH
WORLD WAR I			
Bleckley, 2d Lt. Erwin R.	Wichita, Kan.	Oct. 6, 1918, Binarville, France	KIA, Oct. 6, 1918
Goettler, 2d Lt. Harold E.	Chicago, Ill.	Oct. 6, 1918, Binarville, France	KIA, Oct. 6, 1918
Luke, 2d Lt. Frank, Jr.	Phoenix, Ariz.	Sept. 29, 1918, Murvaux, France	KIA, Sept. 29, 1918
Rickenbacker, Capt. Edward V.	Columbus, Ohio	Sept. 25, 1918, Billy, France	Died, July 23, 1973
WORLD WAR II			
Baker, Lt. Col. Addison E.	Chicago, Ill.	Aug. 1, 1943, Ploesti, Romania	KIA, Aug. 1, 1943
Bong, Maj. Richard I.	Poplar, Wis.	Oct. 10–Nov. 15, 1944, Southwest Pacific	Killed, Aug. 6, 1945, Burbank, Calif.
Carswell, Maj. Horace S., Jr.	Fort Worth, Tex.	Oct. 26, 1944, South China Sea	KIA, Oct. 26, 1944
Castle, Brig. Gen. Frederick W.	Manila, P.I.	Dec. 24, 1944, Liège, Belgium	KIA, Dec. 24, 1944
Cheli, Maj. Ralph	San Francisco, Calif.	Aug. 18, 1943, Wewak, New Guinea	Died as POW, Mar. 6, 1944
Craw, Col. Demas T.	Traverse City, Mich.	Nov. 8, 1942, Port Lyautey, French Morocco	KIA, Nov. 8, 1942
Doolittle, Lt. Col. James H.	Alameda, Calif.	Apr. 18, 1942, Tokyo, Japan	Carmel, Calif. (Ret. Gen.)
Erwin, SSgt. Henry E.	Adamsville, Ala.	Apr. 12, 1945, Koriyama, Japan	Leeds, Ala.
Femoyer, 2d Lt. Robert E.	Huntington, W. Va.	Nov. 2, 1944, Merseburg, Germany	KIA, Nov. 2, 1944
Gott, 1st Lt. Donald J.	Arnett, Okla.	Nov. 9, 1944, Saarbrücken, Germany	KIA, Nov. 9, 1944
Hamilton, Maj. Pierpont M.	Tuxedo Park, N. Y.	Nov. 8, 1942, Port Lyautey, French Morocco	Died, Mar. 4, 1982
Howard, Lt. Col. James H.	Canton, China	Jan. 11, 1944, Oschersleben, Germany	Belleair Bluffs, Fla. (Ret. Brig. Gen.)
Hughes, 2d Lt. Lloyd H.	Alexandria, La.	Aug. 1, 1943, Ploesti, Romania	KIA, Aug. 1, 1943
Jerstad, Maj. John L.	Racine, Wis.	Aug. 1, 1943, Ploesti, Romania	KIA, Aug. 1, 1943
Johnson, Col. Leon W.	Columbia, Mo.	Aug. 1, 1943, Ploesti, Romania	McLean, Va. (Ret. Gen.)
Kane, Col. John R.	McGregor, Tex.	Aug. 1, 1943, Ploesti, Romania	Barber, Ark. (Ret. Col.)
Kearby, Col. Neel E.	Wichita Falls, Tex.	Oct. 11, 1943, Wewak, New Guinea	KIA, Mar. 5, 1944, Wewak, New Guinea
Kingsley, 2d Lt. David R.	Portland, Ore.	June 23, 1944, Ploesti, Romania	KIA, June 23, 1944
Knight, 1st Lt. Raymond L.	Houston, Tex.	Apr. 25, 1945, Po Valley, Italy	KIA, Apr. 25, 1945
Lawley, 1st Lt. William R., Jr.	Leeds, Ala.	Feb. 20, 1944, Leipzig, Germany	Montgomery, Ala. (Ret. Col.)
Lindsey, Capt. Darrell R.	Jefferson, Iowa	Aug. 9, 1944, Pontoise, France	KIA, Aug. 9, 1944
Mathies, SSgt. Archibald	Scotland	Feb. 20, 1944, Leipzig, Germany	KIA, Feb. 20, 1944
Mathis, 1st Lt. Jack W.	San Angelo, Tex.	Mar. 18, 1943, Vegesack, Germany	KIA, Mar. 18, 1943
McGuire, Maj. Thomas B., Jr.	Ridgewood, N.J.	Dec. 25–26, 1944, Luzon, P.I.	KIA, Jan. 7, 1945, Negros, P.I.
Metzger, 2d Lt. William E., Jr.	Lima, Ohio	Nov. 9, 1944, Saarbrücken, Germany	KIA, Nov. 9, 1944
Michael, 1st Lt. Edward S.	Chicago, Ill.	Apr. 11, 1944, Brunswick, Germany	Fairfield, Calif. (Ret. Lt. Col.)
Morgan, 2d Lt. John C.	Vernon, Tex.	July 28, 1943, Kiel, Germany	Marina del Rey, Calif. (Ret. Col.)
Pease, Capt. Harl, Jr.	Plymouth, N.H.	Aug. 7, 1942, Rabaul, New Britain	KIA, Aug. 7, 1942
Pucket, 1st Lt. Donald D.	Longmont, Colo.	July 9, 1944, Ploesti, Romania	KIA, July 9, 1944
Sarnoski, 2d Lt. Joseph R.	Simpson, Pa.	June 16, 1943, Buka, Solomon Is.	KIA, June 16, 1943
Shomo, Maj. William A.	Jeannette, Pa.	Jan. 11, 1945, Luzon, P.I.	Pittsburgh, Pa. (Ret. Lt. Col.)
Smith, SSgt. Maynard H.	Caro, Mich.	May 1, 1943, St. Nazaire, France	Died, May 11, 1984
Truemper, 2d Lt. Walter E.	Aurora, Ill.	Feb. 20, 1944, Leipzig, Germany	KIA, Feb. 20, 1944
Vance, Lt. Col. Leon R., Jr.	Enid, Okla.	June 5, 1944, Wimereaux, France	Killed, July 26, 1944, near Iceland
Vosler, TSgt. Forrest L.	Lyndonville, N.Y.	Dec. 20, 1943, Bremen, Germany	Baldwinsville, N.Y.
Walker, Brig. Gen. Kenneth N.	Cerrillos, N.M.	Jan. 5, 1943, Rabaul, New Britain	KIA, Jan. 5, 1943
Wilkins, Maj. Raymond H.	Portsmouth, Va.	Nov. 2, 1943, Rabaul, New Britain	KIA, Nov. 2, 1943
Zeamer, Maj. Jay, Jr.	Carlisle, Pa.	June 16, 1943, Buka, Solomon Is.	Boothbay Harbor, Me. (Ret. Lt. Col.)
KOREA			
Davis, Maj. George A., Jr.	Dublin, Tex.	Feb. 10, 1952, Sinuiju-Yalu River, No. Korea	KIA, Feb. 10, 1952
Loring, Maj. Charles J., Jr.	Portland, Me.	Nov. 22, 1952, Sniper Ridge, No. Korea	KIA, Nov. 22, 1952
Sebille, Maj. Louis J.	Harbor Beach, Mich.	Aug. 5, 1950, Hamch'ang, So. Korea	KIA, Aug. 5, 1950
Walmsley, Capt. John S., Jr.	Baltimore, Md.	Sept. 14, 1951, Yangdok, No. Korea	KIA, Sept. 14, 1951
VIETNAM			
Bennett, Capt. Steven L.	Palestine, Tex.	June 29, 1972, Quang Tri, So. Vietnam	KIA, June 29, 1972
Day, Col. George E.	Sioux City, Iowa	Conspicuous gallantry while POW	Shalimar, Fla. (Ret. Col.)
Dethlefsen, Maj. Merlyn H.	Greenville, Iowa	Mar. 10, 1967, Thai Nguyen, No. Vietnam	Fort Worth, Tex. (Ret. Col.)
Fisher, Maj. Bernard F.	San Bernardino, Calif.	Mar. 10, 1966, A Shau Valley, So. Vietnam	Kuna, Idaho (Ret. Col.)
Fleming, 1st Lt. James P.	Sedalia, Mo.	Nov. 26, 1968, Duc Co, So. Vietnam	Active duty, Col., Lackland AFB, Tex.
Jackson, Lt. Col. Joe M.	Newnan, Ga.	May 12, 1968, Kham Duc, So. Vietnam	Kent, Wash. (Ret. Col.)
Jones, Lt. Col. William A. III	Norfolk, Va.	Sept. 1, 1968, Dong Hoi, No. Vietnam	Killed, Nov. 15, 1969, Woodbridge, Va.
Levitow, A1C John L.	Hartford, Conn.	Feb. 24, 1969, Long Binh, So. Vietnam	Vienna, Va.
Sijan, Capt. Lance P.	Milwaukee, Wis.	Conspicuous gallantry while POW	Died while POW, Jan. 1968
Thorsness, Lt. Col. Leo K.	Walnut Grove, Minn.	Apr. 19, 1967, No. Vietnam	Santa Monica, Calif. (Ret. Col.)
Wilbanks, Capt. Hilliard A.	Cornelia, Ga.	Feb. 24, 1967, Dalat, So. Vietnam	KIA, Feb. 24, 1967
Young, Capt. Gerald O.	Anacortes, Wash.	Nov. 9, 1967, Da Nang area, So. Vietnam	Anacortes, Wash. (Ret. Lt. Col.)

SOME FAMOUS FIRSTS AMONG US BOMBARDMENT UNITS

June 12, 1918 First bombs dropped by an AEF bomb unit: 8 Breguet 14s of the 96th Aero Sqdn., led by Maj. Harry M. Brown, on Dommary-Baroncourt railyards in France.

Dec. 10, 1941 First heavy bomb mission of WW II: 5 B-17s of the 93d Bomb Sqdn., 19th Bomb Gp., led by Maj. Cecil Combs, attacked Japanese convoy near Vigan, P.I., also sank the first enemy vessel by US aerial combat bombing.

Apr. 18, 1942 First mission against Japan: 16 B-25s of the 17th Bomb Gp. and 89th Recce Sqdn., led by Lt. Col. James H. Doolittle, launched from the carrier *Hornet*.

June 12, 1942 First mission against a European target: 13 B-24s of HALPRO Detachment, led by Col. H. A. Halverson, flying from Egypt against Ploesti oil fields.

Jan. 27, 1943 First mission against the German homeland: 53 B-17s and B-24s of the 1st and 2d Bomb Wgs., flying from the UK, attacked the Wilhelmshaven naval base.

Aug. 6, 1945 First atomic bomb mission: The *Enola Gay*, a 509th Composite Gp. B-29, piloted by Col. Paul W. Tibbets, Jr., flying from Tinian, attacked Hiroshima, Japan.

USAF Leaders Through The Years

SECRETARIES OF THE AIR FORCE

Stuart Symington	Sept. 18, 1947	Apr. 24, 1950
Thomas K. Finletter	Apr. 24, 1950	Jan. 20, 1953
Harold E. Talbott	Feb. 4, 1953	Aug. 13, 1955
Donald A. Quarles	Aug. 15, 1955	Apr. 30, 1957
James H. Douglas, Jr.	May 1, 1957	Dec. 10, 1959
Dudley C. Sharp	Dec. 11, 1959	Jan. 20, 1961
Eugene M. Zuckert	Jan. 24, 1961	Sept. 30, 1965
Harold Brown	Oct. 1, 1965	Feb. 15, 1969
Robert C. Seamans, Jr.	Feb. 15, 1969	May 14, 1973
John L. McLucas	July 18, 1973	Nov. 23, 1975
James W. Plummer (acting)	Nov. 24, 1975	Jan. 1, 1976
Thomas C. Reed	Jan. 2, 1976	Apr. 6, 1977
John C. Stetson	Apr. 6, 1977	May 18, 1979
Hans Mark	July 26, 1979	Feb. 9, 1981
Verne Orr	Feb. 9, 1981	Nov. 30, 1985
Russell A. Rourke	Dec. 9, 1985	Apr. 7, 1986
Edward C. Aldridge, Jr.	June 9, 1986	

USAF CHIEFS OF STAFF

Gen. Carl A. Spaatz	Sept. 26, 1947	Apr. 29, 1948
Gen. Hoyt S. Vandenberg	Apr. 30, 1948	June 29, 1953
Gen. Nathan F. Twining	June 30, 1953	June 30, 1957
Gen. Thomas D. White	July 1, 1957	June 30, 1961
Gen. Curtis E. LeMay	June 30, 1961	Jan. 31, 1965
Gen. John P. McConnell	Feb. 1, 1965	July 31, 1969
Gen. John D. Ryan	Aug. 1, 1969	July 31, 1973
Gen. George S. Brown	Aug. 1, 1973	June 30, 1974
Gen. David C. Jones	July 1, 1974	June 20, 1978
Gen. Lew Allen, Jr.	July 1, 1978	June 30, 1982
Gen. Charles A. Gabriel	July 1, 1982	June 30, 1986
Gen. Larry D. Welch	July 1, 1986	

CHIEF MASTER SERGEANTS OF THE AIR FORCE

CMSAF Paul W. Airey	Apr. 3, 1967	Aug. 1, 1969
CMSAF Donald L. Harlow	Aug. 1, 1969	Oct. 1, 1971
CMSAF Richard D. Kisling	Oct. 1, 1971	Oct. 1, 1973
CMSAF Thomas N. Barnes	Oct. 1, 1973	Aug. 1, 1977
CMSAF Robert D. Gaylor	Aug. 1, 1977	Aug. 1, 1979
CMSAF James M. McCoy	Aug. 1, 1979	July 1, 1981
CMSAF Arthur L. Andrews	Aug. 1, 1981	Aug. 1, 1983
CMSAF Sam E. Parish	Aug. 1, 1983	June 30, 1986
CMSAF James C. Binnicker	July 1, 1986	

AIR FORCE COMMUNICATIONS COMMAND

Maj. Gen. Harold W. Grant	July 1, 1961	Feb. 15, 1962
Maj. Gen. Kenneth P. Bergquist	Feb. 16, 1962	June 30, 1965
Maj. Gen. J. Francis Taylor, Jr.	July 1, 1965	Oct. 31, 1965
Maj. Gen. Richard P. Klocko	Nov. 1, 1965	July 2, 1967
Maj. Gen. Robert W. Paulson	July 15, 1967	Aug. 1, 1969
Maj. Gen. Paul R. Stoney	Aug. 1, 1969	Oct. 31, 1973
Maj. Gen. Donald L. Werbeck	Nov. 1, 1973	Aug. 24, 1975
Maj. Gen. Rupert H. Burris	Aug. 25, 1975	Oct. 31, 1977
Maj. Gen. Robert E. Sadler	Nov. 1, 1977	July 1, 1979
Maj. Gen. Robert T. Herres	July 1, 1979	July 27, 1981
Maj. Gen. Robert F. McCarthy	July 27, 1981	June 1, 1984
Maj. Gen. Gerald L. Prather	June 1, 1984	Aug. 28, 1986
Maj. Gen. John T. Stihl	Aug. 28, 1986	

Formerly Air Force Communications Service.
Redesignated Air Force Communications Command Nov. 15, 1979.

AIR FORCE LOGISTICS COMMAND

Gen. Joseph T. McNarney	Oct. 14, 1947	Aug. 31, 1949
Lt. Gen. Benjamin W. Chidlaw	Sept. 1, 1949	Aug. 20, 1951
Gen. Edwin W. Rawlings	Aug. 21, 1951	Feb. 28, 1959
Lt. Gen. William F. McKee	Mar. 1, 1959	Mar. 14, 1959
Gen. Samuel E. Anderson	Mar. 15, 1959	July 31, 1961
Gen. William F. McKee	Aug. 1, 1961	June 30, 1962
Gen. Mark E. Bradley, Jr.	July 1, 1962	July 31, 1965
Gen. Kenneth B. Hobson	Aug. 1, 1965	July 31, 1967
Gen. Thomas P. Gerrity	Aug. 1, 1967	Feb. 24, 1968
Lt. Gen. Lewis L. Mundell (acting)	Feb. 24, 1968	Mar. 28, 1968
Gen. Jack G. Merrell	Mar. 29, 1968	Sept. 11, 1972
Gen. Jack J. Catton	Sept. 12, 1972	Aug. 31, 1974
Gen. William V. McBride	Sept. 1, 1974	Aug. 31, 1975
Gen. F. Michael Rogers	Sept. 1, 1975	Jan. 27, 1978
Gen. Bryce Poe II	Jan. 28, 1978	July 31, 1981
Gen. James P. Mullins	Aug. 1, 1981	Nov. 1, 1984
Gen. Earl T. O'Loughlin	Nov. 1, 1984	July 31, 1987
Gen. Alfred G. Hansen	July 31, 1987	

Formerly Air Materiel Command.
Redesignated as Air Force Logistics Command Apr. 1, 1961.

AIR FORCE SPACE COMMAND

Gen. James V. Hartinger	Sept. 1, 1982	Aug. 1, 1984
Gen. Robert T. Herres	Aug. 1, 1984	Oct. 1, 1986
Maj. Gen. Maurice C. Padden	Oct. 1, 1986	Nov. 1, 1987
Lt. Gen. Donald J. Kutyna	Nov. 1, 1987	

AIR FORCE SYSTEMS COMMAND

Maj. Gen. David M. Schlatter	Feb. 1, 1950	June 24, 1951
Lt. Gen. Earle E. Partridge	June 24, 1951	June 20, 1953
Lt. Gen. Donald L. Putt	June 30, 1953	Apr. 14, 1954
Lt. Gen. Thomas S. Power	Apr. 15, 1954	June 30, 1957
Maj. Gen. John W. Sessums, Jr.	July 1, 1957	July 31, 1957
Lt. Gen. Samuel E. Anderson	Aug. 1, 1957	Mar. 9, 1959
Maj. Gen. John W. Sessums, Jr.	Mar. 10, 1959	Apr. 24, 1959
Gen. Bernard A. Schriever	Apr. 25, 1959	Aug. 31, 1966
Gen. James Ferguson	Sept. 1, 1966	Aug. 30, 1970
Gen. George S. Brown	Sept. 1, 1970	July 31, 1973
Gen. Samuel C. Phillips	Aug. 1, 1973	Aug. 31, 1975
Gen. William J. Evans	Sept. 1, 1975	July 31, 1977
Gen. Lew Allen, Jr.	Aug. 1, 1977	Mar. 13, 1978
Gen. Alton D. Slay	Mar. 14, 1978	Feb. 1, 1981
Gen. Robert T. Marsh	Feb. 1, 1981	Aug. 1, 1984
Gen. Lawrence A. Skantze	Aug. 1, 1984	July 17, 1987
Gen. Bernard P. Randolph	July 17, 1987	

Formerly Air Research and Development Command.
Redesignated as Air Force Systems Command Apr. 1, 1961.

AIR TRAINING COMMAND

Lt. Gen. John K. Cannon	Apr. 15, 1946	Oct. 15, 1948
Lt. Gen. Robert W. Harper	Oct. 14, 1948	June 30, 1954
Maj. Gen. Glenn O. Barcus	July 1, 1954	July 25, 1954
Lt. Gen. Charles T. Myers	July 26, 1954	July 31, 1958
Lt. Gen. Frederic H. Smith, Jr.	Aug. 1, 1958	July 31, 1959
Lt. Gen. James E. Briggs	Aug. 1, 1959	July 31, 1963
Lt. Gen. Robert W. Burns	Aug. 1, 1963	Aug. 10, 1964
Lt. Gen. William W. Momyer	Aug. 11, 1964	June 30, 1966
Lt. Gen. Sam Maddux, Jr.	July 1, 1966	Aug. 30, 1970
Lt. Gen. George B. Simler	Sept. 1, 1970	Sept. 9, 1972
Lt. Gen. William V. McBride	Sept. 9, 1972	Aug. 31, 1974
Lt. Gen. George H. McKee	Sept. 1, 1974	Aug. 31, 1975
Gen. John W. Roberts	Sept. 1, 1975	Apr. 1, 1979
Gen. B. L. Davis	Apr. 1, 1979	July 29, 1981
Gen. Thomas M. Ryan, Jr.	July 29, 1981	June 30, 1983
Gen. Andrew P. Iosue	July 1, 1983	Aug. 28, 1986
Lt. Gen. (Gen. selectee) John A. Shaud	Aug. 28, 1986	

AIR UNIVERSITY

Maj. Gen. Muir S. Fairchild	Mar. 15, 1946	May 17, 1948
Maj. Gen. Robert W. Harper	May 17, 1948	Oct. 15, 1948
Gen. George C. Kenney	Oct. 16, 1948	July 27, 1951
Lt. Gen. Idwal H. Edwards	July 28, 1951	Feb. 28, 1953
Lt. Gen. Laurence S. Kuter	Apr. 15, 1953	May 31, 1955
Lt. Gen. Dean C. Strother	June 1, 1955	June 30, 1958
Lt. Gen. Walter E. Todd	July 15, 1958	July 31, 1961
Lt. Gen. Troup Miller, Jr.	Aug. 1, 1961	Dec. 31, 1963
Lt. Gen. Ralph P. Swofford, Jr.	Jan. 1, 1964	July 31, 1965
Lt. Gen. John W. Carpenter III	Aug. 1, 1965	July 31, 1968
Lt. Gen. Albert P. Clark	Aug. 1, 1968	July 31, 1970
Lt. Gen. Alvan C. Gillem II	Aug. 1, 1970	Oct. 31, 1973
Lt. Gen. F. Michael Rogers	Nov. 1, 1973	Aug. 31, 1975
Lt. Gen. Raymond B. Furlong	Sept. 1, 1975	July 1, 1979
Lt. Gen. Stanley M. Umstead	July 1, 1979	July 24, 1981
Lt. Gen. Charles G. Cleveland	July 24, 1981	Aug. 1, 1984
Lt. Gen. Thomas C. Richards	Aug. 1, 1984	Nov. 6, 1986
Lt. Gen. Truman Spangrud	Nov. 6, 1986	

Air University was part of Air Training Command between May 1978 and July 1983.

ALASKAN AIR COMMAND

Brig. Gen. Joseph H. Atkinson	Oct. 1, 1946	Feb. 25, 1949
Brig. Gen. Frank A. Armstrong, Jr.	Feb. 26, 1949	Dec. 27, 1950
Maj. Gen. William D. Old	Dec. 27, 1950	Oct. 14, 1952
Brig. Gen. W. R. Agee	Oct. 27, 1952	Feb. 26, 1953
Maj. Gen. George R. Acheson	Feb. 26, 1953	Feb. 1, 1956
Lt. Gen. Joseph H. Atkinson	Feb. 24, 1956	July 16, 1956
Maj. Gen. Frank A. Armstrong, Jr.	July 17, 1956	Oct. 23, 1956
Maj. Gen. James H. Davies	Oct. 24, 1956	June 27, 1957
Lt. Gen. Frank A. Armstrong, Jr.	June 28, 1957	Aug. 18, 1957
Brig. Gen. Kenneth H. Gibson	Aug. 19, 1957	Aug. 13, 1958
Maj. Gen. C. F. Necrason	Aug. 14, 1958	July 19, 1961
Maj. Gen. Wendell W. Bowman	July 26, 1961	Aug. 8, 1963
Maj. Gen. James C. Jensen	Aug. 15, 1963	Nov. 14, 1966
Maj. Gen. Thomas E. Moore	Nov. 15, 1966	July 24, 1969
Maj. Gen. Joseph A. Cunningham	July 25, 1969	July 31, 1972
Maj. Gen. Donavon F. Smith	Aug. 1, 1972	June 5, 1973
Maj. Gen. Charles W. Carson, Jr.	June 18, 1973	Mar. 2, 1974
Maj. Gen. Jack K. Gamble	Mar. 19, 1974	June 30, 1975
Lt. Gen. James E. Hill	July 1, 1975	Oct. 14, 1976
Lt. Gen. M. L. Boswell	Oct. 15, 1976	June 30, 1978
Lt. Gen. Winfield W. Scott, Jr.	July 1, 1978	Apr. 1, 1981
Lt. Gen. Lynwood E. Clark	Apr. 1, 1981	Aug. 31, 1983
Lt. Gen. Bruce K. Brown	Sept. 1, 1983	Sept. 26, 1985
Lt. Gen. David L. Nichols	Sept. 27, 1985	

ELECTRONIC SECURITY COMMAND

Col. Roy H. Lynn	Oct. 26, 1948	July 5, 1949
Col. Travis M. Hetherington	July 6, 1949	Feb. 21, 1951
Maj. Gen. Roy H. Lynn	Feb. 22, 1951	Feb. 13, 1953
Maj. Gen. Harold H. Bassett	Feb. 14, 1953	Jan. 3, 1957
Maj. Gen. Gordon L. Blake	Jan. 4, 1957	Aug. 5, 1959
Maj. Gen. John B. Ackerman	Aug. 6, 1959	Sept. 20, 1959
Maj. Gen. Millard Lewis	Sept. 21, 1959	Aug. 31, 1962
Maj. Gen. Richard P. Klocko	Sept. 1, 1962	Oct. 15, 1965
Maj. Gen. Louis E. Coira	Oct. 16, 1965	July 18, 1969
Maj. Gen. Carl W. Stapleton	July 19, 1969	Feb. 23, 1973
Maj. Gen. Walter T. Galligan	Feb. 24, 1973	May 16, 1974
Maj. Gen. Howard P. Smith	May 17, 1974	July 31, 1975
Maj. Gen. K. D. Burns	Aug. 1, 1975	Jan. 18, 1979
Maj. Gen. Doyle E. Larson	Jan. 19, 1979	July 31, 1983
Maj. Gen. John B. Marks	Aug. 1, 1983	Apr. 16, 1985
Maj. Gen. Paul H. Martin	Apr. 17, 1985	

Formerly USAF Security Service.
Redesignated Electronic Security Command Aug. 1, 1979.

MILITARY AIRLIFT COMMAND

Lt. Gen. Laurence S. Kuter	June 1, 1948	Oct. 28, 1951
Lt. Gen. Joseph Smith	Nov. 15, 1951	June 30, 1958
Lt. Gen. William H. Tunner	July 1, 1958	May 31, 1960
Gen. Joe W. Kelly, Jr.	June 1, 1960	July 18, 1964
Gen. Howell M. Estes, Jr.	July 19, 1964	July 31, 1969
Gen. Jack J. Catton	Aug. 1, 1969	Sept. 12, 1972
Gen. Paul K. Carlton	Sept. 20, 1972	Mar. 31, 1977
Gen. William G. Moore, Jr.	Apr. 1, 1977	June 30, 1979
Gen. Robert E. Huyser	July 1, 1979	June 26, 1981
Gen. James R. Allen	June 26, 1981	June 30, 1983
Gen. Thomas M. Ryan, Jr.	July 1, 1983	Sept. 19, 1985
Gen. Duane H. Cassidy	Sept. 20, 1985	

Formerly Military Air Transport Service.
Redesignated as Military Airlift Command Jan. 1, 1966.

PACIFIC AIR FORCES

Lt. Gen. Ennis C. Whitehead	Dec. 30, 1945	Apr. 25, 1949
Lt. Gen. George E. Stratemeyer	Apr. 26, 1949	May 20, 1951
Lt. Gen. Earle E. Partridge (acting)	May 21, 1951	June 9, 1951
Gen. O. P. Weyland	June 10, 1951	Mar. 25, 1954
Gen. Earle E. Partridge	Mar. 26, 1954	May 31, 1955
Gen. Laurence S. Kuter	June 1, 1955	July 31, 1959
Gen. Emmett O'Donnell, Jr.	Aug. 1, 1959	July 31, 1963
Gen. Jacob E. Smart	Aug. 1, 1963	July 31, 1964
Gen. Hunter Harris, Jr.	Aug. 1, 1964	Jan. 31, 1967
Gen. John D. Ryan	Feb. 1, 1967	July 31, 1968
Gen. Joseph J. Nazzaro	Aug. 1, 1968	July 31, 1971
Gen. Lucius D. Clay, Jr.	Aug. 1, 1971	Sept. 30, 1973
Gen. John W. Vogt	Oct. 1, 1973	June 30, 1974
Gen. Louis L. Wilson, Jr.	July 1, 1974	May 31, 1977
Lt. Gen. James A. Hill	June 1, 1977	June 14, 1978
Lt. Gen. James D. Hughes	June 15, 1978	July 1, 1981
Lt. Gen. Arnold W. Braswell	July 1, 1981	Sept. 30, 1983
Gen. Jerome F. O'Malley	Oct. 8, 1983	Nov. 1, 1984
Gen. Robert W. Bazley	Nov. 1, 1984	Dec. 16, 1986
Gen. Jack I. Gregory	Dec. 16, 1986	

Formerly Far East Air Forces.
Redesignated as Pacific Air Forces July 1, 1957.

STRATEGIC AIR COMMAND

Gen. George C. Kenney	Mar. 21, 1946	Oct. 15, 1948
Gen. Curtis E. LeMay	Oct. 16, 1948	June 30, 1957
Gen. Thomas S. Power	July 1, 1957	Nov. 30, 1964
Gen. John D. Ryan	Dec. 1, 1964	Jan. 31, 1967
Gen. Joseph J. Nazzaro	Feb. 1, 1967	July 31, 1968
Gen. Bruce K. Holloway	Aug. 1, 1968	Apr. 30, 1972
Gen. John C. Meyer	May 1, 1972	July 31, 1974
Gen. Russell E. Dougherty	Aug. 1, 1974	July 31, 1977
Gen. Richard H. Ellis	Aug. 1, 1977	Aug. 1, 1981
Gen. B. L. Davis	Aug. 1, 1981	Aug. 1, 1985
Gen. Larry D. Welch	Aug. 1, 1985	June 30, 1986
Gen. John T. Chain, Jr.	July 1, 1986	

TACTICAL AIR COMMAND

Lt. Gen. E. R. Quesada	Mar. 21, 1946	Nov. 23, 1948
Maj. Gen. Robert M. Lee	Dec. 24, 1948	June 20, 1950
Maj. Gen. Glenn O. Barcus	July 17, 1950	Jan. 25, 1951
Gen. John K. Cannon	Jan. 25, 1951	Mar. 31, 1954
Gen. O. P. Weyland	Apr. 1, 1954	July 31, 1959
Gen. Frank F. Everest	Aug. 1, 1959	Sept. 30, 1961
Gen. Walter C. Sweeney, Jr.	Oct. 1, 1961	July 31, 1965
Gen. Gabriel P. Disosway	Aug. 1, 1965	July 31, 1968
Gen. William W. Momyer	Aug. 1, 1968	Sept. 30, 1973
Gen. Robert J. Dixon	Oct. 1, 1973	Apr. 30, 1978
Gen. W. L. Creech	May 1, 1978	Nov. 1, 1984
Gen. Jerome F. O'Malley	Nov. 1, 1984	Apr. 20, 1985
Gen. Robert D. Russ	May 22, 1985	

US AIR FORCES IN EUROPE

Brig. Gen. John F. McBain	Aug. 15, 1947	Oct. 20, 1947
Lt. Gen. Curtis E. LeMay	Oct. 20, 1947	Oct. 15, 1948
Lt. Gen. John K. Cannon	Oct. 16, 1948	Jan. 20, 1951
Gen. Lauris Norstad	Jan. 21, 1951	July 26, 1953
Lt. Gen. William H. Tunner	July 27, 1953	June 30, 1957
Gen. Frank F. Everest	July 1, 1957	July 31, 1959
Gen. Frederic H. Smith, Jr.	Aug. 1, 1959	June 30, 1961
Gen. Truman H. Landon	July 1, 1961	July 31, 1963
Gen. Gabriel P. Disosway	Aug. 1, 1963	July 31, 1965
Gen. Bruce K. Holloway	Aug. 1, 1965	July 31, 1966
Gen. Maurice A. Preston	Aug. 1, 1966	July 31, 1968
Gen. Horace M. Wade	Aug. 1, 1968	Jan. 31, 1969
Gen. Joseph R. Holzapple	Feb. 1, 1969	Aug. 31, 1971
Gen. David C. Jones	Sept. 1, 1971	June 30, 1974
Gen. John W. Vogt	July 1, 1974	Aug. 31, 1975
Gen. Richard H. Ellis	Sept. 1, 1975	July 31, 1977
Gen. William J. Evans	Aug. 1, 1977	Aug. 1, 1978
Gen. John W. Pauly	Aug. 1, 1978	Aug. 1, 1980
Gen. Charles A. Gabriel	Aug. 1, 1980	June 30, 1982
Gen. Billy M. Minter	July 1, 1982	Nov. 1, 1984
Gen. Charles L. Donnelly, Jr.	Nov. 1, 1984	May 1, 1987
Gen. William L. Kirk	May 1, 1987	

USAF ACADEMY SUPERINTENDENTS

Lt. Gen. Hubert R. Harmon	July 27, 1954	July 27, 1956
Maj. Gen. James E. Briggs	July 28, 1956	Aug. 16, 1959
Maj. Gen. William S. Stone	Aug. 17, 1959	June 30, 1962
Maj. Gen. Robert H. Warren	July 1, 1962	June 30, 1965
Lt. Gen. Thomas S. Moorman	July 1, 1965	July 31, 1970
Lt. Gen. Albert P. Clark	Aug. 1, 1970	July 31, 1974
Lt. Gen. James R. Allen	Aug. 1, 1974	July 31, 1977
Lt. Gen. Kenneth L. Tallman	Aug. 1, 1977	June 16, 1981
Maj. Gen. Robert E. Kelley	June 16, 1981	July 4, 1983
Lt. Gen. Winfield W. Scott, Jr.	July 5, 1983	June 26, 1987
Lt. Gen. Charles R. Hamm	June 26, 1987	

AIR FORCE RESERVE

Maj. Gen. Rollin B. Moore, Jr.	Aug. 1, 1968	Jan. 26, 1972
Brig. Gen. Alfred Verhulst (acting)	Jan. 27, 1972	Mar. 15, 1972
Maj. Gen. Homer I. Lewis	Mar. 16, 1972	Apr. 8, 1975
Maj. Gen. William Lyon	Apr. 16, 1975	Apr. 16, 1979
Maj. Gen. Richard Bodycombe	Apr. 17, 1979	Oct. 31, 1982
Maj. Gen. Sloan R. Gill	Nov. 1, 1982	Oct. 31, 1986
Maj. Gen. Roger P. Scheer	Nov. 1, 1986	

Since Mar. 16, 1972, the Chief of Air Force Reserve has been dual-hatted as Commander, Hq. Air Force Reserve (AFRES). The earlier chief of Hq. Air Force Reserve was Maj. Gen. Tom E. Marchbanks, Jr., from Jan. 18, 1968, to Feb. 1, 1971.

AIR NATIONAL GUARD

Col. William A. R. Robertson	Nov. 28, 1945	Oct. 1948
Maj. Gen. George G. Finch	Oct. 1948	Sept. 25, 1950
Maj. Gen. Earl T. Ricks	Oct. 13, 1950	Jan. 4, 1954
Maj. Gen. Winston P. Wilson	Jan. 26, 1954	Aug. 5, 1962
Maj. Gen. I. G. Brown	Aug. 6, 1962	Apr. 19, 1974
Maj. Gen. John J. Pesch	Apr. 20, 1974	Jan. 31, 1977
Maj. Gen. John T. Guice	Feb. 1, 1977	Apr. 1, 1981
Maj. Gen. John B. Conaway	Apr. 1, 1981	

The head of the Air National Guard was Chief, Aviation Group, National Guard Bureau until 1948, when the title changed to Chief, Air Force Division, NGB. In Dec. 1969 the title was changed to the present Director, Air National Guard.

Air Force Magazine's Guide to Aces

In compiling this list of aces who flew with USAF and its predecessor organizations (the Air Service and the Army Air Forces), AIR FORCE Magazine has relied on USAF's official accounting of aerial victory credits, which is the responsibility of the USAF Historical Research Center at Maxwell AFB, Ala.

As this issue went to press, the Historical Research Center was preparing a revised list of aerial victory credits. The revised list will combine World War I, World War II, Korea, and Southeast Asia (Vietnam) in one volume and is expected to be published this summer.

The USAF Historical Research Center is not authorized and has never attempted to verify aerial victory credits claimed by American pilots who flew with the air forces of other nations. Readers should note that this criterion applies to all of the listings here with the exception of the "Leading American Aces of World War I" box. That listing includes American aces who flew with the Air Service and with the British and French as well. Also, some World War I totals (notably Frank Luke's) include victories for balloons. All other credits are for air-to-air victories as defined and verified by the Historical Research Center.

—THE EDITORS

LEADING AMERICAN ACES OF WORLD WAR I

(Ten or more victories)

Rickenbacker, Capt. Edward V. (AEF)	26	Luke, 2d Lt. Frank, Jr. (AEF)	18	Bennett, 1st Lt. Louis B. (RFC)	12
Lambert, Capt. William C. (RFC)	22	Lufbery, Maj. Raoul G. (FFC/LE)	17	Kindley, Capt. Field E. (AEF)	12
Gillette, Capt. Frederick W. (RFC)	20	Kullberg, Lt. Harold A. (RFC)	16	Putnam, 1st Lt. David E. (LE/AEF)	12
Malone, Capt. John J. (RN)	20	Rose, Capt. Oren J. (RFC)	16	Springs, Capt. Elliott W. (AEF)	12
Wilkinson, Maj. Alan M. (RFC)	19	Warman, Lt. C. T. (RFC)	15	Iaccaci, Lt. Thayer A. (RFC)	11
Hale, Capt. Frank L. (RFC)	18	Libby, Capt. Frederick (RFC)	14	Landis, Capt. Reed G. (AEF)	11
Iaccaci, Capt. Paul T. (RFC)	18	Vaughn, 1st Lt. George A. (AEF)	13	Swaab, Capt. Jacques M. (AEF)	10
		Baylies, Lt. Frank L. (FFC/LE)	12		

AEF—American Expeditionary Force
FFC—French Flying Corps
LE—Lafayette Escadrille
RFC—Royal Flying Corps (British)
RN—Royal Navy (British)

LEADING ARMY AIR FORCES ACES OF WORLD WAR II

(Fourteen and a half or more victories)

Bong, Maj. Richard I.	40	Westbrook, Lt. Col. Robert B.	20	Anderson, Capt. Clarence E., Jr.	16.25
McGuire, Maj. Thomas B., Jr.	38	Gentile, Capt. Donald S.	19.83	Dunham, Lt. Col. William D.	16
Gabreski, Lt. Col. Francis S.	28*	Duncan, Col. Glenn E.	19.50	Harris, Lt. Col. Bill	16
Johnson, Capt. Robert S.	27	Carson, Capt. Leonard K.	18.50	Welch, Capt. George S.	16
MacDonald, Col. Charles H.	27	Eagleston, Maj. Glenn T.	18.50*	Beerbower, Capt. Donald M.	15.50
Preddy, Maj. George E.	26.83	Beckham, Maj. Walter C.	18	Brown, Maj. Samuel J.	15.50
Meyer, Lt. Col. John C.	24*	Green, Maj. Herschel H.	18	Peterson, Capt. Richard A.	15.50
Schilling, Col. David C.	22.50	Herbst, Lt. Col. John C.	18	Whisner, Capt. William T., Jr.	15.50*
Johnson, Lt. Col. Gerald R.	22	Zemke, Lt. Col. Hubert	17.75	Bradley, Lt. Col. Jack T.	15
Kearby, Col. Neel E.	22	England, Maj. John B.	17.50	Cragg, Maj. Edward	15
Robbins, Maj. Jay T.	22	Beeson, Capt. Duane W.	17.33	Foy, Maj. Robert W.	15
Christensen, Capt. Fred J.	21.50	Thornell, 1st Lt. John F., Jr.	17.25	Hofer, 2d Lt. Ralph K.	15
Wetmore, Capt. Ray S.	21.25	Varnell, Capt. James S., Jr.	17	Homer, Capt. Cyril F.	15
Voll, Capt. John J.	21	Johnson, Maj. Gerald W.	16.50	Bochkay, Capt. Donald H.	14.84
Mahurin, Maj. Walker M.	20.75*	Godfrey, Capt. John T.	16.33	Landers, Lt. Col. John D.	14.50
Lynch, Lt. Col. Thomas J.	20			Powers, Capt. Joe H., Jr.	14.50

* Aces who added to these scores by victories in the Korean War.
Ranks are as of last victory in World War II.

USAF ACES OF THE KOREAN WAR

McConnell, Capt. Joseph, Jr.	16	Hagerstrom, Maj. James P.	8.50*	Whisner, Maj. William T., Jr.	5.50*
Jabara, Maj. James	15*	Risner, Capt. Robinson	8	Baldwin, Col. Robert P.	5
Fernandez, Capt. Manuel J.	14.50	Ruddell, Lt. Col. George I.	8*	Becker, Capt. Richard S.	5
Davis, Maj. George A., Jr.	14*	Buttlemann, 1st Lt. Henry	7	Bettinger, Maj. Stephen L.	5
Baker, Col. Royal N.	13*	Jolley, Capt. Clifford D.	7	Creighton, Maj. Richard D.	5*
Blesse, Maj. Frederick C.	10	Lilley, Capt. Leonard W.	7	Curtin, Capt. Clyde A.	5
Fischer, 1st Lt. Harold E.	10	Adams, Maj. Donald E.	6.50	Gibson, Capt. Ralph D.	5
Garrison, Lt. Col. Vermont	10*	Gabreski, Col. Francis S.	6.50*	Kincheloe, Capt. Iven C., Jr.	5
Johnson, Col. James K.	10*	Jones, Lt. Col. George L.	6.50	Latshaw, Capt. Robert T., Jr.	5
Moore, Capt. Lonnie R.	10	Marshall, Maj. Winton W.	6.50	Moore, Capt. Robert H.	5
Parr, Capt. Ralph S., Jr.	10	Kasler, 1st Lt. James H.	6	Overton, Capt. Dolphin D., III	5
Foster, Capt. Cecil G.	9	Love, Capt. Robert J.	6	Thyng, Col. Harrison R.	5*
Low, 1st Lt. James F.	9			Westcott, Maj. William H.	5

*These are in addition to World War II victories.

AAF/USAF ACES OF WORLD WAR II AND LATER WARS

	WW II	KOREA	TOTAL		WW II	KOREA	TOTAL
Gabreski, Col. Francis S.	28	6.50	34.50	Johnson, Col. James K.	1	10	11
Meyer, Col. John C.	24	2	26	Ruddell, Lt. Col. George I.	2.50	8	10.50
Mahurin, Col. Walker M.	20.75	3.50	24.25	Thyng, Col. Harrison R.	5	5	10
Davis, Maj. George A., Jr.	7	14	21	Colman, Capt. Philip E.	5	4	9
Whisner, Maj. William T., Jr.	15.50	5.50	21	Heller, Lt. Col. Edwin L.	5.50	3.50	9
Eagleston, Col. Glenn T.	18.50	2	20.50	Chandler, Maj. Van E.	5	3	8
Garrison, Lt. Col. Vermont	7.33	10	17.33	Hockery, Maj. John J.	7	1	8
Baker, Col. Royal N.	3.50	13	16.50	Creighton, Maj. Richard D.	2	5	7
Jabara, Maj. James	1.50	15	16.50	Emmert, Lt. Col. Benjamin H., Jr.	6	1	7
Olds, Col. Robin	12	4*	16	Bettinger, Maj. Stephen L.	1	5	6
Mitchell, Col. John W.	11	4	15	Visscher, Maj. Herman W.	5	1	6
Brueland, Maj. Lowell K.	12.50	2	14.50	Liles, Capt. Brooks J.	1	4	5
Hagerstrom, Maj. James P.	6	8.50	14.50	Mattson, Capt. Conrad E.	1	4	5
Hovde, Lt. Col. William J.	10.50	1	11.50	Shaeffer, Maj. William F.	2	3	5

* Colonel Olds's 4 additional victories came during the Vietnam War.

AMERICAN ACES OF THE VIETNAM WAR

DeBellevue, Capt. Charles B. (USAF)	6
Cunningham, Lt. Randy (USN)	5
Driscoll, Lt. William (USN)	5
Feinstein, Capt. Jeffrey S. (USAF)	5
Ritchie, Capt. Richard S. (USAF)	5

LEADING AIR SERVICE/ AAF/USAF ACES OF ALL WARS

Bong, Maj. Richard I.	40	WW II	Kearby, Col. Neel E.	22	WW II
McGuire, Maj. Thomas B., Jr.	38	WW II	Robbins, Maj. Jay T.	22	WW II
Gabreski, Col. Francis S.	34.50	WW II, Korea	Christensen, Capt. Fred J.	21.50	WW II
Johnson, Lt. Col. Robert S.	27	WW II	Wetmore, Capt. Ray S.	21.25	WW II
MacDonald, Col. Charles H.	27	WW II	Davis, Maj. George A., Jr.	21	WW II, Korea
Preddy, Maj. George E.	26.83	WW II	Voll, Capt. John J.	21	WW II
Meyer, Col. John C.	26	WW II, Korea	Whisner, Maj. William T., Jr.	21	WW II, Korea
Rickenbacker, Capt. Edward V.	26	WW I	Eagleston, Col. Glenn T.	20.50	WW II, Korea
Mahurin, Col. Walker M.	24.25	WW II, Korea	Lynch, Lt. Col. Thomas J.	20	WW II
Schilling, Col. David C.	22.50	WW II	Westbrook, Lt. Col. Robert B.	20	WW II
Johnson, Lt. Col. Gerald R.	22	WW II	Gentile, Capt. Donald S.	19.83	WW II

SOME FAMOUS FIGHTER FIRSTS

First American to down 5 enemy aircraft in WW I	Pvt. Frederick Libby (serving with the RFC)
First American ace of WW I	Capt. Alan M. Wilkinson (RFC)
First American ace to serve with the AEF	Capt. Raoul G. Lufbery (FFC/LE)
First American AEF ace of WW I	Capt. Douglas Campbell
First American ace of WW II	Pilot Officer William R. Dunn (RAF)
First American USAAF ace of WW II	Lt. Boyd D. "Buzz" Wagner
First American to score an aerial victory in Korea	1st Lt. William G. Hudson (June 27, 1950)
First jet-to-jet kill of the Korean War	1st Lt. Russell J. Brown (Nov. 8, 1950)
First American ace of the Korean War	Capt. James Jabara (May 20, 1951)
First American ace of two wars	Maj. A. J. "Ajax" Baumler (8 in Spain; 5 in WW II)
First USAF ace of two wars	Maj. William T. Whisner, Jr. (15.5 in WW II; 5.5 in Korea)
First USAF ace with victories in WW II and Vietnam	Col. Robin Olds (12 in WW II; 4 in Vietnam)

Source: *Fighter Aces*, by Col. Raymond F. Toliver and Trevor J. Constable, Macmillan Co., N. Y., 1965.

Air Force Communications Command

AIR Force Communications Command (AFCC), headquartered at Scott AFB, Ill., continues its proud tradition of "Providing the Reins of Command" for Air Force operational and support commands. The command's "Excellence in Action" campaign inspires AFCC people to harness today's technology to provide effective and responsive communications service to Air Force customers worldwide.

AFCC is often described as the AT&T, Western Union, IBM, and FAA for USAF—providing telephone systems, base communications centers, computer facilities, ground radio and satellite stations, and the safest air traffic control system in the world. In addition to providing these services at fixed locations, AFCC's combat communications units, using tactical equipment, can provide a complete base communications system in a bare-base environment.

As the Air Force's most widely dispersed command, AFCC has people in more than 700 units stationed at some 440 locations—on five continents, in all fifty states, and in twenty-six foreign countries and island possessions. Approximately seventy-five percent of the more than 49,000 military and nearly 9,000 civilian members of AFCC serve in technical career fields.

The 14,000 Air National Guard and Air Force Reserve personnel gained by AFCC in wartime are a perfect example of the Total Force policy at work. In addition to maintaining readiness for their wartime missions, Guard and Reserve people contributed 80,000 workdays last year to the command's efforts.

AFCC units—tenants at all locations—can be found at virtually every Air Force installation in the world. As base communications officers, local AFCC unit commanders are also key members of host unit commanders' staffs and serve under their operational control. This "dual-hat" concept clearly emphasizes AFCC's role as a support command committed to providing communications systems for Air Force combat operations and support forces.

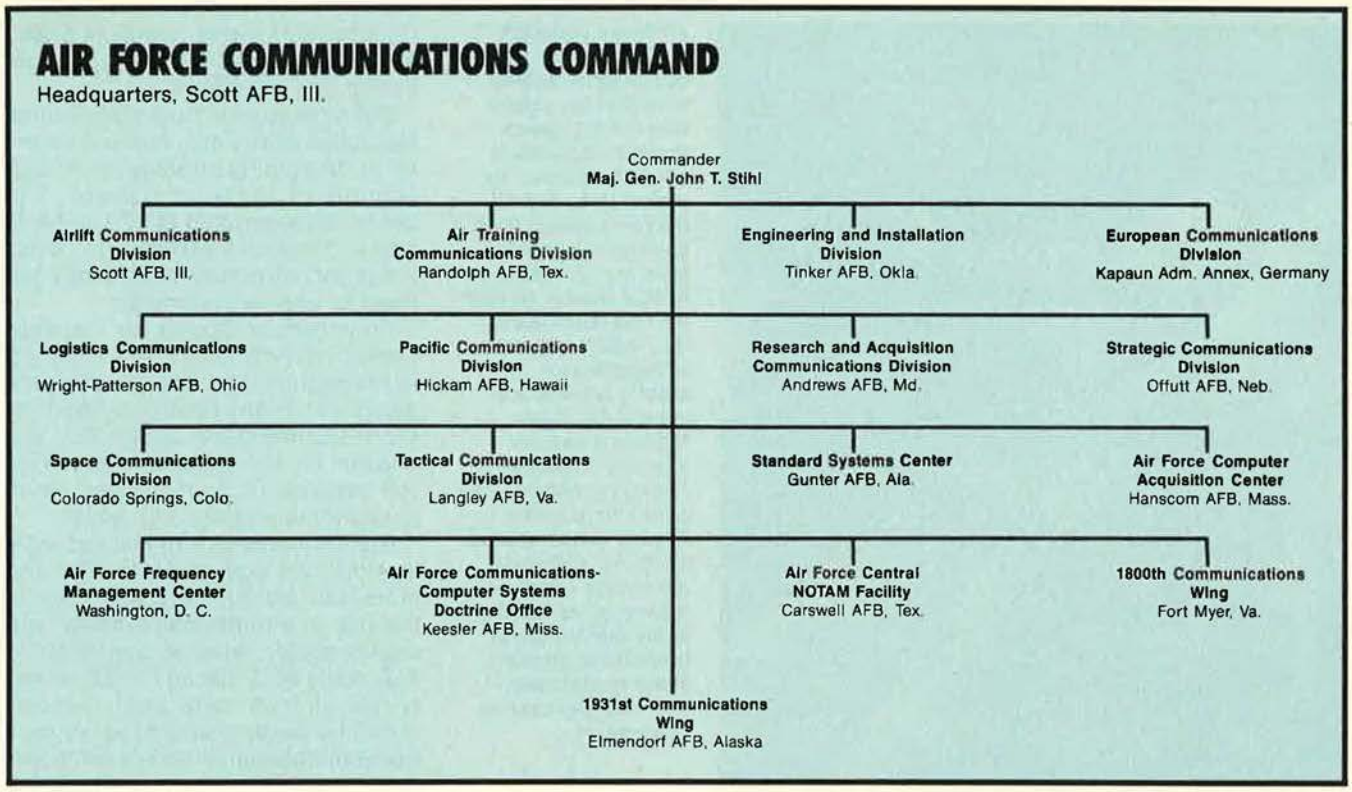
AFCC has the largest military air traffic control system in the free world, with more than 1,100 pieces of air traffic control and landing system equipment at more than 160 locations. Last fiscal year, its air traffic controllers handled approximately 14,000,000 aircraft operations and were involved in saving twenty-eight lives and fifteen aircraft valued at more than $56 million.

AFCC is also responsible for the engineering and installation (E&I) of electronics equipment. The command's E&I people travel around the globe installing new equipment or providing on-site maintenance normally performed at large depot facilities. Last year, these units provided more than $170 million worth of service—and that's just the cost of installation, not the equipment.

AFCC is one of three Air Force major commands involved in the acquisition of new systems. AFCC complements the roles Air Force Systems Command and Air Force Logistics Command play in the procurement of large-scale developmental systems by purchasing communications systems that are commercially available off-the-shelf. Currently, AFCC manages the acquisition of more than eighty programs whose total life-cycle value exceeds $17 billion.

In line with its increasing acquisition role, AFCC has been charged with bringing about the integration of base-level communications-computer systems. Because of growing concerns about the proliferation of in-

Working eighty feet above ground, Air Force technicians service a communications antenna. Such equipment is the hallmark of Air Force Communications Command. AFCC people are distributed among 700 units in some 440 locations on five continents, including twenty-six foreign countries and island possessions, and in all fifty states. This makes AFCC the Air Force's most widely dispersed command, one that deals in air traffic control as well as in communications.



compatible communications-computer systems, the Air Force Communications-Computer Systems Integration Office was established under the direction of AFCC's Vice Commander, Brig. Gen. Charles W. Bartholomew, on October 1, 1987. This office provides technical direction and oversight to achieve base-level systems that are effective, efficient, and responsive to validated, minimum essential mission requirements.

To help with this integration effort, AFCC will rely on the Command Control Communications and Computer Systems Model Base Program at Mather AFB, Calif. Because the communications infrastructure at Mather reflects the future baseline system, new or proposed communications systems can be evaluated to ensure interoperability. The Model Base Program provides AFCC a test-bed to implement a "fly-before-buy" option for future Air Force communications systems.

Air Force Communications Command is a dynamic and changing command with an exciting future, reflecting the advances in communications technology needed to support today's modern, combat-ready Air Force. Through inter- and intrabase communications systems, high-speed computer services, satellite and ground radio systems, and air traffic control services, AFCC supports virtually everyone in the Air Force. AFCC's people are "Excellence in Action," ensuring a viable deterrent capability for our Air Force by "Providing the Reins of Command." ■

Air Force Logistics Command

AIR Force Logistics Command (AFLC) is facing a new challenge in 1988—providing combat strength through logistics while battling mounting fiscal restraints.

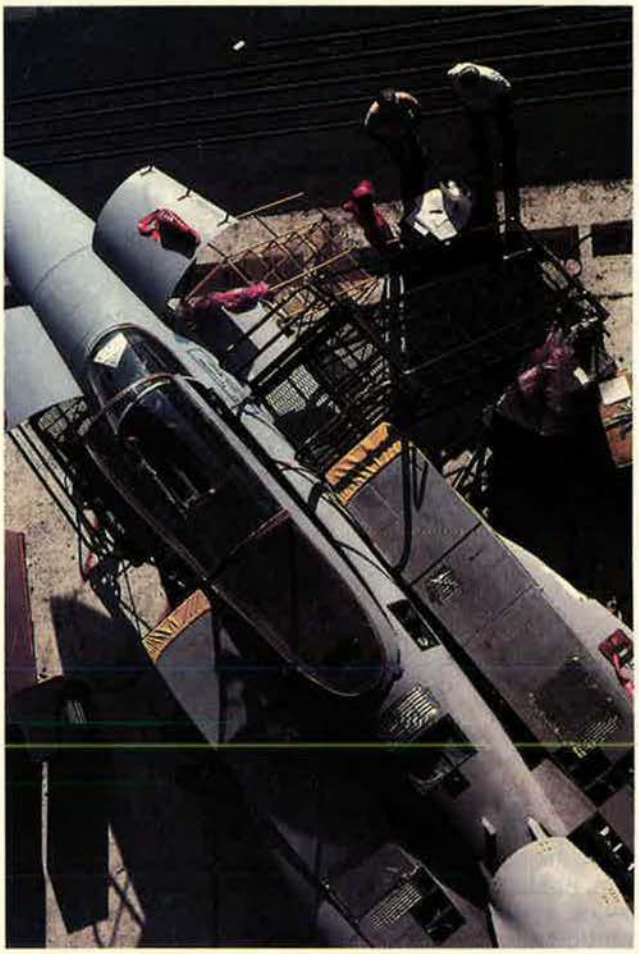
But Gen. Alfred G. Hansen, AFLC Commander, is confident his command will meet the challenge. The command's worldwide work force of more than 90,000 civilians and some 11,000 military members is working to meet five goals that, when attained, will allow AFLC to provide increased combat strength.

AFLC is in the business of supplying combat capability to the operational commands, such as Strategic Air Command and Tactical Air Command. General Hansen, who took command August 1, 1987, identified five major areas in which AFLC would have to focus its efforts and its resources: people, user support, quality, accountability, and financial program execution.

"Budget cuts will impact our operations considerably," General Hansen said. "But the danger to national security will not diminish, and the responsibility of this command to supply combat capability to our fighting forces will not be any less."

Taking advantage of the latest technologies is one big way AFLC is working to keep Air Force weapon systems combat-ready. The command's support capabilities took a healthy step forward in 1987 when nearly half of the command's Logistics Management Systems Modernization Program became operational. The program is replacing some 135 antiquated computer systems with fewer and better systems. The new computer networks will, among other tasks, assist logistics managers in tracking spare parts and inventories, in managing maintenance operations, in streamlining contracting processes, and in projecting operational command requirements.

"The new systems are improving our combat readiness and sustainability by giving us timely, accu-



Air Force Logistics Command is in the business of making sure that the equipment of the operational commands is combat-capable. As part of this, an F-15 fighter is shown here undergoing depot-level maintenance at AFLC's Warner Robins Air Logistics Center, Ga., which oversees all logistics for USAF's premier air-superiority Eagle fighters wherever they are deployed. Taking big hits in budgetary hard times, AFLC is concentrating on taking maximum advantage of new technologies in managing maintenance operations, streamlining contracting, and meeting user requirements.

rate data," said Col. (Brig. Gen. selectee) John F. Phillips, Vice Commander of AFLC's Logistics Management Systems Center at Wright-Patterson.

The modernization program, scheduled for completion in 1994, is managed through an evolutionary process. "Money for a new phase is only obligated after an already-funded phase has proven itself," Phillips said.

Another big step came when AFLC established an office dedicated solely to applying artificial intelligence to the many facets of logistics.

The use of artificial intelligence expert systems involves gathering human expertise in a particular field and placing it in the knowledge base of a computer program.

"Logistics is probably the area where the Air Force and Department of Defense can get the largest short-term payoff using artificial intelligence expert systems," said Maj. Mary Kay Allen, director of the new program office.

This emphasis on getting AFLC to capitalize on technological developments was accentuated at year's end with the appointment of a chief scientist/engineer for the command. The appointee, Earl Briesch, the command's Assistant Deputy Chief of Staff for Materiel Management, will look to direct a comprehensive technology-insertion program and to lead the command's 4,500 engineers and scientists in applying new technology to existing weapon systems.

AFLC provides support in a variety of other ways in helping user commands maintain their combat capability. This support results from command employees mixing new technology with the traditional hands-on, knuckle-busting, wrench-turning, pallet-building maintenance and distribution efforts.

Warner Robins Air Logistics Center, Robins AFB, Ga., began its largest repair project ever with the start of the Pacer Center program in 1987. The $400 million effort involved replacing center wing surfaces on the Air Force's entire fleet of C-141s. The improvement will extend the aircraft's flying life an additional 15,000 hours.

The Air Force is working to normalize its space operations, and, with the Pacer Frontier program, AFLC has emerged as a vital player in space plans. In 1987, AFLC assumed the role of providing logistics support for space systems. In the past, Systems Command provided "cradle to grave" support, acting as developer, operator, and logistician.

Sacramento Air Logistics Center, McClellan AFB, Calif., was instrumental in developing strategy for AFLC's support of space operations. The center demonstrated AFLC's ability to apply its logistics expertise to devise a support structure specifically tailored to user requirements.

Engineers at Ogden Air Logistics Center, Hill AFB, Utah, took on the job of redesigning and reengineering the electronic flight control system for the H-53 helicopter. Ogden ALC was chosen for the difficult engineering job because of its reputation as an outstanding engineering center.

Quality is always emphasized within AFLC. An example of quality and increased productivity was seen in the rise in aircraft-maintenance and engine-repair rates at San Antonio ALC, Kelly AFB, Tex. In FY '87, seventy-five aircraft were kept combat-ready by undergoing programmed depot maintenance compared to sixty-six in FY '86—an increase of 13.6 percent. Production of F-16 engine gearboxes increased 113 percent, from 161 to 343. Production of the fan drive turbine for the same engine increased 101 percent.

Another example of quality is the use of a new advanced electron beam welder at Oklahoma City ALC, Tinker AFB, Okla. The welder reduces flow time and increases the availability of aircraft parts. The welder will help keep the FB-111 flying since it will be used to repair parts of the aircraft's TF30 engine. Not only will the welder improve quality of workmanship, it will also save the Air Force about $100,000 annually.

The Aerospace Guidance and Metrology Center at Newark AFB, Ohio, helped keep the Peacekeeper missile ready. The first Peacekeeper Missile Guidance and Control Set was repaired and sent to the field by the center's new Peacekeeper repair facility.

AFLC considers people its most important resource, and the command's people regularly demonstrate how motivated and accountable they are by being rewarded for their accomplishments. For example, San Antonio ALC was honored for dedication to its employees. The center was named "employer of the year" by the San Antonio Rehabilitation Association and the Texas Commission for the Blind and received the Disabled Veterans Commander's Award.

With the command's emphasis on quality and productivity, it's certainly no accident that AFLC for the sixth straight year led the Air Force in the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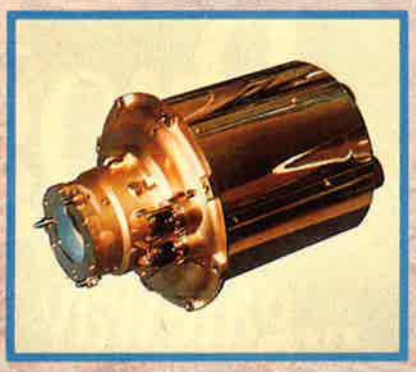

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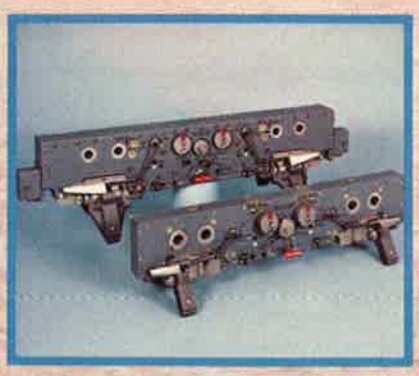

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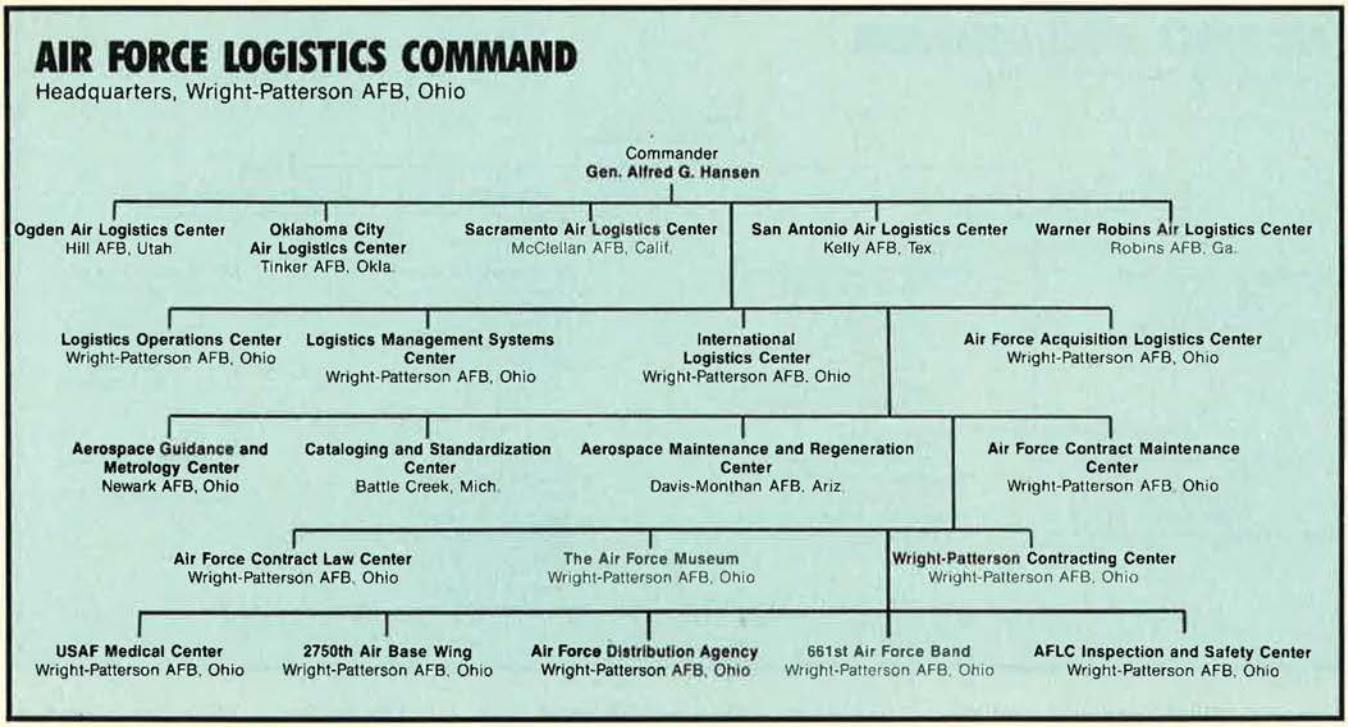


number of suggestions submitted and adopted, resulting in millions of tax dollars saved. The command received some 17,000 "better ideas," with 5,100 being adopted. The suggestions will result in first-year savings of $155 million.

AFLC's competition advocacy program is an example of the command's program execution—using money in the most effective way possible. AFLC headquarters received the 1987 award for outstanding contribution to competition advocacy.

AFLC manages an inventory of some 890,000 aircraft parts and other items. During 1987, almost 60,000 items were screened, and 97.5 percent were designated to be purchased through competitive bidding or directly from the manufacturer. Some 16,000 parts were selected for competitive bidding for the first time.

The command's charter for the coming year is clear. "The primary reason we exist is to ensure Air Force weapon systems have the logistics support required to do the job," General Hansen said. "Only in that way will the warfighting commands have the mission capability they need to protect this nation and its vital interests." ■

Air Force Space Command

ONE of the Air Force's newest commands, Air Force Space Command (AFSPACECOM), with headquarters at Peterson AFB, Colo., is responsible for organizing, training, equipping, and operating forces for strategic aerospace defense, space control, space support, and force enhancement.

The largest component of US Space Command, Air Force Space Command manages resources that provide national warning of space or missile attack, that support ground forces from space, and that negate enemy access to space during periods of conflict.

Lt. Gen. Donald J. Kutyna, as Commander of Air Force Space Command, has sole responsibility for 7,900 Air Force military and civilian men and women and some 5,400 contractor personnel worldwide.

The command operates six bases and four stations at the following locations: Peterson AFB, Colo.; Onizuka AFB, Calif.; Thule and Sondrestrom ABs in Greenland; Clear AFS, Alaska; Cavalier AFS, N. D.; Falcon AFB, Colo.; Cape Cod AFS, Mass.; Eldorado AFS, Tex.; and Cheyenne Mountain Complex, Colo.

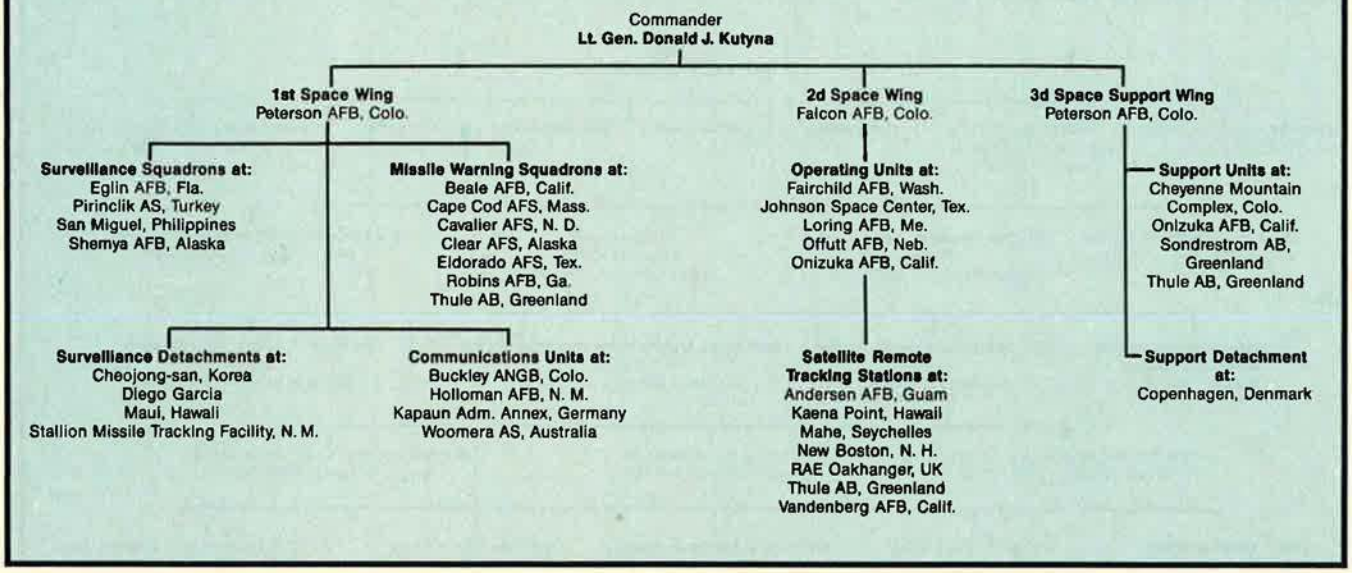
The command also conducts surveillance, tracking, warning, and control operations at nearly thirty other locations around the world. To operate, manage, and maintain these assets, Air Force Space Command employs the 1st and 2d Space Wings, the 3d Space Support Wing, the 1013th Combat Crew Training Squadron, and the Systems Integration Office.

The 1st Space Wing, located at Peterson AFB, Colo., operates missile warning, space surveillance, and communications sites worldwide. The wing's sea-launched ballistic missile detection mission was enhanced in 1987 with the implementation of a new radar system, Pave Paws, which incorporates the latest phased-array technology. Pave Paws sites are located at Eldorado AFS, Tex., Robins AFB, Ga., Beale AFB, Calif., and Cape Cod AFS, Mass.

Data from the 1st Space Wing warning sensors would be the first indication of an aerospace attack aimed at North America. Monitored by Air Force Space Command crews, this data is transmitted to command centers located in Cheyenne Mountain Complex, where the NORAD Com-

AIR FORCE SPACE COMMAND

Headquarters, Peterson AFB, Colo.



mander in Chief evaluates and assesses the validity of detection information. Once a positive assessment of an aerospace attack aimed at North America is made, the President of the United States and the Prime Minister of Canada are contacted simultaneously. The speed of detection and CINCNORAD's timely assessment give National Command Authorities the necessary warning time to determine the appropriate US response. Information is also relayed to Strategic Air Command, the National Military Command Center, and the Alternate National Military Command Center.

Space surveillance-dedicated units of 1st Space Wing provide more than 30,000 space observations daily to keep track of nearly 7,000 man-made objects in space. Wing communications units manage and operate satellite communications stations around the world.

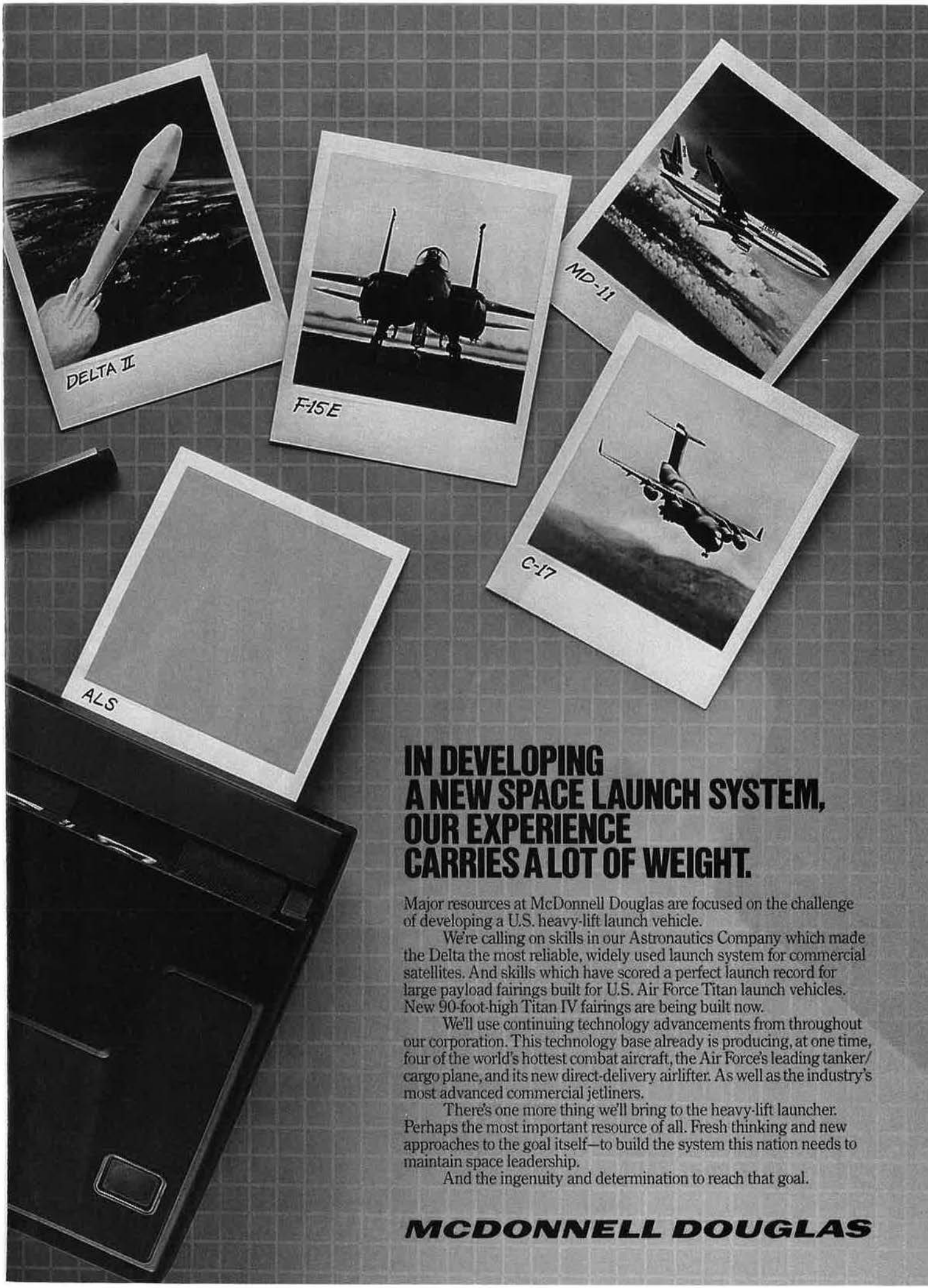
The 2d Space Wing, located at Falcon AFB near Colorado Springs, is responsible for commanding defense common-user satellite systems. Wing members perform this mission from the Consolidated Space Operations Center at Falcon AFB, several separately located command/control nodes, and a global ground-station network.

The 2d Space Wing also provides mission support to several dedicated satellite programs, including the Defense Meteorological Satellite Program (DMSP) and the Navstar Global Positioning System (GPS). When fully operational, the 1st Satellite Control Squadron at Falcon AFB will be responsible for postlaunch checkout and on-orbit servicing of GPS, DMSP, and early warning spacecraft.

In October 1987, the wing assumed operational and resource management of the Air Force Satellite Control Network from Air Force Systems Command. Day-to-day operation of the Air Force Satellite Control Net-

—USAF photo by TSgt. James Pearson

This antenna dish at Falcon AFB, Colo., receives transmissions from USAF's Defense Satellite Communications System (DSCS) series of satellites serving US units and command headquarters around the globe. US Space Command, in charge of operating military satellites, includes Air Force Space Command as its largest component command. Headquartered at Peterson AFB, Colo., AFSPACECOM's responsibilities are stern ones in the space age.



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work is accomplished by members of the 2d Satellite Tracking Group, located at Onizuka AFB, Calif.

In the future, the 2d Space Wing will also support the Defense Satellite Communications System (DSCS), the Fleet Satellite Communications System (FLTSATCOM), and the next-generation military communications constellation, Milstar.

As part of the 2d Space Wing, the 1st Manned Spaceflight Control Squadron at the Johnson Space Center, Houston, Tex., works with NASA to support USAF and Department of Defense payload launches from the Space Shuttle.

The 3d Space Support Wing, located at Peterson AFB, is the single organization responsible for supporting the command's installations around the world.

This concept is particularly well suited to Air Force Space Command since it permits the 1st and 2d Space Wing commanders, with their global responsibilities, to concentrate on operational and technical support matters. The 3d Space Support Wing also provides a framework for future command mission growth while achieving the best management possible of space support assets.

Air Force Space Command today faces great, but achievable, challenges and opportunities. With the increasing importance of space-based assets, the command plays an ever-expanding role in support of US forces and in helping to assure national security and the maintenance of peace through deterrence.

The future offers unlimited prospects for those manning the ramparts of "The High Frontier." ■

Air Force Systems Command

At Air Force Systems Command, (AFSC), the focus is on putting the right combat capability into the hands of the Air Force combat forces where and when they need it.

Systems Command develops, acquires, and delivers the weapon systems that will allow the Air Force's worldwide forces to deter war or, if necessary, allow them to fight and win. Gen. Bernard P. Randolph, AFSC's Commander, has defined three goals to focus the command's attention on its mission:

- Meet the users' needs.
- Maintain acquisition excellence.
- Enhance Air Force technological superiority.

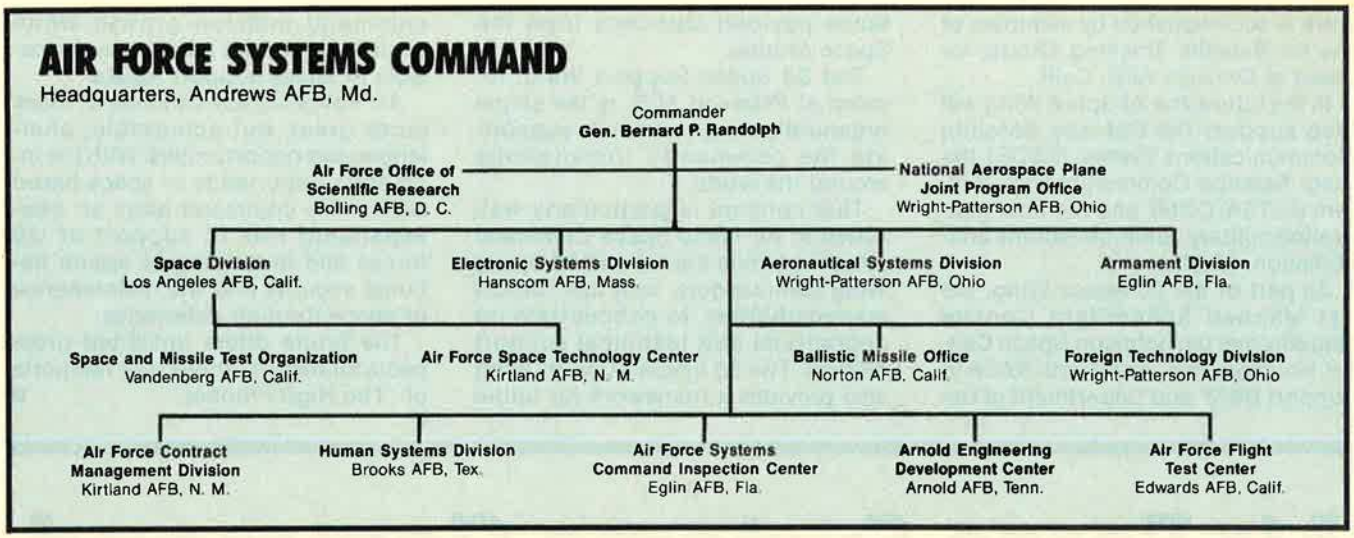
Systems Command is the only Air Force organization responsible for developing and harnessing the technologies to keep the Air Force strong. Throughout the research, development, test, evaluation, and acquisition cycle for new weapon systems, AFSC's scientists and engineers apply technology to answer the using commands' needs. Their emphasis is on delivering systems that are reliable, maintainable, and supportable and that improve the combat capability of the operational forces. Working closely with each of the using commands, AFSC focuses on getting capable weapon systems off the drawing boards and to the field as quickly and cost-effectively as possible.

From AFSC's headquarters at Andrews AFB, Md., General Randolph directs the operations of five product divisions, fourteen laboratories, five test centers, and three supporting divisions. The focus on high technology makes the command the Air Force's largest employer of scientists and engineers. Approximately 10,700 officers, 13,400 enlisted personnel, and 28,700 civilians make up the total work force. About a third of them are in scientific and technical career fields.

The complexity of the systems acquisition business—and the reason for General Randolph's emphasis on acquisition excellence—is manifested by the size and scope of the command's budget. AFSC program directors and scientists manage a budget of approximately $30 billion, or about one-third of the entire Air Force budget. The command currently issues and administers more than 48,000 active contracts valued at approximately $305 billion.

Within the past year, AFSC has achieved a number of significant research, development, and systems acquisition milestones.

- Under General Randolph's leadership, AFSC streamlined its headquarters management structure to better support the operational Air Force. The realignment included a seventeen percent cut in personnel and combined related functions for management efficiency. Technology and Plans, a new mission organization headed by a Deputy Chief of Staff (DCS), combined the former offices of DCS/Plans and Programs and the DCS/Science and Technology. The merger strengthens AFSC's management of basic, exploratory, and advanced research investments and enhances the transition of technology to operating forces. The DCS/Test and Resources, another new mission organization, consolidated the former DCSs for Engineering and Services, for Logistics, for Personnel, and for Test and Evaluation. This streamlining measure puts AFSC's resource planning and programming responsibilities under one DCS.
- In FY '87, the command passed a major milestone by awarding 56.6 percent of total obligations through competition, the first time more than half of AFSC obligations were competed. The increased focus on competition has yielded more programs under budget, acquisition of more reliable products with better warranties, and improved contractor responsiveness.
- Contractor designs for the Advanced Tactical Fighter (ATF) were frozen last fall, and construction of prototypes for the 1990s air-superiority fighter for the tactical air forces began. Lockheed's YF-22A and Northrop Corp.'s YF-23A will fly in late 1989 or early 1990. AFSC's Aeronautical Systems Division manages the ATF program.
- Following a successful flight-test program, the Advanced Medium-Range Air-to-Air Missile (AMRAAM) program reached a significant milestone with transition from development to low-rate initial production last June. The GBU-15/IR went into full-rate production last August after successfully completing Phase II of its initial operational test and evaluation program. The procurement decision ensures the tactical air forces will have an adverse-weather, night-attack capability against hard targets. The GBU-15 is the most accurate precision-guided munition in USAF's inventory. Armament Division manages both programs.
- The National Aerospace Plane (NASP) program moved to Phase II, an ambitious, thirty-six-month effort that will result in ground tests of large-scale engine and selected airframe components and preliminary designs for the NASP experimental vehicle, the X-30. DoD and NASA selected two propulsion contractors



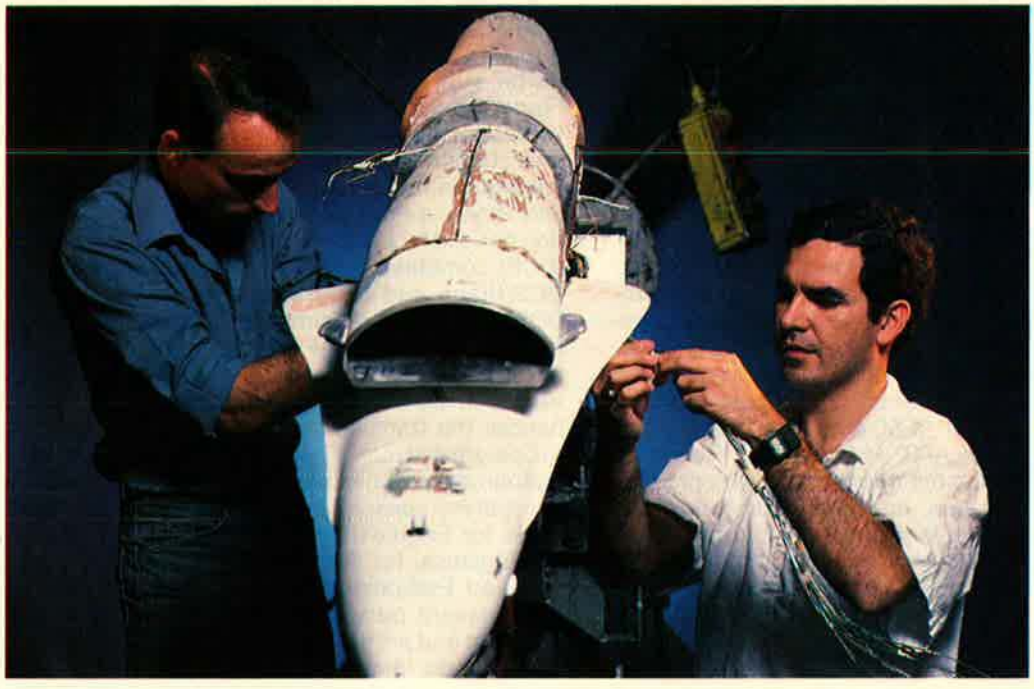
and three airframe companies to continue NASP work. AFSC's NASP Joint Program Office managed the contractor selection process. Engineers at the Arnold Engineering Development Center began the first hypersonic tests of the NASP airframe aerodynamics and assessment studies for future test and development technologies.

• The B-1B, an Aeronautical Systems Division acquisition program, logged international record-setting flights. Joint AFSC and Strategic Air Command crews broke thirteen previously established world records dealing with speed, distance, and payload and set twenty-three world marks. In November, the B-1B successfully test-launched a cruise missile, using a Common Strategic Rotary Launcher. Successful launches of the short-range attack missile and the air-launched cruise missile were managed by the Air Force Flight Test Center. Construction also began at Edwards AFB for a large, $52 million hangar-type anechoic chamber test facility that will test electronic countermeasures in the B-1B as well as similar systems in future aircraft. The 100th and final B-1B is slated for delivery in June to McConnell AFB, Kan.

• The Peacekeeper Rail-Garrison program, managed by the Ballistic Missile Office, reached a major milestone with a $235.5 million contract award for a basing and support system. The system will include locomotives, maintenance cars, and other rail cars as required. Design and development of the garrison will include igloos to house the train, maintenance areas, and other facilities located within the secured area.

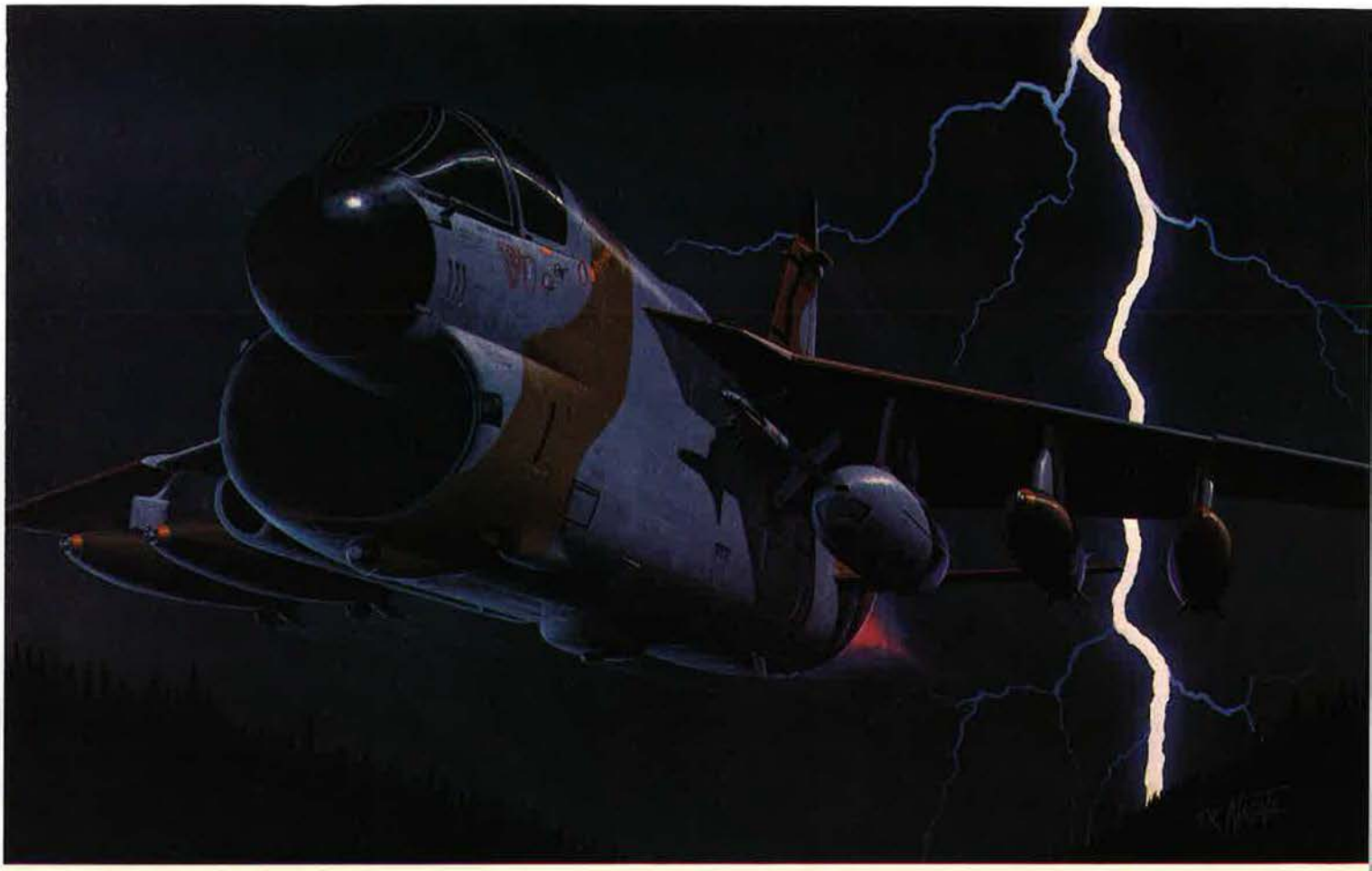
• Special operations forces received attention in mid-summer when development began on the AC-130U gunship program, managed by Aeronautical Systems Division. If all contract options are exercised, up to twelve C-130s will be modified with 105-mm, 40-mm, and 25-mm weapons and fire-control sensors. The first modified gunship would enter service at Hurlburt Field, Fla., in the early 1990s.

• Several new and upgraded radar systems, managed by Electronic Systems Division, significantly improved Air Force command control and communications functions. Last May, the fourth and final Pave Paws radar was turned over to Air Force Space Command, wrapping up a thirteen-year development effort and completing a network of radars that detect submarine-launched ballistic missiles and intercontinental ballistic mis-



—USAF photo by SMSgt. Robert Wickley, AFDG

Engineers at USAF's Arnold Engineering Development Center in Tennessee study the aerodynamics of F-16 engine inlets. AEDC is one of five test centers operated by Air Force Systems Command, headquartered at Andrews AFB, Md. AFSC also operates five product divisions, fourteen laboratories, and three supporting divisions. Focusing on high technology as the main means of keeping USAF's equipment and forces everlastingly superior, AFSC is USAF's largest employer of scientists and engineers.



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siles. In June, upgrade of the Ballistic Missile Early Warning System (BMEWS) radar at Thule AB, Greenland, was completed, also for Space Command. The Over-the-Horizon Backscatter (OTH-B) East Coast radar system began limited operations in December. This long-range radar looks out to 1,800 miles for approaching hostile aircraft. Small-target testing to determine how well OTH-B performs against cruise missiles has also started.

• The Air Force Flight Test Center (AFFTC) achieved several testing and evaluation milestones. Initial performance and avionics testing on the F-15E dual-role fighter cleared the way for LANTIRN systems testing and evaluation on the highly modified Eagle aircraft. The F-15 Multistage Improvement Program (MSIP) progressed with the successful test firing of an AIM-7 Sparrow missile from the aircraft using the new APG-70 advanced radar. AFFTC aided the program to increase the F-16's defense suppression capabilities with the successful test firing of an AGM-45 Shrike air-to-surface missile from an F-16.

• The Titan 34D solid-rocket booster program, managed by Space Division, advanced with the successful test firing of the solid-rocket motor June 15, followed by successful Titan 34D launches in October and November. New Titan II boosters also became operational. The Titan IV, now in production, will achieve initial launch capability in October.

• The Air Force Photonics Center was established last July at the Rome Air Development Center in New York. It is envisioned as an international center for developing excellence in this research area. Scientists and engineers from industry and academia will collaborate there with the RADC staff. Photonics is an emerging technology that someday may replace electronics.

• The Tactical Life Support System (TLSS), the first fully integrated life support system that addresses human physiological requirements in high-performance aircraft of the future, was developed and successfully demonstrated by the Human Systems Division. The TLSS combines elements of life support technology into a single package to protect aircrew members. ■

Air Training Command

Air Training Command (ATC) provides the Air Force's most important resource: quality people, trained to meet the demands of complex and diverse operational missions. Through its accession and training programs, the "First Command" introduces virtually all blue-suiters to USAF. During FY '87, 63,120 military and 13,398 civilians were involved in the ATC mission—recruiting, training, and supporting.

The first step in providing the Air Force with high-quality, motivated people is recruiting. That is a job expertly done by the United States Air Force Recruiting Service. In head-to-head competition both with the private sector and the other uniformed services, this unique Air Force organization continually attracts the best qualified young people available. The results are impressive *(see box on p. 111).*

Molding young people into productive airmen and officers is a massive training task. During FY '87, more than 57,200 enlisted personnel began their Air Force careers with Basic Military Training at Lackland AFB, Tex.—the "Gateway to the Air Force." ATC also introduces new officers to the Air Force through its two commissioning programs. In 1988, the Officer Training School at Lackland AFB will commission approximately 975 new second lieutenants, and the Air Force Reserve Officers Training Corps will commission about 2,820 new lieutenants through its 151 detachments at colleges and universities throughout the nation.

Headquartered at Randolph AFB, Tex., ATC maintains the largest training system in the free world. The command conducts more than 6,300 training courses in more than 350 different specialties. The thirteen major ATC installations support six technical training centers, six undergraduate pilot training wings, one instructor pilot training wing, one navigator training wing, a survival training wing, and a field training wing with detachments (FTDs) at ninety-seven locations worldwide.

ATC's effectiveness is not measured in numbers or facilities. The command's product is a well-trained force, ready to meet the demands of an ever-changing Air Force. To keep pace with changing technology, ATC must continually update its training philosophy and approach.

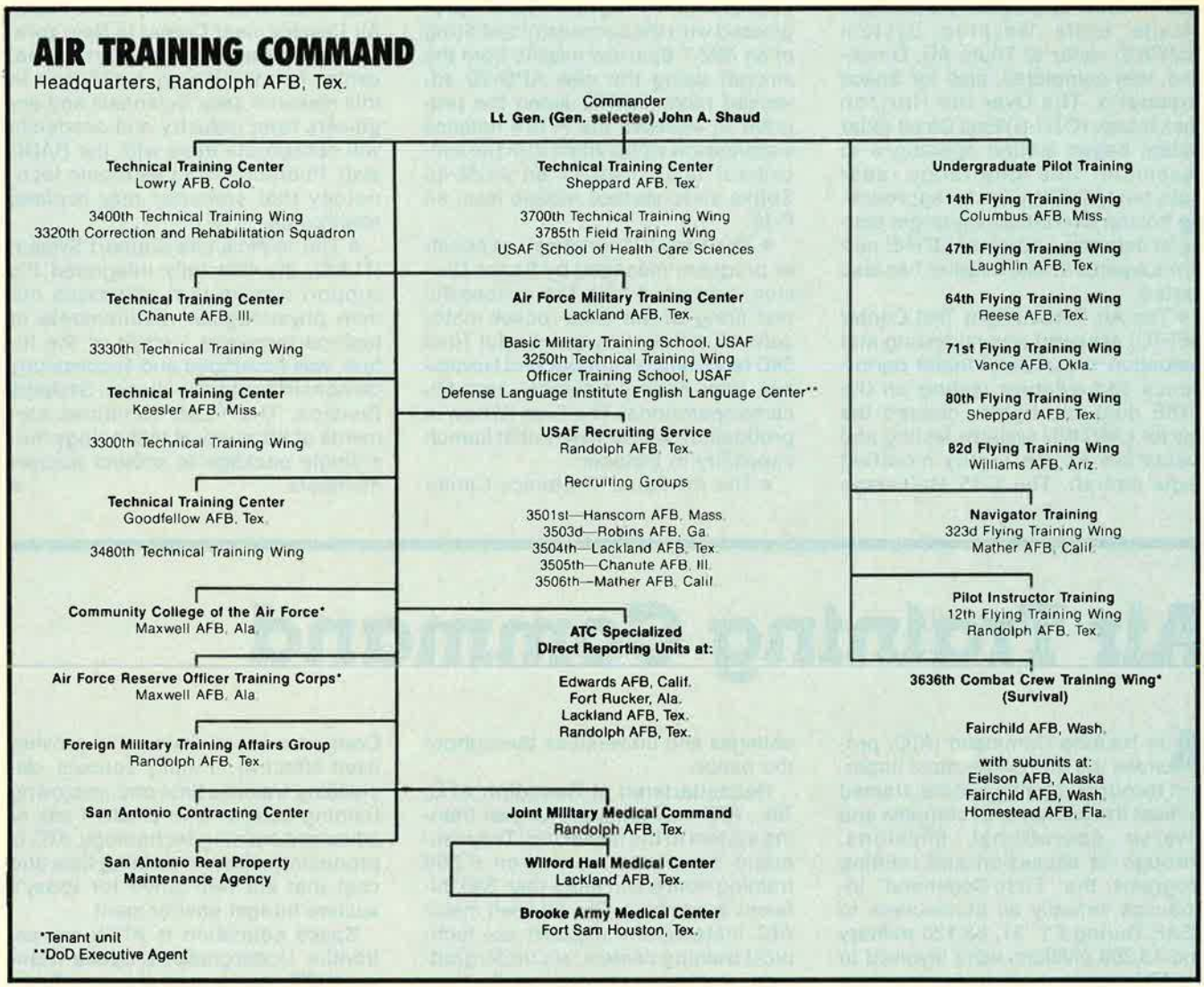
One important recent change is now being tested: "four-level" training. Providing an additional four weeks of hands-on training for F100 jet engine mechanics, this program allows airmen to bypass FTD training at their first assignment and go directly to work. This initiative reduces training in operational units, increases the sortie-generating capability of operational MAJCOMs, and reduces the time required for technicians to upgrade to "five-level" skill proficiency.

New technology is increasingly being put to work in ATC classrooms. Computer-based training is proving itself effective in many courses, decreasing training time and improving training quality. With prudent use of advanced training technology, ATC is producing offsets of training time and cost that are well-timed for today's austere budget environment.

Space education is ATC's newest frontier. Undergraduate Space Training (UST), conducted at Lowry Technical Training Center, Lowry AFB, Colo., is patterned after the Undergraduate Pilot Training (UPT) and Specialized Undergraduate Navigator Training (SUNT) programs. This year, UST will train 150 to 175 officers from all branches of the military as "space generalists." After training, many will be assigned to space operations in the Colorado area. Others will go to NASA's Mission Control Center in Houston, Tex., or to sensor and satellite operations sites throughout the world.

Training skilled aviators remains at the forefront of ATC's agenda. During FY '87, 1,449 active-duty pilots and 598 active-duty navigators received Air Force wings through ATC's flying training programs. The command also trained pilots and navigators for the Air Force Reserve and the Air National Guard.

As in other training programs, substantial changes are under way in pilot and navigator training. These critical programs are being reshaped to produce better aviators for today's and tomorrow's complex aircraft.



New technology and specialized weapon systems continually redefine the navigator's role. Specialized Undergraduate Navigator Training is ATC's way of addressing those changes. After a common core of instruction, SUNT students specialize on either a Fighter/Attack/Reconnaissance (FAR), Tanker/Transport/Bomber (TTB), or Electronic Warfare Officer (EWO) training track.

In the 1990s, ATC will implement specialized training for pilots as well. The concept is not new, having been used by the Air Force prior to 1960, but it is a sensible, cost-effective method of tailoring pilots' training to their follow-on aircraft for the 1990s and beyond.

In Specialized Undergraduate Pilot Training (SUPT), all students will learn fundamental flying skills in a common core of training in the T-37. The remainder of the program will consist of two specialized training tracks: Bomber-Fighter (BF) or Tanker-Transport (TT). SUPT is ATC's roadmap for meeting the Air Force's pilot requirements into the early twenty-first century.

Pilot training was recently extended to fifty-two weeks, enhancing the instructor-student interaction and reducing the flying schedule's vulnerability to inclement weather conditions.

Most Air Force aviators become familiar with ATC's 3636th Combat Crew Training Wing (USAF Survival School) at Fairchild AFB, Wash. This organization conducts survival training for all Air Force aircrew members, USAF Academy cadets, and other appropriate candidates. Last year, the school taught basic survival, water survival, and Arctic survival techniques to more than 10,900 students.

The USAF Occupational Measurement Center (USAFOMC) at Randolph AFB, Tex., is the focal point for evaluating and refining ATC's training programs and techniques. This unique organization plans and analyzes Air Force training, develops the Military Training Standard for all noncommissioned officers, and develops Air Force tests in support of the Weighted Airman Promotion System. USAFOMC also provides specialized training development services through detachments at each of ATC's six technical training centers.

Medical training is playing an increasing role in ATC. The command recently assumed responsibility for DoD's first Joint Military Medical Command (JMMC). This unique, multifacility, joint service organization links all military medical facilities in San Antonio: the Air Force's Wilford Hall USAF Medical Center at Lackland AFB, the Army's Brooks Army Medical Center at Fort Sam Houston, and the clinics at Brooks, Kelly, and Randolph AFBs. JMMC is headquartered at Randolph AFB. In addition to providing health care and consolidating military health-care facilities for more than 180,000 active-duty military members, family members, and retirees, the JMMC provides graduate medical education and technical training for the Department of Defense.

USAF Medical Service officers begin their careers through another ATC organization, the USAF School of Health Care Science at Sheppard AFB, Tex. In FY '87, 1,532 new, active-duty, USAF Reserve, and Air National Guard physicians, dental officers, nurses, and other health-care professionals graduated from the Military Indoctrination for Medical Service Officers Course.

ATC's Community College of the Air Force (CCAF) is the largest community college in the nation. Headquartered at Maxwell AFB, Ala., CCAF awards associate of applied science degrees that are directly related to the recipients' Air Force jobs. Accredited by the Southern Association of Colleges and Schools' Commission on Colleges, CCAF integrates on-duty and off-duty educational experiences into a balanced program of study. The college has graduated more than 58,900 Air Force enlisted members—active-duty, Air Force Reserve, and Air National Guard.

Recruiting: FY '87 Was the Best Ever

For the Air Force, FY '87 was the best recruiting year ever. For the fifth straight year, the Air Force Recruiting Service achieved 100 percent or better in all its programs.

Of the almost 60,000 people the Air Force attracted last year, 55,000 enlisted with no prior military service and approximately 1,000 with prior military service. Officer Training School at Lackland AFB, Tex., attracted some 1,600 candidates, and more than 950 health-care professionals received direct commissions in the Air Force medical service. Almost 400 more received health professions scholarships.

The new officers and enlisted people entering the Air Force brought high marks with them. Officer Training School candidates ranked in the top one-third of all college graduates with their grade points averaging 3.15. Of the nonprior-service enlistees, ninety-nine percent were high school graduates, and forty-nine percent scored in the top two categories on their qualifying tests.

Recruiting Service is composed of a headquarters staff, five recruiting groups, and thirty-five squadrons. Approximately 1,350 subordinate recruiting offices are located throughout the United States, Puerto Rico, Guam, and in areas of Europe and the Pacific with large American populations.

With headquarters at Randolph AFB, Tex., the Recruiting Service commander also functions as Air Training Command's deputy chief of staff for recruiting and commissioning programs.

About 500 new recruiters are needed each year to help meet Air Force personnel requirements. Career noncommissioned officers interested in learning more about this challenging duty should call the Recruit-the-Recruiter Team Chief at AUTOVON 487-2812.

—USAF photo by A1C Greg Spraggins

It is axiomatic in the Air Force that people make the difference—and turning people into high-quality practitioners is the business of Air Training Command, headquartered at Randolph AFB, Tex. Here, ATC SrA. Richard Tophinke examines a nose-wheel well during a through-flight inspection of a T-38 trainer aircraft at Reese AFB, Tex. ATC maintains the largest training system in the free world, conducting more than 6,300 courses in more than 350 different specialties.

ATC's training programs are truly international in scope. In cooperation with America's allies, ATC manages technical and flying training for more than 4,000 men and women from more than eighty allied nations. More than 1,875 international students graduated from the Defense Language Institute's English Language School at Lackland AFB, Tex., in FY '87.

The Euro-NATO Joint Jet Pilot Training Program (ENJJPT) at Sheppard AFB, Tex., offers pilot training to NATO allies and graduated 145 international pilots in FY '87.

The Aviation Leadership Program is another recent ATC flying training innovation, providing unique T-37 pilot training for students from Latin American countries.

ATC's strong commitment to joint service efficiency is evident in its participation in the Interservice Training Review Organization. The command cooperates with the other services to conduct joint training whenever it offers clear advantages and to exchange information to make service-unique training more effective. The presence of Army, Navy, and Marine uniforms in ATC's classrooms illustrates the effectiveness of this important effort.

Training is an investment that the Air Force must continually make in its people—to maintain warfighting capability. Air Training Command continues to "Show the Way," keeping pace with an explosive rise in technology and providing high-quality, highly trained, highly motivated people for the United States Air Force. ■

Air University

Air University (AU), headquartered at Maxwell AFB, Ala., provides professional military education (PME) and degree-granting and professional continuing education (PCE) for officers, NCOs, and civilians.

Most of AU's PME schools are located at Maxwell AFB. These include Air War College (AWC) for senior officers, Air Command and Staff College (ACSC) for midcareer officers, and Squadron Officer School (SOS) for company-grade officers. The Air Force Senior Noncommissioned Officer Academy (SNCOA), the highest level of NCO PME, is located at nearby Gunter AFB.

Other major AU organizations include the Ira C. Eaker Center for Professional Development (CPD); the Center for Aerospace Doctrine, Research, and Education (CADRE); the Air University Library (AUL); and Hq. Civil Air Patrol-USAF (CAP-USAF) (all at Maxwell); the Extension Course Institute (ECI) at Gunter AFB; and the Air Force Institute of Technology (AFIT) at Wright-Patterson AFB, Ohio.

Nearly 2,650 military and 1,627 civilian personnel are permanently assigned to AU. Close to 25,000 military and civilians completed resident AU classes last year. Thousands more completed courses through nonresident programs.

AWC continued to enhance the Air Force's warfighting capability by emphasizing the unique skills, perspectives, knowledge, and analytical thinking required of senior officers, with a curriculum emphasizing joint and combined operations.

The Air Force National Security Briefing Team, in its fifth year of operation, gave more than 323 presentations in thirty-one states. Since 1983, the team has given more than 1,300 briefings across the nation.

During 1987, CADRE continued to offer its Senior Officer Combat Employment Course, providing general/flag officers with unique, operational, combat-oriented experiences to enhance their understanding of wartime operations in a joint context.

CADRE's Air Force Wargaming Center, the clearinghouse for Air Force wargaming applications and the service's focal point for information on computer-assisted wargames, continued to upgrade its wargaming capability. Ultimately, as the Command Readiness Exercise System, it will be used to teach wartime decision-making and to explore new concepts and strategies using real-world or notional data.

CADRE's Airpower Research Institute published the premier issue of *Airpower Journal*, the Air Force's new professional journal, while continuing to perform research on the employment of airpower. Additionally, CADRE's Combat Employment Institute offered its Combined Air Warfare and Contingency/Wartime Planning courses.

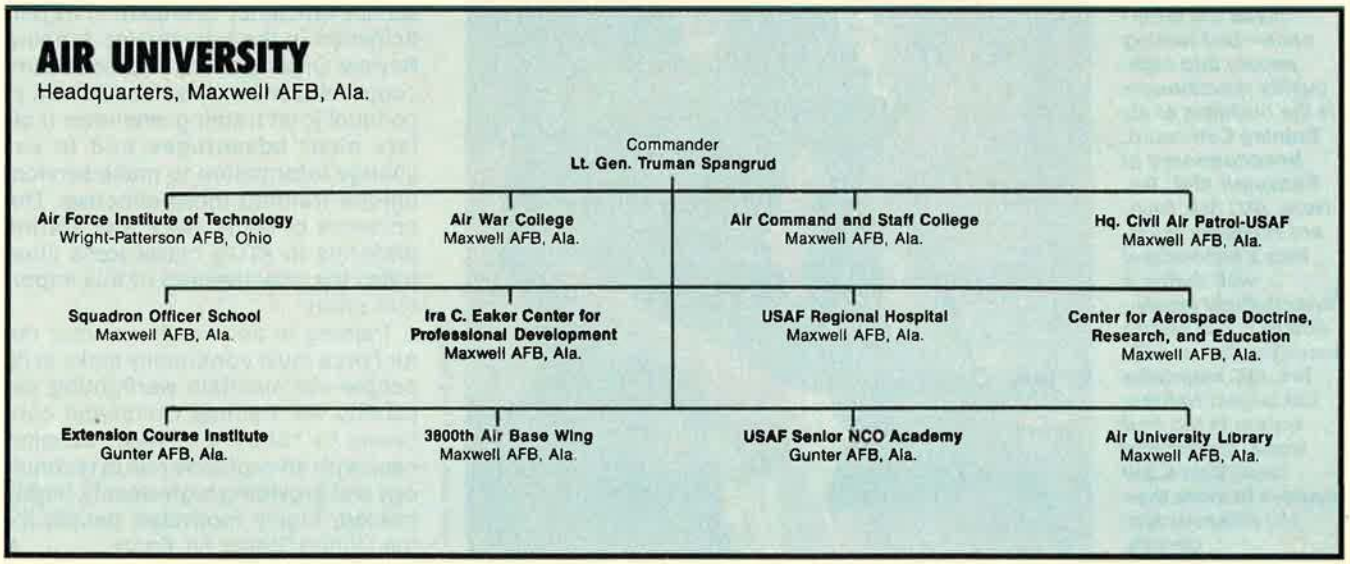
ACSC hosted its fourth annual Latin American Symposium, attracting military officers, diplomats, and citizens from several countries. ACSC's seventh Gathering of Eagles saw seventeen famous aviators participating in the heritage-oriented airpower symposium.

SOS continued its emphasis on leadership, fine-tuning its "Combat Leadership Exercise" and renaming it "Leadership in a Hostile Environment." The exercise gives students leadership opportunities in a physically and mentally stressful environment.

A total of 1,250 senior NCOs graduated from five classes at the SNCOA during 1987. The USAF Enlisted Heritage Hall, within the SNCOA, drew several thousand visitors.

AUCPD, activated in August 1986, was renamed the Ira C. Eaker Center for Professional Development in December 1987, honoring the late General for his many contributions to professional military education. The center provides professional development through eight schools with fifty-five courses. More than 4,000 students graduated from comptroller, historian, judge advocate, chaplain, personnel, aircraft maintenance, resource management, systems information, and other courses.

Wing and base commanders attended courses on commanders' responsibilities. The USAF Chaplain Resource Board provided programs and support to Air Force chaplains worldwide. In addition, the center's International Officer School, through a unique application of interactive



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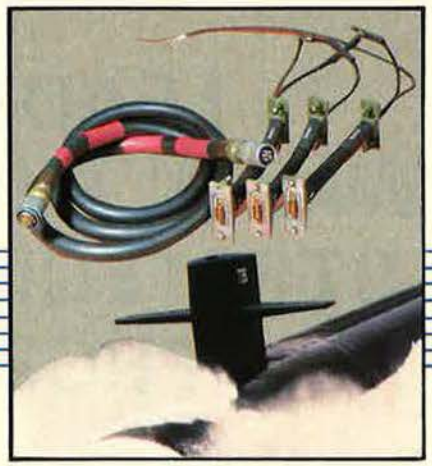

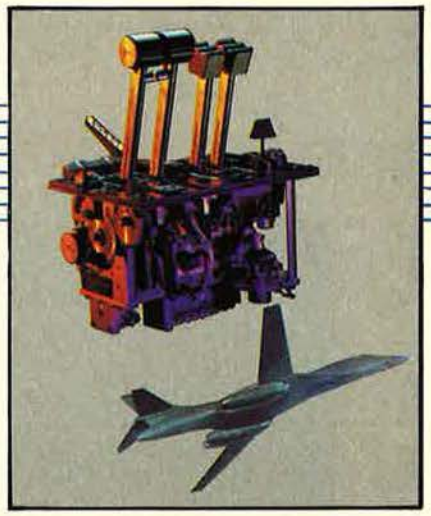

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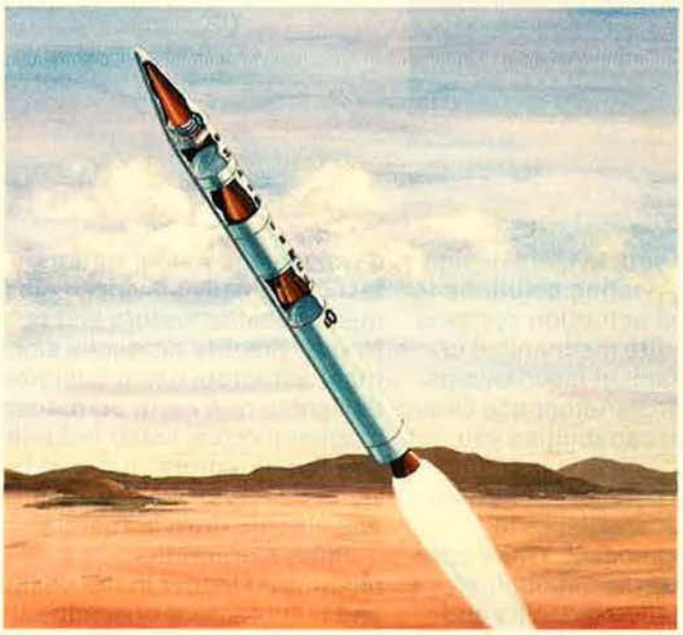

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video-disc technology, dramatically increased its effectiveness in teaching international officers the American version of English.

AFIT is responsible for university-level education in support of Air Force and DoD requirements by providing accredited resident degree and PCE programs in its schools of Engineering, Civil Engineering and Services, and Systems and Logistics. Additionally, AFIT places students at civilian institutions and monitors their progress there. During 1987, AFIT tracked more than 3,034 Air Force members attending approximately 309 civilian colleges, universities, medical schools, and sixty-six industrial firms worldwide. Construction on AFIT's new $12.8 million, 110,000-square-foot Science and Research Center began in 1987 and is scheduled for completion in early 1989.

ECI, the center for the Air Force's correspondence education programs, has approximately 375,500 students enrolled in career development, specialized, and professional military education courses. Automated production of course materials, development of an interface between the AU Registrar and the military personnel system, and interlink of ECI with education and on-the-job training (OJT) offices worldwide are being pursued.

AUL—the most comprehensive military library in the free world—came on line with all modules of its new Integrated Library System (ILS), including the On-line Public Access Catalog and automated acquisition and circulation. The system can be accessed from throughout AU and from other areas through minicomputers equipped with 1,200-baud modems.

Also active under the AU umbrella is Hq. CAP-USAF, the Air Force organization that advises and assists CAP with its primary missions of emergency services, aerospace education, and a youth cadet program. CAP boasts 72,000 volunteer members in 1,900 units in the US, in Puerto Rico, and in eight foreign countries. During 1987, CAP saved 108 lives, topping the one hundred mark for the fifth consecutive year and the sixth time in CAP's history. ■

Alaskan Air Command

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F-15 Eagles of the 43d Tactical Fighter Squadron, 21st Tactical Fighter Wing, stand ready for anything at Elmendorf AFB, Alaska. They are instrumental in providing "Top Cover for North America," the right-on-the-money motto of Alaskan Air Command. AAC F-15s in the air defense mission intercepted more than fifty Soviet aircraft in 1987, a number indicative of increasing Soviet reconnaissance efforts.

ALONG with the extreme beauty, a military assignment to "The Great Land" offers many challenges. A harsh Arctic environment, vast distances, and a changing threat challenge the men and women of Alaskan Air Command (AAC) as they fulfill their command's motto of providing "Top Cover for North America."

AAC provides, trains, and equips tactical air forces to preserve the national sovereignty of United States lands, waters, and airspace. Responsibility for the command's vast area of operations lies with the 785 officers, 6,558 enlisted, and 1,437 civilian employees.

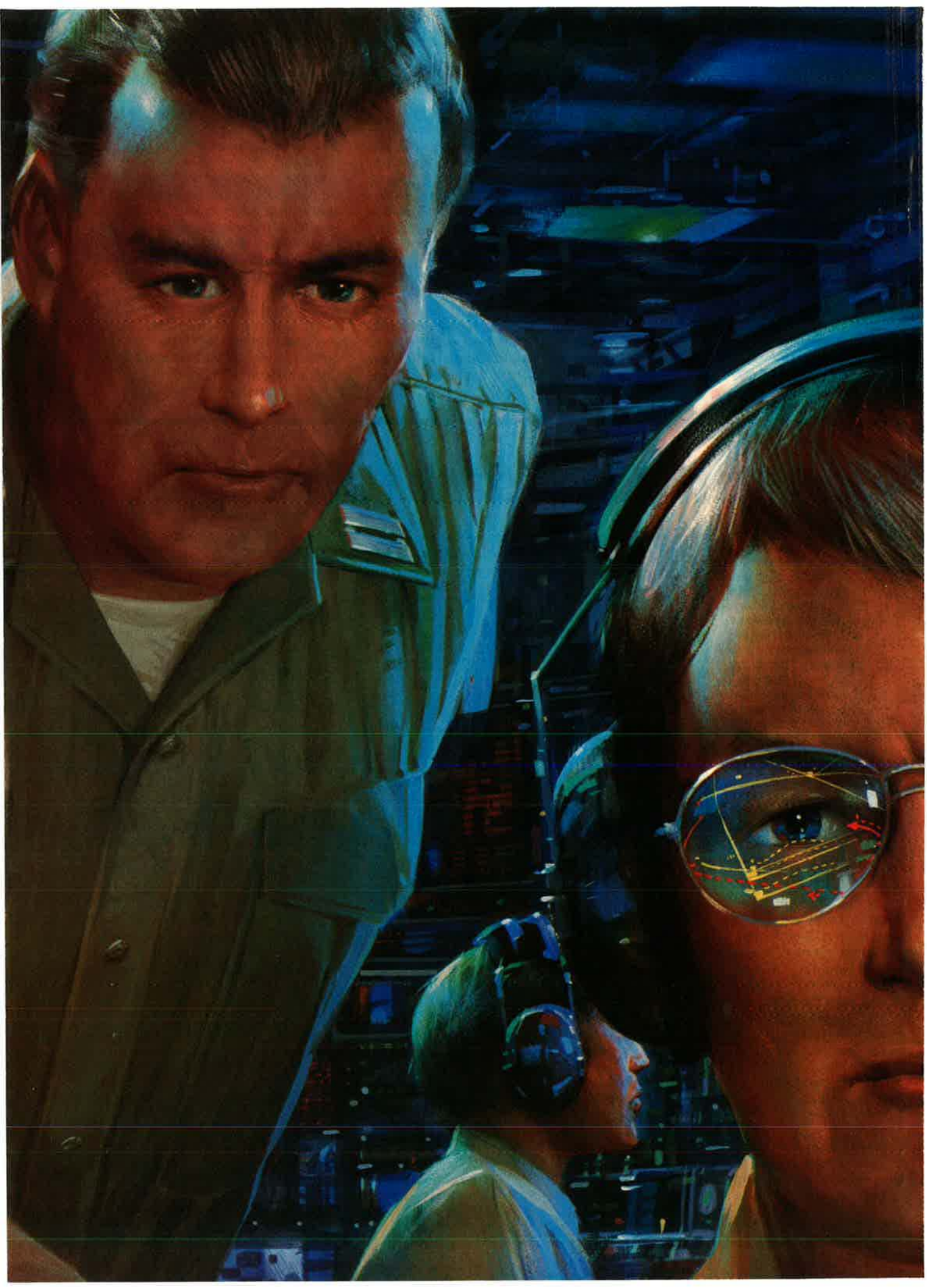
Alaska-based forces have gained increased significance as the first line of defense against the Soviet air-launched cruise missile. AAC F-15s on NORAD alert intercepted more than fifty Soviet aircraft in 1987, reflecting an apparent increased Soviet interest in the North Pacific and polar regions.

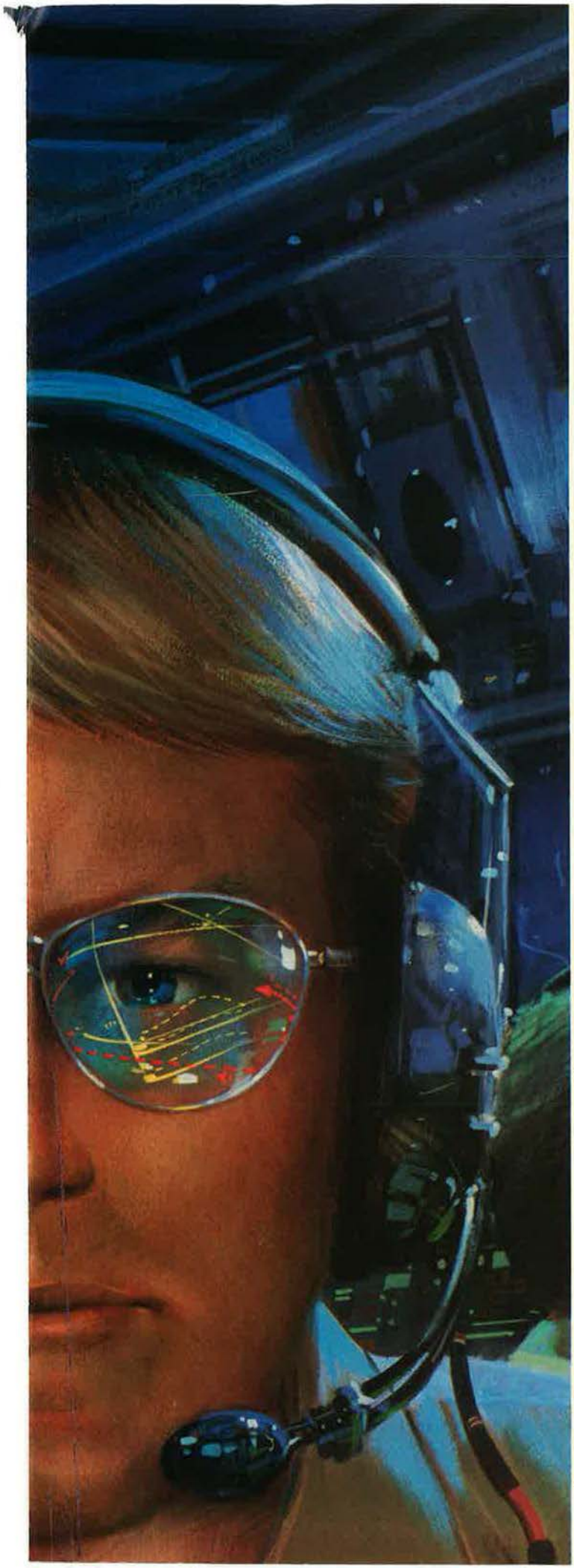
Alaska's strategic location has been recognized for many years. The state lies across the most frequently flown routes connecting the Orient with Europe and North America, making Alaska an ideal location for deployment or refueling of aircraft flying polar routes. The Alaskan and Soviet land masses are separated by only forty-four nautical miles at the Bering Strait.

As the senior military officer in the state, the AAC Commander has major command responsibilities to provide, train, and equip tactical air forces and is the coordinating authority for all joint military administrative and logistical matters in Alaska.

The AAC Commander also serves as Commander of the Alaskan North American Aerospace Defense Command Region. In this capacity, he is responsible to CINCNORAD for the defense of North America against atmospheric attack and for accomplishing assigned operational missions. To assist in these duties, a Canadian Forces brigadier general is assigned as the NORAD Region deputy commander. Alaskan air defense forces are routinely tested through both system-wide NORAD exercises and Alaskan NORAD Region-generated exercises.

In the event of emergency or natural disaster or when directed by the Joint Chiefs of Staff, the AAC Com-





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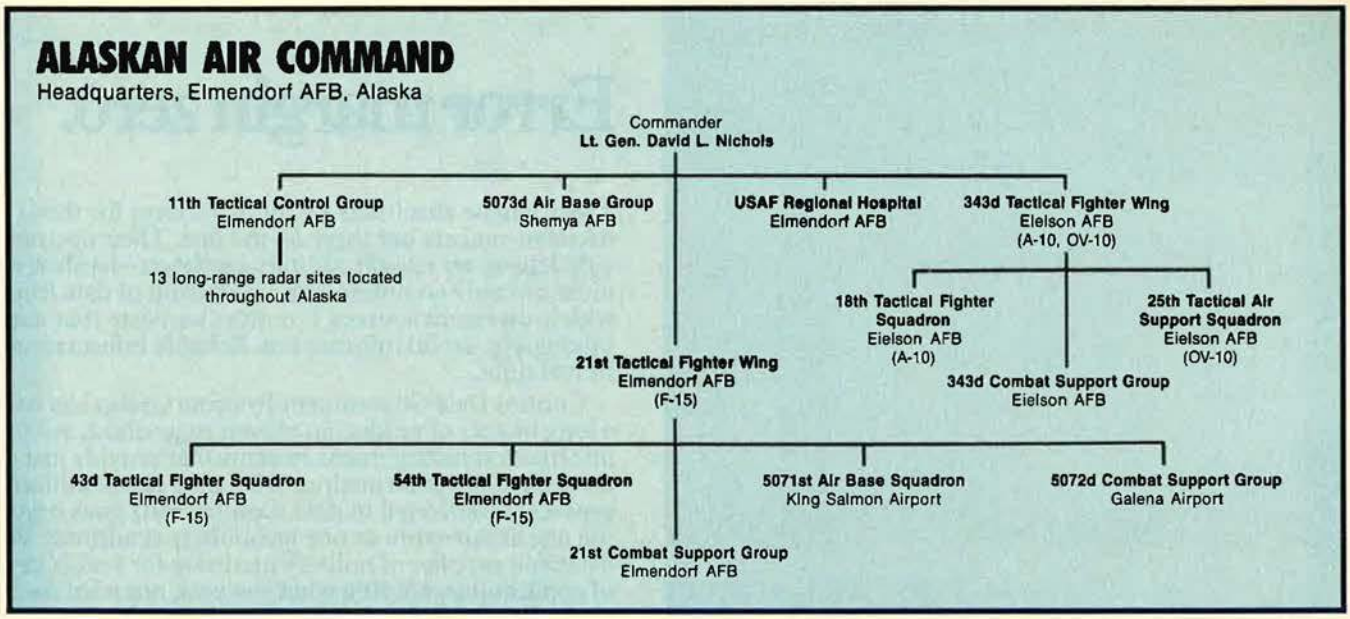

mander becomes the Commander, Joint Task Force-Alaska (JTF-AK), responsible for unified defense of mainland Alaska. In addition to numerous command post exercises, JTF-AK participates biennially in Brim Frost, a major joint Arctic training exercise involving more than 15,000 personnel and more than 100 aircraft.

AAC people are assigned to three main bases and two forward operating locations. The main bases are Elmendorf AFB, adjacent to Anchorage; Eielson AFB, twenty-six miles southeast of Fairbanks; and Shemya AFB, near the western tip of the Aleutian Islands chain. Galena and King Salmon Airports are forward operating locations on state-owned airports that host alert F-15 aircraft from Elmendorf.

AAC, which celebrated its forty-second anniversary in December 1987, is headquartered at Elmendorf, home also of the 11th Tactical Control Group, 21st Tactical Fighter Wing (host unit), and 21st Combat Support Group.

Assigned to the 21st TFW are the 43d and 54th Tactical Fighter Squadrons, flying newly assigned F-15C aircraft with conformal fuel tanks allowing extended range. The 21st TFW is charged with an air superiority and strategic air defense mission for America's first line of defense.

In 1987, 21st TFW aircraft, equipment, and personnel deployed to Deadhorse, Alaska, operating in some of the coldest bare-base conditions ever encountered, with temperatures of less than fifty degrees below zero and wind-chill factors exceeding 100 degrees below zero. The 21st TFW also hosted such large-scale, NORAD-sponsored air defense exercises as Amalgam Brave '87 and Amalgam Warrior '88, involving deployment of numerous fighter aircraft and hundreds of personnel to Alaska for low-level, overland intercept training.

With the Air Force phasing out the T-33, the wing's last Shooting Star departed in March 1988. Most air defense training services provided by the T-33s are now provided by contract Learjets, which began operations at Elmendorf in January 1988.

The 11th TCG is responsible for the Alaskan NORAD Region Operations Control Center (ROCC), the command's thirteen long-range radar sites (LRRS), and the Alaskan Tactical Air Control System—consisting of the Tactical Air Control Center and 3d Air Support Operations Center—and is the operating agency for the command's Alternate Command Post (ALCOP). The ROCC maintains surveillance around the clock to protect the air sovereignty of the Alaskan NORAD Region. Aircraft that cannot be identified by ROCC personnel are intercepted by F-15s on NORAD alert.

The Distant Early Warning (DEW) Line on Alaska's North Coast began a modernization program in 1987 when three sites were converted to modern Minimally Attended Radars under the US/Canada North Warning System. Other sites will be converted and new sites added in coming years. Work is also under way to integrate a 120-degree over-the-horizon backscatter radar into the Alaskan air defense system.

The Elmendorf Rescue Coordination Center (RCC) coordinates search-and-rescue efforts involving aircraft and people from all military services and many federal, state, local, and civil volunteer agencies. During 1987, the RCC coordinated more than 220 requests for emergency assistance from military and civilian persons in distress and was credited with saving more than sixty lives. Since its inception in October 1961, the RCC has recorded more than 4,000 saves and assisted more than 10,100 people.

Eielson AFB, named after famed Arctic pioneer and aviator Carl Ben Eielson, is headquarters for the 343d Tactical Fighter Wing and the 343d Combat Support Group.

The wing's 18th Tactical Fighter Squadron operates the command's A-10 Thunderbolt II close air support aircraft, while the 25th Tactical Air Support Squadron flies the OV-10 Bronco forward air control aircraft.

The 18th TFS trains and equips its people to fight in the demanding close air support role with particular emphasis placed on antiarmor capability in supporting friendly ground forces in an Arctic environment.

The 25th TASS can deploy throughout Alaska to provide control elements for close air support operations. The squadron conducts training operations by providing Army units with ground and airborne forward air controllers. Visual reconnaissance, search-and-rescue, artillery adjustment, flare support, and cold-weather testing round out the squadron's mission.

As the oldest air combat unit in Alaska, the 343d Tactical Fighter Wing has conducted worldwide deployments to locations including Korea, Norway, and Canada. Additionally, the 343d TFW hosts Yukon Lightning, an A-10 tactical employment competition. ■

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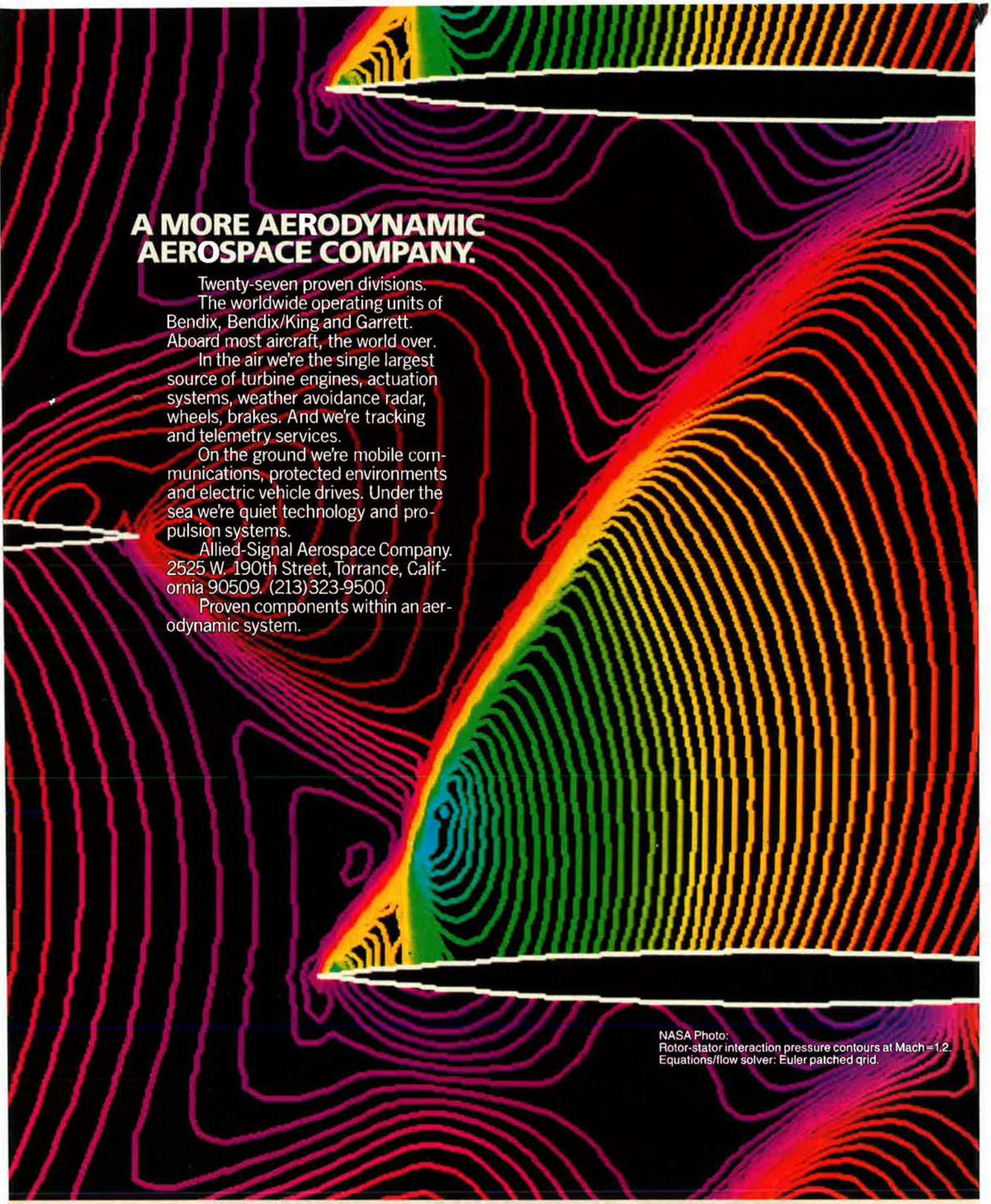

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Electronic Security Command

ELECTRONIC Security Command (ESC) is a major Air Force command with headquarters at San Antonio, Tex. ESC headquarters has an all-source intelligence function and provides electronic combat support and operations security (OPSEC) support to Air Force units.

ESC units provide rapid radio relay, command control and communications countermeasures (C³CM), and computer security (COMPUSEC) and communications security (COMSEC) support to US and allied forces worldwide.

The command plays an important role in developing Air Force electronic warfare (EW) and C³CM capabilities, techniques, and systems. By providing C³CM training to operational support elements during exercises, the command helps prepare the Air Force for combat operations in a hostile electromagnetic environment. To help tactical commanders satisfy their C³CM requirements, ESC develops, maintains, updates, and disseminates the C³CM support data base and an all-source data base.

ESC is also the executive agent for the Air Force operations security program, with the responsibility of strengthening and supporting the OPSEC program for the entire Air Force.

To fulfill mission requirements, Hq. Electronic Security Command formulates all-source intelligence requirements and plans and procures all-source intelligence systems to ensure connectivity with national data bases while providing data base support and services to the command and the Joint Electronic Warfare Center. As part of the all-source intelligence function, the command prepares threat assessments to support Air Force and command mission systems and develops and disseminates unique information on the tactics and capabilities of potential adversaries.

Closely supporting efforts of ESC field units are the Air Force Electronic Warfare Center (AFEWC) and the Air Force Cryptologic Support Center (AFCSC).

The AFEWC is a primary source of EW and C³CM analysis. It provides battle commanders with analytical reports on EW systems' effectiveness. AFEWC assists strategic and tactical commanders in making combat decisions and performs analyses to support planning, developing, testing, and using EW equipment.

The AFCSC is responsible for the Air Force's communications and computer systems security (COMPUSEC) programs, composed of COMSEC, emanations security (TEMPEST), and COMPUSEC. AFCSC also provides analytical and engineering services in support of these programs to Air Force activities worldwide. The center manages and accounts for cryptologic devices, codes, call signs, and documents that protect Air Force communications and computer systems; performs depot-level maintenance and life-cycle support of cryptologic equipment and systems; and develops and distributes multimedia educational materials to Air Force organizations.

The command provides support to the multiservice Joint Electronic Warfare Center (JEWC), which is collocated with Hq. ESC. The ESC commander is also the JEWC director.

One major aspect of ESC's mission is providing support to other Air Force commands and sister services.

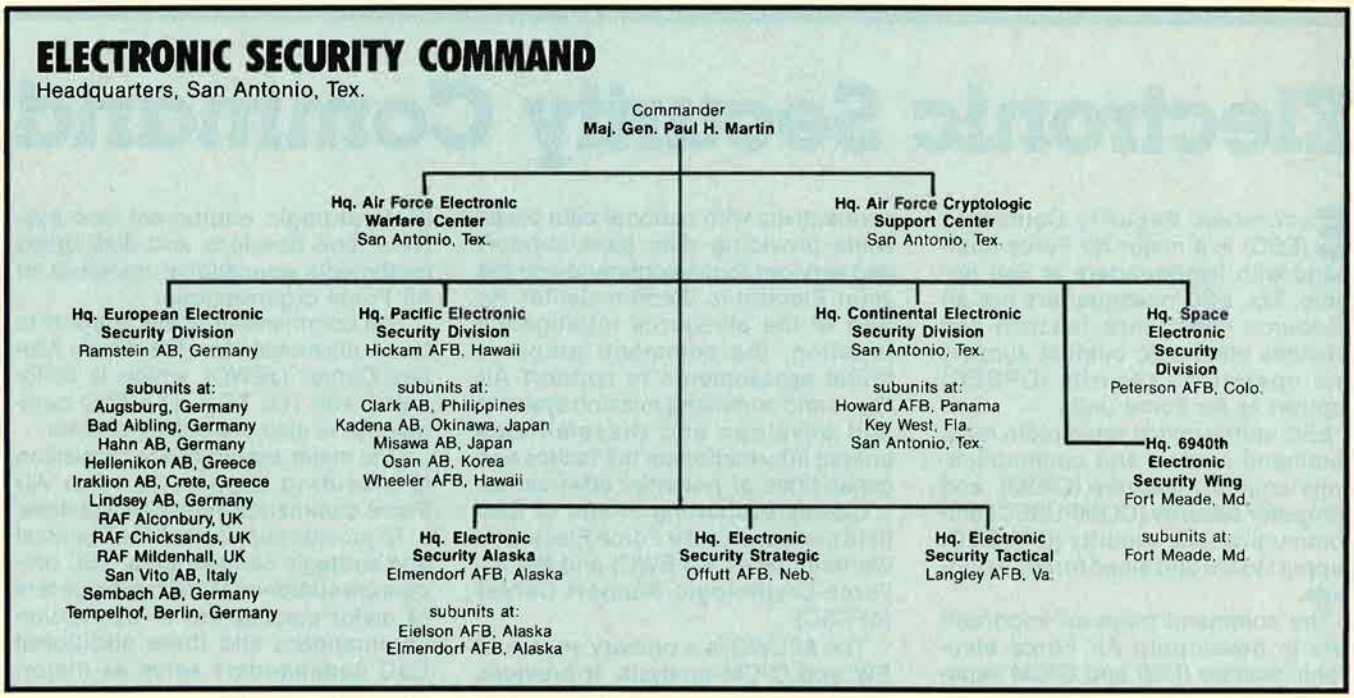
To provide support to USAF tactical and strategic commanders, ESC officers are stationed at the headquarters of major commands. Three division commanders and three additional ESC commanders serve as major-command liaisons.

Combat elements depend heavily on ESC support during exercises and real-world operations. During an average year, ESC provides support for more than 100 exercises around the world. The command is dedicated to helping US and allied military forces accomplish their mission. ESC experts support such exercises as Red Flag, Green Flag, Team Spirit, Global Shield, Bright Star, Cope Thunder, and many others.

To provide training to aircrews in hostile electronic environments, ESC people deploy around the world to perform the role of adversary in military exercises.

In the adversarial role, ESC people jam transmissions to confuse pilots and block communication. For aircrews who have never experienced

Computer and communications security is increasingly vital to the efficacy of military operations in this electronic age. Here, an Electronic Security Command technician monitors USAF radio and telephone communications for telltale electronic emissions that might give away the game. Headquartered at San Antonio, Tex., ESC provides command control and communications countermeasures (C³CM), computer security (COMPUSEC), and communications security (COMSEC) support to US and allied forces worldwide.



these disruptions and false transmissions, the impact can be significant.

ESC personnel also monitor US radio and telephone communications or errant electronic emissions to determine whether or not information of value is being exposed.

The publication of the ESC "Master Plan" in January 1985 ties ESC planning to the Air Force, DoD agencies, and supported commands' programs, plans, goals, and objectives. In providing direction to planning, the master plan will guide ESC's advancement into the next century.

One result of the ESC master plan is an ever-expanding series of strategy papers, covering everything from specific systems to innovation.

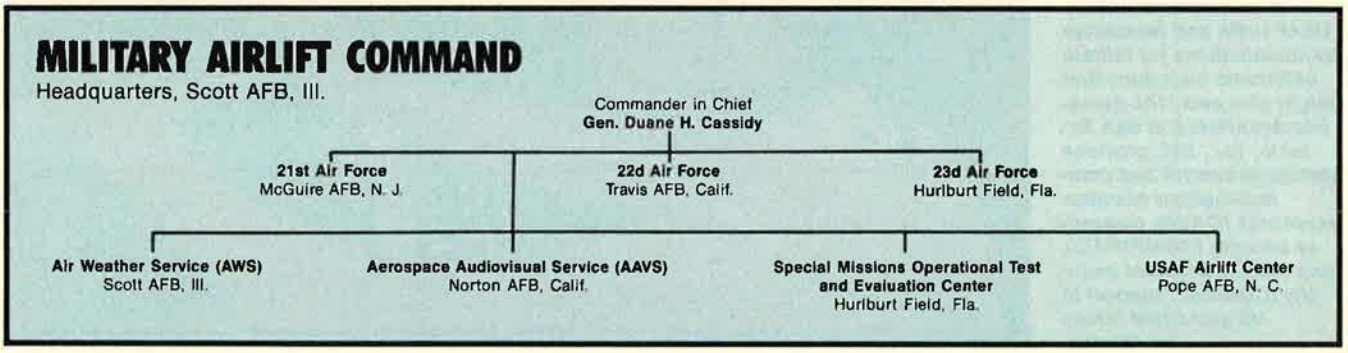
The Office of Innovation houses the Innovation Center and Long-Range Innovation Team, which serves as a clearinghouse for new ideas from the field. The Long-Range Innovation Team is also responsible for evaluating ESC's innovation suggestion program, which is aimed at minimizing bureaucracy and allowing ideas to be put to work without lengthy justification or fear of failure.

As new technologies and advancements continue to challenge the world, ESC will be in a position to respond in a timely fashion—thanks to the framework for change provided by long-range planning. ■

Military Airlift Command

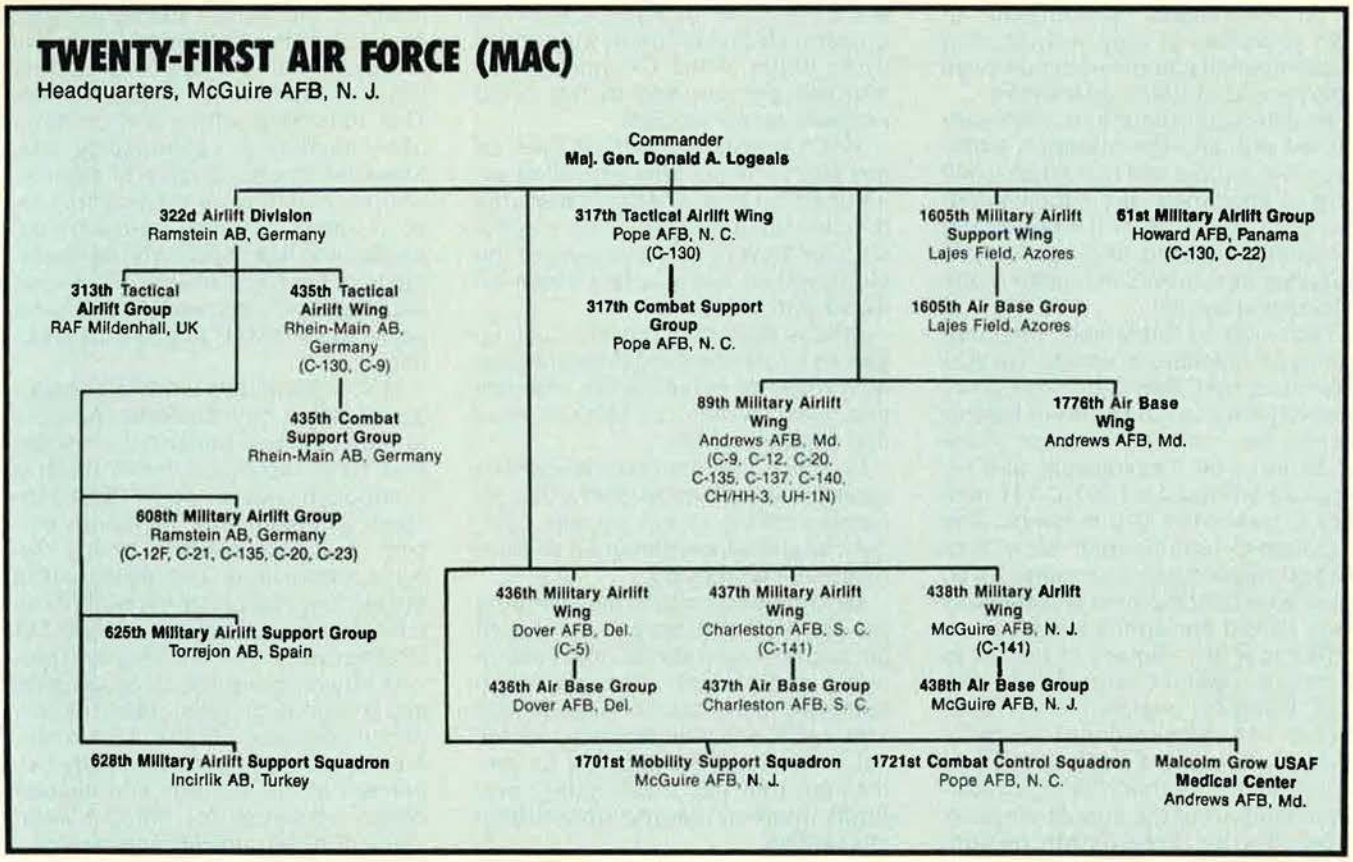
THE Military Airlift Command (MAC) is a specified command of the Department of Defense and a major command of the Air Force. It directs more than 90,000 active-duty military and civilians as well as more than 1,000 aircraft at some 290 locations in twenty-four countries. MAC gained ANG and AFRES assets comprise 71,000 people and approximately 400 aircraft.

MAC operates thirteen bases in the United States and controls US facilities at Lajes Field in Portugal's Azores and at Rhein-Main AB, West Germany. MAC's major missions include deployment, employment, resupply, and redeployment of combat forces and their support equipment. MAC is the Air Force component for US Transportation Command, and MAC's Twenty-third Air Force is the component for US Special Operations Command. USTRANSCOM is located at



TWENTY-FIRST AIR FORCE (MAC)

Headquarters, McGuire AFB, N. J.



Scott AFB, Ill. MAC's Commander in Chief, Gen. Duane H. Cassidy, is dual-hatted as USCINCTRANS.

Nowhere does MAC get better training in these missions than in JCS exercises. In FY '88, MAC units will participate in seventy-one of the eighty JCS exercises—more than any other command. This worldwide exercise involvement requires some 65,000 flying hours and constitutes twelve percent of MAC's yearly flying-hour program.

The command also serves as the single manager for DoD airlift and moved more than 462,274 tons of cargo and more than 2,137,031 passengers in FY '87 on a combination of military and commercial contract flights.

MAC was tasked to its maximum as it completed its most active period of flying in post-Vietnam history during the summer of 1987. Taskings ranging from support of operations in the Persian Gulf, fighting forest fires in California, evacuation of Afghan patients, airlift for national leaders, humanitarian relief operations under the McCollum Amendment, and support

Military Airlift Command takes the troops and their equipment wherever they have to go. Headquartered at Scott AFB, Ill., MAC is the USAF component for US Transportation Command, and MAC's Twenty-third Air Force is the USAF component for US Special Operations Command. In this photo, Capt. Christopher Cinkoske, a Combat Control Team Officer, is in touch with the tower at Pope AFB, N. C., as it hands over control of a C-130 preparing to perform a LAPES (Low-Altitude Parachute Extraction System) drop of combat gear.

of an unparalleled concentration of JCS exercises in July, August, and September all combined to maximize aircrew and airplane operations.

Persian Gulf operations were supported with fifty-one missions, airlifting 1,440 people and more than 6,500 tons of equipment and supplies. Under the provisions of the McCollum Amendment, food and other relief supplies were moved in humanitarian efforts worldwide.

From July to September, the command participated in twenty-five JCS exercises. MAC flew eighty-five C-141 and sixty-five C-130 sorties in-theater during the combat-simulation phase of Bright Star. Deployment and redeployment required 307 C-141 missions, twenty-five C-5 missions, and eighteen C-130 missions. More than 22,560 passengers and some 5,760 short tons of equipment and supplies were moved during the exercise.

Reforger '87—Return of Forces to Germany—was the largest ever, with MAC flying 151 commercial contract, 107 C-141, fifteen C-5, and three C-130 missions airlifting 32,000 troops and more than 934 tons of cargo in support of the annual exercise.

During the three-month period, MAC aircrews logged more than 9,700 flying hours in July, 8,390 in August, and 8,200 hours in September. In the process, MAC overflew its authorized flying hours in the C-5 program by fourteen percent and in the C-130 program by six percent.

MAC's operations staff has been on the road for some time educating airlift users on how valuable a resource the command provides. The emphasis is on how to maximize use of the airlift system and put less strain on those who work in it.

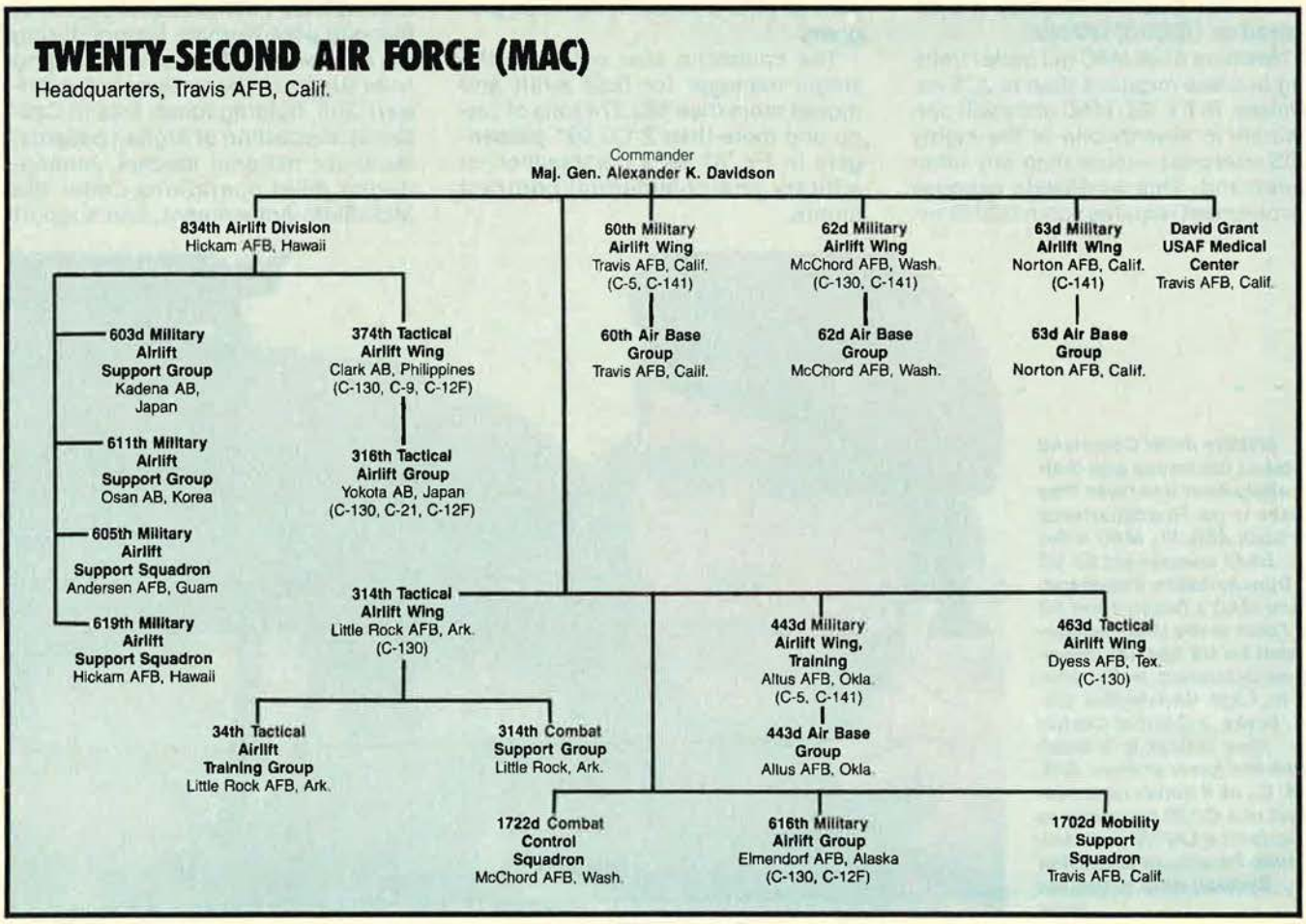
MAC is also using incentive billing, geared to get users' requirements early in order to minimize the changes that make life hard for MAC aircrews and support people.

In 1987, the command leadership established a program that further expanded efforts to ensure safe commercial air transportation for defense personnel worldwide.

MAC actions include implementing periodic in-depth inspections of each air carrier's operations and maintenance departments. The inspection teams are composed of experienced MAC pilots and maintenance personnel. MAC is also responsible for performing periodic airlift safety preflight inspections and operational checkrides.

In order to help ensure that the commercial air carriers used by DoD maintain the highest standards, MAC established the Air Carrier Survey and Analysis Office under the Deputy Chief of Staff for Air Transportation. This innovative office will continuously monitor air carrier safety data, financial fitness, quality of service, and management's disposition toward safety. A computer-controlled system was developed, with the assistance of the Department of Transportation and industry aviation safety experts, to alert MAC to potential problems.

MAC's active-duty airlift forces constitute about half the force available to the command under full mobilization. When mobilized, the Air Reserve Component (ANG and AFRES) provides approximately fifty-seven percent of tactical airlift capability. Reserve Associate units provide half of the aircrews and forty percent of the maintenance personnel for the C-141 strategic airlift aircraft. They also provide fifty-nine percent of the aircrews and forty-one percent of the maintenance personnel for the C-5 aircraft. Additionally, they provide twenty-two percent of the aircrews and maintenance personnel for the C-9 aeromedical airlift aircraft and approximately fifty-five percent of the command's wartime aerial port capability.



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The newest generation of Gulfstream jets can enlarge this effectiveness.

For example, it makes non-stop missions of nearly 5,000 statute miles in about 9.5 hours a reality, even against prevailing winds. SAM would enjoy greater flexibility in flight planning and crew scheduling, as well as more cost-effective utilization of aircraft types, particularly on long overseas missions.

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Operating cost savings also would compound at an even faster rate because of the increased fuel efficiency of its new Rolls-Royce Tay engines; the design improvements and reduced maintenance requirements of its many new aircraft systems; and the significant commonalities it has with the C-20 Gulfstream in maintenance procedures, spares supply and support programs.

The way we see it, the Air Force took a big step forward when it began operating its present C-20 Gulfstreams.

When SAM steps into the next generation of Gulfstream jets, it will prove to be a quantum leap.

For more information about maximizing Gulfstream jet aircraft in military applications, contact: Larry O. Oliver, Regional Vice President, Military Requirements, Gulfstream Aerospace Corporation, 1000 Wilson Blvd., Suite 2701, Arlington, Virginia 22209 U.S.A. Telephone (703) 276-9500.

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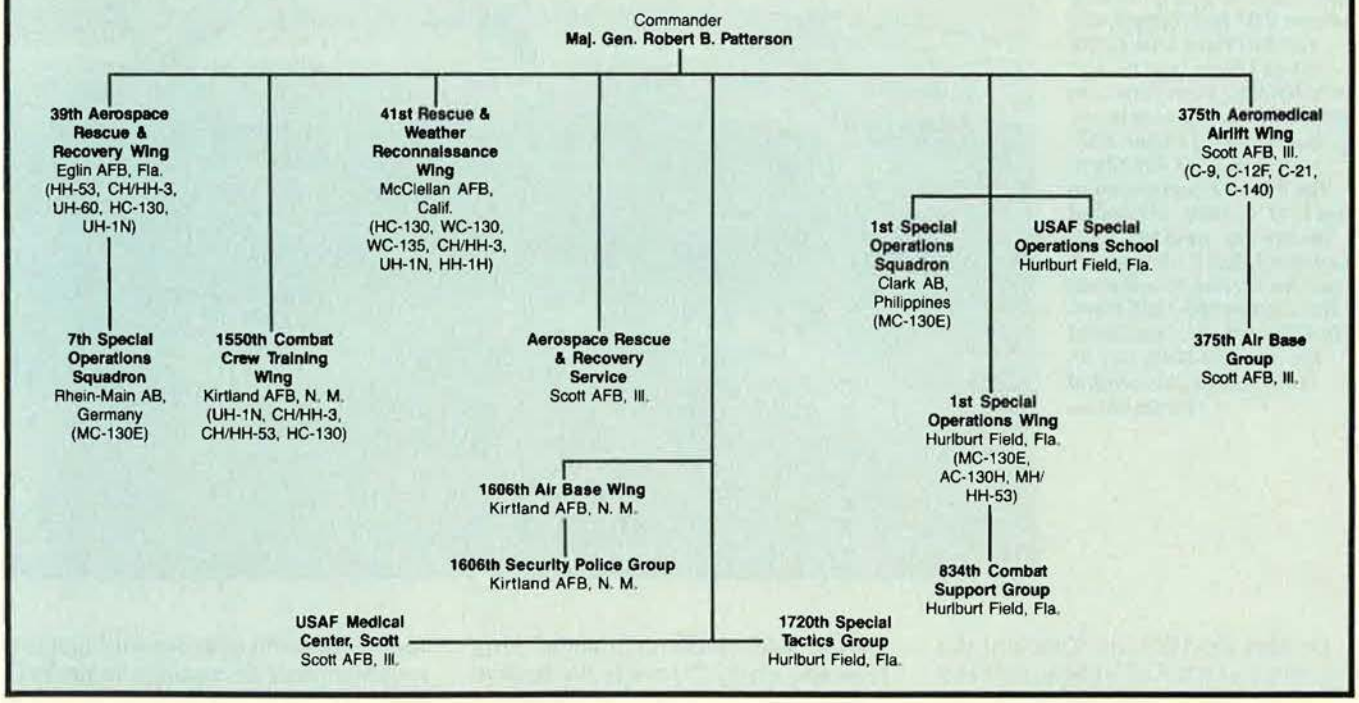
TWENTY-THIRD AIR FORCE (MAC)

Headquarters, Hurlburt Field, Fla.



The Civil Reserve Air Fleet (CRAF) is a significant part of MAC's total airlift capability. The partnership between the civil aviation industry and Department of Defense began more than three decades ago to meet airlift requirements for contingencies or wartime. CRAF currently consists of twenty-nine commercial carriers providing 393 cargo and passenger aircraft. Should CRAF be activated, these aircraft represent approximately half the airlift that would be available to DoD during times of crisis.

MAC has begun implementing many of the new guidelines of the President's National Airlift Policy by addressing the challenges that may limit CRAF participation or constrain a commercial aircraft's ability to fly a military mission. The effort is called CRAF Plus.

Current programs include work to provide secure communication capability with CRAF aircraft and to include civil aircraft compatibility in the design of the NATO Identification System (Mark XV IFF) aircraft equipment.

The program will also absorb the existing CRAF Enhancement Program. CRAF Enhancement adds cargo features to civil passenger aircraft to increase the cargo capability of the CRAF and to reduce the cargo airlift shortfall. The modification adds a cargo door and reinforced floor to existing airplanes or those in production. The Air Force has contracted for twenty-one wide-body airplanes. These twenty-one aircraft add more than 3,000,000 ton-miles per day to MAC's airlift capability.

—USAF photo by TSgt. Lee Schading

This MAC AC-130H gunship is shown during its deployment to Korea during Exercise Team Spirit '87. MAC supported an unparalleled concentration of JCS exercises last July, August, and September—twenty-five in all—that were designed in combination to get the utmost out of MAC aircrew and aircraft operations. Persian Gulf operations alone were supported with fifty-one missions in which 1,440 people and more than 6,500 tons of equipment and supplies were airlifted. During the three-month period of JCS exercises, MAC aircrews logged more than 26,000 flying hours.

Special operations are attracting ever-greater attention and funding. MAC's indispensable role in such operations is exemplified by these SOF helicopters, the MH-53H Pave Low II, the MH-53J Pave Low III, and the MH-60G Pave Hawk, as arrayed from top to bottom. The Air Force began converting rescue HH-53s to the MH-53J configuration last year. In 1989, the first of twenty-four new MC-130H Combat Talon II aircraft will go into service to augment the current MC-130E Combat Talon force. The first of the new MH-60Gs has already joined the combat rescue force.

On May 28, 1986, the Office of the Secretary of the Air Force authorized the creation of a new CRAF segment completely dedicated to aeromedical evacuation. USAF will use eighty-five B-767s to replace C-141s for strategic aeromedical evacuation. Thirty MD-80s will redistribute casualties within the CONUS, allowing the C-9 Nightingale to support overtasked C-130s. The B-767s, which carry 111 litters each, and the MD-80s, each carrying forty-eight litters, will reach full operational capability in the early 1990s.

Several other initiatives are also under way to enhance the posture of airlift forces. In 1987, MAC placed eight new C-20Bs in service to support the special airlift mission of the 89th MAW, Andrews AFB, Md. The C-20As at Andrews were moved to Ramstein AB, Germany, and became part of the 58th MAS, supporting the special airlift mission in Europe.

MAC's C-5 Galaxy fleet completed the wing modification started in 1983. This program extends the life of the C-5A well into the twenty-first century.

To increase near-term airlift, the Air Force began acquisition of fifty C-5B aircraft. MAC had received delivery of twenty-one C-5B aircraft as of December 1987.

Responding to USAF's plan to transfer additional strategic airlift assets to the Air Reserve Component (ARC), MAC began transferring additional C-5As to the Air Force Reserve and the Air National Guard in July 1985. Transfer of C-141s began in July 1986. The 172d MAG (ANG) at Jackson, Miss., and 459th MAW (AFRES) at Andrews AFB, Md., each has eight C-141s. Ultimately, MAC plans to transfer forty C-5s and eighty C-141s to the reserve forces.

The Air Force received approval in December 1987 from the Defense Acquisition Board to produce the first two C-17 aircraft. The C-17 will increase MAC's long-range airlift capability and provide an outsize strategic airlift and an outsize airdrop capability. Additionally, the C-17 will replace the theater capability lost as MAC retires its older, less-maintainable C-130s. The first flight will be in 1990, and MAC plans to begin operating its first squadron in 1992. The initial operational capability for the C-17 should be in the fall of 1993. The C-17 aircrew training contract has been awarded to three companies to develop competitive proposals over the next year. One will then be selected to build and deploy the system.

Twenty-third Air Force is MAC's only numbered Air Force with worldwide responsibility. From its new headquarters at Hurlburt Field, Fla., it controls Air Force special operations forces (SOF), combat rescue and recovery forces, and weather reconnaissance aircraft. The Twenty-third Air Force, through the 1720th Special Tactics Group, provides special operations combat control and pararescue forces trained and equipped to provide quick-response air traffic management and pararescue/medical-survival support during short notice, sensitive contingencies as well as during peace and war.

Twenty-third Air Force also commands CONUS aeromedical-evacuation and operational-support airlift forces and helicopter security support for SAC missile sites, supports air sampling and the Space Shuttle, and is responsible for coordinating federal search-and-rescue activities in the CONUS. In October 1987, four C-140A and two T-39A aircraft, along with their worldwide flight-inspection mission, were transferred from AFCC to MAC and were organized under Twenty-third Air Force and the 375th Aeromedical Airlift Wing. ANG and AFRES forces significantly augment the diverse mission of the Twenty-third.

Special operations may include unconventional warfare, collective security, counterterrorist operations, psychological operations, and civil affairs measures. In 1987, the Air Force began converting rescue H-53s to the MH-53J Pave Low III configuration. In 1989, the first of twenty-four new MC-130H aircraft will arrive to augment the current MC-130E force. Furthermore, the Air Force will begin the procurement of the CV-22 tilt-rotor aircraft beginning in FY '94. The first of the new MH-60Gs has joined the combat rescue force. These improvements will considerably enhance the SOF operational capability and deployment flexibility.

Twenty-third Air Force and AFRES weather reconnaissance units fly the WC-130, providing MAC's Air Weather Service people with the aerial platforms needed to perform their mission. The WC-135 provides atmospheric-sampling capability to aid the National Command Authorities in verification of safeguards of the Limited Test-Ban Treaty.

Aerospace Rescue and Recovery Service, an element of Twenty-third

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Air Force, is the executive management agency for search and rescue (SAR) within the forty-eight continental United States. ARRS operates the Air Force Rescue Coordination Center (AFRCC) at Scott AFB to provide humanitarian assistance by coordinating all inland SAR using USAF Rescue, Civil Air Patrol, and other military and federal assets. The AFRCC works closely with state and local agencies and solicits services of police and sheriff's departments as well as the US Coast Guard. Rescue forces have saved more than 21,676 lives during the past forty years.

ARRS also operates the US Mission Control Center for the Search and Rescue Satellite-Aided Tracking System. Worldwide, SARSAT information helped save more than 340 lives.

Aeromedical airlift is another vital MAC mission. The C-9 Nightingale "air ambulances" of Twenty-third Air Force's 375th AAW and the 932d Aeromedical Airlift Group (AFRES Assoc.) tie into the MAC airlift system to move thousands of patients to medical facilities all over the world. In FY '87, MAC and AFRES aircrews and 375th AAW and 932d AAG nurses and medical technicians provided aeromedical evacuation for patients on approximately 5,000 C-5, C-9, C-141, C-130, C-21, and C-12 aeromedical evacuation missions.

The 375th AAW also manages the CONUS-based operational support airlift fleet, which in 1987 carried more than 52,000 passengers on time-sensitive government missions. The fleet consists of C-21A and C-12F aircraft, which in 1985 replaced the aging CT-39s. In 1986, MAC purchased these aircraft, which had been on lease from Gates Learjet and Beech Aircraft Corp.

The 10th MAS (European Distribution System) operates eighteen C-23 aircraft from Zweibrücken AB, Germany, to provide airlift of critical spare parts for US military weapon systems in Europe. The newly formed 13th MAS (Pacific Distribution System) will operate six C-12F aircraft from Kadena AB, Okinawa, Japan, to provide airlift of critical spare parts for Air Force weapon systems in the Pacific.

Another airlift unit, the 89th MAW, continues to provide airlift for the President, Vice President, other US government officials, and foreign dignitaries, using a variety of aircraft. In 1987, the Air Force awarded a contract to Boeing to provide two 747-200B aircraft to be used as new Presidential aircraft. Delivery of the 747s, designated VC-25As, is set for November 1988 and May 1989.

The Air Weather Service (AWS), a technical service of MAC with headquarters at Scott AFB, provides staff and operational weather support to active, Guard, Reserve, and Army units, unified and specified commands, and other agencies as directed. AWS has more than 4,800 military and civilian personnel serving in more than 216 locations worldwide.

During contingencies and wartime, environmental support is a vital part of the decision-making process in the use of air and ground forces. Peacetime environmental support is essential for protection of military personnel and national resources.

Using meteorological satellites as well as Twenty-third Air Force and AFRES WC-130 aircraft, AWS provides critical tropical-storm surveillance. AWS also uses a series of satellite and ground-based facilities to observe, forecast, and provide information on hazards resulting from solar activity. The space program needs this information to ensure the safety of man's activities in space as well as to measure and predict the effect of solar activity on surveillance and warning systems, satellite tracking systems, and communications.

MAC's other technical service, the Aerospace Audiovisual Service (AAVS) headquartered at Norton AFB, Calif., is the Air Force's single management agency for visual information documentation of combat, operational, and humanitarian activities. AAVS operates six squadrons, twenty-nine detachments, and thirty-two operating locations around the world.

"The Military Airlift Command succeeds because of the personal commitment of our people. MAC people are involved—just watch the news in Europe, in South and Central America, throughout the Pacific region, and in the Persian Gulf. You see MAC airplanes everywhere. What MAC does is important. People all over the world depend on us. For many disaster victims, we are their only means of support and survival. The seemingly endless demand for airlift and services makes our job demanding, and every man and woman in the command should be proud of our record," says MAC Commander in Chief General Cassidy. ■

Pacific Air Forces

Pacific Air Forces (PACAF), with headquarters at Hickam AFB, Hawaii, is the principal air arm of the US Pacific Command. PACAF's primary mission is to plan, conduct, and coordinate offensive and defensive air operations in an area extending from the west coast of the Americas to the east coast of Africa and from the Arctic to the Antarctic.

Gen. Jack I. Gregory, Commander in Chief, Pacific Air Forces, is responsible for more than 60,000 military and civilian people serving in the PACAF region. This force, plus their 35,000 dependents, is stationed at ten major installations and many smaller facilities, primarily in Hawaii, Japan, the Republic of Korea, and the Republic of the Philippines.

The command operates 300 PACAF fighter and attack aircraft, including air-superiority F-15s and F-4Es, ground-attack F-16s, A-10s to handle tanks in Korea, RF-4s, F-5s, and OV-10s. In addition, aircraft of other commands, such as MAC's C-12s, C-21s, C-130s, C-5s, C-141s, and HH-3s, SAC's B-52s and KC-135s, and TAC's E-3s, provide needed support.

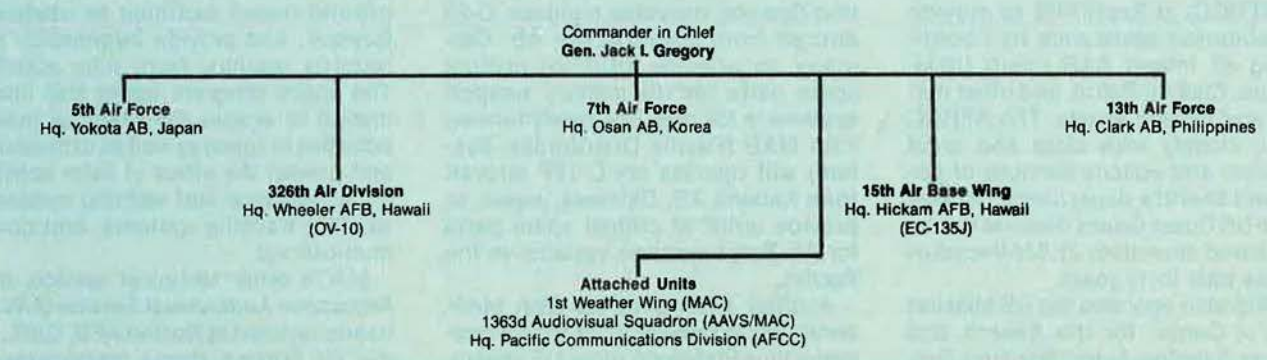
All of this manpower and materiel is directed toward maintaining security, defending US interests, and fulfilling mutual defense agreement responsibilities in a region encompassing 2,000,000,000 people in thirty-five countries across half the world's surface. Operating in such a vast area of responsibility and countering the ever-growing Soviet threat in the Pacific pose a formidable challenge.

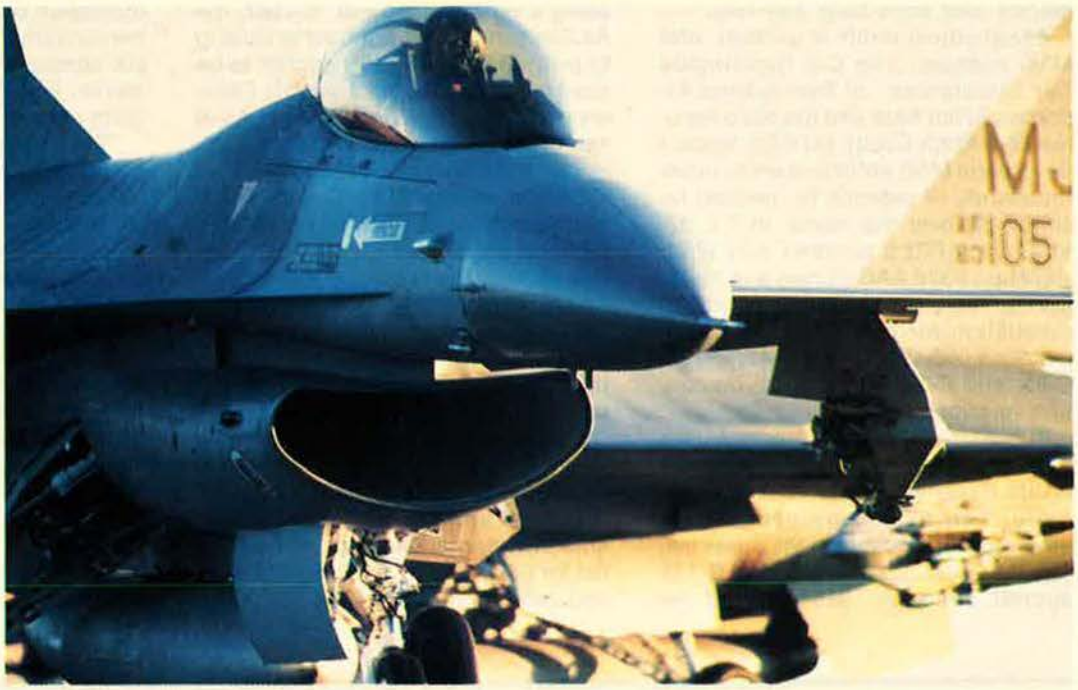
To meet these ever-changing requirements, PACAF pursues a variety of priorities and initiatives in a flexible manner. This ability to change its operations smoothly and adapt to regional and world situations greatly improves its readiness posture and mission capability.

"We've had a change of mindset in the Pacific from the days when the focus was exclusively on Korea," General Gregory explained in a recent interview with Air Force Magazine.

PACIFIC AIR FORCES

Headquarters, Hickam AFB, Hawaii





An F-16 Fighting Falcon from Misawa AB, Japan, taking part in Exercise Team Spirit '87 in Korea, an exercise showing Pacific Air Forces' prowess throughout the far-flung region that PACAF must protect. Headquartered at Hickam AFB, Hawaii, PACAF must plan, conduct, and coordinate offensive and defensive air operations in an area extending from the west coast of the Americas to the east coast of Africa and from the Arctic to the Antarctic. PACAF operates 300 fighter and attack aircraft, plus a whole lot more.

"Today, our focus is broader. For example, how best can you take pressure off Western Europe by applying pressure to the other side?" PACAF war plans now have definite global overtones.

To help apply constant pressure in the Pacific, PACAF continues to modernize its equipment and increase its capability and sustainability. This includes the acquisition of more advanced aircraft for the PACAF inventory as well as the introduction of the latest air-to-air and air-to-ground munitions into its weapons stocks.

PACAF is completing the modernization of its fleet of F-16s from A models to C models at both Misawa AB, Japan, and Kunsan AB, Korea. Other upgrades of PACAF aircraft are planned for the near future.

To help meet the logistics needs of these aircraft and the rest of the command, PACAF operates a variety of logistics programs. Using C-12 aircraft, the recently activated Pacific Distribution System (PDS) gives PACAF a flexible and responsive distribution system to transport critical airplane parts to its bases.

A forward stockage facility at Kadena AB, Okinawa, Japan, will be activated this year, thus bringing aircraft parts forward from supply depots in the continental United States. Having these parts 7,000 miles closer to PACAF's fighter forces will significantly reduce the time to get a part into the hands of maintenance personnel.

Working in concert with the PDS and Kadena's supply facility will be an advanced data network, currently in development, that will rapidly identify available theater assets and automate the process for moving parts to where they are needed most.

Another newly established program is PACAF's Combat Oriented Supply Organization (COSO). The COSO concept places peacetime spare parts and war readiness spares together at aircraft maintenance locations. This system improves the readiness posture and mission capability of command weapon systems.

But command planners realize that even with its advanced aircraft, professional people, and good logistics system, PACAF can't "go it alone." As a result, joint and combined operations receive increasing command attention.

PACAF planners continue to work with the Army and Navy in support of their operations within the theater. The command also works with the military forces of US allies and friendly nations to achieve a common core of knowledge and experience that allows all services to function more efficiently and effectively.

FIFTH AIR FORCE (PACAF)

Headquarters, Yokota AB, Japan

Commander
Lt. Gen. James B. Davis

- **475th Air Base Wing**
  Yokota AB, Japan
  (UH-1N)
- **313th Air Division**
  Hq. Kadena AB, Japan
  - **18th Tactical Fighter Wing**
    Kadena AB, Japan
    (F-15, RF-4C)
- **432d Tactical Fighter Wing**
  Misawa AB, Japan
  (F-16)

SEVENTH AIR FORCE (PACAF)

Headquarters, Osan AB, Korea

Commander
Lt. Gen. Craven C. Rogers, Jr.

- **8th Tactical Fighter Wing**
  Kunsan AB, Korea
  (F-16)
- **51st Tactical Fighter Wing**
  Osan AB, Korea
  - **36th Tactical Fighter Squadron**
    Osan AB, Korea
    (F-4E)
  - **25th Tactical Fighter Squadron**
    Suwon AB, Korea
    (A-10)
  - **497th Tactical Fighter Squadron**
    Taegu AB, Korea
    (F-4E)
- **5th Tactical Air Control Group**
  Osan AB, Korea
  (OV-10)

THIRTEENTH AIR FORCE (PACAF)

Headquarters, Clark AB, Philippines

Commander
Maj. Gen. Donald Snyder

- **3d Tactical Fighter Wing**
  Clark AB, Philippines
  (F-4E/G, F-5E)

—USAF photo by TSgt. Daniel C. Perez

Assisted by his crew chief, a Royal Australian Air Force pilot clambers into his Mirage fighter. Given the sweeping territorial scope of its responsibilities and its excellent but relatively limited resources, PACAF can't go it alone. In consequence, the command places increasing emphasis on conducting joint and combined operations with allied air forces in the region, and the RAAF is a vital part of this. Exercises such as Team Spirit in the Republic of Korea and Cope Thunder in the Philippines give all parties realistic combat training.

—USAF photo by TSgt. Daniel C. Perez

Maintenance crews use test equipment on a 36th Tactical Fighter Squadron F-4E. Known as the "Flying Fiends," the 36th TFS is based at Osan AB, Korea, at the cutting edge of PACAF's combat responsibilities. PACAF aircrews now fly as many as sixteen sorties per month, double the monthly rate that was typical in the 1970s. In FY '87, PACAF flew more than 77,000 sorties in nearly 106,000 hours. In emphasizing warfighting readiness, PACAF puts a premium on its people.

This increase in interoperability is achieved partly through participation in more than fifty realistic joint and combined exercises held within the command each year. These exercises are a key factor in maintaining force readiness. More than sixty percent of them are combined operations that include allied countries, and more than ninety percent are conducted jointly with other US services.

Some of these exercises have gained world-class status. Team Spirit takes place annually in the Republic of Korea. It involves more than 200,000 US and Republic of Korea forces in a demonstration of commitment to the defense of the Republic. More than 17,000 USAF personnel and 850 aircraft participate in the deployment of tactical forces from the United States, the massive airlift of cargo and troops, and other combat-oriented activities including air operations from specially prepared highway landing strips.

Cope Thunder gives PACAF's fighter pilots and those of other nations the most intense, realistic, tactical air warfare training in the Pacific. It is held seven times a year in the Republic of the Philippines. Other exercises, such as Cope North in Japan and Cobra Gold in Thailand, are more local in nature, yet no less important in their ability to promote multinational teamwork and sharpen warfighting skills.

In addition to receiving benefits from its extensive exercise program, PACAF pilots are profiting from an increase in the average sorties flown per month. Aircrews now fly as many as sixteen sorties per month, compared with eight sorties per month flown in the 1970s. In Fiscal 1987, PACAF flew more than 77,000 sorties in almost 106,000 hours.

Despite its emphasis on warfighting and readiness, PACAF never loses concern for the welfare of its people. A wide variety of command initiatives makes work easier and more efficient, offers help to people in need, and provides entertainment and self-improvement opportunities to those who desire them.

PACAF Family Support Centers, fully operational throughout the command, strengthen the bond between the Air Force's mission and its families. Special emphasis during 1987 focused on developing comprehensive financial-assistance services, on spouse-employment training, and on support for community volunteer activities. These and other programs help sustain force readiness and enhance the morale of PACAF personnel and their families.

To further improve the lives of its families, PACAF also boasts an aggressive program to pursue construction of new military family and unaccompanied-personnel housing. This includes the construction of 450 housing units at Clark AB as well as the Japanese government's construction of new homes for US military families on the home islands of Japan and on Okinawa.

This continuing concern by PACAF for its people and their living conditions and working conditions pays tangible dividends in the form of high retention rates. More than seventy-seven percent of eligible PACAF first-termers reenlisted in FY '87—well above the Air Force average of sixty-five percent. In addition, the retention rate among PACAF's pilots, navigators, and support officers is consistently higher than USAF's average.

But command concern for people's welfare goes beyond just PACAF members and their dependents. In February 1987, a seventeen-member team from the 15th Civil Engineering Squadron at Hickam AFB deployed to the Cook Islands, a fifteen-island nation in the South Pacific, to repair damage from Cyclone Sally. Team members not only received valuable training that tested their wartime repair skills but also helped Cook Islanders in their recovery efforts.

Later that year, other Pacific storms ripped through South Korea and the Philippines, causing untold destruction and hardships for residents of those countries. Again, PACAF people were quick to respond with aid for the sick, hungry, and homeless. When there was a need, PACAF was ready to help.

This kind of humanitarian effort not only increases goodwill between the United States and its Pacific friends and allies but also improves morale in the command and demonstrates PACAF's concern for its Pacific neighbors. This, combined with the already high degree of professionalism and dedication to duty, makes PACAF a force to be reckoned with at the tip of the Pacific spear. ■

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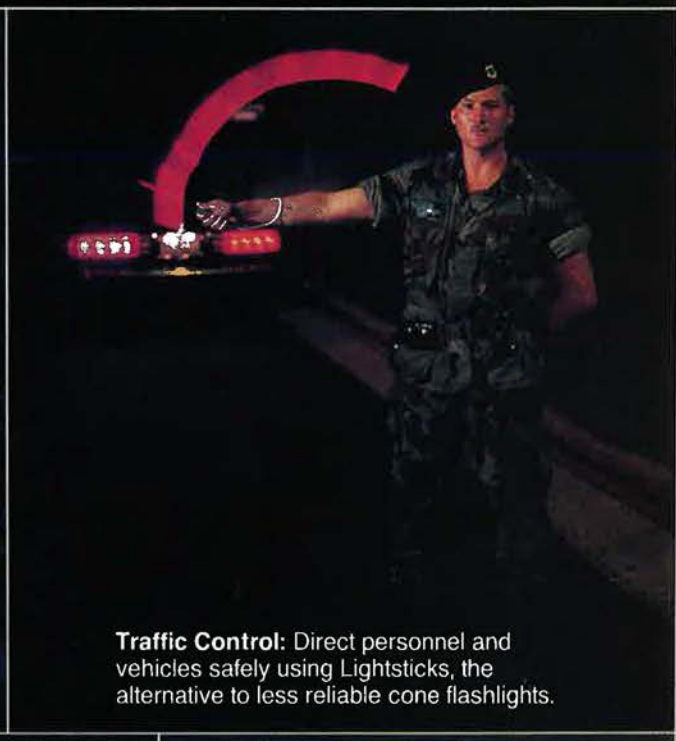

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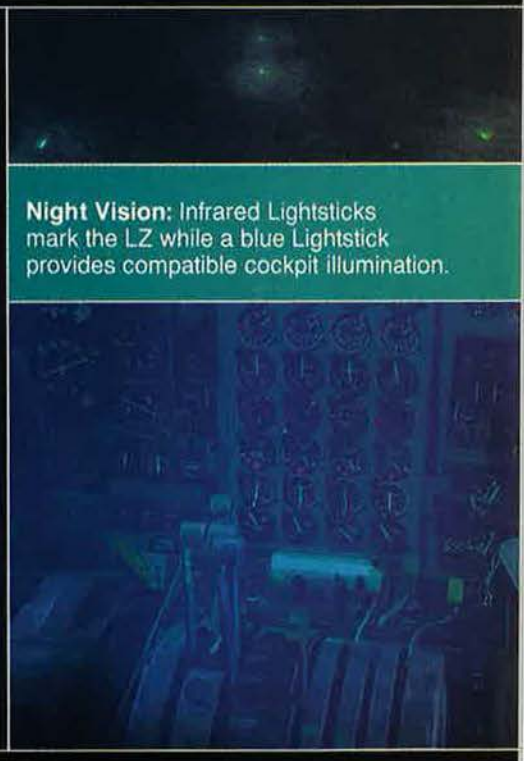

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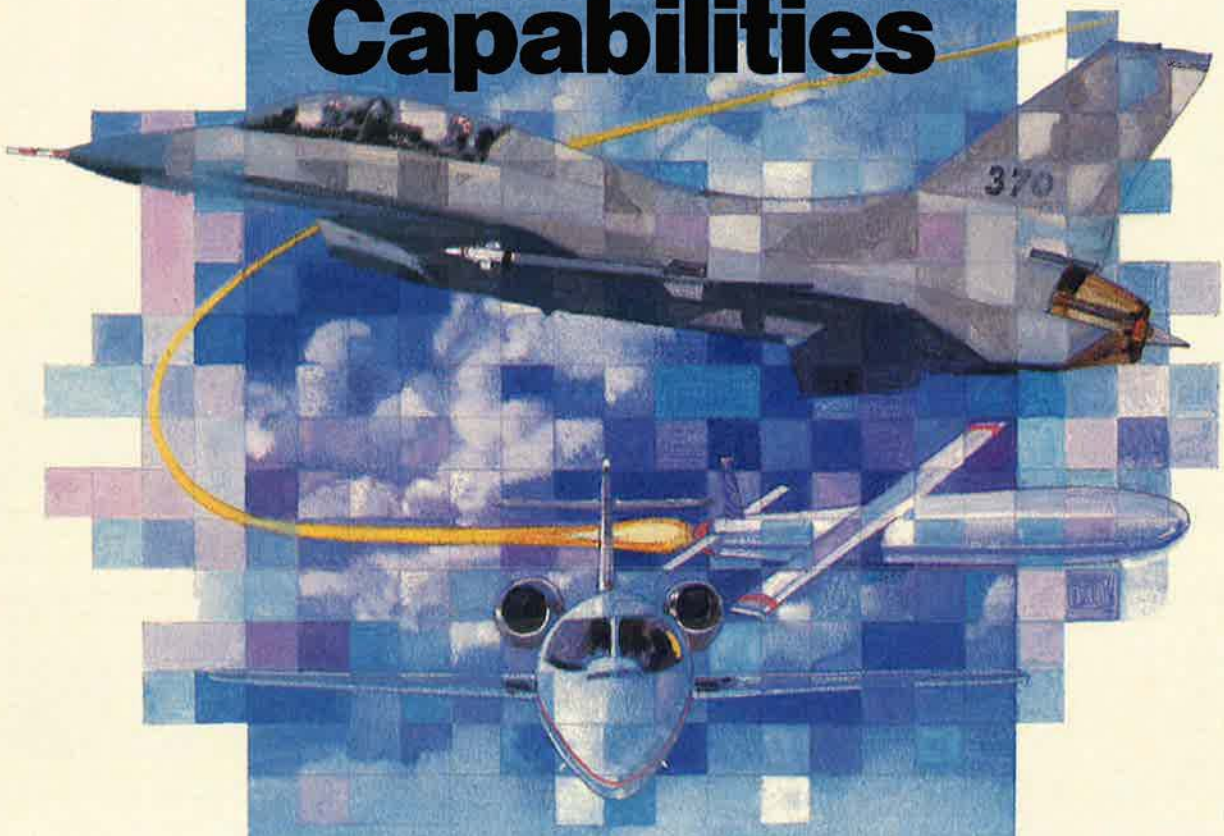

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Strategic Air Command

THE business of Strategic Air Command is to build combat capabilities and deter war. As Gen. Curtis E. LeMay, former Commander in Chief, Strategic Air Command, once said, "The important thing to remember is that if we do, in fact, possess the power to deter, it is only because we clearly possess the power to win."

Deterrence—protecting America's freedom—demands that SAC be prepared to respond anytime, anywhere. Being ready at a moment's notice has been part of SAC's lifestyle since SAC people began pulling alert on October 1, 1957. For more than thirty years, 365 days a year, twenty-four hours a day, SAC alert forces have provided the foundation of our nation's deterrence. To recognize this achievement and its importance to our country, SAC is celebrating 1988 as "The Year of the SAC Alert Force."

SAC emphasizes both nuclear and conventional combat capability. Our national leaders depend on SAC for its long-range strike force of manned bombers and intercontinental ballistic missiles. The might of the SAC strike force resides in more than 400 bombers—B-1Bs, FB-111s, and B-52s—nearly 1,000 Minuteman intercontinental ballistic missiles, and, by the end of this year, fifty Peacekeeper ICBMs. The bombers are supported by more than 600 tankers, including aircraft of the Air National Guard and Air Force Reserve.

SAC strategic reconnaissance and worldwide command and control networks are vital for force-posturing. The reconnaissance mission relies on the SR-71, U-2, and RC-135 aircraft along with the newer TR-1. EC-135 and E-4B Post-Attack Command and

—Staff photo by Guy Aceto

The cabin area of this Strategic Air Command B-52 is a study in shadows as the bomber prepares for an evening flight at SAC's Loring AFB, Me. The "Buffs" have been SAC's air-breathing bellwethers forever, it seems. The B-52 remains synonymous with the mission of deterring nuclear war that is entrusted to USAF's largest command—with its more than 121,000 officers, enlisted people, and civilians, as well as 15,000 SAC-gained reserves.

STRATEGIC AIR COMMAND

Headquarters, Offutt AFB, Neb.

Commander in Chief
Gen. John T. Chain, Jr.

8th Air Force
Hq. Barksdale AFB, La.

7th Air Division
19th Air Division
40th Air Division
42d Air Division
45th Air Division

1st Strategic Aerospace Division
Hq. Vandenberg AFB, Calif.

394th ICBM Test Maintenance Squadron
4315th Combat Crew Training Squadron
4392d Aerospace Support Wing
4392d Security Police Group

15th Air Force
Hq. March AFB, Calif.

3d Air Division
4th Air Division
12th Air Division
14th Air Division
57th Air Division

1st Combat Evaluation Group
Barksdale AFB, La.

544th Strategic Intelligence Wing
Offutt AFB, Neb.

—Photo by Paul Kennedy

Through a one-way window, instructors literally look over the shoulders of an ICBM crew in the training simulator at Francis E. Warren AFB, Wyo., home of SAC's 90th Strategic Missile Wing and of its new Peacekeeper ICBMs. The instructors create combat situations and other contingencies on computers and observe each crew as it reacts to them throughout a twenty-four-hour test period. SAC's ICBMs are the land-based leg of the time-tested US strategic triad that also includes SAC's bombers and the Navy's submarine ballistic missile force.

Control System (PACCS) aircraft offer a survivable and enduring airborne alternate to SAC's worldwide ground-based command and control system.

Careful maintenance and ongoing upgrades have improved and extended SAC's older systems far beyond their original capability. State-of-the-art electronics and addition of air-launched cruise and Harpoon missiles will give the B-52 a significant combat capability well into the future. The Avionics Modernization Program has enhanced the bombing, navigation, and terrain-following radar potential of the FB-111. The life span of the KC-135 has been extended into the middle of the next century by re-skinning the wings, installing new engines, and improving the aircraft cockpit.

The accuracy, responsiveness, and flexibility of the Minuteman system continue to improve. Upgrades to older systems are being complemented by the deployment of major new strategic aircraft and missiles—the B-1B bomber, the KC-10 tanker, and the Peacekeeper missile—which adds enormous combat capability to the nation's arsenal.

On the horizon, the B-2 Advanced Technology Bomber, along with such developmental systems as the Advanced Cruise Missile and the new Short-Range Attack Missile (SRAM II), will help sustain the inherent flexibility of America's triad of manned bombers, land-based ICBMs, and sea-launched ballistic missiles. The Rail-Garrison Peacekeeper ICBM and the Small ICBM in hardened, mobile launchers offer promising concepts to add enduring high-quality weapons to the ICBM portion of the strategic triad.

But SAC is not just a nuclear command. All SAC bomber crews have both nuclear and conventional missions. New tactics, training, and munitions are improving the command's capability to project conventional firepower worldwide. Much of this strength comes from the muscle and reach of the venerable B-52.

SAC "trains the way we'll fight." The new Strategic Training Center at Ellsworth AFB, S. D., will improve the quality of aircrew training and allow crews to practice improved tactics. Standoff munitions are planned, which will further add to SAC's conventional strength.

To ensure effective employment of both new and existing weapon systems, state-of-the-art communications are necessary. This fall, the new underground command center located at Hq. SAC at Offutt AFB, Neb., will join the Defense Satellite Communications System (DSCS III), Milstar, and the Air Force Satellite Communications (AFSATCOM) system to provide the best possible communications for the direction of SAC forces. The new Ground Wave Emergency Network (GWEN) now being deployed resists electromagnetic pulse (EMP) effects and will improve communications among US-based forces.

Weapons and support systems provide one of the two pillars of combat capability. The other essential element is people. SAC is the Air Force's largest command, with more than 121,000 officers, enlisted people, and civilians, as well as 15,000 SAC-gained reserves. The command focuses on people and fosters pride, professionalism, and innovation. SAC makes an extra effort to recognize superior performers and gives special attention to quality of life. These programs are a top priority in SAC because they translate into increased readiness and combat capability.

SAC people are confident of their ability to carry out their mission anytime, anywhere. Those who pull alert and those who support them guard this nation on freedom's front line. SAC's traditions of unsurpassed professionalism and dedication have built a proud heritage. "The Year of the SAC Alert Force" will celebrate SAC's vigilance in safeguarding America's freedom in the future. ■

EIGHTH AIR FORCE (SAC)

Headquarters, Barksdale AFB, La.

Commander
Lt. Gen. Ellie G. Shuler, Jr.

7th Air Division
Ramstein AB, Germany

17th Reconnaissance Wing
RAF Alconbury, UK

306th Strategic Wing*
RAF Mildenhall, UK

11th Strategic Group
RAF Fairford, UK

19th Air Division
Carswell AFB, Tex.

7th Bomb Wing
Carswell AFB, Tex.
(B-52, KC-135)

340th Air Refueling Wing*
Altus AFB, Okla.
(KC-135)

351st Strategic Missile Wing
Whiteman AFB, Mo.
(Minuteman)

384th Bomb Wing
McConnell AFB, Kan.
(B-1B, KC-135)

40th Air Division
Wurtsmith AFB, Mich.

379th Bomb Wing
Wurtsmith AFB, Mich.
(B-52, KC-135)

410th Bomb Wing
K. I. Sawyer AFB, Mich.
(B-52, KC-135)

416th Bomb Wing
Griffiss AFB, N. Y.
(B-52, KC-135)

42d Air Division
Blytheville AFB, Ark.

2d Bomb Wing
Barksdale AFB, La.
(B-52, KC-10, KC-135)

19th Air Refueling Wing*
Robins AFB, Ga.
(KC-135)

68th Air Refueling Wing*
Seymour Johnson AFB, N. C.
(KC-10)

97th Bomb Wing
Blytheville AFB, Ark.
(B-52, KC-135)

305th Air Refueling Wing
Grissom AFB, Ind.
(KC-135)

45th Air Division
Pease AFB, N. H.

42d Bomb Wing
Loring AFB, Me.
(B-52, KC-135)

380th Bomb Wing
Plattsburgh AFB, N. Y.
(FB-111, KC-135)

509th Bomb Wing
Pease AFB, N. H.
(FB-111, KC-135)

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FIFTEENTH AIR FORCE (SAC)

Headquarters, March AFB, Calif.

Commander
Lt. Gen. Richard A. Burpee

3d Air Division
Andersen AFB, Guam

43d Bomb Wing
Andersen AFB, Guam
(B-52)

376th Strategic Wing*
Kadena AB, Japan
(KC-135)

4th Air Division
F. E. Warren AFB, Wyo.

28th Bomb Wing
Ellsworth AFB, S. D.
(B-1B, KC-135)

44th Strategic Missile Wing
Ellsworth AFB, S. D.
(Minuteman)

90th Strategic Missile Wing
F. E. Warren AFB, Wyo.
(Minuteman/Peacekeeper)

341st Strategic Missile Wing
Malmstrom AFB, Mont.
(Minuteman)

12th Air Division
Dyess AFB, Tex.

93d Bomb Wing
Castle AFB, Calif.
(B-52, KC-135)

96th Bomb Wing
Dyess AFB, Tex.
(B-1B, KC-135)

320th Bomb Wing*
Mather AFB, Calif.
(B-52)

14th Air Division
Beale AFB, Calif.

6th Strategic Wing
Eielson AFB, Alaska
(RC-135)

9th Strategic Reconnaissance Wing
Beale AFB, Calif.
(SR-71, U-2, TR-1, KC-135)

22d Air Refueling Wing
March AFB, Calif.
(KC-10, KC-135)

55th Strategic Reconnaissance Wing
Offutt AFB, Neb.
(RC/KC-135)

57th Air Division
Minot AFB, N. D.

5th Bomb Wing
Minot AFB, N. D.
(B-52, KC-135)

91st Strategic Missile Wing
Minot AFB, N. D.
(Minuteman)

92d Bomb Wing
Fairchild AFB, Wash.
(B-52, KC-135)

319th Bomb Wing
Grand Forks AFB, N. D.
(B-1B, KC-135)

321st Strategic Missile Wing
Grand Forks AFB, N. D.
(Minuteman)

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13. Rapier area low-level air defence system
14. Sky Flash all-weather air-to-air missile
15. Sea Dart shipborne area-defence missile
16. Seawolf shipborne anti-missile system
17. ASRAAM (Advanced Short-Range Air-to-Air Missile)
18. Hawk 200 single-seat fighter
19. Tornado Air Defence Variant
20. EFA (proposed European Fighter Aircraft)
21. EAP (Experimental Aircraft Programme)
22. Skynet military communications satellite

BRITISH AEROSPACE

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Tactical Air Command

THE mission of Tactical Air Command (TAC) is to organize, train, equip, and maintain combat-ready forces capable of rapid deployment and employment as well as to ensure that strategic air defense forces are ready to meet the challenges of peacetime air sovereignty and wartime air defense. TAC is also charged with the responsibility of working with the Army, Navy, and Marine Corps to develop joint doctrine, procedures, tactics, techniques, training, publications, and equipment for joint operations.

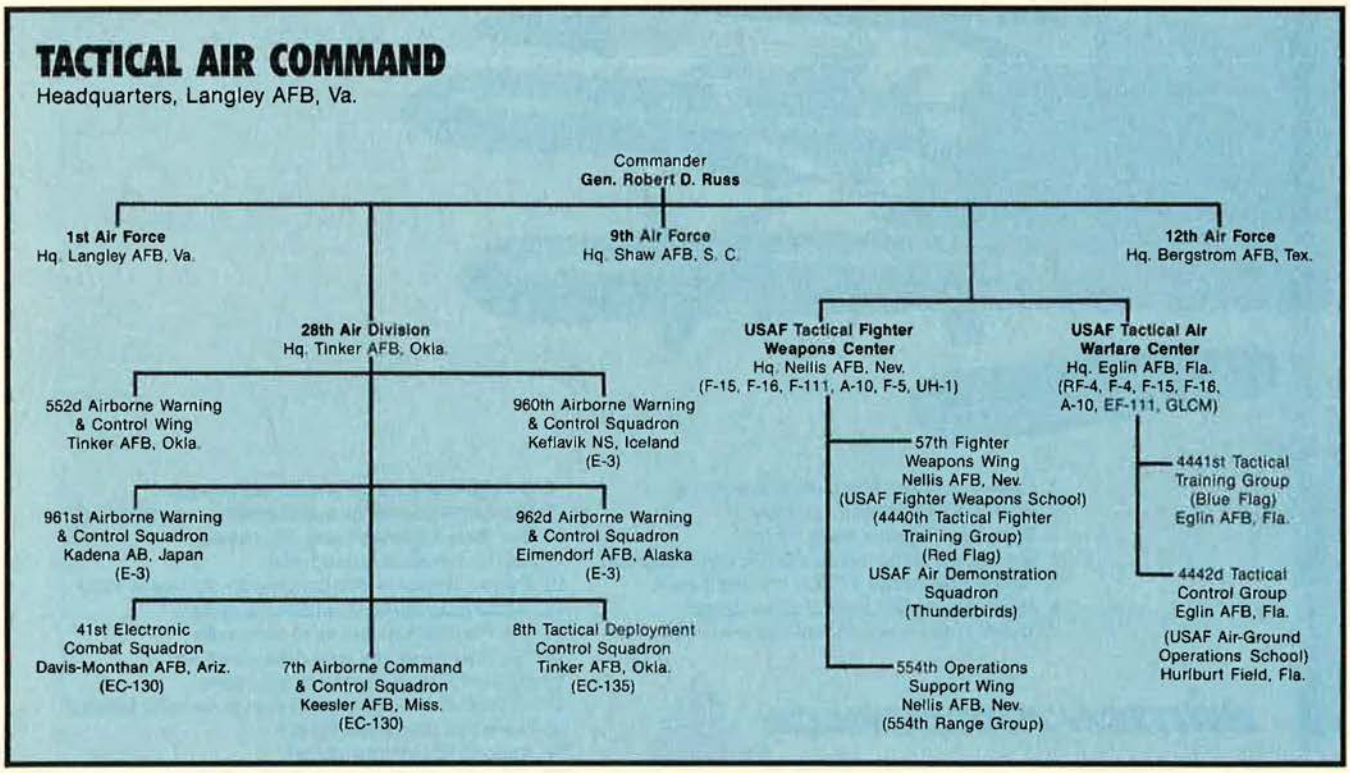
When mobilized, more than 70,000 members of the Air National Guard (ANG) and Air Force Reserve (AFRES), along with their 1,400 aircraft, are assigned to TAC to accomplish its wartime mission. In total, TAC and these TAC-gained units consist of more than 4,000 aircraft (some forty-four percent of all USAF aircraft). The TAC active-duty force consists of more than 119,000 people, including civilians.

TAC's joint service responsibilities include providing the Air Force component of the US Atlantic Command, US Central Command, and US Southern Command. The TAC Commander is dual-hatted as MAJCOM commander and CINCAFLANT. TAC's Ninth Air Force commander doubles as COMUSCENTAF, and TAC's Twelfth Air Force commander doubles as COMUSSOUTHAF. TAC's First Air Force commander also serves as the commander of the CONUS North American Aerospace Defense (NORAD) Region, which, along with the Alaskan and Canadian regions, provides an operational command and control system for NORAD.

When activated as Air Forces Atlantic under the unified Atlantic Command, TAC conducts air operations within the USLANTCOM area of responsibility, which includes the North Atlantic and the Caribbean. In support of USCENTCOM, TAC, through Ninth Air Force in its role as USCENTAF, provides combat-ready units for joint operations in Southwest Asia. In support of US Southern Command in Latin America, TAC, through Twelfth Air Force in its role as USSOUTHAF, provides air defense, tactical air support, and command and control for the region as required. In addition to providing forces to USLANTCOM, USCENTCOM, and USSOUTHCOM, TAC also supports the US Pacific Command (USPACOM) and the US European Command (USEUCOM) by ensuring that its resources are adequately trained, organized, and equipped for deployment to these theaters as required by various contingency plans.

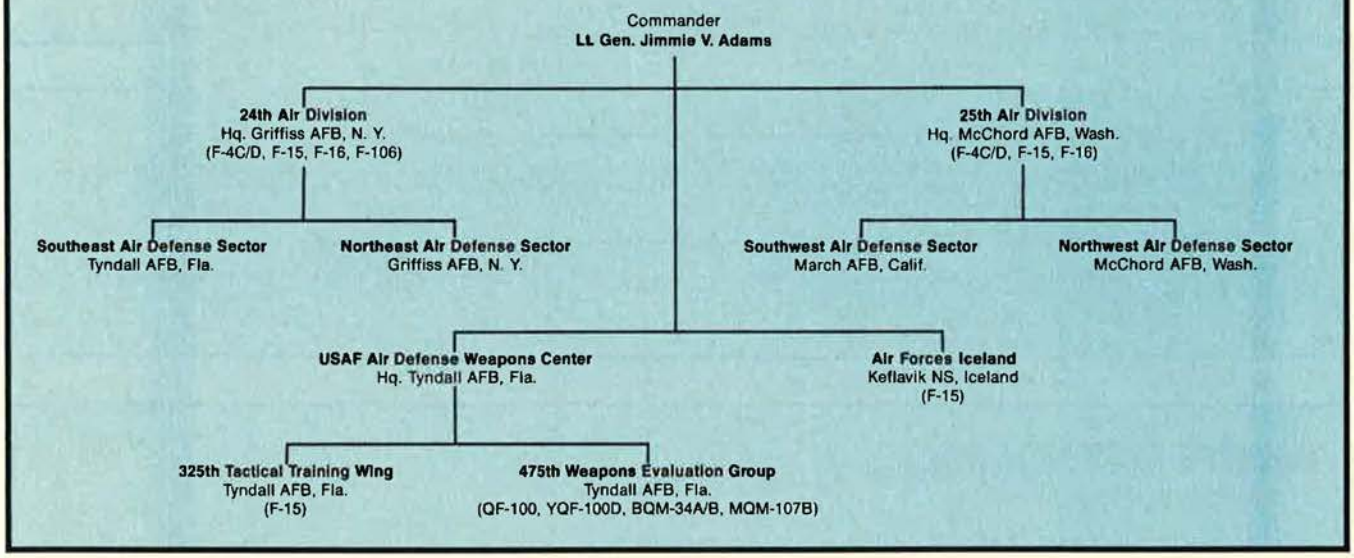
TAC's forces are organized under three numbered air forces and three major direct reporting units.

- First Air Force, headquartered at Langley AFB, Va., includes two air divisions, each having two air defense sectors responsible for the air defense of particular CONUS geographic areas. First Air Force also manages the USAF Air Defense Weapons Center (USAFADWC), Tyndall AFB, Fla., which provides specialized air defense weapons training and tactics development for aircrews and air weapons controllers and performs operational test and evaluation of strategic air defense systems. Air Forces Iceland at Keflavik Naval Station, Iceland, which is under the operational control of USCINCLANT, provides a combat force for the air defense of Iceland. The commander, First Air Force, as Commander, CONUS NORAD Region, reports directly to CINCNORAD for the air sovereignty and air defense of the CONUS.
- Ninth Air Force at Shaw AFB,



FIRST AIR FORCE (TAC)

Headquarters, Langley AFB, Va.



S. C., has ten wings performing tactical fighter operations and training as well as reconnaissance and the tactical air control mission.

• Twelfth Air Force at Bergstrom AFB, Tex., has five air divisions. Four of the air divisions and thirteen wings perform tactical fighter operations and training, reconnaissance, tactical air control, and a wide range of electronic combat tasks, including F-4G Wild Weasel and EF-111 Raven support jamming. One group is responsible for ground-launched cruise missile training. The 5th Air Division, USAF Southern Air Division (USAFSO), Howard AFB, Panama, is responsible for the joint defense of the Panama Canal. USAFSO assists in training Latin American air forces and provides air support for combined training exercises with Latin American military forces.

• The USAF Tactical Air Warfare Center (USAFTAWC), Eglin AFB, Fla., is responsible for all aspects of electronic combat activities and provides training and evaluation of command control and intelligence systems. Additionally, it provides the electronic combat expertise for TAC's "Green Flag" exercises, in which TAC aircrews as well as those from sister services fly realistic, simulated combat missions in a demanding electronic jamming environment to exercise tactics and procedures developed for use under these conditions.

• The USAF Tactical Fighter Weapons Center (USAFTFWC), Nellis AFB, Nev., conducts advanced training and testing in tactical air concepts, doc-

—USAF photo by MSgt. Ken Hammond

Here's one of the F-15 Eagles of the 71st Tactical Fighter Wing at Langley AFB, Va., home of the USAF's Tactical Air Command. TAC has the tall order of maintaining combat-ready fighter forces for extensive operations Stateside and for expeditious deployment to overseas commands, including providing them to the Air Force component of US Atlantic Command, US Central Command, and US Southern Command. TAC is also assigned the CONUS air defense mission and is heavily involved in joint-service operations.

NINTH AIR FORCE (TAC)

Headquarters, Shaw AFB, S.C.

Commander
Lt. Gen. Charles A. Horner

- **1st Tactical Fighter Wing** — Langley AFB, Va. (F-15, EC-135, UH-1)
- **4th Tactical Fighter Wing** — Seymour Johnson AFB, N. C. (F-4E)
- **23d Tactical Fighter Wing** — England AFB, La. (A-10)
- **31st Tactical Fighter Wing** — Homestead AFB, Fla. (F-4D, F-16)
- **33d Tactical Fighter Wing** — Eglin AFB, Fla. (F-15)
- **56th Tactical Training Wing** — MacDill AFB, Fla. (F-16, UH-1)
- **347th Tactical Fighter Wing** — Moody AFB, Ga. (F-4E, F-16)
- **354th Tactical Fighter Wing** — Myrtle Beach AFB, S. C. (A-10)
- **363d Tactical Fighter Wing** — Shaw AFB, S. C. (F-16, RF-4C)
- **507th Tactical Air Control Wing** — Shaw AFB, S.C. (OV-10, OT-37, CH-3)

TWELFTH AIR FORCE (TAC)

Headquarters, Bergstrom AFB, Tex.

Commander
Lt. Gen. Merrill A. McPeak

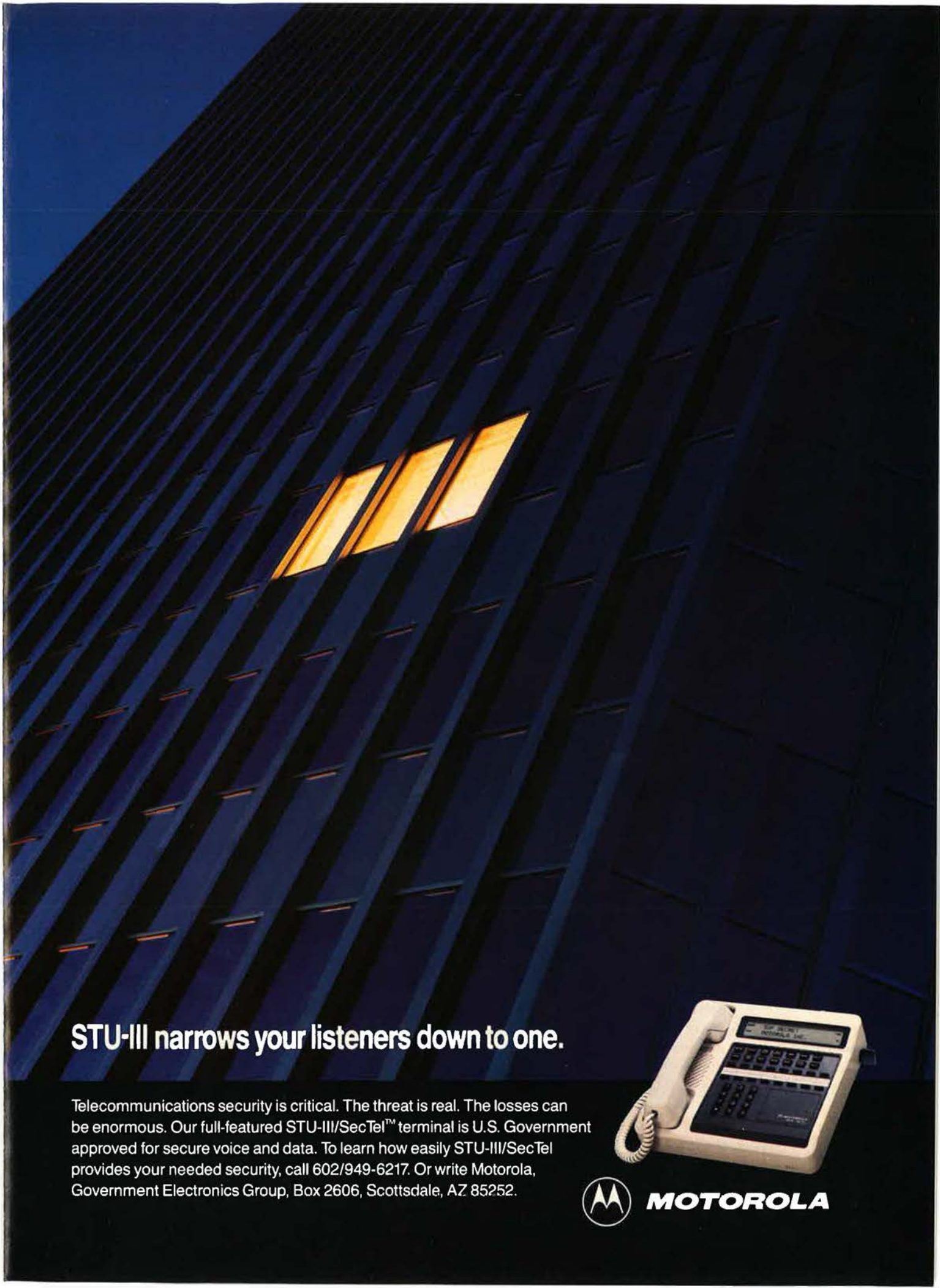
- **831st Air Division** — George AFB, Calif.
  - **35th Tactical Training Wing** — George AFB, Calif. (F-4E)
  - **37th Tactical Fighter Wing** — George AFB, Calif. (F-4E/G)
- **832d Air Division** — Luke AFB, Ariz.
  - **58th Tactical Training Wing** — Luke AFB, Ariz. (F-16)
  - **405th Tactical Training Wing** — Luke AFB, Ariz. (F-15, F-5)
- **833d Air Division** — Holloman AFB, N. M.
  - **49th Tactical Fighter Wing** — Holloman AFB, N. M. (F-15)
  - **479th Tactical Training Wing** — Holloman AFB, N. M. (AT-38B)
- **836th Air Division** — Davis-Monthan AFB, Ariz.
  - **355th Tactical Training Wing** — Davis-Monthan AFB, Ariz. (A-10)
  - **602d Tactical Air Control Wing** — Davis-Monthan AFB, Ariz. (OA-37, OV-10, OA-10)
  - **868th Tactical Missile Training Group** — Davis-Monthan AFB, Ariz. (GLCM)
- **USAF Southern Air Division** — Hq. Howard AFB, Panama
- **24th Composite Squadron (USAFSO)** — Howard AFB, Panama (OA-37)
- **Inter-American AF Academy** — Albrook, Panama
- **27th Tactical Fighter Wing** — Cannon AFB, N. M. (F-111D)
- **67th Tactical Reconnaissance Wing** — Bergstrom AFB, Tex. (RF-4C)
- **366th Tactical Fighter Wing** — Mountain Home AFB, Idaho (F-111, EF-111A)
- **388th Tactical Fighter Wing** — Hill AFB, Utah (F-16)
- **474th Tactical Fighter Wing** — Nellis AFB, Nev. (F-16)

trine, weapons, and tactics. USAFTFWC also evaluates equipment and munitions designs for tactical fighter operations. The Thunderbirds, the USAF Air Demonstration Squadron, is a USAFTFWC unit. The center is responsible for all Red Flag and Green Flag activities and TAC's aggressor forces.

• The 28th Air Division, Tinker AFB, Okla., operates E-3 AWACS, EC-130E, EC-130H, and EC-135 aircraft. The air division comprises a wing at Tinker AFB, Okla., and squadrons at Kadena AB, Japan, Keflavik NS, Iceland, Davis-Monthan AFB, Ariz., Keesler AFB, Miss., and Elmendorf AFB, Alaska, as well as a detachment in Saudi Arabia. The E-3 provides surveillance and warning, control of friendly fighters, airborne battle management, and an airborne command post in support of NORAD for air defense of North America. Two versions of the EC-130 provide airborne battlefield command and control and jamming of enemy command control and communications networks. The EC-135s serve as flying command posts to assist overseas deployment of tactical fighter aircraft.

During the last year, TAC continued its highly praised "Flag" programs to provide combat training under realistic conditions. Key Flag programs include the following:

• Checkered Flag assists in unit preparation for operations from overseas bases. Under Checkered Flag, TAC fighter squadrons and tactical air control units are assigned a specific overseas deployment training location. Aircrews and tactical air controllers study and practice all facets of operation from these locations. Flying units deploy regularly to their Checkered Flag training bases for realistic on-scene training.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Next to his aircraft's power plant and flight instruments, a pilot's most valuable equipment for night/adverse weather operations is his radar system. It puts him on course, keeps him out of danger, helps him complete the mission sucessfully, then guides him home again safely.

Texas Instruments plays a leading role in this drama. Since 1959 TI has been the world leader in designing and manufacturing terrain-following radars (TFR), advanced TFR, multi-mode forward-looking radars, and navigation and attack radars. Today these radar systems are operating on a variety of U.S. Air Force, U.S. Navy and Allied aircraft.

The list of users of TI radar systems reads like a combat aircraft hall of fame:

- F-15E & F-16 — advanced TFR in the LANTIRN navigation pod, with high-speed, low-altitude capabilities.
- RF-4C — AN/APQ-99 or AN/APQ-172 multi-mode, forward-looking radar for low level TF/TA and ground mapping.
- A-7 — AN/APQ-126 variable configuration TF/TA navigation and attack radar.
- F-111 — AN/APQ-171, an upgraded version of F-111 series TFR's with new transmitters and computer LRU components.
- Tornado nose radar — terrain-following, terrain-avoidance, ground mapping and attack targeting, with a digital scan converter advanced radar display.

All these current systems demonstrate TI's broad range of radar experience and technical development. And the future looks just as bright, with development programs such as solid state phased array (SSPA) and covert penetration radar. It's technology at work, enhancing flight crews' survivability.

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TEXAS INSTRUMENTS

• Red Flag furnishes tactical fighter training in a large, joint, combined exercise that gives aircrews experience against simulated enemy ground and air opposition. As many as 300 aircraft, including Navy and Marine Corps forces as well as those of our allies, fly up to 4,500 sorties during each six-week exercise.

• Green Flag is an "electronic combat Red Flag" that focuses on integrating and improving the electronic combat (EC) capabilities of the tactical air forces. In cooperation with USAFTFWC, USAFTAWC provides the exercise scenarios that train aircrews in the use of appropriate tactics and electronic combat systems.

• Copper Flag, the air defense equivalent of Red Flag, is conducted at Tyndall AFB, Fla., to increase the readiness of air defense forces. These exercises provide individual aircrew, weapons controller, and command control system training against realistic simulated enemy attackers in scenarios covering the full range of attack and defense options.

• Silver Flag trains combat support force units to operate in a potentially hostile, bare/austere base environment. Personnel are tasked to resolve a variety of simulated combat problems that closely resemble the circumstances likely to be encountered in a war or contingency.

• Blue Flag provides real-time command and control and communications training for battle staff personnel in realistic joint and combined NATO, Korean, and Southwest Asian scenarios. Training is provided not only for TAC people but also for personnel from other Air Force commands, our sister services, and, on a regular basis, from allied nations.

In 1987, TAC accelerated its involvement in joint forces development by participating in joint exercises as well as active interaction within the Joint Force Development Process (JFDP). A goal of JFDP is to maximize the US total-force warfighting capability by fielding affordable joint forces. TAC is tasked with fourteen of thirty-seven joint initiatives designed to increase its joint warfighting capabilities. These joint initiatives include the development of the Army-Air Force Joint Surveillance and Target Attack Radar System (Joint STARS), the development of Army-Air Force doctrine and procedures for external defense of air bases, the refinement of procedures for requesting and controlling close air support in rear operations, improvements in joint suppression of enemy air defenses, and the development of joint reconnaissance roadmaps to identify requirements and refine the force mix for future surveillance systems.

TAC participated in numerous composite force training exercises, such as Sand Eagle and Coronet Sentry, and joint systems training exercises that provide training for both ground and airborne elements of the Tactical Air Control System. These exercises ensure effective command training of forces within joint operations.

TAC restructured its air defense mission by organizing along geographic areas of responsibilities, which eliminated two divisions and created four new air defense sectors. These new sectors—Northeast, Southeast, Northwest, and Southwest—were assigned to the two remaining air divisions, the 24th Air Division in the East and the 25th Air Division in the West.

The forward air control modernization program began in earnest when the first OA-10 FAC squadron was activated at Davis-Monthan AFB, Ariz. The OA-10 will eventually replace the OA-37.

Other modernization programs continued during the year as one squadron converted from F-16A/B models to newer F-16C/D models, two squadrons of F-4Es converted to F-16A/Bs, and one wing completed its conversion to the Multistage Improvement Program F-15C/D.

The 552d Airborne Warning and Control Wing logged its 5,000th mission in Saudi Arabia. This milestone marked the completion of more than 67,000 hours of continuous airborne surveillance to enhance the security of allies in the Persian Gulf region.

Gunsmoke '87, the US Air Force biennial worldwide air-to-ground gunnery meet, was conducted at Nellis AFB, Nev., October 4–17.

During the year, hospitals within the command were renamed medical groups with the numerical designations of their supported units.

The Thunderbirds Air Demonstration Squadron flew eighty-one demonstrations at thirty-five Stateside locations and in ten foreign countries before a total of more than 14,800,000 spectators. The highlight of the season was an overseas deployment to ten countries in the Far East, with first-time appearances in Guam, China, Thailand, Malaysia, Singapore, Indonesia, and Australia. ■

Ground crew takes tender loving care of a Tactical Air Command F-16 fighter. The dedication and proficiency of TAC's enlisted ground crewmen are major reasons for the superlative sortie rates of the command's combat aircraft. Ground crews exemplify the "people" part of the equation that enables USAF to come up with the right answers in readiness. Excellence of enlisted personnel extends to TAC-gained Air National Guard and Air Force Reserve units as well, consisting of 1,400 aircraft.

—USAF photo by SSgt Fernando Serna

United States Air Forces in Europe

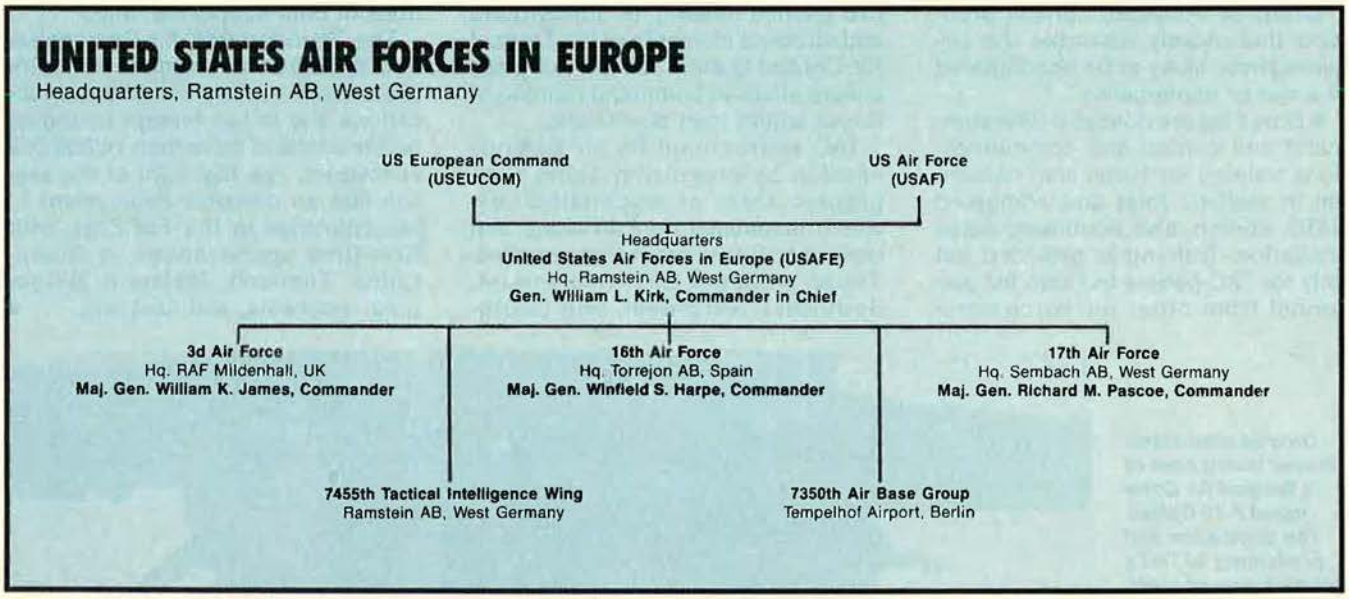
THE United States Air Forces in Europe (USAFE) is the air component of the US European Command and a vital element of the North Atlantic Treaty Organization. USAFE comprises Third Air Force in the United Kingdom, Sixteenth Air Force in the Southern/Mediterranean Region, and Seventeenth Air Force in central Europe.

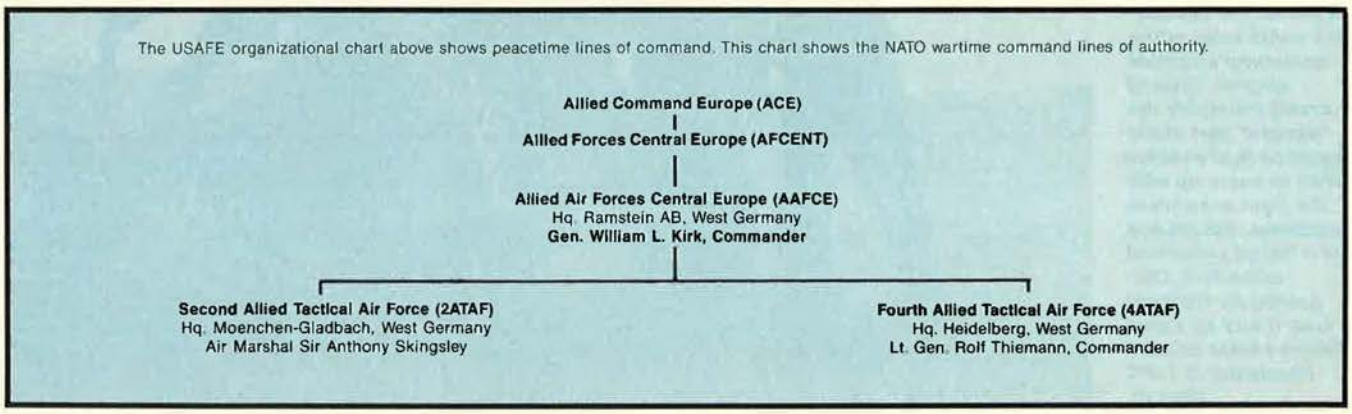
The Commander in Chief of USAFE also serves as Commander, Allied Air Forces Central Europe, with responsibility for the area extending from the North Sea and the Elbe River to the borders of Austria and Switzerland. Belgium, Canada, the Federal Republic of Germany, the Netherlands, the United Kingdom, and the United States provide air resources.

Through the Second and Fourth Allied Tactical Air Forces, COMAAFCE controls some 2,000 tactical aircraft and defensive and offensive missiles. "Command forces" comprise an integrated peacetime air defense. Upon political decision by member nations, "assigned forces" are available for contingencies or wartime.

In FY '87, USAFE flew its 600 tactical aircraft nearly 225,000 high-performance hours under the most realistic training scenarios and in the worst weather in the Air Force. Six Class-A mishaps (computed against 171,000 flying hours because of an Air Force change in analysis procedures) compare favorably with previous USAFE years and with other tactical commands. Ground fatalities were reduced twenty-four percent, with ground mishaps down in every category.

By fall, the command's F-16A/Bs will have been swapped for F-16C/Ds with improved avionics. The Multistage Improvement Program (MSIP) begun last year continues an F-15 swap/retrofit to provide improved avionics in the Eagles as well. The EF-111s began receiving P109 engines last year to increase thrust and fuel efficiency, and the Avionics Modernization Program began replacing the attack and terrain-following radar and the bomb navigation systems on the F-111Fs. Ground-launched cruise missile deployments continued, as the sixth GLCM wing was activated at Woensdrecht AB, the Netherlands.





THIRD AIR FORCE (USAFE)

Headquarters, RAF Mildenhall, United Kingdom

Commander
Maj. Gen. William K. James

- **10th Tactical Fighter Wing**
  RAF Alconbury, UK
  (A-10, F-5, SAC TR-1)
- **20th Tactical Fighter Wing**
  RAF Upper Heyford, UK
  (F-111E, EF-111)
- **48th Tactical Fighter Wing**
  RAF Lakenheath, UK
  (F-111F)
- **81st Tactical Fighter Wing**
  RAF Bentwaters/Woodbridge, UK
  (A-10; MAC Rescue HC-130, HH-53)
- **303d Tactical Missile Wing**
  RAF Molesworth, UK
  (BGM-109G GLCM)
- **501st Tactical Missile Wing**
  RAF Greenham Common, UK
  (BGM-109G GLCM)
- **513th Airborne Command and Control Wing**
  RAF Mildenhall, UK
  (USAFE EC-135; MAC rotational C-130; SAC rotational KC-135, SAC SR-71)
- **7020th Air Base Group**
  RAF Fairford, UK
  (SAC rotational KC-135)
- **7274th Air Base Group**
  RAF Chicksands, UK
  (Support; communications)

SIXTEENTH AIR FORCE (USAFE)

Headquarters, Torrejon AB, Spain

Commander
Maj. Gen. Winfield S. Harpe

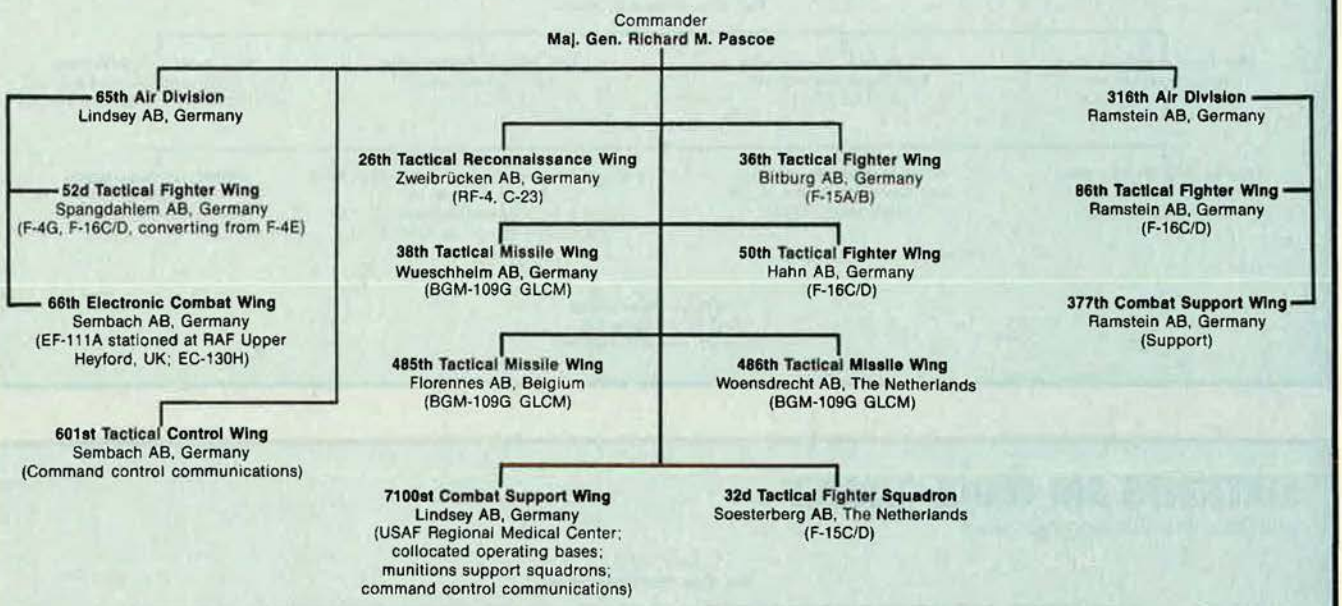
- **Hq. TUSLOG**
  Ankara AS, Turkey
  (Logistics management)
- **401st Tactical Fighter Wing**
  Torrejon AB, Spain
  (F-16C/D)
- **406th Tactical Fighter Training Wing**
  Zaragoza AB, Spain
  (Tactical range support, weapons)
- **487th Tactical Missile Wing**
  Comiso AB, Italy
  (BGM-109G GLCM)
- **39th Tactical Group**
  Incirlik AB, Turkey
  (Rotational USAFE aircraft)
- **7217th Air Base Group**
  Ankara AS, Turkey
  (Command and logistical management)
- **40th Tactical Group**
  Aviano AB, Italy
  (Rotational USAFE aircraft)
- **7206th Air Base Group**
  Hellenikon AB, Greece
  (Support; communications)
- **7275th Air Base Group**
  San Vito dei Normanni AB, Italy
  (Support; communications)
- **7276th Air Base Group**
  Iraklion AB, Crete
  (Support; communications)
- **7241st Air Base Group**
  Izmir AS, Turkey
  (NATO unit support)

—USAF photo by SSgt. Fernando Serna

Fighter aircraft of US Air Forces in Europe (USAFE) are protected and maintained in such hardened shelters as this one at Hahn AB, West Germany, featuring an F-16 in the foreground. USAFE is the air component of the US European Command and an indispensable element of the North Atlantic Treaty Organization. USAFE's Commander in Chief also serves as Commander, Allied Air Forces Central Europe, shouldering sweeping geographical responsibilities.

SEVENTEENTH AIR FORCE (USAFE)

Headquarters, Sembach AB, Germany



(The GLCMs will be phased out following Senate ratification of the Intermediate-range Nuclear Forces Treaty signed in 1987.)

Other command improvements include USAFE-negotiated host nation storage facilities and standard shipping containers for munitions transport and storage at forward bases. Weapons maintenance and explosive-ordnance disposal have been added to the command's annual "Sure-Fire" competition to enhance munitions handling. With cooperation from its NATO partners, USAFE has developed the most modern aircraft refueling systems in the free world. Examples include computer-controlled refueling in hardened aircraft shelters and improved ramp refueling systems.

Through US and NATO funding, the command has completed seven hardened avionics shelters. Construction is under way on 950 semihardened aircraft shelters for NATO-committed units. Other hardening, sheltering, and chemical-warfare protection programs are also under way throughout the command. Under terms similar to those of an agreement USAFE has with the United Kingdom, Germany and Turkey operate US-owned air defense assets—the Roland in Germany and Rapier in Turkey—to provide critically needed point air defense.

USAFE has established a full-scale air-base operability (ABO) program to ensure that combat and support units can survive attack and recover rapidly. The new organization includes a headquarters directorate and ABO divisions at twenty-two bases. The new divisions merged additional manpower with disaster preparedness and explosive-ordnance disposal to form a single manager for base-wide survival and recovery. Areas emphasized include survivable communications and utilities; rapid runway repair; individual and collective chemical protection; camouflage, concealment, and deception; and hardened protection of critical assets.

The first Survivable Collective Protection System-Medical (SCPS-M) has been completed at Ramstein AB, West Germany. It puts "shirtsleeve" wartime medical care into fixed locations where most Air Force casualties will be generated during chemical/biological warfare. Ten contingency hospitals provide a 5,011-bed capacity—a more than 100 percent increase in the past three years. A 1,000-bed hospital is planned for Luxembourg, 500-bed hospitals are planned for Belgium and the Netherlands, and a 500-bed facility is being negotiated with Denmark.

The USAF Regional Medical Center, located at Wiesbaden, West Germany, began a major two-year upgrade last year. New clinics and other medical construction are planned at five other bases.

USAFE is firmly committed to its 64,000 military men and women, more than 29,000 associates from other major commands, the 11,000 civilian team members, and their family members in seventeen European countries. Quality of life remains a top command priority. Accompanied tour options have been increased, and twenty-three Family Support Centers assist service members and families. Four hundred housing units were recently constructed in the United Kingdom and 460 at Comiso AB, Italy. Another 3,000 units are under design and construction elsewhere in the command.

"Creek Positive" programs reflect increased emphasis on improving quality of life to help reduce personnel costs. Phase one funded 150 community facilities, which include dormitories, dining halls, and family support centers. Phase two emphasized customer service, increased operating hours at community facilities, and similar initiatives. Approximately 2,900 people extended or requested consecutive overseas tours for an initial savings of $32 million.

In summary, new USAFE weapon systems are more reliable and easier to maintain. Aircraft availability rates are the highest ever. Spare parts increases have enabled sortie generation nearly to double. Aircrews are flying more than in 1980, and aircrew proficiency is at its highest in years. The key ingredient in those achievements is people. The challenges of readiness and deterrence remain. USAFE's ready warriors have shown they can and will continue to meet those challenges. ■

Air Force Accounting and Finance Center

THE Air Force Accounting and Finance Center (AFAFC), located at Lowry AFB, Colo., is the focal point for Air Force financial operations for the worldwide network of 124 Air Force Accounting and Finance Offices (AFOs), numerous disbursing agent offices, geographically separated units, and 132 Air Force Reserve payroll offices.

AFAFC provides centralized pay service to all Air Force military members, including active duty, retired, Air National Guard, and Air Force Reserve. The center also accounts for all money appropriated to the Air Force and reports to Congress and financial managers throughout the government on the use of these funds.

AFAFC is also the DoD executive agent for supporting the Security Assistance Accounting Center (SAAC). A component of the Defense Security Assistance Agency, SAAC is responsible for overall financial management of the total DoD Foreign Military Sales (FMS) program. These responsibilities include centralized accounting, billing, collecting, analysis, and systems development for the 17,000 active FMS cases valued at approximately $144 billion. To improve FMS financial management, SAAC is developing an automated accounting and billing system that will be linked to improved automated systems in each of the services.

The center directly supports the Air Staff Directorate of Budget in the areas of policy and procedures, information systems, and financial analysis. It is a vital link in the Comptroller Office Automation Network (COAN) and is active in data management and development functions. AFAFC is also the Comptroller focal point for wartime and contingency planning and is responsible for developing and maintaining planning documents that guide Comptroller activities in the areas of training, education, and personnel development. The Directorate of Comptroller Support is the focal point for small computers in the comptroller community.

In 1987, the center's sixty-nine officers, 165 enlisted, and 2,156 civilians paid more than 803,000 active, Guard, and Reserve personnel from combined appropriations totaling more than $21 billion. AFAFC accounted for more than $120 billion, controlled more than 31,000 reports, and processed more than 1,400,000 disbursement and collection vouchers.

The Joint Uniform Military Pay System (JUMPS) Data Collection System, using desktop microcomputers, has replaced the IV-Phase minicomputer. The results are a cost savings of more than $1 million per year in lease and maintenance costs. This system eliminates numerous time-consuming software and hardware maintenance jobs associated with maintaining the IV-Phase minicomputer. It does not require a controlled environment, has versatility allowing multiple applications, and still maintains the twenty-four-hour turnaround time for processing pay actions.

An Automated Agent Input System (AAIS) provides pay service to Air Force members at remote locations. This system has been implemented at all agent and geographically separated large units. The system uses a desktop microcomputer connected directly to AFAFC for transmitting and receiving pay information. This system enhances customer service by providing on-line Electronic Case Control System capability, twenty-four-hour turnaround time for pay actions, and on-line pay record inquiry capability.

The Trainee Military Pay System, using Automated Teller Machines (ATMs), was implemented last June. The new system greatly improves customer service. Development is now under way on the Worldwide ATM Prototype test to determine whether active-duty personnel can be paid their regular military pay or travel pay through the machines.

Retired Pay Operations paid more than $6.8 billion to 546,834 retirees and 37,043 annuitants under the Survivor Benefit Plan. Air Force retirees enjoy customer service at 124 bases worldwide in addition to service over toll-free telephone lines from anywhere in the United States. An automatic sequencer controls phone calls, ensuring better service by answering calls promptly, announcing messages, and distributing calls in the order they are received.

The new Casualty and Annuitant Pay System, implemented in March 1986, improves casualty reporting, provides faster settlements of arrears of pay and survivor benefit cost refunds, and expedites the first check to annuitants. The total system overhaul is scheduled to be completed in August 1991.

Work continues on designing a centralized pay system for Air Force civilians. The current system, which operates at 100 locations throughout the Air Force, is complex and labor intensive. Under the centralized method, civilians will be paid from AFAFC. This new system will operate more efficiently and provide better service.

By the end of 1987, the System 2200 program had installed fifty-six Sperry System 2200 computer systems in base-level comptroller organizations. These new computers are used to run accounting and finance as well as budget systems. Five of the seven software packages to be developed have been completed and distributed, and the remaining two will be fielded in 1988.

To complement changes in travel pay, the Automated Travel Record Accounting System (ATRAS) was developed to automate travel-voucher processing. The system will provide an integrated one-step process for computing vouchers, making payments, updating accounting records, and posting a centrally maintained travel record. This will speed travel-voucher processing time, improving customer service.

One unique function at AFAFC is performed in the freight and travel office of the Directorate of Settlement and Adjudication. This office judges and files claims against commercial carriers for in-transit loss or damage of government-owned property and ensures that collections are made for the Air Force. The office is also responsible for the Air Force Freight Loss and Damage Claims System and portions of the DoD Freight Claim System. In FY '87, claims in the amount of $2,090,000 were assessed against commercial carriers, and $705,000 was collected. This does not include property recovered as a result of claim actions. Also, 1,230 doubtful travel claims were settled. Revised regulations were published for use by transportation field personnel. Two workshops were conducted at AFAFC

and attended by 130 working-level transportation personnel. This will improve the quality of reports submitted for claim action, resulting in increased recovery from the carrier.

The banking industry continues to recognize the Air Force direct deposit program as one of the most successful in the world. Currently, ninety-four percent of active duty, eighty-three percent of all civilian employees, forty-six percent of Air Force Reservists, and forty-eight percent of the Air National Guard participate voluntarily.

The center's Directorate of Resource Management is acquiring a new Office Information System (OIS). The Local Area Network (LAN) provides the latest innovations to rid employees of the tedious methods of handling paperwork and will connect this electronic marvel to other offices within DoD through the Defense Data Network and the Comptroller Office Automated Network.

In 1987, the Judge Advocate General of the Air Force delegated two new jobs to the center. The Staff Judge Advocate became the reviewing and certifying official for DD Forms 1787, which pertain to former members and current or former defense contractor employees, and for DD Forms 1357, which pertain to retired regular officers. The Staff Judge Advocate was also tasked with filing proofs of claim for certain nonbusiness bankruptcies and monitoring bankruptcies where the Air Force is either the employer or a creditor.

On December 2, the employees of AFAFC received the Air Force Organizational Excellence Award for their efforts from January 1, 1985, through December 31, 1986. Their work during this period resulted in dramatic improvements to the accounting and finance network worldwide and provided the men and women of the Air Force with the best financial and accounting support in DoD. The center continues to put into action their motto: "Serving With Honor . . . Honored With Trust." ■

Air Force Audit Agency

THE Air Force Audit Agency (AFAA), a separate operating agency headquartered at Norton AFB, Calif., provides all levels of Air Force management with independent, objective, and constructive evaluations of the effectiveness and efficiency with which managerial responsibilities (financial, operational, and support) are carried out.

The Auditor General of the Air Force, John W. Boddie, reports directly to the Secretary of the Air Force. This enables AFAA independently to assess the activities and functions it audits. Brig. Gen. Basil H. Pflumm, the Deputy Auditor General, is located in the Pentagon and acts for the Auditor General at the Air Staff and Secretariat.

AFAA has two staff directorates (Operations and Resource Management) and the following three line directorates:

- The Acquisition and Logistics Systems Directorate at Wright-Patterson AFB, Ohio, directs the development and management of audits relating to supply, maintenance, acquisitions, weapon systems, foreign military sales, and installation-level logistics.
- The Forces and Support Management Directorate at Norton AFB, Calif., directs the development and management of audits relating to personnel, support services, information technology, comptroller, nonappropriated funds, forces management, communications, intelligence, and transportation.
- The Field Activities Directorate, also at Norton AFB, Calif., manages installation-level audit work at sixty-seven area audit offices located at major Air Force installations worldwide. Supervision of the sixty-seven offices is exercised through four geographic region offices located at Andrews AFB, Md. (Eastern), Offutt AFB, Neb. (Central), McClellan AFB, Calif. (Western), and Ramstein AB, West Germany (European).

In March 1986, the Office of Representative for Air Force Logistics Command ADP Modernization was established at Wright-Patterson AFB, Ohio, to review programs and provide management advisory support in connection with the AFLC ADP Modernization Program (updating computerized logistics system). This representative reports directly to the Auditor General.

The agency has two basic procedures for reporting audit results to Air Force management:

- Reports of audit containing the overall results of centrally directed multisite audit efforts, which are addressed to top major command and air staff management levels.
- Reports of audit containing results of installation-level audits, which are addressed to local commanders.

The Audit Agency employs 1,000 people and has a civilian/military ratio of seventy-five/twenty-five percent. Ninety-seven percent of the auditors have at least one college degree, and forty-three percent have graduate degrees. Also, thirty-eight percent of Audit Agency personnel are certified public accountants, certified internal auditors, and/or certified information system auditors. ■

Air Force Commissary Service

THE Air Force Commissary Service (AFCOMS), with headquarters at Kelly AFB, Tex., operates 113 troop-support facilities and 146 resale stores around the world.

The primary mission of AFCOMS in peace and war is troop support. This separate operating agency ensures that food and rations are available for troops either on the battlefield or in dining facilities.

AFCOMS's most visible mission is the day-to-day operation of resale commissary stores in the United States and abroad. In 1987, AFCOMS handled more than $2.2 billion in sales, averaging $8.7 million in daily sales. This makes AFCOMS the tenth largest food retailing group in the United States.

Recent surveys show that the com-

missary benefit is considered the second most important nonpay compensation for Air Force people. It ranks just behind medical benefits as the reason career airmen remain in the Air Force.

Air Force commissaries sell goods at cost plus a five percent surcharge. The surcharge is required by law to pay for equipment, supplies, and other operating expenses.

Patrons save an average of twenty-five percent by shopping in the commissary. In 1987, they saved more than $730 million simply by taking advantage of this discount. Thanks to special sales and deep price cuts of up to fifty or sixty percent on certain items throughout the year, patrons save even more.

In 1987, shoppers added to their savings by redeeming nearly 110,000,000 cents-off coupons. Close to $50 million in customer savings was generated by the use of coupons.

Commissary managers are finding innovative ways to save their patrons money. Sidewalk sales, truckload sales, and case-lot sales are becoming more commonplace. In some locations, managers have purchased entire fields of produce—strawberries and watermelons, for example—and sold them to customers for much less than the "farmers' market" price.

The major goal of the almost 11,000 civilian and military employees of AFCOMS is to provide excellent commissary service. Initiatives in the past have gone a long way toward meeting this goal, and 1987 was no exception.

More Air Force commissaries were open during hours that would provide additional shopping time for working couples and families on the go.

In 1987, twelve new commissaries were opened. Four of those were overseas, where patrons rely heavily on their commissary for a "touch of home." Two stores that opened in the US last year were in remote northern-tier areas. And a second store was opened at MacDill AFB, Fla., where the shopping population had outgrown the first commissary's capacity.

Additional Wee Serv stores—small stores collocated with the main stores—were opened. Wee Servs are generally open during the hours that the main store is closed. They sell quick-stop items, such as bread and milk, and other fast-selling staple items at the same prices as those at the main commissary.

AFCOMS has taken some behind-the-scenes steps to ensure excellent service. Several stores now operate the Automated Commissary Operations System. When installation of the system is completed later this year, all phases of commissary operations will be tracked by computer.

For the first time ever, commissary officers will know at the stroke of a few computer keys what items sell and how many of those items are likely to be sold during a certain period.

At the headquarters, the Commissary Automated Management Network (CAMNET) has been installed. CAMNET allows real-time communication with any commissary store in the system. Through CAMNET, headquarters personnel are tracking store operations and spotting potential problems before they occur. ■

Air Force Engineering and Services Center

THE US Air Force Engineering and Services Center (AFESC), Tyndall AFB, Fla., is a separate operating agency, developing policies and programs in support of Hq. USAF.

The center also provides engineering and service guidance and assistance to MAJCOMs and bases in the areas of readiness (encompassing all Prime BEEF, Prime RIBS, and RED HORSE forces), fire protection, bachelor housing, food services, mortuary services, and the overall operation and maintenance of facilities at all Air Force installations.

The center's laboratory is the Air Force's lead laboratory in air base operability, civil engineering, and environmental science and engineering research and development. Efforts are directed at current and future wartime requirements, including hardened structures, utility systems, aircraft operating surfaces, and fire protection. The laboratory is also developing new and cost-effective technologies to solve existing environmental problems and to anticipate and minimize adverse environmental consequences of new Air Force weapon systems. It also conducts research and development geared to improve rescue, fire detection, and fire suppression systems.

Developing procedures and equipment for rapid runway repair (RRR) in wartime, a responsibility of the center, includes full-scale engineering development and initial acquisition of all Air Force RRR systems that improve the capability to launch and recover mission-essential aircraft.

The center develops cost data to ensure that weapon system beddown and program costs include sufficient funds to acquire, operate, and maintain needed facilities as part of the formal Independent Cost Analysis Program. The center is also helping all levels of engineering and services to "work smarter" through the development, programming, and fielding of the Work Information Management System (WIMS) and the Services Information Management System (SIMS).

In 1987, Hq. Air Force Engineering and Services Center and its many travel teams:

- Conducted joint tests with the USAF Tactical Air Warfare Center at North Field, S. C., on final development of folded Fiberglas mats for rapid runway repair and operational test on polymer spill repair techniques and a minimum operating strip marking system.
- Assisted in arranging hydropower transportation or "wheeling" agreements for new hydro-allocations at thirteen bases that will result in savings in excess of $4 million annually during each of the next fifteen years.
- Assisted bases and major commands in arranging new gas-supply contracts from alternative gas suppliers, resulting in an annual savings in excess of $6 million.
- Conducted pavement evaluation and skid tests at thirty-two bases.
- Implemented an "expert system" for design of pavements that employs user-friendly design programs, computerized guide specifications, and standard details.
- Designed, developed, and demonstrated the accuracy of a parametric estimating system for managing the cost of DoD facilities from con-

cept formulation through construction.

- Developed, with the MAJCOMs, the Air Force concepts and strategies for privatization and also obtained congressional approval for executing the concept through an out-lease of land for visitors quarters at Wright-Patterson AFB, Ohio, and at Nellis AFB, Nev.
- Conducted Readiness Challenge '87, an exercise in which Prime BEEF and Prime RIBS teams representing fourteen commands demonstrated their combat support skills and competed in the categories of force and base recovery after attack.
- Completed full-scale development of a device (SAFECOMP) that will revolutionize fire protection for computer and other electronic equipment by detecting and suppressing fires within equipment cabinets.
- Completed concept design for an automatic fixed fire-protection system for hardened aircraft shelters that will detect and extinguish fires within ten seconds of combustion.
- Reissued ten generator sets for the Air Force Excess Real Property Program, saving more than $5 million.
- Provided three 1,000-kW emergency power systems to Lajes Field, Azores, saving $1 million in rental costs.
- Completed the installation of four rebuilt generator sets for Thule AB, Greenland, saving more than $3 million.
- Provided one 500-kW emergency power system to Dyess AFB, Tex., in support of B-1B testing. ■

Air Force Inspection and Safety Center

THE Air Force Inspection and Safety Center (AFISC), Norton AFB, Calif., provides the Secretary of the Air Force, the Chief of Staff, and major commands and separate operating agencies an assessment of Air Force fighting capability and resource management effectiveness. Maj. Gen. Stanton R. Musser commands AFISC and is also the Deputy Inspector General for Inspection and Safety, Hq. USAF.

AFISC is assigned 363 military and 139 civilian people who represent 111 Air Force specialties. The center incorporates four directorates and two offices.

- The Directorate of Inspection determines the operational readiness status within the major commands by analyzing their operational readiness inspection (ORI) results and by conducting assistance and command evaluation (ACE) inspections with command inspector general teams during ORIs. The directorate also evaluates the effectiveness and efficiency of USAF management systems through functional management inspections (FMIs), system acquisition management inspections (SAMIs), and follow-up inspections.
- The Directorate of Aerospace Safety is the Air Force manager for flight, ground, missile, explosives, and systems safety programs. This di-

—USAF photo by Bob King

Aircraft accident investigators examine an area containing authentic wreckage as part of Air Force Inspection and Safety Center's Flight Safety Officer Course at Norton AFB, Calif. The center's "Crash Lab" provides eyes-on and hands-on training to investigators from all US armed services. AFISC incorporates four directorates and two offices. Altogether, they are manned by 363 military and 139 civilian personnel representing 111 Air Force specialties. The directorates deal in inspection, aerospace safety, nuclear weapons surety, and medical inspection. The offices have to do with computer systems and resource management. The AFISC commander is also USAF's Deputy Inspector General for Inspection and Safety.

rectorate provides guidance and monitors the implementation and effectiveness of mishap-prevention programs. This includes administering the investigation and reporting of mishaps to determine their cause and corrections.

• The Directorate of Nuclear Surety manages the Air Force Nuclear Weapons Surety Program and ensures that DoD nuclear weapon system safety standards are met during all phases of design, operation, maintenance, modification, and movement. The directorate uses various program elements. These include the Nuclear Safety Inspection System, the Accident/Incident Reporting System, the Nuclear Safety Certification Programs, the Personnel Reliability Program, and the Two-Man Concept.

The directorate also has the nuclear surety responsibilities for terrestrial nuclear reactor systems and for review procedures concerning nuclear power systems and space or missile use of radioactive resources. Located at Kirtland AFB, N. M., the directorate is near the hub of the nuclear community for close coordination on nuclear-related matters with the Air Force Weapons Laboratory, Field Command Defense Nuclear Agency, the Department of Energy, Sandia National Laboratories, the Air Force Office of Security Police, and Los Alamos National Laboratory.

• The Directorate of Medical Inspection plans and conducts Air Force health services management inspections (HSMIs), Air National Guard/Reserve components health services readiness inspections (HSRIs), and special investigations to ensure effective management of health-care resources and the readiness of Air Force medical units. In addition to the 290 functional areas inspected in each medical facility, special emphasis items, as selected by the Air Force Surgeon General, are given close attention.

• The Office of Computer Systems provides the commander and his staff with automatic data processing, database management, and computer systems support. It designs and develops all computer application software and operates a centrally located computer system to support all aspects of AFISC's mission. The office also serves as USAF custodian and repository for flight records (dating from 1911) of rated individuals.

• The Office of Resource Management directs the center's manpower, personnel, budget, and supply functions plus plans and programs development. ■

Air Force Intelligence Service

THE Air Force Intelligence Service (AFIS), a separate operating agency reporting directly to the Assistant Chief of Staff for Intelligence (ACS/I), provides the Air Staff with perspective and synergy in the application of all-source intelligence in support of the Air Staff and combatant commands.

More than 2,300 active-duty, reserve, and civilian intelligence professionals are stationed worldwide to collect, process, disseminate, and apply reliable, accurate, and timely intelligence for Air Force commanders during peace, war, and contingency situations.

Headquartered in Washington, D. C., AFIS is composed of eleven directorates functionally aligned under Deputy Commanders for Assessments and Resources and the Air Force Special Activities Center.

The Deputy Commander for Assessments is responsible for estimative, targeting, and warning intelligence. The directorates within the deputate are Regional Estimates, Research and Soviet Studies, Threat and Technology, Warning and Current Intelligence, and Targets.

AFIS acts as the ACS/I's executive agent in the national intelligence process by developing Air Force positions in National Intelligence Estimates (NIEs), Defense Intelligence Projections for Planning (DIPPs), Air Force Planning Guide (AFPG), and a host of other finished intelligence assessments used by plans and operations staffs.

AFIS directorates work closely with Air Force System Command's Foreign Technology Division in determining the threat posed by current and projected foreign weapon systems to Air Force weapon systems. These estimates, provided to Air Force weapons design and acquisition experts, ensure that USAF systems will be effective on the battlefields of today and tomorrow.

AFIS elements conduct the Soviet Awareness Program. While hosting presentations at Bolling AFB, D. C., and throughout the world, they also publish several unique publications on Soviet military writings. Also at Bolling is the Directorate of Targets, the Hq. USAF executive agent for classical targeting functions as well as for influencing weapons research, development, and acquisition. The directorate is also the focal point for all USAF mapping, charting, and geodesy matters.

From the Pentagon, AFIS provides daily intelligence highlights to more than eighty organizations, including all four services, the Defense Intelligence Agency, the State Department, and the White House. Additionally, the Secretary of the Air Force and the Chief of Staff receive AFIS intelligence briefings on a regular basis and special briefings as necessary.

The Deputy Commander for Resources, with elements at Bolling AFB and Fort Belvoir, Va., is responsible for AFIS's intelligence-related support functions, including the Directorates of Security and Communications Management, Intelligence Data Management, Personnel/Force Management, Intelligence Reserve Forces, Attaché Affairs, and Joint Services Support.

AFIS sets policy and manages the worldwide Air Force Special Security Office and Sensitive Compartmented Information programs. AFIS also plans, develops, and manages all Air Force intelligence data-handling systems.

AFIS also develops and manages policies and procedures for intelligence personnel accessions and training and professional development for both active-duty and reserve forces. AFIS also centrally manages 1,400 intelligence reservists to support peacetime, wartime, and contingency requirements of twenty-six MAJCOMs and agencies.

Other functions managed by AFIS organizations include Air Force participation in the Defense Attache program, Department of Defense Code of Conduct training programs, and central control of Air Force human intelligence activities. ■

Air Force Legal Services Center

THE Air Force Legal Services Center (AFLSC) is a separate operating agency headquartered in Washington, D. C. The center helps provide complete civil and military legal services to US Air Force members around the world.

Members of the center provide independent and specialized legal services to Air Force members in the areas of military justice, claims for and against the Air Force, tort litigation, labor law, environmental law, acquisition law, preventive law, and legal aid. The center also handles all Air Force patent, copyright, and other intellectual property matters, provides trial officials for general and special courts-martial, and reviews trial results.

The Air Force Judge Advocate General serves in a dual role as Commander of the Air Force Legal Services Center. Approximately 600 people are assigned to the center, staffing legal offices in Washington, D. C., and at virtually every Air Force installation in the world.

The Judiciary Directorate in the Air Force Legal Services Center has several divisions that administer or manage a variety of military justice services.

- The Court of Military Review reviews all courts-martial resulting in dismissal, confinement of one year or more, or dishonorable or bad-conduct discharges. The Court was established by the Military Justice Act of 1968, which expanded the duties of its predecessor, the Air Force Board of Review, and assigned them to the Court of Military Review. Decisions made by the Court of Military Review may be appealed for limited issues to the US Court of Military Appeals and the US Supreme Court.
- The Military Justice Division reviews, for general sufficiency, those records of trial by general courts-martial that are not reviewed by the Court of Military Review. The division advises the Judge Advocate General on petitions for new trial or relief from conviction and directs the travel of witnesses required to appear in overseas courts-martial. The division also prepares a number of regulations, manuals, and policy letters relating to the administration of military justice. Another service is the preparation of responses to high-level military justice inquiries.
- The Defense Services Division provides defense services to Air Force members appearing before the Court of Military Review, the US Court of Military Appeals, and the United States Supreme Court. Supervision of all area defense counsel and circuit defense counsel is another responsibility of this division.
- The Trial Judiciary Division oversees seven judiciary circuits and their three subordinate districts throughout the world. The chief judge of each circuit supervises the military judges and court administrators of that circuit. Military judges are appointed to the trial judiciary by the Judge Advocate General. The judges hear all courts-martial and, when available, act as legal advisors to administrative discharge boards and as hearing officers for environmental impact hearings. Air Force judges are assigned to the Air Force Legal Services Center to ensure independence.
- The Government Trial and Appellate Counsel Division represents the Air Force before the Air Force Court of Military Review and the US Court of Military Appeals and assists the Solicitor General in appeals to the United States Supreme Court. The division also supervises the twenty-one full-time circuit trial counsel who prosecute most general and special courts-martial. Military lawyers in the division also provide guidance and training in courts-martial to base-level legal personnel engaged in trial work.
- The Special Assistant for Clemency and Rehabilitation Matters recommends appropriate clemency actions, including reduction in sentence, change in place of confinement, or substitution of administrative discharge for selected court-martial convictions. The special assistant also advises the Judge Advocate General on and monitors matters of confinement, corrections, and rehabilitation policies and programs. The assistant responds to all congressional, executive, and individual correspondence dealing with confinement, clemency, and post-trial matters. The special assistant also maintains liaison with the US Disciplinary Barracks at Fort Leavenworth, Kan., and the Air Force Retraining Program at Lowry AFB, Colo.

A portion of the Civil Law Directorate is also in the center and has divisions responsible for a portion of claims and tort litigation, general litigation, patents, preventive law and legal assistance, contracts, and environmental law.

- The Claims and Tort Litigation Division performs operational and management functions over claims and tort litigation arising from worldwide Air Force activities. The division settles or recommends settlement of claims above the base-level settlement authority and provides litigation support to the Department of Justice during its defense of tort suits filed against the Air Force. The division also develops Air Force claims regulations and policies and exercises operational supervision of subordinate claims offices.
- The General Litigation Division protects Air Force interest in all domestic litigation except in copyright and patent cases, contract cases, environmental cases, and cases arising under the Federal Tort Claims Act. Legal actions are concentrated in the major areas of information, privacy, personal torts, personnel matters, general litigation, utilities, and labor law.
- The Contract Law Division represents the Air Force in contract litigation, such as lawsuits filed by contractors for money damages, suits seeking injunctions against the award of contracts, and bankruptcies. This division advises the Judge Advocate General on all contract law matters, including fraud, waste, and abuse. The Contract Law Division also furnishes direct contract law support to all major command staff judge advocates and their base legal offices.
- The Environmental Law Division provides representation in environmental matters throughout the Air Force. For example, this division provides Air Force legal representation regarding environmental matters before the Environmental Protection Agency regional headquarters, the states, and their regional and local implementing agencies.
- The Patents Division manages matters concerning inventions, patents, copyrights, trademarks, and trade secrets and rights in USAF technical data. The division investigates and assists the Department of Justice in all patent and copyright claims litigation against the Air Force. It con-

ducts patent searches, prepares and prosecutes patent applications for the Air Force, administers the Inventions Secrecy Act, and manages the Air Force patent licensing program. Further, the division advises, counsels, and renders opinions to Air Force activities on questions about inventions, patents, copyrights, trademarks, trade secrets, rights in technical data, and related matters.

• The Preventive Law and Legal Assistance Office supervises the worldwide Air Force preventive law and legal assistance program, through which installation legal officers assist Air Force members with their legal affairs. The division also maintains a clearinghouse of material for use in improving the legal assistance program and annually publishes and distributes the *All States Income Tax Guide.*

Computers are playing an increasingly important role in modern law. The Air Force Legal Services Center uses computers to track claims with the Claims Administrative Management Program and to monitor military justice activities with the Automated Military Justice Analysis and Management System.

On behalf of the Department of Defense, the center also oversees the Federal Legal Information Through Electronics computer system, which provides computerized research of reported case law, including Comptroller General decisions and Air Force administrative regulations. The computer system is located in Denver, Colo., and its research base is constantly expanding to meet the needs of the Judge Advocate General as well as those of other DoD users. ■

Air Force Management Engineering Agency

THE Air Force Management Engineering Agency (AFMEA) leads Air Force efforts to make the best use of valuable manpower resources.

AFMEA's primary mission is to develop and maintain Air Force manpower standards to improve manpower utilization and assure the implementation of technical and procedural guidance for the Air Force Management Engineering Program (MEP). In addition, AFMEA manages Air Force Productivity programs, develops manpower programming tools, and provides data systems support for the MAJCOM manpower community.

To do this, AFMEA works with units and headquarters to apply the most progressive industrial engineering techniques available. The resulting manpower standards specify, by grade and skill, the correct number of people necessary to perform each unit's mission. The MEP also enables AFMEA and commanders to assess wartime manpower needs and develop models to help commanders determine what manpower will be required for wartime operations.

AFMEA administers major Air Force productivity programs that capitalize on technological advances and new ideas to increase productivity and free manpower for other priorities in the Air Force. These programs include the Air Force Suggestion program, Fast Payback Capital Investment (FASCAP) program, and Commercial Activities (A-76) program. In FY '87, the Suggestion program saved taxpayers a record $309 million. Also in FY '87, AFMEA directed the distribution of $10.5 million to help bases finance productivity improvements and provided technical guidance to MAJCOMs for the A-76 program, which eliminated 1,271 work-years, thereby saving taxpayers another $14 million.

AFMEA's other major responsibilities include managing the Air Force's officer/enlisted grade distribution; operating and maintaining the Logistics Composite Model (LCOM), a computer simulation that determines maintenance manpower requirements for different weapon systems; developing Transient and Holding Accounts factors for special Air Force manpower accounts; and providing automated support for facets of the manpower management community that involve management engineering and productivity programs, including the following systems: Microcomputer Manpower Standards Development System (Micro-MSDS), Single Location Standards Development System (SLSDS), Commercial Activities Management Information System (CAMIS), Manpower Central Address and AIG System (MCAAS), and the AFMEA Bulletin Board System.

From its headquarters at Randolph AFB, Tex., AFMEA directs ten subordinate units throughout the US and provides assistance and technical guidance to Command Management Engineering Teams (CMETs) at nearly every Air Force base in the world. These ten units include eight Functional Management Engineering Teams (FMETs) and two specialized units.

The FMETs are responsible for using industrial engineering work measurement techniques to develop efficient organizations and manpower standards in functional areas common to most locations throughout the Air Force. When possible, the FMETs are collocated with functional centers.

The FMETs include the Comptroller Management Engineering Team located at Lowry AFB, Colo. (AFCOMPMET); Engineering and Services Management Engineering Team at Tyndall AFB, Fla. (AFESMET); Intelligence Management Engineering Team at Fort Belvoir, Va. (AFINTELMET); Medical Management Engineering Team at Maxwell AFB, Ala. (AFMEDMET); Manpower and Personnel Management Engineering Team at Randolph AFB, Tex. (AFMPMET); Special Staff Management Engineering Team at Peterson AFB, Colo. (AFSSMET); Security Police Management Engineering Team at Kirtland AFB, N. M. (AFSPMET); and Logistics Management Engineering Team at Dover AFB, Del. (AFLOGMET).

The specialized units are OLA at the Pentagon in Washington, D. C., which provides data support to Hq. USAF/PRM, and Air Force Wartime Manpower and Personnel Readiness Team (AFWMPRT) at Fort Ritchie, Md., which advises Hq. USAF on such matters as wartime manpower requirements, personnel availability, and training.

AFMEA has an authorized strength of ninety-two officers, 143 enlisted, and 106 civilians. ■

Air Force Military Personnel Center

THE Air Force Military Personnel Center (AFMPC), located at Randolph AFB, Tex., is the hub of Air Force personnel management programs. The center's mission is people, and nearly 600,000 active-duty Air Force men and women worldwide are affected by the procedures and policies formulated and implemented at AFMPC. In addition, AFMPC provides services to approximately 600,000 retired Air Force members.

The center is a separate operating agency commanded by Maj. Gen. Ralph E. Havens. General Havens also serves as the Assistant DCS/Personnel for Military Personnel, Hq. USAF.

AFMPC's most significant responsibility is to put people with the right skills in the right job in order to enable commanders to accomplish their missions. To do this, the center's staff of approximately 2,000 military and civilian personnel balances the need to accommodate individual preferences and professional goals with meeting the skill needs of commanders. But even before initial assignments are made, AFMPC works closely with the Air Force Recruiting Service and Air Training Command to acquire, classify, and train the numbers and types of people the Air Force needs.

Another major responsibility of the center is managing officer promotion programs and convening promotion boards. Last year, the center hosted sixteen selection boards for promotion of officers up through the grade of colonel and for promotions to senior and chief master sergeant. In addition, boards were conducted to select 713 officers for the Air Force Institute of Technology, fifty-four officers for Education With Industry, 885 officers and approximately 1,300 noncommissioned officers to attend professional military education courses in-residence, and 240 officers to attend special flying programs.

Other boards at the center identified individuals for various categories of special recognition, including the Twelve Outstanding Airmen of the Year.

During 1987, nearly 4,500 humanitarian assignment requests were processed, of which almost 2,100 were approved. In addition, more than 1,200 CHAP (Children Have A Potential) requests were processed, with almost 950 being approved. AFMPC also responded to more than 8,000 Presidential, congressional, inspector general, and other high-level inquiries on a myriad of personnel matters.

The center administers the Weighted Airman Promotion System (WAPS) and the Stripes for Exceptional Performers (STEP) program. In 1987, approximately 25,000 enlisted members received promotions under WAPS, and 550 were selected by commanders for STEP promotions.

Air Force awards and decorations, quality force, line of duty determinations, physical fitness, and dress and personal appearance programs are AFMPC's responsibilities, too. The center also handles all separations and retirements and is the focal point for retiree activities.

Quality force initiatives continued to influence reenlistments and retention activities in 1987. The Selective Reenlistment Program ensured that only the most highly qualified people were allowed to reenlist. More than 67,000 airmen reenlisted during FY '87, and more than 10,000 people were retrained into new career fields through voluntary and selective retraining programs to achieve a better balance in career field manning. In addition, worldwide retention symposia are held annually and help to focus attention on this Air Force priority.

Ensuring the ability of the personnel activity to support commanders and mission tasking in wartime is another continuing concern. Programs and procedures for mobility, mobilization, and sustainment procedures are developed, tested, and refined by AFMPC through participation in such exercises as Team Spirit.

AFMPC is also responsible for Air Force Morale, Welfare, and Recreation (MWR) activities. The Air Force Sports Program supports the operation of 196 fitness centers at 151 bases, 516 fields (softball, soccer, etc.), 478 tennis courts, and more than 1,000 various other facilities (tracks, racquetball courts, etc.) worldwide. Last year, 7,395 athletes participated in MAJCOM-level sports, while 1,097 athletes competed at Air Force-level championships.

The 1987 Tops in Blue Program, consisting of two units, one overseas and one Stateside, provided entertainment to more than 600,000 Air Force personnel and their families.

The MWR Marketing and Community Business Activities Division was formed to provide marketing guidance for all MWR programs and places specific emphasis on the management and operation of MWR revenue-generating programs. Marketing initiatives are directed at improved customer service and improved customer awareness of MWR. Initiatives in the open-mess area included the establishment of the Cost-Effectiveness Team concept designed to provide staff management assistance to open messes. Open-mess membership had a slight increase in FY '87, up 2,509 since 1986 for a total of 576,203 members.

The MWR initiative to increase critically needed child care for Air Force families was significantly enhanced by the establishment of 1,840 family day-care homes. The second Air Force-wide Teen Leadership Forum involving more than forty-five youth leaders was conducted in 1987, and plans are to expand the program overseas.

Programs to help those in need are also managed at AFMPC. Last year, Air Force members donated nearly $8 million to help others through the Air Force Assistance Fund.

Another primary responsibility of the center is to provide procedural and operational guidance to 126 active-duty consolidated base personnel offices worldwide. The center was also recently designated as the Air Force functional manager for more than 3,000 unit orderly rooms Air Force-wide and given the responsibility to coordinate future orderly room automation initiatives.

The center monitors the day-to-day operation of and develops programs for Social Actions at 134 bases and sixteen major commands and separate operating agency offices. Last year, the center implemented a new base-level curriculum, redesigned the Air Force Affirmative Action Plan, and developed a DoD-initiated counselor certification program.

To keep in touch with the Air Force's most important resource—people—AFMPC has an active survey program. Surveys provide senior leadership with important information in making personnel policy decisions.

Within AFMPC, the Office of the Surgeon is responsible for assuring

full staffing of health profession positions. At present, more than 1,800 physicians are being trained in active-duty or deferred status to meet physician specialty requirements. The Surgeon's Office is also responsible for monitoring nonflying physical standards, and it reviewed more than 2,600 physical exams and 2,300 medical evaluation board reports in FY '87.

One of the most sensitive areas AFMPC is charged with is administering the Air Force Casualty Service Program. In addition to assisting families of active-duty and retired casualties, the center maintains contact with the families of the 899 unaccounted-for Air Force personnel from the Southeast Asian conflict.

The Colonels' Group is an AFMPC special staff responsible for the worldwide assignment and personnel management of 6,000 colonels and colonel selectees to meet senior leadership requirements. In addition to the many assignment actions made annually, the Colonels' Group manages executive development programs, processes nondisability retirement actions, maintains master selection records, and manages the senior service school program for all colonels and colonel selectees.

To ensure that personnel information is transmitted from AFMPC to major commands, separate operating agencies, and bases in a fast, efficient manner, units are now linked by a worldwide computer system that provides this information twenty-four hours a day. This network includes powerful minicomputers at major commands and separate operating agencies, complemented by some 3,500 remote terminals installed throughout the Air Force's personnel community.

A recent center innovation, the Advanced Personnel Data System II, provides base-level personnel activities with terminals and software that automate office functions. It also provides access to data stored on the AFMPC large mainframe computers.

Personnel Concept III, a new computer-based program, is shaping the future of Air Force personnel management. This $152 million funded program will greatly enhance mission support by replacing time-consuming, labor- and paper-intensive base-level processes with fast, efficient electronic processing.

Exploiting advances in computer and communications technologies and the latest software designs, PC-III will, by 1992, be a worldwide network of more than 16,000 computers. This network will further extend the office automation benefits of APDS-II to unit level, expand the variety of automated personnel applications, and provide a means to ensure interoperability with other data systems throughout the Air Force.

It is AFMPC's aim to continue its efforts to develop systems, programs, and procedures that streamline administration and release more people to meet the Air Force operational mission. ■

Air Force Office of Medical Support

THE Air Force Office of Medical Support (AFOMS) is a separate operating agency with headquarters at Brooks AFB, Tex. The AFOMS Commander serves on the staff of the Surgeon General, USAF, as the Director of Health Care Support and is also the Deputy Corps Chief, Medical Service Corps.

The Air Force Office of Medical Support assists the Air Force Surgeon General in developing programs, policies, and practices relating to Air Force health care in peace and war. It acts for the Surgeon General to put policies and directives into effect. The office is organized into the Directorate of Health Care Support and selected Professional Affairs Activities.

The Directorate of Health Care Support develops plans, programs, and management guidance through its five divisions: Patient Administration and Biostatistics Division, Health Facilities Division, Medical Service Information Systems Division, Medical Logistics Division, and the Center for Healthcare Innovation. The Air Force Medical Logistics Office, located at Fort Detrick, Md., is an Air Force element assigned to the Medical Logistics Division, AFOMS.

The Patient Administration and Biostatistics Division formulates Air Force policy in the areas of patient affairs, medical records, and biostatistical reporting systems. This includes the development, implementation, operation, and management of all related functional activities within all medical facilities.

The Health Facilities Division serves as focal point for Air Staff management and coordination of all matters pertaining to medical facilities through the Military Construction Program, facilities maintenance and improvements, and medical facility design.

The Medical Service Information Systems Division monitors the development, acquisition, installation, and application of computer-based medical information handling and retrieval systems. This division is the automated data-processing single manager for Medical Service operations and performs special procedural and cost-benefit analyses.

The Medical Logistics Division develops plans and policies concerning medical material, both supply and equipment, biomedical equipment maintenance and repair, service contracts, and medical material support of Medical Service missions during peace and war. The Air Force Medical Logistics Office, Fort Detrick, Md., is an operational element of the Medical Logistics Division. It functions as an operational control center for medical material in direct support of all base medical facilities, major commands, the Air Force Reserve, the Air National Guard, and various defense supply centers. It is the direct contact point with the Defense Personnel Support Center and all USAF medical materiel activities. It is the USAF single manager of the medical commodity and provides technical operational guidance and surveillance of base and major command medical materiel maintenance activities.

The Center for Healthcare Innovation is responsible for facilitating, collecting, and disseminating all medically innovative practices throughout the Air Force medical community worldwide. The office develops programs and procedures to collect and compile ongoing comprehensive listings of all current and proposed innovative practices implemented within all Air Force medical treatment facilities.

Professional Affairs Activities consists of two programs and one committee, each serving as consultant to the Surgeon General in its particular areas of expertise.

The Health Promotion Program provides policy and guidance to major command and medical treatment facility program coordinators by disseminating health information on various components of wellness. The program staff develops and monitors health promotion publicity programs and collects data on the work load activities.

The Family Advocacy Program Office manages Air Force-wide programs designed to assist Air Force families with children that have exceptional medical or educational needs and to assist families experiencing family maltreatment. There is a major emphasis on outreach programs to increase awareness of and to prevent these problems from occurring. The program manager represents the Air Force on several DoD committees associated with these issues and serves as the consultant to the Surgeon General for all social work programs. There is a Family Advocacy Program Manager for each major command and a Family Advocacy Officer at each medical treatment facility.

The USAF Radioisotope Committee coordinates administrative and regulatory aspects of licensing, possession, use, storage, handling, and disposal of all radioactive material used by the Air Force. It acts as the only point of Air Force contact with the United States Nuclear Regulatory Commission on matters of licensing of radioactive material.

AFOMS is directly involved on a daily basis with the Air Force Surgeon General, other Air Staff directorates, major commands, and other federal agencies. A continuing interchange is required as operational policy and practices for medical support are developed and implemented. ■

Air Force Office of Security Police

THE Air Force Office of Security Police (AFOSP), located at Kirtland AFB, N. M., is commanded by Brig. Gen. Frank K. Martin, who also serves as the Assistant Inspector General for Security and as the Air Force Chief of Security Police. A staff of ninety-four is assigned to Kirtland AFB, and forty-five people are part of the Air Force Security Clearance Office, an operating location in Washington, D. C. Another fourteen are assigned to the Inspector General's staff at the Pentagon to represent security police at the Air Staff.

AFOSP develops security, law enforcement, air-base ground defense, and combat arms training and maintenance policies. The agency plans, directs, and manages programs for 50,000 active-duty, air reserve forces, and DoD civilian and contract civilian personnel in the security police and combat arms training and maintenance career fields. Programs include security of aerospace systems, maintenance of law and order, information security, management of security police personnel programs, vehicle traffic management, air-base ground defense, security police and combat arms training, security education, and prisoner rehabilitation and correction. AFOSP also manages security police systems and equipment programs and serves as the executive agent for DoD's Military Working Dog Program.

General Martin assumed command of AFOSP in February 1987 and was promoted to his present rank last August.

During 1987, AFOSP staff members reviewed and revised Air Force resources protection and aerospace systems security regulations to allow installation and unit commanders maximum flexibility in managing their programs. AFOSP also issued new guidance for confrontation management, emergency services and hostage negotiations teams, corrections, and security police investigations.

—Photo by Paul Kennedy

Air Force Office of Security Police patrolmen safeguard the surroundings of Peacekeeper ICBM silos at F. E. Warren AFB, Wyo. Headquartered at Kirtland AFB, N. M., AFOSP is responsible for many forms of USAF security, law enforcement, air-base ground defense, vehicle traffic management, security education, and prisoner correction and rehabilitation. Its explosives-detection capabilities are utilized by other government agencies.

Revised regulations and guidance were also published in the area of information security. The newly published Information Security Program regulation signified the biggest change to the information security program in the past fifteen years.

In response to concerns raised by some NATO countries, classification guidance for the installation of weapons storage and security system facilities was revised. The revised guidance recognizes host country security requirements and demonstrates the commitment of the Air Force to safeguarding this sensitive information. In addition, a new USAF Personnel Security Program regulation was published to streamline procedures for conducting personnel security investigations. It also places increased emphasis on granting security clearances only to the minimum number of personnel needed to ensure mission effectiveness.

AFOSP continued to support the US Secret Service, State Department, and other federal agencies with explosives-detection capabilities. Working with major command action officers, AFOSP accepted more than 200 Secret Service and State Department requests and dispatched more than 350 explosives-detector dog teams. Such teams provided support for Pope John Paul II's visit to the United States and for the tenth Pan American Games.

In October 1987, Army instructors at Fort Dix, N. J., began ground combat skills training for Air Force Security Police in both the law enforcement and security specialties. Three courses—one for enlisted grades from airman basic to senior airman, another for noncommissioned officers from sergeant to senior master sergeant, and one for flight leaders in officer grades from second lieutenant through captain—are now taught at Fort Dix. In FY '88, the Army will train approximately 7,000 security police.

The Air Force tested a new qualification training course for handgun users that included the introduction of a new firing stance and double-tap firing. The new procedures should give handgun users greater incapacitating power and leave them less vulnerable when fired upon.

The past year saw the initial deliveries of the new M9 personal defense weapon. AFOSP is the Air Force proponent for the M9 program.

The number of stand-alone microcomputers supporting the Security Police Automated System (SPAS) has increased to more than 3,300 throughout the Air Force. The Standard System Center also released updated software to increase the speed and efficiency of the system. SPAS is the first Air Force standard system based solely on microcomputers, and it will automate security and law enforcement management with more than 4,000 systems at 455 locations.

AFOSP information security personnel participated in a study of the Defense Investigative Service (DIS) under the Goldwater-Nichols DoD Reorganization Act of 1986. The report from the study of DIS support to the Air Force, which recommended sweeping changes to the Defense Industrial Security program, after approval by the Secretary of the Air Force and the Secretary of Defense, was submitted to Congress.

The information security staff presented regional personnel and industrial security seminars for security police at base level. The staff also spearheaded Air Force efforts to provide a greater deterrent to espionage and identify lifestyle changes indicative of an individual's susceptibility to espionage through increased emphasis on periodic reinvestigations of those who hold security clearances.

AFOSP also arranged four Law Enforcement Explorer Advisor conferences with the Boy Scouts of America at different Air Force bases throughout the country.

AFOSP sponsored the seventh annual Air Force Security Police competition, Peacekeeper Challenge. Seventeen teams representing Air Force major commands, the Air National Guard, the Air Force Reserve, and the Royal Air Force Regiment competed in eleven individual and team events. ■

Air Force Office of Special Investigations

THE Air Force Office of Special Investigations (AFOSI) has been the Air Force's major investigative service since August 1, 1948. Headquartered at Bolling AFB, D. C., its commander is Col. (Brig. Gen. selectee) Francis R. Dillon.

The primary responsibilities of AFOSI are to provide investigative and counterintelligence services to commanders USAF-wide. The organization seeks to identify and neutralize clandestine intelligence, subversion, terrorism, sabotage, and criminal activities that may threaten Air Force resources. AFOSI investigative services may be requested by an Air Force commander at any level. AFOSI commanders work closely with local wing/base commanders to direct effort to those commanders' priorities.

Local AFOSI detachments have a full range of on-call specialists and state-of-the-art techniques to assist them. Electronics, computer, forensics, and behavioral-science specialists routinely deploy worldwide to protect Air Force people and resources.

AFOSI's polygraph examiners, in addition to providing valuable investigative support, also support all other Air Force polygraph needs, such as screening those in special access programs and meeting requests by defense counsels, commanders, or other military and federal agencies. In 1987, AFOSI conducted some 6,000 polygraph examinations. The continued rapid growth of polygraph use is mostly due to its increased use for counterintelligence screening for those in special access programs.

AFOSI has about 3,000 people, of whom two-thirds are special agents. Ninety percent of special agents are military, both enlisted and officer, and ten percent are civilian. AFOSI recruits, selects, and trains its own special agents, who come from almost every Air Force specialty. About 240 officers, civilians, and noncommissioned officers annually attend the three-month-long investigators' course at the USAF Special Investigations Academy, located at Bolling AFB, D. C. Four hundred Individual Mobilization Augmentees also bring a wealth of civilian experience through AFOSI's Reserve program.

Fighting economic crime at all levels is a major AFOSI priority. The "typical" fraud investigation in 1987 dealt with a dollar value of $100,956, compared to $2,800 in 1982. Techniques at local levels to prevent and detect fraud include surveying high-value areas vulnerable to economic crime, developing intelligence networks in high-value activities, and briefings to base populations.

In the central weapon systems acquisition process, the "Seven Pros" program, established four years ago, continues to be a significant asset in

fighting major contract fraud. These special agents have recovered more than $30 million for the Air Force.

Hostile intelligence gathering and terrorist threats directed against Air Force people and resources continue unabated, requiring considerable activity in the counterintelligence area. In addition to analyzing data on this threat and producing numerous assessments, studies, and reports for commanders, major counterintelligence activities during 1987 included:

- Conducting 216 counterintelligence investigations concerning intelligence threats to Air Force people.
- Presenting 5,550 defensive counterespionage awareness briefings to more than 230,000 Air Force members.
- Providing AFOSI counterintelligence support to Air Force elements involved with systems security, technology transfer, and operations security.
- Conducting about 370 Protective Service Operations for key Air Force, DoD, other US government officials and foreign dignitaries.
- Providing 2,380 terrorist-threat/personal-security briefings to 70,000 Air Force members.

Investigating such major crimes as drug trafficking, murder, theft, rape, and assault consumes the largest portion (forty percent) of AFOSI manhours. Of all types of criminal investigations, drug cases are the most common.

As a result of AFOSI criminal and fraud investigations, the Air Force recovered or saved nearly $68 million in assets in 1987 as well as assessing almost $7 million in fines. ■

Air Force Operational Test and Evaluation Center

THE Air Force Operational Test and Evaluation Center (AFOTEC) is the Air Force's independent test agency responsible for operational testing of new or modified weapon systems and/or components being developed for Air Force and multiservice use.

AFOTEC is a separate operating agency under Hq. USAF. The Commander, Maj. Gen. Cecil W. Powell, reports directly to the Chief of Staff of the Air Force. The primary purpose of operational test and evaluation is to reduce risk in the acquisition process by determining how well systems perform when operated and maintained by Air Force personnel in a realistic operational environment.

The results from the center's tests are used at all levels of the Air Force and the Department of Defense to support program decisions that lead to the production and fielding of systems. The center's efforts focus on the task of providing assessments of the operational effectiveness and suitability of the Air Force's future weapon systems and supporting equipment.

The center's activities address equipments used over the entire spectrum of Air Force missions, including aircraft, strategic missiles, munitions, and space and command control communications and intelligence systems. The center is currently planning or conducting tests on the Consolidated Space Operations Center, the Next-Generation Weather Radar, the B-1B, and the Peacekeeper missile.

The center is also testing the Advanced Medium-Range Air-to-Air Missile (AMRAAM). Center personnel will be involved in testing the Advanced Tactical Fighter, the Airborne Self-Protection Jammer, and simulator systems, including the B-1B and F-15E weapon system trainers. The most recently completed tests include those for the Joint Tactical Information Distribution System program and the High-Speed Antiradiation Missile.

The center has approximately 500 people assigned to its headquarters at Kirtland AFB, N. M., and an additional 175 at five detachments and twenty-four test teams. The center has detachments at Eglin AFB, Fla., Nellis AFB, Nev., Edwards AFB, Calif., Colorado Springs, Colo., and Kapaun Administrative Annex, West Germany.

AFOTEC personnel form the management cadre for test programs, while the major commands supplement the test teams with the majority of the evaluators. There are approximately 2,400 people under the center's operational control. The additional personnel provide current operational experience to ensure that the evaluation reflects the needs of the ultimate users of the system—the operators and the maintainers as well as the support and training specialists. By testing under operationally realistic conditions, the center ensures that the new equipment will meet the user's requirement and will be ready for operational use in accomplishing the Air Force mission. ■

Air Force Service Information and News Center

THE Air Force Service Information and News Center (AFSINC) communicates Air Force and defense news to Air Force members and their families worldwide. This information on policies, activities, and people makes AFSINC, headquartered at Kelly AFB, Tex., a key voice in Air Force public affairs. In addition, the center provides stories about soldiers and airmen to hometown civilian news media across the United States.

AFSINC is commanded by Col. Paul Heye and reports to the Air Force Director of Public Affairs. AFSINC has four mission elements: Internal Information Directorate, Army and Air Force Hometown News Service, Air Force Broadcasting Service, and the Air Force Office of Youth Relations.

- Internal Information produces

materials to help commanders communicate to the Air Force audience. Print products include *Airman* magazine, the Air Force News Service, the *Air Force Policy Letter for Commanders,* and *Family News.*

Internal also oversees the *Commander's Call,* the base newspaper program, and *Air Force Now* films and videos and produces the Air Force Radio News Service releases, general-officer biographies, the lithographs series, and theme posters.

- During 1987, the Army and Air Force Hometown News Service released stories on more than 433,000 individual soldiers and airmen to their hometown newspapers and broadcast outlets, resulting in 1,800,000 releases to about 14,000 news media. Radio and television feature teams also produced 3,900 releases to electronic media.
- The Air Force Broadcasting Service manages the overseas Air Force operations of the Armed Forces Radio and Television Service. Three broadcast squadrons in Europe, the Pacific, and the Arctic operate 160 radio and television outlets that bring information and entertainment to DoD personnel and their families around the world. Significant progress has been made in delivering US news and time-sensitive programming via satellite.
- The Air Force Office of Youth Relations acts as liaison between the Air Force and almost thirty national youth organizations. It conducts special community-relations activities that promote aerospace education and provides Air Force mission and career information to 14,000,000 of the nation's youth.

A1C Terrie Brooks gathers photo prints on a roll. She works as a photographer for Army and Air Force Hometown News Service, part of the Air Force Service Information and News Center at Kelly AFB, Tex. AFSINC dispenses Air Force and defense news to USAF personnel and their families around the world. It also sends stories about individuals to their hometown news media throughout the United States. Radio and TV reports are a big part of AFSINC work.

—USAF photo by CMSgt. Don Sutherland

Backing the mission elements are support elements for administration, resources, and communications and computers. AFSINC's centralized resource management supports Air Force Public Affairs operations across the United States.

Regional public affairs offices in Chicago, Los Angeles, and New York City and the Air Force Orientation Group in Dayton, Ohio, receive budget, manpower, and logistics support. State-of-the-art support includes a major postal distribution center, a mass-production photo laboratory, and a small computer technical center.

As of January 1988, AFSINC operated with an authorized staff of 728 military and 198 civilian employees. ■

Air Reserve Personnel Center

THE Air Reserve Personnel Center (ARPC) in Denver, Colo., has the primary mission of peacetime support and mobilization readiness of more than 250,000 Air National Guard and Air Force Reserve members. Specifically, ARPC's mission has three aspects: assist in mobilization of the reserve forces, provide personnel support to individual members, and maintain master personnel records of all members not on extended active duty.

The Total Force defense policy has increased the ARPC mission both in breadth and significance. ARPC has a staff of more than 800 military and civilian workers who provide assignments, promotions, career-planning, school selections, orders, pay, SATO support, VA, SGLI, DEERS, and a myriad of other personnel support activities to reservists worldwide.

Two accomplishments during 1987 demonstrate the readiness and *esprit de corps* exhibited by the center's dedicated employees. One was the first-ever nationwide screening of the Individual Ready Reserve (IRR). These former active Air Force members do not drill or receive pay, but have a remaining military service obligation and can be recalled to active duty. ARPC developed procedures for which no precedent existed and then assisted 114 regular, Reserve, and Air Guard installations in recalling more than 13,000 IRR members. ARPC will again provide the field operations center for the 1988 screening.

Another 1987 accomplishment was the Individual Mobilization Augmentee Task Force established by the chief of Air Force Reserve and chaired by ARPC Commander Col. Joseph C. Ramsey, Jr. It explored thirty-seven key IMA issues and developed recommendations to address them. These were approved by the Air Staff and will be implemented during 1988. One improvement to the problem of frag-

mentation of authority will be an IMA management office at ARPC to perform as an intermediary between the Air Staff and major commands that use IMAs.

ARPC continues to provide an even broader range of services to IMAs. Because IMAs train directly with the active force and thus have no reserve unit assignment, their base-level CBPO functions are done at ARPC. The Consolidated Reserve Personnel Office serves nearly 15,000 IMAs and participating Individual Ready Reservists, mostly by mail and telephone. It is the largest base-level personnel office in the Air Force.

ARPC also operates single manager programs serving the special needs of nearly 690 medical, 1,060 legal, and 570 chaplain reserve personnel. In addition, ARPC provides this support to some 1,300 students working toward medical degrees under the Health Professions Scholarship Program and to nearly 270 chaplain candidates.

Always on the frontiers of technology, ARPC's computer systems provide backup for the Air Force Military Personnel Center. The growing demands on the Air National Guard and the Air Force Reserve provide the impetus to keep ARPC in an active role and constantly striving to improve its operations. ARPC's job has spanned more than three decades, three mobilizations in support of national emergencies, and quantum leaps in the technology of personnel management. Each recall and mobilization exercise has taught invaluable lessons that enable ARPC to continue to enhance its peacetime support and mobilization readiness. ■

Air Force Reserve

THE AFRES goal "is to find more and better ways to work together with the active forces—to increase readiness."

That's how Maj. Gen. Roger P. Scheer, Chief of Air Force Reserve and Air Force Reserve (AFRES) Commander, views the role of the Reserve.

"The combat readiness of our fifty-eight flying squadrons and 450 mission support units has never been higher," General Scheer said.

In 1987, Air Force Reservists demonstrated their readiness in real-world deployments, competitions, and such training exercises as Volant Oak, Airlift Rodeo, Gunsmoke, Team Spirit, Volant Partner, and European Tanker Task Force. The 80,000-plus Reservists took part in forty-six such events in some forty countries in support of the Total Force mission.

Air Force Reserve units also continued conversions to new aircraft. Factory-fresh F-16C and D model fighters were delivered to the newly formed 944th Tactical Fighter Group at Luke AFB, Ariz., C-5As replaced C-130s at Westover AFB, Mass., and new C-130H airlifters replaced thirty-year-old A models at the 911th Tactical Airlift Group, Pittsburgh IAP, Pa. A significant step to assist Strategic Air Command occurred when AFRES activated three 250-member KC-10 Associate maintenance squadrons at March AFB, Calif., Barksdale AFB, La., and Seymour Johnson AFB, N. C. And a new special operations squadron equipped with CH/HH-3 helicopters was established at Davis-Monthan AFB, Ariz.

The command reorganized its air refueling and fighter unit structure for better command and control. The 434th Air Refueling Wing was established at Grissom AFB, Ind., to control Reserve KC-135 and KC-10 Associate flying units in the eastern United States, and the 917th Tactical Fighter Wing unfurled its new flag at Barksdale AFB in a realignment of A-10 "tank-killer" units.

Flying and support units took part

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F-4Ds of the 507th Tactical Fighter Group at Tinker AFB, Okla., prowl the sky in preparation for the real thing. They exemplify the goal of the Air Force Reserve as expressed by the AFRES Commander: "To find more and better ways to work together with the active forces—to increase readiness." The three AFRES Phantoms pictured here are veterans of combat in Vietnam, and each has a MIG kill.

AIR FORCE RESERVE FLYING WINGS AND ASSIGNED UNITS

Air Force	Wing Hq.	Group	Squadron	Type Aircraft	Location	Gaining Command
Fourth Air Force (Hq. McClellan AFB, Calif.) Maj. Gen. James C. Wahleithner Commander			71st SOS	HH-3E, CH-3E	Davis-Monthan AFB, Ariz.	MAC
		919th SOG	711th SOS	AC-130A	Eglin AFB, Fla. (Aux. 3)	MAC
		939th ARRG	304th ARRS	HC-130H/HH-1H, HH-3E/CH-3E	Portland IAP, Ore.	MAC
			301st ARRS	HC-130H/N, HH-3E	Homestead AFB, Fla.	MAC
			305th ARRS	HC-130H/N, HH-3E	Selfridge ANGB, Mich.	MAC
	349th MAW (Assoc)		301st MAS (Assoc)	C-5A	Travis AFB, Calif.	MAC
			312th MAS (Assoc)	C-5A	Travis AFB, Calif.	MAC
			708th MAS (Assoc)	C-141B	Travis AFB, Calif.	MAC
			710th MAS (Assoc)	C-141B	Travis AFB, Calif.	MAC
	403d TAW		815th TAS	C-130E, WC-130E/H	Keesler AFB, Miss.	MAC
		934th TAG	96th TAS	C-130E	Minneapolis-St. Paul IAP, Minn.	MAC
	433d MAW		68th MAS	C-5A	Kelly AFB, Tex.	MAC
	302d TAW		731st TAS	C-130B	Peterson AFB, Colo.	MAC
		943d TAG	303d TAS	C-130B	March AFB, Calif.	MAC
	440th TAW		95th TAS	C-130A	General Mitchell IAP, Wis.*	MAC
		927th TAG	63d TAS	C-130E	Selfridge ANGB, Mich.	MAC
		928th TAG	64th TAS	C-130A/H	O'Hare ARFF, Ill.*	MAC
	445th MAW (Assoc)		728th MAS (Assoc)	C-141B	Norton AFB, Calif.	MAC
			729th MAS (Assoc)	C-141B	Norton AFB, Calif.	MAC
			730th MAS (Assoc)	C-141B	Norton AFB, Calif.	MAC
	446th MAW (Assoc)		97th MAS (Assoc)	C-141B	McChord AFB, Wash.	MAC
			313th MAS (Assoc)	C-141B	McChord AFB, Wash.	MAC
Tenth Air Force (Hq. Bergstrom AFB, Tex.) Brig. Gen. John J. Closner III Commander	301st TFW		457th TFS	F-4D/E	Carswell AFB, Tex.	TAC
		924th TFG	704th TFS	F-4D	Bergstrom AFB, Tex.	TAC
	419th TFW		466th TFS	F-16A/B	Hill AFB, Utah	TAC
		507th TFG	465th TFS	F-4D	Tinker AFB, Okla.	TAC
		944th TFG	302d TFS	F-16C/D	Luke AFB, Ariz.	TAC
	434th AREFW (H)		72d AREFS (H)	KC-135	Grissom AFB, Ind.	SAC
		98th AREFG (H)	78th AREFS (H) (Assoc)	KC-10A	Barksdale AFB, La.	SAC
		916th AREFG (H)	77th AREFS (H) (Assoc)	KC-10A	Seymour Johnson AFB, N. C.	SAC
	442d TFW		303d TFS	A-10A	Richards-Gebaur AFB, Mo.*	TAC
		930th TFG	45th TFS	A-10A	Grissom AFB, Ind.	TAC
	917th TFW		47th TFS	A-10A	Barksdale AFB, La.	TAC
			46th TFTS	A-10A	Barksdale AFB, La.	TAC
		926th TFG	706th TFS	A-10A	NAS New Orleans, La.	TAC
	452d AREFW (H)		336th AREFS (H)	KC-135	March AFB, Calif.	SAC
			79th AREFS (H) (Assoc)	KC-10A	March AFB, Calif.	SAC
		940th AREFG (H)	314th AREFS (H)	KC-135	Mather AFB, Calif.	SAC
	482d TFW		93d TFS	F-4D	Homestead AFB, Fla.	TAC
		906th TFG	89th TFS	F-4D	Wright-Patterson AFB, Ohio	TAC
Fourteenth Air Force (Hq. Dobbins AFB, Ga.) Brig. Gen. Dale R. Baumler Commander		932d AAG (Assoc)	73d AAS (Assoc)	C-9A	Scott AFB, Ill.	MAC
	94th TAW		700th TAS	C-130H	Dobbins AFB, Ga.*	MAC
		907th TAG	356th TAS	C-130A/E	Rickenbacker ANGB, Ohio	MAC
		908th TAG	357th TAS	C-130H	Maxwell AFB, Ala.	MAC
	315th MAW (Assoc)		300th MAS (Assoc)	C-141B	Charleston AFB, S. C.	MAC
			701st MAS (Assoc)	C-141B	Charleston AFB, S. C.	MAC
			707th MAS (Assoc)	C-141B	Charleston AFB, S. C.	MAC
	439th MAW		337th MAS	C-130E/C-5A	Westover AFB, Mass.*	MAC
		911th TAG	758th TAS	C-130H	Greater Pittsburgh IAP, Pa.*	MAC
		914th TAG	328th TAS	C-130E	Niagara Falls IAP, N. Y.*	MAC
	459th MAW		756th MAS	C-141B	Andrews AFB, Md.	MAC
		910th TAG	757th TAS	C-130B	Youngstown MAP, Ohio*	MAC
		913th TAG	327th TAS	C-130E	Willow Grove ARF, Pa.*	MAC
	512th MAW (Assoc)		326th MAS (Assoc)	C-5A	Dover AFB, Del.	MAC
			709th MAS (Assoc)	C-5A	Dover AFB, Del.	MAC
	514th MAW (Assoc)		335th MAS (Assoc)	C-141B	McGuire AFB, N. J.	MAC
			702d MAS (Assoc)	C-141B	McGuire AFB, N. J.	MAC
			732d MAS (Assoc)	C-141B	McGuire AFB, N. J.	MAC

AAG	Aeromedical Airlift Group	ARRG	Aerospace Rescue and Recovery Group	TAS	Tactical Airlift Squadron
AAS	Aeromedical Airlift Squadron	ARRS	Aerospace Rescue and Recovery Squadron	TAW	Tactical Airlift Wing
AREFG	Air Refueling Group	MAS	Military Airlift Squadron	TFG	Tactical Fighter Group
AREFS	Air Refueling Squadron	MAW	Military Airlift Wing	TFS	Tactical Fighter Squadron
AREFW	Air Refueling Wing	SOG	Special Operations Group	TFTS	Tactical Fighter Training Squadron
ARF	Air Reserve Facility	SOS	Special Operations Squadron	TFW	Tactical Fighter Wing
ARRF	Air Reserve Forces Facility	TAG	Tactical Airlift Group	*	Indicates AFRES Base

in several major exercises during the year, many of which took Reservists into large readiness tests in the European and Pacific theaters. Such familiar ongoing exercises as Reforger, Team Spirit, and Checkered Flag put AFRES fighter, airlift, and tanker crews into full support of gaining-command requirements while medical, civil engineering, aerial port, and other support teams packed their bags for tours to such places as Honduras, England, Egypt, and Germany. The command continues to provide Military Airlift Command with half of its combat-ready C-141 and C-5 aircrews, forty percent of its strategic airlift maintenance force, forty-seven percent of the aerial port force, nearly three-quarters of all MAC medical crews, half of all AC-130 gunship crews, and a quarter of all Air Force C-130 tactical airlift crews.

Selected AFRES units took part in a Department of Defense exercise that tested the ability of Reservists to respond to a Presidential "call-up." The random-sample test conducted in November proved that the Air Force Reserve is ready for a national emergency recall or partial mobilization.

The old cliché "weekend warriors" has been replaced by "full-time partners" as the day-to-day productive efforts of Reservists have become routine. Humanitarian efforts began early in the year when eight victims of a New Year's Eve hotel fire in San Juan, Puerto Rico, were evacuated by the 446th Military Airlift Wing, based at McChord AFB, Wash., to hospitals in the United States.

Within two months, other Reservists answered another call for help. This time they flew supply missions from Howard AFB, Panama, to Ecuador in the wake of earthquakes and aftershocks that rocked the Andean nation. The Reservists airlifted tents, blankets, and other supplies for the some 10,000 left homeless following the earthquakes. The aircrews were from the 315th MAW, Charleston AFB, S. C., and the 914th Tactical Airlift Group, Niagara Falls IAP, N. Y.

An AFRES unit returned to San Juan in the summer to quash the threat of another natural disaster. The 907th Tactical Airlift Group, Rickenbacker ANGB, Ohio, flew aerial spray missions with specially equipped C-130s to suppress a possible epidemic of dengue hemorrhagic fever, caused by a specific type of mosquito.

Fighting fires in California teamed the 943d TAG, March AFB, Calif., with Air National Guardsmen using C-130s to help contain this natural disaster, which spread over a large area of California, Oregon, and Washington.

Rescue units in Oregon, Florida, and Michigan were credited with fifteen saves for the first ten months of the year.

According to USAF Airlift Center officials at Pope AFB, N. C., the 514th MAW, McGuire AFB, N. J., put a new record in the cargo drop books when a crew airdropped the heaviest single load from a C-141—a 38,490-pound Army Sheridan tank at Pope.

A team of aircrews, pararescuemen, and support personnel from the 403d Rescue and Reconnaissance Wing, Keesler AFB, Miss., brought home top honors from SAREX at Prince Edward Island, Canada. The annual competition pits twelve Canadian teams against American teams in a challenging search-and-rescue scenario.

AFRES units notched their share of awards at Gunsmoke '87, the Air Force-wide fighter-gunnery competition at Nellis AFB, Nev. Maj. Danny Hamilton, 419th TFW, Hill AFB, Utah, won the Top Gun award, followed closely by teammates who came in second and fifth in the event. The 419th took second overall in team competition.

The 926th Tactical Fighter Group, New Orleans, La., took the Gunsmoke '87 maintenance team crown and finished second in the weapons load event.

The combined AFRES team from the 452d AREFW, March AFB, Calif., 434th AREFW, Grissom AFB, Ind., and 940th Air Refueling Group, Mather AFB, Calif., received the Saunders Trophy at the Strategic Air Command Bombing and Navigation Competition. A crew from the 452d AREFW also won the best KC-135 crew award.

During MAC's Airlift Rodeo competition, the 445th MAW, Norton AFB, Calif., landed second place in the best overall wing category, best in C-141 aircraft maintenance, second in the C-141 crew competition, and third in the combat run.

The 446th MAW from McChord AFB finished second in C-141 maintenance, and the 514th MAW from McGuire AFB came in third in the C-141 crew category.

Hq. AFRES at Robins AFB, Ga., and the Office of Air Force Reserve in the Pentagon were awarded the Air Force Organizational Excellence Award, the organizational equivalent to the AFOUA.

The Air Force Association named the 315th MAW from Charleston AFB the best Reserve flying unit, and the Reserve Officers Association selected the 94th Combat Support Group at Dobbins AFB, Ga., as its outstanding Reserve unit.

General Scheer summed up the Air Force Reserve commitment to the Total Force. "Our Air Force Reservists are there every day, working shoulder to shoulder with their active-duty counterparts. Sure, we're part-time airmen, but we're full-time partners, carrying our share of the burden of defending America." ■

Air National Guard

With both a state and a federal mission, the Air National Guard (ANG) is unique among the Air Reserve Forces. In 1987, Guardsmen and women proudly celebrated 351 years of service to their communities, state, and nation.

Air National Guard units in a nonmobilized status are commanded by the governors of the fifty states, the Commonwealth of Puerto Rico, the Territories of Guam and the Virgin Islands, and the Commanding General of the District of Columbia. All units in a state are responsible to the governor, who is represented in the state or territory chain of command by the adjutant general.

Units may be called to federal service by the President to enforce federal authority, suppress insurrection, or repel invasion. They may also be ordered to active duty by Congress. During peacetime, all Air National Guard units are assigned to gaining Air Force commands. These commands provide advisory assistance and evaluate unit training, safety, and readiness programs.

The importance of the Air National Guard to the Total Force is evident through its operational and mission support units. In both areas, the emphasis is on modernization and growth.

The Air National Guard today pro-

vides eighty-six percent of the fighter-interceptor force, fifty percent of the reconnaissance force, thirty-nine percent of tactical air support, thirty-five percent of tactical airlift, twenty-five percent of tactical fighters, eighteen percent of the air refueling capability, and seventeen percent of the rescue capability of the Total Air Force.

In 1985, the ANG began flying the world's finest air-superiority fighter, the F-15 Eagle. This year, the 102d Fighter Interceptor Wing from the Massachusetts ANG will complete its conversion to the F-15A/B and will be the fourth Guard unit to be mission-ready with that front-line fighter.

Also in 1988, other ANG fighter units are scheduled to convert to the F-16 Fighting Falcon. These include the 184th Tactical Fighter Group, McConnell AFB, Kan.; the 187th TFG, Montgomery, Ala.; the 188th TFG, Fort Smith, Ark.; and the 177th Fighter Interceptor Group, Atlantic City, N. J. Additionally, it has been announced that two Oregon Air Guard fighter units will convert to F-16s in 1989.

In addition to receiving new aircraft, the Air Guard is also modernizing its existing fleet. The KC-135 re-engining program has been completed. This upgrade, which replaces older J57 engines with reconditioned JT3D engines, greatly improves the reliability of the ANG's KC-135s and results in a sixty percent reduction in noise, a ninety percent reduction in smoke, and a twelve to fourteen percent increase in fuel efficiency.

On the airlift side, the ANG continues to receive new C-130H models to replace older aircraft. Eight units currently fly this latest model intra-theater airlifter.

In the near future, ANG air-to-ground A-7, A-10, F-4E, F-15, and F-16 fighters will be made more combat capable with advanced AIM-9L/M air-to-air missiles, improved AGM-65D television-guided missiles, and a new area-denial submunition called the CBU-87/89. Along with the newer munitions, ANG munition storage personnel are attending more realistic bomb-building training at the Air Force Combat Ammunition Center in Herlong, Calif.

In order to improve overall readiness and warfighting capabilities further, the Guard and Air Force Reserve have joined in establishing the ANG-AFRES Test Center in Tucson, Ariz. This office improves the communication and cooperation with the MAJCOMs on matters relating to weapon system support and flight testing, to include mutual efforts with major TAC test centers.

The ANG had its best flying safety year ever in FY '87 when it recorded only five Class-A flight mishaps. This gave the Guard a rate of only 1.5 mishaps per 100,000 flying hours. This is better than the previous ANG record of 1.7 mishaps recorded in FY '81 and equals the overall Air Force rate for FY '87. For the seventh consecutive year, the Air National Guard mishap rate was below 3.0, a noteworthy achievement when you consider that the majority of ANG units fly high-performance fighter aircraft.

Like their flying counterparts, the ANG mission-support units play a key role in the Total Air Force.

At this time, there are approximately 239 units heavily concentrated in the area of base fixed communications and computers, combat communications systems, weather, tactical control, engineering installation, aerial port, civil engineering, medical support, and air-base ground defense.

A total of 150 ANG units provides tactical control, aircraft control and warning, range control, combat communications support, and engineering installation support to USAF. The combat communication and tactical control units are being upgraded with state-of-the-art communications and electronics equipment, including satellite communications capabilities. ANG combat communications units provide sixty-six percent of the people and equipment used in Air Force combat communications and air traffic services. Also, Guard engineering and installation (E&I) units represent sixty-eight percent of the total Air Force E&I capability.

Civil engineering and services are growing missions in the Air National Guard. ANG Prime RIBS (Readiness In Base Services) units provide forty percent of the Air Force's deployable contingency support requirement for food service and base services personnel. Guard engineering and services units participated in more than 200 unit deployments for training in FY '87 at both CONUS and overseas locations.

Air Guard Prime BEEF (Base Engineer Emergency Force) squadrons were reorganized on October 1, 1987, along with all active-duty and Air Force Reserve units. The major emphasis of this reorganization was to provide standardization of Prime BEEF units and to tie those units directly to deploying flying units in order to better support those missions. The two Guard RED HORSE (Rapid Engineer Deployable, Heavy Operational Repair Squadron, Engineer) units continued their dynamic training and deployment programs by participating in exercises in Europe and Central and South America. The Air National Guard has two of the seven Air Force RED HORSE squadrons.

In maintaining their readiness through training, ANG medical units in 1987 deployed approximately 5,000 people in support of Air Force medi-

An F-16, foreground, and an F-15 of the Louisiana Air National Guard pair up on the ramp during an ANG tactical forces exercise. The fighters symbolize the modernization that characterizes the ANG, which today provides eighty-six percent of USAF's fighter-interceptor force, fifty percent of the reconnaissance force, thirty-nine percent of tactical air support, and thirty-five percent of tactical airlift.

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The Air National Guard does more than augment the warfighting capability of the active Air Force. Here, for example, an ANG C-130 helps fight rampant forest fires in California last June by spraying fire-suppressant material from above. ANG units taking part in that endeavor were from California, Wyoming, and North Carolina.

cal programs. The sites ranged from Germany and Italy to Honduras, Wake Island, Japan, and Iceland and provided valuable medical readiness training through interface with active Air Force counterparts. The Air Guard also has initiated its most aggressive increase in medical personnel to respond to wartime mobilization requirements. This expansion is programmed to add 2,600 medical service professionals by FY '92.

Twenty-two ANG aerial port units account for eleven percent of the total Air Force aerial port resources. In 1987, Guard aerial port units deployed on ninety annual tours to eight CONUS and thirteen overseas locations.

Readiness is the watchword for the 1980s. Overseas training and deployments have been key to attaining and maintaining the higher state of readiness of the Air National Guard. Every day, all over the world, ANG units work alongside their active service counterparts.

Air Guard C-130 Hercules aircraft provide more than six months of support annually to the US Southern Command. This JCS-directed deployment, called Volant Oak, positions six C-130s at Howard AFB, Panama, on a rotational basis with Air Force Reserve C-130 units. Also, ANG A-7 units share a continuous rotational air defense commitment, named Coronet Cove, in Panama. These ANG units have met this year-round commitment every year since December 1977, when the Guard assumed the responsibility.

The New York ANG's 109th Tactical Airlift Group has the only ski-equipped LC-130Hs in the Air Force and has an annual responsibility to fly resupply missions to remote radar sites in Greenland. Because of their experience in operating on snow-packed and ice runways, the unit's aircrews conducted their first-ever familiarization deployment to the South Pole in January 1988 and plan to do the same next January as well. There they will train in Antarctic resupply and search-and-rescue missions in preparation to replace the US Navy aircraft that normally perform those duties. In 1990 and 1991, the Navy planes will be out of service for scheduled maintenance.

Closer to home, ANG F-106, F-16, and F-4 air defense units perform a twenty-four-hour alert mission along the coasts of the United States. ANG units in Hawaii are responsible for the entire air defense of that state.

The ANG mission support units are also doing their fair share to help the Guard meet its worldwide readiness commitments.

In FY '87, approximately 3,000 Guardsmen from combat communications, engineering installation, and communications flights were involved in twenty-eight deployments to Europe, Korea, Central America, the Caribbean, and CONUS locations in support of JCS and NATO exercises.

The Total Force competition for combat communications units, Combat Challenge '87, was held at Tinker AFB, Okla., in September 1987. The 252d Combat Communications Group from the Washington ANG placed second overall among active Air Force and Guard combat communications units competing.

During Airlift Rodeo '87, the 176th Tactical Airlift Group (TAG) from Kulis ANG Base, Anchorage, Alaska, captured the title of best overall short-field landing. In this competition, Air Guard members compete not only against their active and Reserve counterparts but also against top teams from around the globe. During this Airlift Rodeo, another Guard unit, the 145th TAG from Charlotte, N. C., took third place in the C-130 Best Aircrew category, and the Minnesota ANG's 133d Tactical Airlift Wing from Minneapolis/St. Paul was third in the short-field landing competition.

The ANG set another record in FY '87 by reaching an all-time high of 114,600 members, meeting its program end-strength for the ninth straight year.

Training is increasingly important in maintaining the readiness levels required to perform the missions. During FY '87, more than 50,000 Air Guard members attended more than 1,000 separate formal courses, including more than 100 officers who attended such residence programs as Air, Army, and Naval War Colleges, National War College, and the Industrial College of the Armed Forces. Additionally, some 200 enlisted personnel attended NCO Academies and Leadership Schools conducted by various major commands, and more than 700 received training at ANG's I. G. Brown Professional Military Education Center at McGhee Tyson Airport near Knoxville, Tenn.

Also during FY '87, the number of Air Guardsmen participating in the Education Assistance Act of 1985 ("New GI Bill") increased by 15.6 percent over the previous fiscal year to a total of 9,600 of the 27,000 people eligible.

Exciting missions, equipment modernization, significant participation in worldwide exercises and deployments, and exemplary performance in inspections and competitions have helped make today's Air National Guard a proud, prepared, professional, and vital component of the Total Force. ■

THE AIR NATIONAL GUARD BY MAJOR COMMAND ASSIGNMENT

(As of January 1, 1988)

STRATEGIC AIR COMMAND

KC-135E Stratotanker

101st Air Refueling Wing	Bangor, Me.
126th Air Refueling Wing	Chicago, Ill.
141st Air Refueling Wing	Fairchild AFB, Wash.
171st Air Refueling Wing	Pittsburgh, Pa.
128th Air Refueling Group	Milwaukee, Wis.
134th Air Refueling Group	Knoxville, Tenn.
151st Air Refueling Group	Salt Lake City, Utah
157th Air Refueling Group	Pease AFB, N. H.
160th Air Refueling Group	Rickenbacker ANG Base, Ohio
161st Air Refueling Group	Phoenix, Ariz.
170th Air Refueling Group	McGuire AFB, N. J.
190th Air Refueling Group	Forbes Field, Kan.

TACTICAL AIR COMMAND

A-7D/K Corsair II

121st Tactical Fighter Wing	Rickenbacker ANG Base, Ohio
127th Tactical Fighter Wing	Selfridge ANG Base, Mich.
132d Tactical Fighter Wing	Des Moines, Iowa
140th Tactical Fighter Wing	Buckley ANG Base, Colo.
112th Tactical Fighter Group	Pittsburgh, Pa.
114th Tactical Fighter Group	Sioux Falls, S. D.
138th Tactical Fighter Group	Tulsa, Okla.
150th Tactical Fighter Group	Kirtland AFB, N. M.
156th Tactical Fighter Group	San Juan, Puerto Rico
162d Tactical Fighter Group*	Tucson, Ariz.
178th Tactical Fighter Group	Springfield, Ohio
180th Tactical Fighter Group	Toledo, Ohio
185th Tactical Fighter Group	Sioux City, Iowa
192d Tactical Fighter Group	Richmond, Va.

F-16A/B Fighting Falcon

149th Tactical Fighter Group	Kelly AFB, Tex.
158th Tactical Fighter Group	Burlington, Vt.
169th Tactical Fighter Group	McEntire ANG Base, S. C.

A-10A Thunderbolt II

128th Tactical Fighter Wing	Truax Field, Wis.
174th Tactical Fighter Wing	Syracuse, N. Y.
103d Tactical Fighter Group	Bradley, Conn.
104th Tactical Fighter Group	Barnes, Mass.
175th Tactical Fighter Group	Baltimore, Md.

F-4C Phantom

188th Tactical Fighter Group	Fort Smith, Ark.

F-4D Phantom

113th Tactical Fighter Wing	Andrews AFB, Md.
183d Tactical Fighter Group	Springfield, Ill.
184th Tactical Fighter Group*	McConnell AFB, Kan.
187th Tactical Fighter Group	Montgomery, Ala.

F-4E Phantom

108th Tactical Fighter Wing	McGuire AFB, N. J.
122d Tactical Fighter Wing	Fort Wayne, Ind.
131st Tactical Fighter Wing	St. Louis, Mo.
163d Tactical Fighter Group	March AFB, Calif.
181st Tactical Fighter Group	Terre Haute, Ind.

RF-4C Phantom

117th Tactical Reconnaissance Wing	Birmingham, Ala.
123d Tactical Reconnaissance Wing	Louisville, Ky.
124th Tactical Reconnaissance Group	Boise, Idaho
152d Tactical Reconnaissance Group	Reno, Nev.
155th Tactical Reconnaissance Group	Lincoln, Neb.
186th Tactical Reconnaissance Group	Meridian, Miss.

*Replacement Training Unit (RTU). The 162d TFG serves also as the RTU for the F-16 Fighting Falcon.

OA-37 Dragonfly

110th Tactical Air Support Group	Kellogg, Mich.
111th Tactical Air Support Group	Willow Grove ARF, Pa.
182d Tactical Air Support Group	Peoria, Ill.

F-15A/B Eagle

116th Tactical Fighter Wing	Dobbins AFB, Ga.
159th Tactical Fighter Group	New Orleans, La.

AIR DEFENSE UNITS (TAC)

F-106A/B Delta Dart

102d Fighter Interceptor Wing	Otis ANG Base, Mass.
177th Fighter Interceptor Group	Atlantic City, N. J.

F-4C Phantom

142d Fighter Interceptor Group	Portland, Ore.

F-4D Phantom

144th Fighter Interceptor Wing	Fresno, Calif.
107th Fighter Interceptor Group	Niagara Falls, N. Y.
119th Fighter Interceptor Group	Fargo, N. D.
147th Fighter Interceptor Group	Ellington Field AGS, Tex.
148th Fighter Interceptor Group	Duluth, Minn.
191st Fighter Interceptor Group	Selfridge ANG Base, Mich.

F-16A/B Fighting Falcon

120th Fighter Interceptor Group	Great Falls, Mont.
125th Fighter Interceptor Group	Jacksonville, Fla.

MILITARY AIRLIFT COMMAND

C-130 Hercules

118th Tactical Airlift Wing	Nashville, Tenn.
133d Tactical Airlift Wing	Minneapolis/St. Paul, Minn.
136th Tactical Airlift Wing	Dallas, Tex.
137th Tactical Airlift Wing	Oklahoma City, Okla.
146th Tactical Airlift Wing	Van Nuys, Calif.
109th Tactical Airlift Group	Schenectady, N. Y.
130th Tactical Airlift Group	Charleston, W. Va.
135th Tactical Airlift Group	Baltimore, Md.
139th Tactical Airlift Group	St. Joseph, Mo.
143d Tactical Airlift Group	Quonset Point, R. I.
145th Tactical Airlift Group	Charlotte, N. C.
153d Tactical Airlift Group	Cheyenne, Wyo.
164th Tactical Airlift Group	Memphis, Tenn.
165th Tactical Airlift Group	Savannah, Ga.
166th Tactical Airlift Group	Wilmington, Del.
167th Tactical Airlift Group	Martinsburg, W. Va.
176th Tactical Airlift Group	Anchorage, Alaska
179th Tactical Airlift Group	Mansfield, Ohio
189th Tactical Airlift Group	Little Rock, Ark.

HC-130 Hercules/HH-3 Jolly Green Giant

106th Aerospace Rescue & Recovery Group	Suffolk, N. Y.
129th Aerospace Rescue & Recovery Group	NAS Moffett, Calif.

C-141B StarLifter

172d Military Aircraft Group	Jackson, Miss.

C-5A Galaxy

105th Military Airlift Group	Newburgh, N. Y.

EC-130E

193d Special Operations Group	Middletown, Pa.

PACIFIC AIR FORCES

F-15A/B Eagle

154th Composite Group	Hickam AFB, Hawaii

Civilian Personnel Management Center

THE mission of the Air Force Civilian Personnel Management Center is to manage and operate Air Force civilian personnel data and information systems, recruitment and training programs, and career management, development, and placement programs. These programs affect more than 250,000 civilian employees, including foreign nationals, at Air Force installations worldwide.

The Air Force Civilian Personnel Management Center was established as a direct reporting unit of the Air Force Director of Civilian Personnel on January 1, 1986. Its forerunner, the Office of Civilian Personnel Operations, had been in existence at Randolph AFB, Tex., since July 1, 1976.

The center is organized into three divisions: Integrated Systems Management, Recruiting and Training, and Career Management. Each plays an integral role in the personnel life-cycle management of the civilian resource.

- The Integrated Systems Management Division is the Air Force focal point for civilian personnel information systems management. It provides automated data processing (ADP) support to the civilian personnel community by determining requirements and assuring requirements are met, either by developing systems in-house or arranging for their development and maintenance by other activities. It provides function leadership and oversight to civilian personnel systems management staff worldwide. It keeps abreast of changing ADP and communications technology to plan and improve civilian personnel management support.
- The Recruitment and Training Division is responsible for a variety of civilian recruitment programs geared to the Air Force demand for individuals with college degrees in many technical or professional career fields. The staff also conducts quality-of-worklife studies and performs research in performance appraisal and selection improvements. Additionally, the division is responsible for developing and administering the Air Force-wide civilian education and training budget. It helps civilian personnel managers find the right school or course for employees' educational needs.
- The Career Management Division helps identify civilian executive positions that need to be managed centrally for job referral and training. The goal is to satisfy Air Force needs by providing a pool of career employees with strong skills in professional, technical, management, and administrative fields.

Seventeen career programs are now in effect, including comptroller; engineering and services; historian; logistics; manpower and personnel, which encompasses education, technical training, and morale, welfare, and recreation; acquisition; information systems; safety, security, and special investigation; commissary; administration; and public affairs. Civilians involved in the program can receive a combination of government, academic, and industry training. They have the opportunity to attend armed forces college programs and to participate in courses in executive development and may be selected for Education With Industry assignments.

The Air Force Civilian Personnel Management Center serves as a landmark organization for the Department of Defense and federal government commitment to effective and efficient personnel life-cycle management of the Air Force's valued civilian resources. ■

Air Force District of Washington

THE Air Force District of Washington (AFDW) is the single manager for support of Air Force activities in the National Capital Region. Although its headquarters is located at historic Bolling AFB, D. C., AFDW covers a much broader area. Subordinate units, detachments, and operating locations are at the Pentagon, Andrews AFB, Md., and Fort Meade, Md.

Two major units form the majority of AFDW. They are the 1100th Air Base Group (ABG) and the 1100th Resource Management Group (RMG).

The 1100th ABG is the host unit for Bolling AFB. It has the typical squadrons and support agencies usually found at the base level. These support functions serve numerous tenant units on Bolling, such as the Air Force Office of Scientific Research and Hq. Air Force Office of Special Investigations. Among Bolling's Air Staff tenants are the Surgeon General, the Office of Air Force History, and the Chief of Chaplains.

The 1100th RMG has many personnel activities, including command personnel, education office programs, and military personnel offices at Bolling, Fort Meade, and the Pentagon.

Another major branch of the 1100th RMG is plans and operations. This includes a diverse group of responsibilities, including engineering services, audiovisual production for the Air Staff, and management of more than 800 Pentagon parking spaces and 1,500,000 square feet of leased building space.

Contracting and financial services for all Air Force activities in the Washington area are provided by two 1100th RMG units, the 1100th Contracting Squadron and the AFDW Accounting and Finance Office. With 43,977 military and civilian customers, it constitutes the Air Force's largest base-level accounting and finance office.

Air Force ceremonial events in the nation's capital are the responsibility of the AFDW. Two of the Air Force's most visible ambassadors are the US Air Force Honor Guard and the US Air Force Band, both based at Bolling.

The Honor Guard represents the Air Force at arrival and departure ceremonies for visiting dignitaries at the White House, Pentagon, and Andrews AFB as well as performing other ceremonial functions. It also participates in military funerals at Arlington National Cemetery and in memorial ceremonies at the Tomb of the Unknowns. The Honor Guard Drill Team is an elite component that performs nationwide.

Some of the nation's best musicians make up the Air Force Band. Its varied components provide quality entertainment for many different events. The Concert Band, String Orchestra, Singing Sergeants, Airmen of Note jazz ensemble, Spectrum pop band, and Ceremonial Brass make up the band. ■

Air Force Technical Applications Center

THE Air Force Technical Applications Center (AFTAC), a direct reporting unit, operates and maintains the US Atomic Energy Detection System (USAEDS). USAEDS is a worldwide system with operations in more than thirty-five countries. In operating the USAEDS, AFTAC is responsible for detecting events in the atmosphere, under water, under ground, and in space; determining if such events are nuclear; and reporting the events to national command authorities through Hq. USAF.

Specific responsibilities assigned to AFTAC include implementing Safeguard (d) of the 1963 Limited Test-Ban Treaty and monitoring the Threshold Test-Ban Treaty of 1974 and the Peaceful Nuclear Explosions Treaty of 1976.

AFTAC also conducts an active research and development program to contribute to the nation's ability to monitor international test-ban agreements. Because of its capabilities, from time to time AFTAC may also be tasked with unique missions in response to world events.

AFTAC was responsible for tracking debris from the Soviet reactor accident at Chernobyl in 1986. The center worked closely with the Environmental Protection Agency, the Federal Aviation Administration, and other executive agencies to document the radiological health hazard to Americans overseas and at home.

The concept of the USAEDS originated in the minds of several senior government leaders, including Gen. Hoyt S. Vandenberg and Adm. Lewis L. Strauss, after World War II when it became apparent that other nations would develop a nuclear weapons capability and that it was in the best interest of the US to be aware of these developments. A committee of experts subsequently endorsed the concept of a detection system, and in 1947, Gen. Dwight D. Eisenhower directed the Army Air Forces to "detect atomic explosions anywhere in the world."

The mission remained with the Air Force when it became a separate service, and AFTAC proved its value in September 1949 when an AFTAC sensor aboard a B-29 flying between Alaska and Japan detected debris from the first Russian atomic test. The detection was considered particularly noteworthy since most experts had predicted that the first Russian atomic test could not occur until the mid-1950s.

During subsequent years, new detection systems were developed, and older systems were improved. When the Limited Test-Ban Treaty was signed in 1963, the primary role of monitoring certain provisions was assigned to AFTAC. The Treaty prohibits the signatory states from testing nuclear weapons in the atmosphere, under water, or in space. It also prohibits the venting of nuclear debris from underground tests across international boundaries.

To accomplish its mission, approximately 1,400 AFTAC men and women operate and maintain a worldwide system of satellite, electromagnetic pulse, hydro-acoustic, seismic, laboratory, sampling, and airborne operations facilities.

AFTAC headquarters is located at Patrick AFB, Fla., and includes a complex of operations centers to monitor the USAEDS network and receive data twenty-four hours a day. These centers are primarily responsible for the detection and identification of nuclear events occurring anywhere in the world.

To manage the USAEDS properly, AFTAC has three intermediate headquarters units that supervise and support the center's twelve detachments, five operating locations, and seventy equipment locations.

The largest subordinate is the Technical Operations Division, McClellan AFB, Calif. This major complex contains the McClellan Central Laboratory, the central analysis facility of the USAEDS, as well as a centralized logistics depot for the engineering, maintenance, and provisioning of the USAEDS network. In addition, an airborne operations directorate provides airborne special equipment operators for the USAEDS mission.

Hq. Pacific Technical Operations Area, located at Wheeler AFB, Hawaii, and Hq. European Technical Operations Area, Lindsey AB, West Germany, provide logistics and administrative support to subordinate activities in their geographic areas.

AFTAC's people possess a wide range of technical expertise, and many hold advanced degrees in chemistry, physics, nuclear engineering, and electrical engineering. Complementing an impressive scientific capability is an experienced and talented operational force of skilled, handpicked technicians. ■

USAF Historical Research Center

THE USAF Historical Research Center is the repository for Air Force historical documents. The center's collection, begun in Washington during World War II, moved to Maxwell AFB, Ala., in 1949. It consists today of more than 60,000,000 pages devoted to the history of the service and constitutes the largest and most valuable organized collection of documents on US military aviation in the world.

In 1979, the center became a direct reporting unit of the Air Force, receiving technical direction and guidance from the Chief, Office of Air Force History. It is collocated with the Air University Library and provides research facilities for professional military education students, the faculty, and visiting scholars.

More than eighty-five percent of the center's pre-1955 holdings are declassified. Almost the entire collection is recorded on 16-mm microfilm, with copies deposited at the National Archives and Record Administration, Washington, D. C., and the Office of Air Force History, located at Bolling AFB, D. C.

Center holdings consist largely of periodic unit histories prepared by the major commands, numbered air forces, and other subordinate organizations. These histories provide comprehensive coverage of Air Force activities beginning in 1942, when the President authorized the program. Extensive primary source material is attached to the histories, greatly enhancing their value.

Special collections complement

the unit histories. Among them are historical monographs, end-of-tour reports, joint and combined command documents, aircraft record cards, and materials from the US Army, British Air Ministry, and German Air Force. The center also houses the personal papers of key retired Air Force leaders and a substantial collection of their oral history interviews. About 6,000 documents and collections of all types are accessioned annually.

In 1974, the center adopted automated data processing as a finding aid and began in 1980 to enter abstracts of the documents into a computer. The Inferential Retrieval Index System, or IRIS, became operational in 1983 when the center acquired an IBM 4341 computer. IRIS became accessible in 1987.

The center is organized in four divisions.

- Reference. Maintains documents and microfilm, answers inquiries about holdings, produces bibliographies, collects personal papers, reviews records for possible downgrading or declassification, and provides other reference services to users.
- Research. Writes books and papers; prepares lineage and honors of Air Force units; maintains records of the Air Force seal and flag, records of unit and establishment emblems and flags, and records of Air Force organizations; determines aerial victory credits; and performs various other research and teaching services.
- Oral History. Conducts oral history interviews, monitors the USAF end-of-tour report program, and provides a training course for oral historians.
- Technical Services. Accessions, catalogs, abstracts, and indexes documents; conducts automated data processing and microfilming for the center; and coordinates computer applications for the Air Force history program. ■

United States Air Force Academy

THE mission of the US Air Force Academy (USAFA) is "to provide instruction and experience to all cadets so they graduate with the knowledge and character essential to leadership and the motivation to become career officers in the US Air Force." A Department of the Air Force agency, the Academy stands on an 18,000-acre site in the foothills of the Rocky Mountains near Colorado Springs, Colo. The US Air Force Academy is the largest of the service academies in land area.

Air Force Academy cadets take four years of academic studies leading to a bachelor of science degree. They also take professional military training to earn regular commissions in the US Air Force. When cadets enter the Academy, they agree to serve four years as a cadet and, upon graduation, to serve five years or longer as an active-duty Air Force officer, depending on their career fields. While they are at the Academy, the cadets are provided food, housing, and medical care by the US government. In addition, they receive a monthly salary to pay for uniforms, textbooks, and personal expenses.

In 1947, with the establishment of a separate Air Force, the issue of educating Air Force professionals became crucial. In 1949, the Secretary of Defense appointed a service academy board to study the need for another academy. After traveling 21,000 miles and considering 580 proposed sites in forty-five states, the board recommended three locations—Alton, Ill., Lake Geneva, Wis., and Colorado Springs. The latter was selected, and the state of Colorado contributed $1 million toward the purchase of the property.

Congress authorized creation of the Air Force Academy in 1954. The first class of 306 cadets entered temporary facilities at Lowry AFB, Denver, in July 1955. Meanwhile, construction of the new facility began in Colorado Springs. The cadet wing moved into its permanent home in August 1958. Nine months later, 207 cadets graduated.

Initial plans called for just over 2,500 cadets in the wing. In 1964, President Lyndon B. Johnson signed legislation that increased the Academy's strength to its present size of 4,417 cadets. Women first entered the Academy in 1976 and began graduating with the class of 1980.

The four-year program of instruction averages 186 semester hours and consists of military training, academics, athletics, and moral and spiritual development.

Academics include studies in the basic sciences, engineering, humanities, and the social sciences. Within this framework, all cadets complete a core curriculum with a balance from these four areas. They also select additional courses in one or more available majors. In addition, cadets may visit other Air Force or government installations to participate in various research projects. Cadets can compete with students from other universities for fellowships and scholarships.

Athletics consists of physical education classes and intramural and intercollegiate sports. With few exceptions, all cadets must participate in one or more of the twenty-one intramural sports or in intercollegiate competition throughout their Academy careers. To remain eligible for intercollegiate sports, a cadet must maintain an average of at least seventy percent in each academic subject. In addition, they participate in athletic periods as well as in their physical education classes.

The Cadet Honor Code is the centerpiece of moral and ethical development. Cadets pledge: "We will not lie, steal, or cheat, nor tolerate among us anyone who does." All cadets take a formal course in ethics and receive honor and ethics instruction. In addition, they are encouraged to participate in voluntary religious services and programs offered at the Academy.

Cadets live in dormitories located in the cadet area. The normal weekday begins with reveille at 6:30 a.m., followed by room inspection and breakfast. Classes are held from 8:00 a.m. until noon and then from 1:00 p.m. to 4:00 p.m. The majority of classes are held in small classrooms and laboratories. After classes, cadets participate in sports and extracurricular activities. The evening meal is followed by an allocated three-hour study period in the dormitories or Academy library beginning at 8:00 p.m. Taps is sounded at 11:00 p.m.

Candidates for appointment to the Academy must be citizens of the United States, at least seventeen but not yet twenty-two years old on July 1 of the year of entry, unmarried with no legal dependents, and of good moral character. They must also pass qualifying medical examinations, the candidate fitness test, and college entrance examinations to qualify for appointment.

Full information, including preparation and admission procedures, can be obtained from the Director of Admissions, US Air Force Academy, Colo. 80840-5651. ■

Revolutionary "smart skins" will integrate avionics and sensors directly into the skin and structure of future aircraft and space vehicles. As part of the U.S. Air Force's Project Forecast II, Hughes Aircraft Company is working with the USAF Avionics Laboratory to develop concepts and applications for a new generation of avionics. Systems using these technologies will provide levels of performance, reliability, and fault tolerance not possible in current conventional avionics systems.

A new display system has successfully passed Aegis Combat System integration testing, and is ready to be installed aboard U.S. Navy ships. The AN/UYQ-21 display system, developed by Hughes, is the new standard Navy display for warships. During testing, the UYQ-21 demonstrated that its system consoles and related supporting functions meet all requirements for use aboard Aegis cruisers and destroyers. The UYQ-21 will also be used aboard other classes of destroyers, guided missile frigates, and aircraft carriers. The display will be employed for antisubmarine warfare, electronic warfare, command and control, and fire control.

A new inspection tool can locate breaks and imperfections in optical fibers and visually inspect the continuity of individual fibers. The Hughes Glocater™ fiber-optic fault locator consists of an "enhanced" helium-neon laser, high-efficiency fiber coupler, and power supply. Designed for use during installation, re-arrangement, maintenance, and other procedures, the locator is attached to fibers being tested. In addition to its use in system acceptance testing of cables, jumpers and pigtails, the Glocater can serve as a tool for fiber-optic training centers. It can also be used on both single-mode or multimode fiber of any wavelength to verify continuity and provide positive end-to-end identification.

A new cabin control system for Boeing's 747-400 jumbo jetliner uses all-digital technology to perform a wide range of passenger service functions previously unavailable. The Advanced Cabin Entertainment and Service System (ACESS), designated the APAX-140, extends the application of digital multiplexed techniques to such functions as cabin interphone, lighting, and advisory signs. Other features include an interactive, two-way capability that allows passengers to communicate back to a central computer for in-flight ordering of specific goods and services, and a self-test function that monitors and records faults while in flight. Hughes, supplying multiplexed passenger entertainment and service systems since 1970, designed and built ACESS for Boeing.

Hughes designed and built a probe for the Galileo Mission, which is expected to unlock the secrets of Jupiter, providing scientists with data about the planet's atmosphere. Scheduled for launch from the Space Shuttle in late 1989, Galileo will employ a solid-fueled Inertial Upper Stage rocket, aided by gravity assists from Venus and Earth, to boost itself from the Shuttle's orbit to the giant planet. Once Galileo is within reach of outer Jupiter, the Hughes-built probe will be released into the Jovian atmosphere. During its 60-minute descent to the surface, the probe will continually broadcast scientific data back to Galileo, which will then transmit the information to Earth.

For more information write to: P.O. Box 45068, Los Angeles, CA 90045-0068

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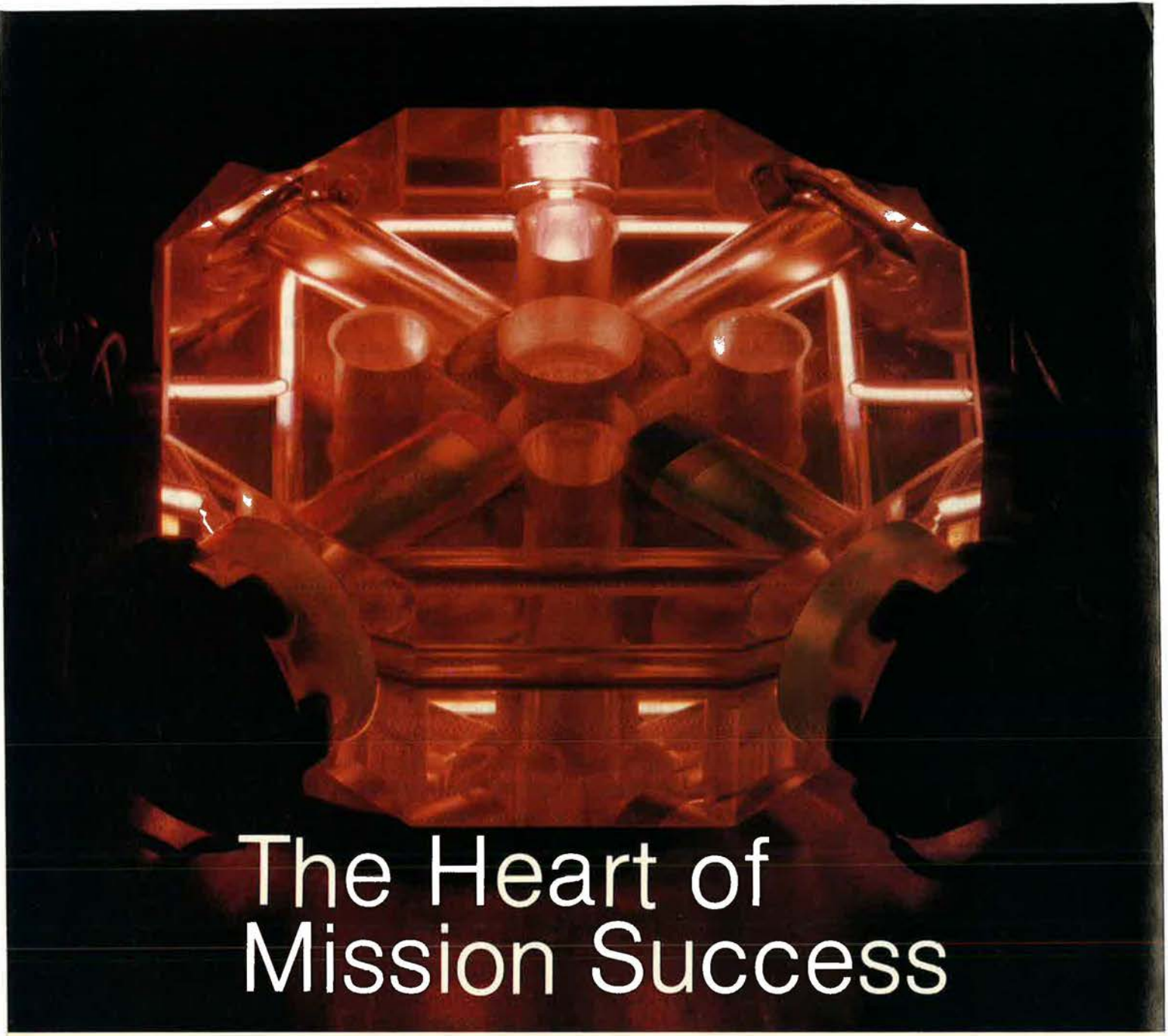

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Gallery of USAF Weapons

BY SUSAN H. H. YOUNG, ASSOCIATE COMPILER, JANE'S ALL THE WORLD'S AIRCRAFT
EDITED BY JOHN W. R. TAYLOR, EDITOR IN CHIEF, JANE'S ALL THE WORLD'S AIRCRAFT

Bombers

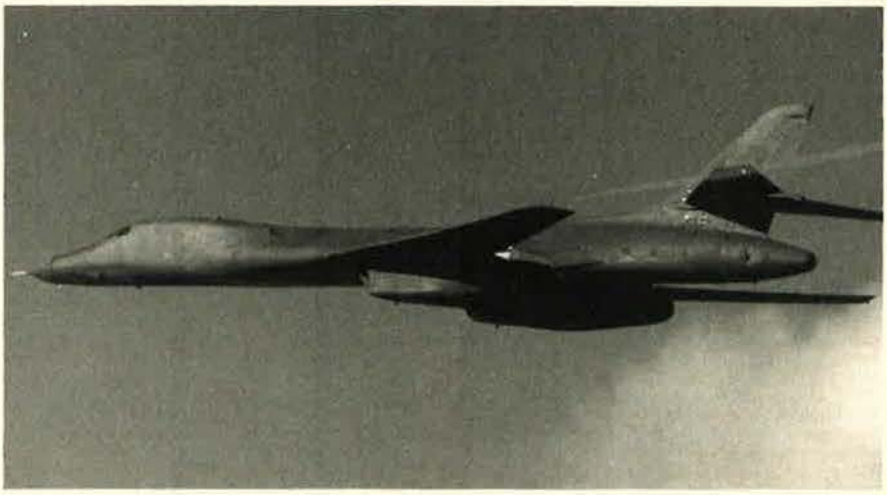
B-1B

A significant milestone in SAC's long-awaited reequipment is being reached this year, when the last of its full complement of B-1B long-range penetrating bombers enters service, just three years after the first operational B-1B was delivered to Dyess AFB, Tex., in June 1985. Described as "essentially a large computer system surrounded by fuel and engines," this highly survivable system is smaller than the B-52, but carries a considerably greater weapons load because of improved engine performance and advanced aerodynamic technology. Up to 90 of the 100 B-1Bs will be assigned to a dual-role nuclear/theater mission, each with three weapons bays providing the flexibility to carry long- and short-range nuclear air-to-surface missiles, nuclear or conventional gravity bombs, mines, other weapons, or fuel, as required. A movable bulkhead in the forward weapons bay, to allow for the carriage of a wide range of different-size weapons, including the ALCM, was incorporated from the ninth production airframe onwards and retrofitted to earlier aircraft. The first launch of an AGM-69 SRAM from a B-1B was made successfully in January last year.

The B-1B is equipped with electronic jamming equipment, infrared countermeasures, radar location and warning systems, and other devices necessary to defeat enemy defensive systems. To facilitate very-low-level penetration of hostile territory, it has a radar system that will allow it to follow "the nap of the earth" at near supersonic speeds. This will make it extremely difficult for enemy radar systems to track the B-1B, as hills, mountains, towers, buildings, and even trees will clutter the radar screen. The use of radar-absorption materials reduces further the aircraft's radar cross section. Flying low at high speeds also negates the effectiveness of enemy interceptors because it is difficult to acquire and track B-1Bs flying close to the ground. This will enable the B-1B to penetrate sophisticated enemy defenses well into the 1990s and to operate within less heavily defended areas into the next century.

Developed from the original B-1A design, the blended wing/body B-1B is outwardly generally similar to prototype B-1A No. 4. The variable-geometry wing was retained, its unswept setting permitting rapid takeoff from a base threatened by imminent attack or operation from shorter runways and less-sophisticated airfields; the fully swept position is used in supersonic flight and for the primary role of high-subsonic, low-level penetration. Structural strengthening facilitated an increase in gross T-O weight from 395,000 lb to 477,000 lb. Empty weight of the B-1B is only 8,000 lb above that of the B-1A, but a 75,000 lb increase in fuel/payload has been achieved. Ejection seats replace the crew ejection capsule. Fixed engine inlets replace variable inlets, and new engine nacelles and simplified overwing fairings have been introduced.

Offensive and defensive electronics systems were much improved over the B-1A. The offensive avionics include a modern forward-looking and terrain-following radar, an extremely accurate inertial navigation system, a link to the Air Force Satellite Communications (AFSATCOM) system, a new computer-driven avionics system, strategic Doppler radar, and radar altimeter. The defensive avionics package is built around the ALQ-161 electronic countermeasures (ECM) system with an extended frequency coverage. This flexible, reprogrammable system automatically detects and analyzes radars illuminating the aircraft. A central computer then selects an appropriate countermeasure and applies the best ECM technique at precisely the right time, with the right power and optimal angle to protect the aircraft from the probing radar. The defensive avionics package also includes a tail warning function using the ALQ-161 system and such expendables as chaff and flares. Development of the full potential of the system is continuing, and it is hoped that current problems will be largely corrected by next year.



B-1B

B-52G

Dyess AFB achieved IOC in September 1986 and has received all of its scheduled 29 B-1Bs. Deliveries to Ellsworth AFB, S. D. (35 aircraft), Grand Forks AFB, N. D. (17 aircraft), and McConnell AFB, Kan. (17 aircraft), are scheduled for completion this summer.

Last summer, a series of international speed and distance with payload records was set by the B-1B. On July 4, a 2,000-km closed circuit was covered at a speed of 1,078.2 km/h (669.96 mph) with a payload of 30,000 kg (66,140 lb). On September 17, a similar payload was carried around a 5,000-km circuit at 1,054.206 km/h (655.05 mph).

Contractors: Rockwell International, North American Aircraft Operations; Eaton Corporation, AIL Division; Boeing Military Airplane Company; and General Electric.

Power Plant: four General Electric F101-GE-102 turbofans; each 30,780 lb st.

Accommodation: four: pilot, copilot, and two systems operators (offensive and defensive).

Dimensions: span spread 136 ft 8½ in, fully swept 78 ft 2½ in, length 147 ft, height 34 ft.

Weight: max T-O weight 477,000 lb.

Performance: max speed at low level high subsonic (supersonic at altitude); range intercontinental.

Armament: three internal weapons bays capable of accommodating in a nuclear role 24 AGM-69 SRAMs, 12 B-28 or 24 B-61 or B-83 free-fall nuclear bombs; in a nonnuclear role up to 84 Mk 82 (500 lb) bombs or Mk 36 (500 lb) mines. The forward and aft bays can be combined to carry eight cruise missiles on a common strategic rotary launcher (CSRL). Six underfuselage stores stations can carry an additional 12 cruise missiles.

B-2 (ATB)

Regarded as a program of the highest priority, the Advanced Technology Bomber (ATB), or B-2 as it is now officially known, is in an advanced stage of engineering development, with "the technology . . . well understood and working." The date for the first flight remains classified, but initial operational capability is expected in the early 1990s, with the B-2 assuming the high-threat penetration role of the B-1B during the final years of that decade. Sophisticated technologies, in particular the use of low-observable (stealth) techniques, provide a low probability of engagement by projected Soviet air defenses, ensuring the system's effectiveness well into the next century. The Air Force plans to deploy 132 B-2s in the 1990s at a program cost of $36.6 billion (FY '81 dollars), with first deliveries to Whiteman AFB, Mo.

Prime Contractor: Northrop Corporation Aircraft Group, with Boeing Aerospace and LTV (Vought) as key members of the development team.

Power Plant: provided by General Electric Engine Group.

B-52 Stratofortress

Although the SAC inventory is undergoing a radical change, USAF is not planning to retire any more of its remaining B-52s until most of the B-1Bs and at least some of the B-2s (ATBs) are operational. The 263 B-52s currently operational are capable of delivering a wide range of weapons, including conventional and nuclear bombs, air-launched cruise missiles, and nuclear-tipped air-to-surface short-range attack missiles. Apart from their primary nuclear mission, the B-52s can be deployed in various conventional roles, including show of

force, maritime interdiction, precision strikes, and defense suppression. Other collateral missions in recent years have included sea-surveillance flights, aerial minelaying and antisurface warfare operations in cooperation with the US Navy, and support for NATO exercises.

The two versions still in service are the **B-52G,** which introduced important changes, including a redesigned wing containing integral fuel tanks, fixed underwing external tanks, a new tail fin of reduced height and broader chord, and a remotely controlled tail gun turret that allowed the gunner to be repositioned with the rest of the crew; deliveries began in February 1959, and 193 were built; and the **B-52H,** the final version, which switched to TF33 turbofans, providing increased unrefueled range, and which has improved defensive armament, including a 20-mm Vulcan multibarrel tail gun; 102 were built, with deliveries starting in May 1961.

During the early 1970s, all B-52Gs and Hs were modified to carry AGM-69A Short-Range Attack Missiles (SRAMs). Additionally, all Gs and Hs have been equipped with an AN/ASQ-151 Electro-optical Viewing System (EVS), using forward-looking infrared (FLIR) and low-light-level TV sensors to improve low-level flight capability. Under USAF improvement programs begun in 1974, the Gs and Hs have been progressively updated with Phase VI avionics. These include ALQ-122 SNOE (Smart Noise Operation Equipment) and AN/ALQ-155(V) advanced ECM; an AFSATCOM kit permitting worldwide communications via satellite; a Dalmo Victor ALR-46 digital radar warning receiver; Westinghouse ALQ-153 pulse-Doppler tail warning radar; and an improved ITT Avionics ALQ-117 Pave Mint or ALQ-172 ECM jamming system. The G/Hs have also been fitted with a digital-based solid-state Offensive Avionics System (OAS) that includes inertial guidance, Tercom (terrain comparison) guidance, and microprocessors to upgrade their navigation and weapons delivery systems. This program was completed in 1986.

Because of the long range and diversified payload capabilities of their aircraft, two B-52H wings have been assigned to support conventional operations by employing airpower over great distances on short notice. With the continued improvement of Soviet defenses and the development and deployment of USAF's next-generation bombers, the role of the B-52 is transitioning to ALCM (AGM-86) carrier. A typical profile would see multiple ALCM launches at high altitude, often followed by B-52 low-level descent to attack additional targets using gravity weapons or SRAMs. USAF completed deployment of AGM-86s on 98 on-line B-52Gs, each with 12 external cruise missiles, in December 1984. As B-1Bs entered service, USAF began deployment of ALCMs on 96 B-52Hs. Full-scale production of the Common Strategic Rotary Launcher (CSRL), which will permit internal carriage of eight additional AGM-86s in the B-52H, is under way, with 54 of the planned 104 already contracted for. This will allow a total ALCM offensive weapon load of 20 cruise missiles. Completion of this program is scheduled for FY '90. The 69 B-52Gs not scheduled for use as cruise missile carriers have replaced the now-retired B-52Ds in conventional roles. They achieved full operational capability in June 1985 in support of naval antisurface warfare operations through Harpoon employment. Two full squadrons are equipped for this role, based at Loring AFB, Me., for Atlantic operations, and at Andersen AFB, Guam, for Pacific operations.

Additionally, flight testing began in 1986 of an integrated conventional stores management system (ICSMS) for installation on the 69 non-ALCM B-52Gs. The ICSMS enables aircraft normally configured for the carriage of nuclear weapons to carry conventional weapons by rearranging data stored in the weapon systems computer, using a preprogrammed removable software cassette. IOC for the system is planned for this year. Future plans call for an increase in the number of B-52G/Hs assigned to the dual-role mission, capable of both nuclear and theater warfare. (Data for B-52G, except where noted.)

Contractor: Boeing Military Airplane Company.
Power Plant: eight Pratt & Whitney J57-P-43WB turbojets; each 13,750 lb thrust.
Accommodation: two pilots, side by side, plus navigator, radar navigator, electronic warfare officer, and fire control system operator (gunner).
Dimensions: span 185 ft 0 in, length 160 ft 10.9 in, height 40 ft. 8 in.
Weight: G/H models gross more than 488,000 lb.
Performance (approx): max level speed at high altitude 595 mph, service ceiling 55,000 ft, range more than 7,500 miles.
Armament: G model has four 0.50-caliber guns in tail turret; H model has 20-mm gun. G/H models being adapted to carry eight SRAMs and nuclear free-fall bombs internally and 12 AGM-86B ALCMs instead of SRAMs externally. Provision for eight more ALCMs instead of SRAMs internally on H model. Alternatively, modified G models can carry eight to 12 Harpoons in underwing clusters.

FB-111A

Capable of providing high-precision, low-altitude weapons delivery in all weather, day or night, the FB-111A is a two-seat, medium-range, supersonic strategic bomber version of the swingwing F-111, developed originally to provide SAC with a replacement for early versions of the Stratofortress and supersonic B-58A Hustlers. The first of 76 production aircraft flew in July 1968, and the initial delivery was made in October 1969 to the 340th Bomb Group; 60 aircraft remain, 48 for strike duties and 12 in reserve. Although the FB-111A is currently assigned to the nuclear mission, its conventional weapons capability will suit it to dual-role use. FB-111s will remain operational throughout the 1990s, with several Class IV modifications, including avionics modernization to enhance navigation, attack, and terrain-following capabilities, engine work, and escape module modifications, in progress. Operational units equipped with FB-111As are the 380th and 509th Bomb Wings.

FB-111

Contractor: General Dynamics Corporation.
Power Plant: two Pratt & Whitney TF30-P-7 turbofans; each 20,350 lb thrust with afterburning.
Accommodation: two, side-by-side.
Dimensions: span spread 70 ft 0 in, fully swept 33 ft 11 in, length 73 ft 6 in, height 17 ft 1.4 in.
Weight (approx): gross 100,000 lb.
Performance: max speed at 36,000 ft Mach 2.5, service ceiling more than 60,000 ft, range 4,100 miles with external fuel.
Armament: up to four AGM-69A SRAM air-to-surface missiles on external pylons, plus two in the weapons bay, or six nuclear bombs, or combinations of these weapons; provision for up to 31,500 lb of conventional bombs.

Fighters

F-4 Phantom II

Although the F-4 continues to be replaced by the F-15 and F-16 in active USAF units, many hundreds are still operational and are replacing older aircraft in reserve units. Designed in the mid-1950s, the F-4 has moved to a predominantly air-to-ground role, although it retains residual air-to-air capability. Continuous updating has maintained the effectiveness of the F-4, and under a 1986 contract the navigation and weapons delivery systems on up to 600 USAF and ANG F-4s are to be modified. Some are also receiving a low-smoke engine modification and radar warning receiver update in the FY '85–89 tactical aircraft modification program. First version supplied to USAF was the **F-4C,** a two-seat twin-engine all-weather tactical fighter with J79-GE-15 turbojets, dual controls, an inertial navigation system, and boom flight refueling. F-4Cs still equip a few Air National Guard units. The **F-4D** introduced major systems changes, including new weapon ranging and release computers to increase accuracy in air-to-air and air-to-surface weapon delivery. F-4Ds equip both Air Force Reserve and Air National Guard units. All AFRES F-4s will be repainted gray-on-gray by 1990 to make them less visible at high altitudes. The **F-4E** was developed as a multirole fighter capable of performing counterair, close-support, and interdiction missions. A 20-mm Vulcan multibarrel gun is fitted, together with an improved fire-control system and an additional fuselage fuel tank. Leading-edge slats, to improve maneuverability, were retrofitted to all USAF F-4Es. In addition, from early 1973, some were fitted with Northrop's target-identification system electro-optical (TISEO) as an aid to positive long-range visual identification of airborne or ground targets. System improvements include the Pave Tack system, which provides a day/night adverse weather capability to acquire, track, and designate ground targets for laser, infrared, and electro-optically guided weapons; the Pave Spike day tracking/laser ordnance designator pod, for use with "smart" weapons; and a digital intercept computer that includes launch computations for USAF AIM-9 and AIM-7 missiles. As this version is replaced by F-15s and F-16s in the active force, it is being transferred to the ANG, replacing C and D models. All ANG F-4Ds and Es are being modified to carry AIM-9L/M Sidewinder missiles. The **F-4G** "Advanced Wild Weasel" is a modified F-4E with its gun replaced by AN/APR-38 electronic warfare equipment that enables it to detect, identify, and locate enemy radars and then direct against them weapons for their destruction or suppression. A Performance Update Program (PUP) is currently proposed to upgrade the system's signal processor and direction receiver. Primary armament includes Shrike (AGM-45) and HARM (AGM-88A). (Data for F-4E.)

F-4E

Contractor: McDonnell Aircraft Company, Division of McDonnell Douglas Corporation.
Power Plant: two General Electric J79-GE-17A turbojets; each 17,900 lb thrust with afterburning.
Accommodation: pilot and weapon systems operator in tandem.
Dimensions: span 38 ft 7½ in, length 63 ft 0 in, height 16 ft 5½ in.
Weights: empty 30,328 lb, gross 61,795 lb.
Performance: max speed at 40,000 ft Mach 2.0 class, range with typical tactical load 700 miles.
Armament: one 20-mm M61A1 multibarrel gun; provision for up to four AIM-7E Sparrow, AGM-45A Shrike, AGM-88A HARM, or AIM-9 Sidewinder missiles on four underfuselage and four underwing mountings, or up to 16,000 lb external stores.

F-5E/F Tiger II

Developed as the successor to Northrop's F-5A export fighter, the Tiger II was intended primarily to provide America's allies with an uncomplicated air-superiority tactical fighter that could be operated and maintained relatively inexpensively. The single-seat **F-5E,** first flown in August 1972, is basically a VFR day/night fighter with limited all-weather capability. Design emphasis is on maneuverability rather than high speed, notably through the use of maneuvering flaps. Well over 1,000 F-5Es and two-seat **F-5Fs** were delivered through early 1987, when the last two aircraft were delivered to an export customer.

TAC, assisted by ATC, trains pilots and technicians of user air forces. For this purpose, 20 F-5Es were supplied to USAF, beginning in April 1973, before deliveries to foreign governments began in early 1974. TAC also operates two "aggressor squadrons" of camouflaged F-5Es, simulating late-model MiG threat aircraft, in "Red Flag" exercises at Nellis AFB, Nev. Similar training is provided by F-5Es of the 527th Tactical Fighter Training Aggressor Squadron, USAFE, at RAF Alconbury, England; and by PACAF's 26th Tactical Fighter Training Squadron, located at Clark AB, Philippines.

In a program planned to upgrade USAF's 74 F-5Es and Fs, the current APQ-153 radar will be replaced by a new AN/APQ-159(V)5 or AN/APQ-159(V)6 radar, respectively, doubling detection range and incorporating off-boresight target acquisition and track-while-scan. A new warning receiver and radar jammer will also be installed. (Data for F-5E.)

Contractor: Northrop Corporation, Aircraft Division.
Power Plant: two General Electric J85-GE-21B turbojets; each 5,000 lb thrust with afterburning.
Accommodation: pilot only.
Dimensions: span 26 ft 8 in, length 47 ft 4¾ in, height 13 ft 4¼ in. (F-5F length 51 ft 4 in, height 13 ft 2 in.)
Weights: empty 9,723 lb, gross 24,722 lb.
Performance (at 13,350 lb): max level speed at 36,000 ft Mach 1.64, service ceiling 51,800 ft, range with max fuel, with reserve fuel for 20 min at S/L (with external tanks retained), 1,543 miles.
Armament: two AIM-9 Sidewinder missiles on wingtip

launchers; two M39-A2 20-mm cannon in nose, with 280 rounds per gun (one 20-mm in F-5F); up to 7,000 lb of mixed ordnance on four underwing attachments and one underfuselage station. Optional armament and equipment includes AGM-65 Maverick, laser-guided bombs, and centerline multiple ejector rack.

F-15 Eagle

USAF's primary air-superiority aircraft, the F-15 has been progressively replacing the F-4 since the mid-1970s. The original single-seat **F-15A** and two-seat **F-15B** were followed from June 1979 by the **F-15C** and **F-15D** respectively, with 2,000 lb of additional internal fuel and provision for carrying conformal fuel tanks (CFTs). Basic F-15 equipment included a Hughes Aircraft APG-63 lightweight X-band pulse-Doppler radar for long-range detection and tracking of small high-speed objects down to treetop level. Under ongoing contracts initiated in February 1983, the F-15 is undergoing a multistage improvement program (MSIP). Improvements include a programmable armament control set (PACS), improved central computer, MIL-STD-1760 incorporation, APG-70 radar, and an expanded tactical electronic warfare system (TEWS) allowing for the addition of such weapons as advanced versions of the AIM-7 and AIM-9 and AMRAAM. Delivery of MSIP-equipped F-15s began in June 1985. An overload warning system, permitting safe maneuver to 9*g* throughout most of the flight envelope at flight design gross weights, is now being delivered in F-15C/Ds and will be retrofitted to earlier aircraft.

The **F-15E** is USAF's new two-seat dual-role fighter for all-weather air-to-air and deep interdiction missions. The demonstrator was a modified two-seat F-15B with the rear cockpit upgraded to include four multipurpose CRT displays for radar, weapon selection, and monitoring of enemy tracking systems. Production F-15Es also have front cockpit modifications, including redesigned controls, a wide field of view head-up display, and three CRT multipurpose displays. The F-15E is capable of carrying up to 24,500 lb of ordnance. The digital, triple-redundant Lear Siegler flight-control system permits coupled automatic terrain following, and navigational accuracy is improved by a Honeywell ring laser gyro INS. For low-altitude, high-speed penetration and precision attack on tactical targets at night and in adverse weather, the F-15E carries a high-resolution Hughes APG-70 radar and LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) pods, with wide-field forward-looking infrared (FLIR). The F-15E is the first aircraft to be so equipped. To accommodate the new avionics, internal fuel capacity is reduced slightly, but the F-15E is fitted with CFTs, adapted to carry ordnance tangentially to reduce drag. In addition to its primary load of guided and unguided bombs and other air-to-ground weapons, the F-15E retains its air-superiority performance and weapons. Armament options include AIM-7F and M Sparrow, AIM-9J, L, M, and P Sidewinder, and AIM-120A AMRAAM, as well as AGM-65 Maverick, GBU-12/-24 laser-guided bombs, and GBU-15 glide bombs. A new engine bay has been developed by McDonnell Douglas to allow installation of either General Electric F110 or Pratt & Whitney F100 engines, and an F-15 powered by Pratt & Whitney's improved F100-PW-220 engines was delivered to the 33d TFW at Eglin AFB, Fla., in August 1986 for in-service evaluation. Other improvements include foam-filled fuel tanks for greater survivability, higher-rated generators, and improved environmental control system. The first of three prototypes flew in December 1986, and the first production F-15E was scheduled for delivery to the 405th TTW at Luke AFB, Ariz., early this year. Procurement of 392 F-15E Eagles is planned, with IOC scheduled for mid-1989.

Planned production of all models of the F-15 totals 1,266 aircraft for USAF, plus the original 20 R&D models, by the mid-1990s. Orders to date total 966 for operational use by USAF. Units already equipped with Eagles include TAC's 57th FWW, 325th and 405th TTWs, and 1st, 33d, and 49th TFWs; USAFE's 32d TFS and 36th TFW; and PACAF's 18th TFW. First US air defense squadron to receive Eagles was the 48th FIS at Langley AFB, Va., followed by the 318th FIS at McChord AFB, Wash., and the 5th FIS at Minot AFB, N. D. In addition, the 57th FIS at Keflavik NAS, Iceland, received its first aircraft for the air defense role in July 1985. AAC's base at Elmendorf has been operational since 1982 in support of air defense. Part of the F-15 FIS role at Langley was intended to be an antisatellite mission, using the ASAT weapon *(see page 190).*

Equipment of ANG units with F-15A/B aircraft began in 1985 with the 159th TFG, followed by the 116th TFW in 1986 and the 154th Composite Group in 1987; the 102d FIW is due to convert this year.

In response to a USAF request made in September 1983, McDonnell Douglas is to develop and flight-test an advanced technology version of the F-15 with short takeoff and landing (STOL) and new maneuvering capabilities, designated **F-15 SMTD** (STOL/Maneuvering Technology Demonstrator). Scheduled to begin flight trials this year, the airplane will have movable canards mounted forward of the wings to increase lift and reduce overall drag. Rectangular jet nozzles will vector engine thrust during takeoff and in-flight maneuvers and might reverse thrust to shorten the landing run. The aircraft will be used to investigate rough/soft-field STOL landing gear and is expected to be capable of takeoff with full internal fuel and a 6,000 lb external payload from a 1,500 ft runway; landing run with payload expended is expected to be under 1,250 ft on a wet runway. Flying control, engine, steering, and braking functions will be integrated with existing F-15 controls through a digital fly-by-wire system to take optimum advantage of the aircraft's added capability while reducing the pilot's work load. Radar, infrared, and inertial navigation systems will generate data to locate the runway and furnish guidance cues. (Data for F-15C, except where stated.)

Contractor: McDonnell Aircraft Company, Division of McDonnell Douglas Corporation.

Power Plant: two Pratt & Whitney F100-PW-100 turbofans; each approx 23,830 lb thrust. Improved F100-PW-220 will equip new F-15s.

Accommodation: pilot only in F-15A/C; two seats in F-15-B/D/E.

Dimensions: span 42 ft 9¾ in, length 63 ft 9 in, height 18 ft 5½ in.

Weights: empty 27,300 lb, gross 68,000 lb in F-15A/B/C/D; gross 81,000 lb in F-15E.

Performance: max speed Mach 2.5, service ceiling 60,000 ft, ferry range, with external fuel tanks, more than 2,878 miles; with CFTs, 3,570 miles.

Armament: one internally mounted M61A1 20-mm six-barrel cannon; four AIM-9L/M Sidewinder and four AIM-7F/M Sparrow air-to-air missiles, or eight AMRAAMs, carried externally. Provision for carrying up to 24,500 lb of ordnance on weapon stations on F-15E.

F-5E

F-15s

F-16C

F-16 Fighting Falcon

The F-16 was developed to replace F-4s in the active force and to modernize the air reserve forces. Advanced technologies incorporated from the start in the single-seat **F-16A** and two-seat **F-16B** versions made them two of the most maneuverable fighters ever built. The advances include decreased structural weight through the use of composites, decreased drag resulting from reduced static stability margin, fly-by-wire flight controls with side stick force controller, high *g* tolerance/high visibility cockpit with a 30-degree reclined seat and single-piece bubble canopy, blended wing-body aerodynamics with forebody strakes, and automatically variable wing leading-edge flaps. The F-16 is powered by a single afterburning turbofan. Equipment includes a multimode radar with clutter-free look-down capability, advanced radar warning receiver, a head-up display, internal chaff or flare dispensers, and a 500-round 20-mm internal gun. The aircraft also has provisions for ECM.

The F-16 entered operational service with TAC's 388th TFW at Hill AFB, Utah, in January 1979. Production of the F-16A and B for USAF ended in 1985. However, USAF and NATO operators are cooperating in an operational capabilities upgrade (OCU) program to permit F-16A/Bs to utilize next-generation air-to-air and air-to-surface weapon systems by changes to existing radar systems and software and by improving the aircraft's fire control and stores management computers.

A forward-looking plan for the aircraft, known as the Multinational Staged Improvement Program (MSIP), had been implemented by USAF in February 1980 to assure the aircraft's capability to accept systems under development, thereby minimizing retrofit costs. As a first stage, all F-16s delivered since November 1981 have had built-in structural and wiring provisions and systems architecture that expand the single-seater's multirole flexibility to perform precision strike, night attack, and beyond-visual-range interception missions. Stage two was applicable to the improved **F-16C** (single-seat) and **F-16D** (two-seat) versions, of which deliveries to USAF began in January 1985. Current aircraft have a Westinghouse APG-68 multimode radar with increased range and advanced ECCM, and advanced cockpit displays including a wide-angle head-up display with FLIR video. Shrike antiradiation missiles and multitarget AMRAAM compatibility were added last year. System improvements to be introduced from the end of this year include installation of LANTIRN nav/attack system (on about 350 aircraft), digital flight controls, automatic terrain following, advanced IFF, increased T-O weight and maneuvering limits, while monitoring 9*g* capability and an 8,000-hour airframe. The airborne self-protection jammer (ASPJ), ALR-74 or ALR-56M advanced radar warning receiver, and increased performance F100-PW-229 and F110-GE-IPE engines will follow.

A sophisticated research variant of the F-16, known as the **AFTI/F-16,** continues in use at Edwards AFB, Calif., to test and evaluate advanced fighter technologies, including flight-control systems, pilot/vehicle interface, an automated maneuvering attack system, and an advanced weapon interface. The next phase of the program will evaluate close air support technologies.

Up to 270 of the original F-16As are to be modified to **F-16 (ADF)** standard under a contract awarded in October 1986, to meet USAF's requirement for an air defense

fighter to replace aging F-106s and F-4s in eleven ANG continental air defense squadrons. The APG-66 radar of these aircraft will be upgraded with an AMRAAM data link, provisions for AIM-7 Sparrows, improved ECCM, and improved capability against cruise missiles. New equipment will include HF radio, an IFF interrogator, ID light, a crash-survivable flight data recorder, and provisions for GPS. Armament will include the M61 gun and up to six missiles, including combinations of Sparrows, AMRAAMs, and Sidewinders.

A further version, known as **Agile Falcon,** with 25 percent larger composite wings, minor aerodynamic changes, and improved engine, is under consideration as a potential close air support and battlefield air interdiction (CAS/BAI) aircraft.

USAF plans a total buy of 2,699 F-16s through FY '94. To date, 1,679 have been funded, with 1,453 to be delivered by the end of FY '88.

F-16s are standard equipment with TAC, USAFE, and PACAF units and are progressively replacing older aircraft in the AFRES and ANG. F-16As also equip USAF's Thunderbirds Air Demonstration Squadron. Over 1,100 more have been delivered to, or ordered for, the air forces of Bahrain, Belgium, Denmark, Egypt, Greece, Indonesia, Israel, the Netherlands, Norway, Pakistan, Singapore, South Korea, Thailand, Turkey, Venezuela, and the US Navy. Japan has ordered a variant of the F-16 to be called SX-3. (Data for F-16C.)

Contractor: General Dynamics Corporation.
Power Plant: one augmented turbofan. General Electric F110-GE-100 and Pratt & Whitney F100-PW-220 are alternative standard engines; each 29,000 lb thrust.
Accommodation: pilot only.
Dimensions: span over missiles 32 ft 9¾ in, length overall 49 ft 4 in, height 16 ft 8½ in.
Weights: empty 16,794 lb, gross with external loads 37,500 lb.
Performance: max speed Mach 2 class, service ceiling more than 50,000 ft, ferry range more than 2,000 miles.
Armament: one M61A1 20-mm multibarrel cannon, with 500 rounds, mounted in fuselage; wingtip-mounted infrared missiles; seven other external stores stations for fuel tanks and air-to-air and air-to-surface munitions.

ATF (YF-22A and YF-23A)

The aim of the Advanced Tactical Fighter (ATF) program is to produce the next-generation air-superiority fighter as a follow-on to the F-15 to counter the threat projected for the mid-1990s and beyond. ATF will be designed to penetrate high-threat enemy airspace and support AirLand Battle forces with a first-look, first-kill capability against multiple targets. It will combine a highly maneuverable airframe with low-observable "stealth" technologies, sustained supersonic cruise capability, and advanced avionics and weapon systems, permitting simultaneous engagement of multiple targets. Program emphasis from the outset has been on achieving the proper balance of reliability/supportability, affordability, survivability, and performance.

In 1986, the program was restructured to incorporate the development of prototype vehicles, implement Packard Commission recommendations, emphasize "fly before buy" and competition, and reduce technical/cost risk for full-scale development (FSD). In October that year, USAF awarded contracts to the Lockheed and Northrop Corporations to enter the 50-month demonstration/validation phase of the program. First flight of the prototype aircraft (Lockheed **YF-22A** and Northrop **YF-23A**) is expected in early 1990. The FY '88 budget contained approval for $500 million for the ATF. FSD is scheduled to begin in FY '91. USAF has a stated requirement for up to 750 ATFs, with IOC by the mid-1990s. Lockheed has teamed with Boeing and General Dynamics, Northrop with McDonnell Douglas. Simultaneous demonstration and validation of ground-based avionics prototypes and development of ground-test General Electric YF120 and Pratt & Whitney YF119 prototype engines are also under way. Both aircraft will be required to fly with GE and P&W engines.

QF-106

F-106 Delta Dart

The F-106 air defense fighter was developed in the mid-1950s. Constant updating enabled USAF to maintain its effectiveness, but only four squadrons remain in service with ANG units, and these are progressively converting to newer aircraft.

The two production versions were the **F-106A** single-seat interceptor and the **F-106B,** a tandem two-seat dual-purpose combat trainer. All F-106s in the active inventory will be phased out by the end of this year and converted to QF-106 aerial target drones. (Data for F-106A.)

Contractor: Convair Division of General Dynamics.
Power Plant: one Pratt & Whitney J75-P-17 turbojet; 24,500 lb thrust with afterburning.
Accommodation: pilot only.
Dimensions: span 38 ft 3½ in, length 70 ft 8¾ in, height 20 ft 3⅓ in.
Weights (approx): empty 25,300 lb, gross 42,400 lb.
Performance (approx): max speed at 40,000 ft Mach 2.0, service ceiling 65,000 ft, range 1,200 miles.
Armament: four AIM-4F/G Falcon air-to-air missiles carried internally; one 20-mm cannon on most F-106As.

F-111

Representing USAF's only current long-range, around-the-clock, interdiction fighters, four versions of this pioneer variable-geometry tactical aircraft were built. Deliveries of production **F-111As** to the first operational wing began in October 1967, and 141 were built. This version served with distinction in SEA in 1972–73 and currently equips the 366th TFW. The A was superseded in production by the **F-111E,** with modified air intakes that improved engine performance above Mach 2.2. Ninety-four were built, and most of these serve with the 20th TFW, based at RAF Upper Heyford in the UK, in support of NATO. The replacement of current analog bombing and navigation systems with digital equipment will begin in 1989, with completion expected in 1993. This will enable F-111A/E aircraft to handle modern guided munitions and advanced sensors as well as future systems, such as the Global Positioning System (GPS). The **F-111D** was designed with advanced avionics, offering improvements in navigation and air-to-air weapon delivery. Ninety-six were built and equip the 27th TFW at Cannon AFB, N. M. The **F-111F,** of which 106 were built, has uprated turbofans. Equipping the 48th TFW at RAF Lakenheath, this version can carry in its weapons bay the Pave Tack system, which provides a day/night capability to acquire, track, and designate ground targets for laser, infrared, and electro-optically guided weapons.

Production of the F-111 was completed in 1976. Its EW capabilities are being updated with the ALQ-131 ECM pod system, and future improvements will include AIM-9L/M self-defense capability. In addition, French Durandal parachute-retarded, rocket-boosted, runway attack bombs were introduced into TAC's inventory during 1984 to equip F-111s, each of which is capable of carrying up to twelve bombs and delivering them at low altitudes and high speed. Another F-111 weapon is Gator, USAF's first air-delivered mine system, which is compatible also with the A-7, A-10, F-4, F-15, F-16, and B-52.

On April 15, 1986, F-111s stationed in the UK were used for the retaliatory raid on Libya.

AFTI/F-111 is the test-bed for the Mission Adaptive Wing (MAW) developed by ASD's Flight Dynamics Laboratory and built by Boeing Military Airplane Company. Flight testing is being conducted at Edwards AFB. Research is directed at developing a wing without flaps, slats, ailerons, or spoilers and that changes its camber in flight through the use of internal hydraulic actuators while the flexible composite skin maintains a smooth surface. Phase II of the program, running through this summer, will see the testing of the AFTI/F-111 in a fully automated manner. The MAW is expected to increase range, maneuverability, and survivability for tactical and strategic missions by using the automatic wing configuration control to maintain peak aerodynamic efficiency. The F-111 was chosen as test-bed because its variable geometry permits simulation of a variety of military aircraft.

The **EF-111A** is an ECM conversion of the F-111A *(see page 181).* SAC has a strategic bomber version, designated **FB-111A** *(see page 176).* The Royal Australian Air Force acquired 24 **F-111Cs** for strike duties, four of which were subsequently modified for tactical reconnaissance.

Contractor: General Dynamics Corporation.
Power Plant: F-111A/E: two Pratt & Whitney TF30-P-3 turbofans; each 18,500 lb thrust with afterburning. F-111D: two TF30-P-9 turbofans; each 19,600 lb thrust with afterburning. F-111F: two TF30-P-100 turbofans; each approx 25,100 lb thrust with afterburning.
Accommodation: crew of two side-by-side in escape module.
Dimensions: span spread 63 ft 0 in, fully swept 31 ft 11.4 in, length 73 ft 6 in, height 17 ft 1.4 in.
Weights (F-111F): empty 47,481 lb, gross 100,000 lb.
Performance (F-111F): max speed at S/L Mach 1.2, max speed at altitude Mach 2.5, service ceiling more than 59,000 ft, range with max internal fuel more than 2,925 miles.
Armament: two nuclear bombs in internal weapon bay; four swiveling wing pylons carrying total external load of up to 25,000 lb of bombs, rockets, missiles, or fuel tanks.

F-111F

Attack and Observation Aircraft

A-7D/K Corsair II and YA-7F

Operated by ANG units in ten states and Puerto Rico, the **A-7D Corsair II** is a single-seat, subsonic close air support and interdiction aircraft, of which 459 were delivered between 1968 and 1976. Thirty-one **A-7K** combat-capable two-seat training models were delivered from April 1981. The A-7Ds have demonstrated outstanding target kill capability, initially in Southeast Asia. This is achieved with the aid of a continuous-solution navigation and weapon-delivery system, including all-weather radar bomb delivery, and is undergoing continuous update. Pave Penny laser target-designation pods were installed on 383 A-7Ds. LTV is modifying 72 A-7Ds and eight A-7Ks for low-altitude night attack (LANA) capability, with forward-looking infrared (FLIR) and automatic terrain following (ATF) systems to provide round-the-clock effectiveness. The first LANA-equipped A-7 was delivered in June last year to the 150th TFG. LTV has also tested augmented wing flaps and spoilers to enhance flight control characteristics.

Under a contract awarded in May 1987, LTV is upgrading two A-7Ds to "A-7 Plus" configuration, now officially designated **YA-7F.** Modifications include a lengthened fuselage to accommodate a new F100-PW-220 afterburning engine and additional fuel; an airframe-mounted accessory drive unit for self-contained ground

operations; wing strakes, an extended vertical tail, automatic maneuvering flaps, trailing-edge flap augmentors, and lift dump spoilers to enhance maneuverability; upgraded avionics, including the LANA system; and provision for AGM-65 Maverick and AIM-9 Sidewinder missile operation. Flight testing is scheduled to begin at Edwards AFB, Calif., in April 1989 and will continue until July 1990. Up to 335 A-7Ds and Ks could be modified to A-7 Plus standard. (Data for A-7D.)

Contractor: LTV Aerospace and Defense Company (formerly Vought Corporation).

Power Plant: one Allison TF41-A-1 nonafterburning turbofan; 14,500 lb thrust.

Accommodation: pilot only.

Dimensions: span 38 ft 9 in, length 46 ft 1½ in, height 16 ft 0¾ in.

Weights: empty 19,781 lb, gross 42,000 lb.

Performance: max speed at S/L 698 mph, ferry range with external tanks 2,871 miles.

Armament: one M61A1 20-mm multibarrel gun; up to 15,000 lb of air-to-air or air-to-surface missiles, bombs, Gator mines, rockets, or gun pods on six underwing and two fuselage attachments.

A-10/OA-10 Thunderbolt II

Designed specifically for the close air support (CAS) mission, the **A-10** offers a combination of large military load, long loiter, and wide combat radius. In a typical antiarmor close air support mission, the A-10, affectionately nicknamed "Warthog," could fly 150 miles and remain on station for an hour. It can carry up to 16,000 lb of mixed ordnance with partial fuel or 12,086 lb with full internal fuel. The 30-mm GAU-8/A gun can fire 2,100 or 4,200 rds/min and provides a cost-effective weapon with which to defeat the whole array of ground targets encountered in the CAS role, including tanks. The A-10 achieves its survivability through a combination of high maneuverability and design features that make it a "hard" aircraft. Equipment includes an inertial navigation system, head-up display, laser seeker, ECM, target penetration aids, self-protection systems, and associated equipment for Maverick missiles and air-to-air missiles.

Delivery of 713 A-10s was completed in March 1984. The first operational squadron was activated at Myrtle Beach AFB, S. C., in June 1977 and achieved operational capability in October. Pave Penny laser target-designation pods, introduced in 1978, are standard equipment for the aircraft. The first IR Maverick-equipped A-10 squadron became fully operational at RAF Bentwaters, UK, in February 1986. Introduction of the AIM-9 missile system for self-defense has recently begun by configuring the aircraft to accommodate dual rail adapters with associated launchers.

USAFE controls the largest A-10 wing, the 81st TFW, with six squadrons at RAF Bentwaters and Woodbridge in the UK. TAC A-10 units are the 23d and 354th TFWs and the 355th TTW. The 57th FWW, Nellis AFB, Nev., also has some A-10s. AAC's 18th TFS at Eielson AFB, Alaska, and PACAF's 25th TFS at Suwon AB, Korea, are A-10 equipped. Additionally, A-10s were the first first-line aircraft to be assigned to the ANG; they equip the 128th and 174th TFWs and the 103d, 104th, and 175th TFGs. A-10s also equip the 434th and 442d TFWs and the 917th and 926th TFGs of AFRES.

In October last year, the first of 24 operational and two backup **OA-10s** entered the inventory of the 23d Tactical Air Support Squadron. These aircraft, twenty of which will be transferred from the 355th TTW by November, are redesignated A-10s and will be used for forward air control, combat escort, search and rescue, and visual reconnaissance. The 30-mm GAU-8/A gun will be retained as well as some or all of the 16,000 lb of ordnance.

Contractor: Fairchild Republic Company, Division of Fairchild Industries.

Power Plant: two General Electric TF34-GE-100 turbofans; each 9,065 lb thrust.

Accommodation: pilot only.

Dimensions: span 57 ft 6 in, length 53 ft 4 in, height 14 ft 8 in.

Weights: empty 24,959 lb, max gross 50,000 lb.

Performance: combat speed at S/L, clean, 439 mph; range with 9,500 lb of weapons and 1.7 hr loiter, 20 min reserve, 288 miles.

Armament: one 30-mm GAU-8/A gun; eight underwing hard points and three under fuselage for up to 16,000 lb of ordnance, including various types of free-fall or guided bombs, combined effects munition (CEM) dispensers, gun pods, six AGM-65 Maverick missiles, or four AIM-9 Sidewinder missiles, and jammer pods. Chaff and flares carried internally to counter radar- or infrared-directed threats. The centerline pylon and the two flanking fuselage pylons cannot be occupied simultaneously.

AC-130A/H/U Spectre

Two versions of the AC-130 gunship are currently in USAF service. **AC-130As** are operated by the Air Force Reserve's 711th SOS at Eglin AFB, Fla.; **AC-130Hs** continue in active service with US Special Operations Command's 1st Special Operations Wing's 16th SOS. AC-130As are equipped with two 40-mm cannon, two 20-mm Vulcan cannon, and two 7.62-mm Miniguns. AC-130Hs are similar, except that one 40-mm cannon is replaced with a 105-mm howitzer and the 7.62-mm Miniguns are deleted. Both models are equipped with sensors and target-acquisition systems, including forward-looking infrared and low-light-level TV. AC-130Hs are equipped for in-flight refueling. Under an improvement program announced in spring 1987, AC-130Hs will be fitted with new fire-control computers, navigation equipment, and sensors by FY '92.

In July last year, Rockwell was awarded a contract to cover research and development of a new **AC-130U** side-firing gunship to replace the aging and increasingly unsupportable AC-130A version. A first increment of six AC-130Us is requested in the FY '89 budget proposals, all produced by modification of new-build C-130H airframes supplied by Lockheed, with the aim of producing aircraft capable of combining intense firepower with the latest methods of target location and increased loitering capability. AC-130Us will have a highly accurate suite of 105-mm, 40-mm, and 25-mm guns that can be slaved to FLIR, low-light-level television (LLLTV), or strike radar, permitting night and/or adverse weather operations. ECM will enhance survivability in a low- to medium-threat environment. Apart from their primary precision fire support mission, the air-refuelable AC-130Us will be capable of performing other special operations roles, including escort, surveillance, and reconnaissance/interdiction. Rollout of the first aircraft is expected in 1990, and it is hoped to complete delivery of 12 AC-130Us to 23d Air Force units (primarily the 16th SOS) by the end of 1992. Data basically as for C-130 *(see p. 184).*

A-7D

A-10

AC-130H

OA-37B

OV-10A

OA-37B Dragonfly

A-37B Dragonfly ground support aircraft withdrawn from operational service with AFRES have been adapted for forward air control duty, replacing O-2As in ANG's 110th, 111th, and 182d Tactical Air Support Groups. There are some OA-37Bs in TAC's 602d TACW at Davis-Monthan AFB, Ariz., and at 24th Composite Wing, Howard AFB, Panama. Those at Davis-Monthan will be replaced with OA-10s.

Contractor: Cessna Aircraft Company.

Power Plant: two General Electric J85-GE-17A turbojets; each 2,850 lb thrust.

Accommodation: two, side-by-side.

Dimensions: span over tip-tanks 35 ft 10½ in, length excluding fuel probe 28 ft 3¼ in, height 8 ft 10½ in.

Weights: empty 6,211 lb, gross 14,000 lb.

Performance: max level speed at 16,000 ft 507 mph, service ceiling 41,765 ft, range with max payload, including 4,100 lb ordnance, 460 miles.

Armament: one GAU-2B/A 7.62-mm Minigun installed in forward fuselage, four pylons under each wing able to carry various combinations of rockets and bombs.

OV-10A Bronco

This counterinsurgency combat aircraft, first flown in August 1967, was acquired by USAF for use in the forward air control role and for limited quick-response ground support pending the arrival of tactical fighters. One hundred and fifty-seven were delivered to USAF before production for the US services ended in April 1969, and they equip TAC, PACAF, and AAC units. Versions are also in service with USN, US Marine Corps, and foreign air forces.

Contractor: Rockwell International Corporation, Aircraft Operations.

Power Plant: two Garrett T76-G-416/417 turboprops; each 715 hp.

Accommodation: two, in tandem.

Dimensions: span 40 ft 0 in, length 41 ft 7 in, height 15 ft 2 in.
Weights: empty 6,893 lb, overload gross weight 14,444 lb.
Performance: max speed at S/L, without weapons, 281 mph; service ceiling 24,000 ft; combat radius with max weapon load, no loiter, 228 miles.
Armament: four fixed forward-firing M60C 7.62-mm machine guns; four external weapon attachment points under short sponsons, for up to 2,400 lb of rockets, bombs, etc.; fifth point, capacity 1,200 lb, under center fuselage. Provision for carrying one Sidewinder missile on each wing and, by use of a wing pylon kit, various stores, including rocket and flare pods and free-fall ordnance. Max weapon load 3,600 lb.

Reconnaissance and Special-Duty Aircraft

SR-71A/B "Blackbird"

Despite its twenty-plus years, the multisensored **SR-71A** Blackbird remains the fastest, highest-flying production aircraft yet built. Assigned to the 9th Strategic Reconnaissance Wing, Beale AFB, Calif., its mission is to respond to national and strategic requirements and to support theater commanders throughout the spectrum of conflict. Advanced equipment is capable of specialized coverage of up to 100,000 sq miles of territory in one hour, by day and night, and in all weather. In July 1976, flown by three USAF crews, the SR-71 set an absolute world speed record of 2,193.167 mph over a 15/25 km straight course, a speed of 2,092.294 mph around a 1,000-km closed circuit, and a sustained altitude of 85,069 ft in horizontal flight. Another SR-71A flew from New York to London, England, in 1 hr 54 min 56.4 sec in September 1974 at an average speed of 1,806.987 mph. The prototype flew for the first time in December 1964, and delivery of production aircraft began in January 1966. The **SR-71B** is a two-seat training version, with elevated rear cockpit.

As part of SAC's force modernization, improvements to the SR-71 are currently planned.
Contractor: Lockheed Corporation.
Power Plant: two Pratt & Whitney JT11D-20B (J58) turbojets; each 34,000 lb thrust with afterburning.
Accommodation: crew of two in tandem.
Dimensions: span 55 ft 7 in, length 107 ft 5 in, height 18 ft 6 in.
Weights (estimated): empty 60,000 lb, gross 170,000 lb.
Performance (estimated): max speed at 78,750 ft more than Mach 3, operational ceiling above 80,000 ft.
Armament: none.

U-2 and TR-1

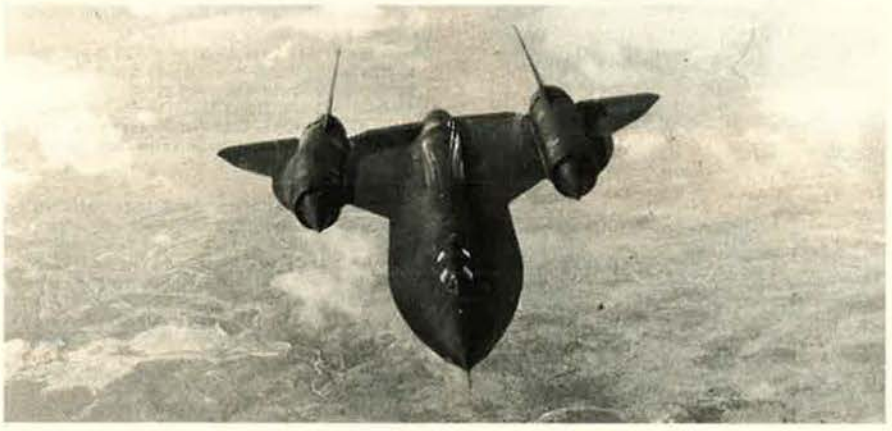
Production of the basic U-2 began in the late 1950s. It is essentially a powered glider, with high aspect ratio wings and lightweight structure, designed to carry out strategic reconnaissance for long periods at very high altitudes. Fifty-five are believed to have been built, in various forms. All have similar dimensions except for the **U-2R,** which has much increased span and length. This is now the primary version. Air Force U-2s have performed important nonmilitary missions, including flights for the Department of Agriculture land management and crop estimate programs; photographic work in connection with flood, hurricane, and tornado damage; data gathering for a geothermal energy program; and search missions for missing boats and aircraft.

A derivative of the U-2R, the **TR-1A,** is a single-seat tactical reconnaissance aircraft designed for high-altitude standoff surveillance missions in Europe. Initial funding was provided by the FY '79 budget. A total of 26 aircraft (including one ER-2 for NASA) was ordered through FY '86, leaving three to be funded to complete the planned inventory of 26 TR-1As for USAF, plus two two-seat **TR-1Bs.** Each TR-1 is equipped with electronic sensors to provide continuously available, day or night, all-weather surveillance of the battle area, or potential battle area, in direct support of US and allied ground and air forces during peace, crises, and war situations. They include an advanced synthetic aperture radar system in side-looking airborne radar (SLAR) form and modern ECM. The first TR-1A flew on August 1, 1981, and pilot training at Beale AFB began later that year. The first of 14 TR-1s now stationed with USAF's 95th Reconnaissance Squadron at RAF Alconbury in the UK arrived in February 1983. A detachment of the aircraft is housed at RAF Wethersfield. Although operating in Europe, they remain under the jurisdiction of SAC. (Data for TR-1A.)
Contractor: Lockheed Corporation.
Power Plant: one Pratt & Whitney J75-P-13B turbojet; 17,000 lb thrust.
Dimensions: span 103 ft 0 in, length 63 ft 0 in, height 16 ft 0 in.
Weight: gross 40,000 lb.
Performance: max cruising speed at over 70,000 ft more than 430 mph, range more than 3,000 miles.
Armament: none.

EC-130H "Compass Call"

RF-4C

TR-1



SR-71

RF-4C

This unarmed multisensor version of the F-4C Phantom II was developed to replace the day-only RF-101 for day/night, all-weather reconnaissance operations. The first production RF-4C flew in May 1964, and 505 were built before manufacture ended in December 1973. They are operated by five TAC, USAFE, and PACAF tactical reconnaissance squadrons and by six squadrons of the ANG. The RF-4 was the first tactical aircraft equipped with a forward-looking radar capable of simultaneous terrain-following and low-altitude navigation. The basic aircraft is configured with conventional optical cameras for day operations and infrared (IR) sensors for night. Both the radar and the camera systems are housed in a modified nose, which increases the length of the aircraft by 33 in compared with the fighter version. Twenty-four RF-4Cs were fitted with a tactical electronic reconnaissance (TEREC) sensor for locating electronic emitters. Other equipment includes the ARN-101 digital avionics system for improved navigation accuracy and greater reconnaissance capability; and data link transmission of TEREC intelligence in near real time to enhance timeliness of information to tactical decision-makers. Proposals to replace the RF-4Cs' cameras with electro-optical sensors, under the joint-service Advanced Tactical Air Reconnaissance System (ATARS) program, have been abandoned due to the limited long-term survivability of these aircraft. (Data similar to F-4.)

EC-130

Several variants of the basic C-130 have been produced for specialized missions, including the **EC-130E ABCCC** (known until 1977 as the C-130E-II) used as an airborne battlefield command and control center by the 7th Airborne Command and Control Squadron at Keesler AFB, Miss., a geographically separated unit of the 28th Air Division, Tinker AFB, Okla.; the **EC-130E "Volant Solo II"** electronic surveillance version operated by the 193d Special Operations Group, ANG, from Middletown, Pa.; and the **EC-130H "Compass Call"** enemy communications jammer operated by the 41st Electronic Combat Squadron at Davis-Monthan AFB, Ariz., also a geographically separated unit of the 28th Air Division, and the 66th Electronic Combat Wing at Sembach AB, West Germany. A total of 16 EC-130Hs was due to be acquired by the end of last year. An upgrade program was scheduled to begin during FY '88. (Data basically as C-130.)

EC-135, etc.

Several aircraft in the KC-135 Stratotanker series were modified for specialized missions during production or at a later date. Thirty-nine are modified for strategic airborne command and control missions. Five KC-135A tankers were converted for airborne command post use by SAC in 1960. Additional aircraft were modified in 1962, and 17 new production KC-135B turbofan aircraft entered the system in 1965. Currently, **EC-135A/C/G/L/H/J/P** aircraft are assigned to SAC, TAC, PACAF, and USAFE. They are fitted with extensive communications equipment to support strategic command and control missions of their respective CINCs. At least one SAC EC-135C is airborne at all times, accommodating a flight crew of four, a general officer, and a staff of 18. EC-135Cs can be refueled by SAC tankers. Thirteen are in service and have been adapted to provide control of Minuteman ICBMs. TAC provides overseas deployment control of tactical fighters with the **EC-135K.**

Three **EC-135N Advanced Range Instrumentation Aircraft (ARIA)** are operated by ASD's 4950th Test Wing as telemetry and voice relay stations to supplement land and sea receiver stations for DoD and NASA space and missile programs. The aircraft's distinctive bulbous nose houses the world's largest airborne steerable antenna.

Versions of the C-135 Stratolifter series used for reconnaissance include turbofan **RC-135Vs** and **RC-135Ws,** equipped also for electronic reconnaissance with SAC, **RC-135Ss,** and **RC-135Us. WC-135Bs,** converted C-135Bs, are used by MAC for long-range weather reconnaissance missions. In addition, a highly instrumented version, designated **NKC-135** ALL (Airborne Laser Laboratory), has been utilized by USAF as a test-bed in support of the HEL (High Energy Laser) research program. The primary objective has been to acquire technology data on laser operations that might have combat potential in the airborne environment.

In order to minimize the cost of retrofitting the special-purpose -135s with more efficient turbofan engines, USAF has installed in some aircraft refurbished Pratt & Whitney JT3D-3Bs taken from Boeing 707-100B aircraft, purchased as surplus from commercial air carriers. (Data basically as C-135.)

EF-111A Raven

The EF-111A Raven is a conversion of the basic General Dynamics F-111A airframe fitted with mainly off-the-shelf components that enable it to accomplish important defense suppression missions in worldwide support of US tactical strike forces. Its ALQ-99E primary jammer is a modification of the Navy ALQ-99 and is carried internally. This very powerful system's frequency coverage, reliability, and effective use of available jamming power enable the EF-111A to suppress extremely dense electronic defenses. Other equipment includes self-protection systems from the F/FB-111 (ALQ-137, ALR-62). The crew capsule is revised, and a new vertical stabilizer houses the ALQ-99E receivers. Phase I of a proposed three-phase upgrade program for the EF-111A is currently under way with improvements to the ALQ-99E being undertaken to enable the system to counter advanced electronic defenses for the 1990s; flight testing was scheduled to begin early this year.

Forty-two EF-111As were produced for missions that include barrier surveillance jamming, degradation of acquisition radars during close air support operations, and escort jamming for deep strike missions. Flight testing began in March 1977, and the first "production" EF-111s were delivered in late 1981 to the 366th TFW at Mountain Home AFB, Idaho, where they achieved initial operational capability with the 390th Electronic Combat Squadron in December 1983. Second operational location was at RAF Upper Heyford in the UK, where the first EF-111 arrived in February 1984 for the 42d ECS. Aircraft from this unit took part in the attack on Libyan targets in April 1986.

Contractor: Grumman Aerospace Corporation.
Power Plant: two Pratt & Whitney TF30-P-3 turbofans; each 18,500 lb thrust with afterburning.
Accommodation: crew of two, side-by-side in escape module.
Dimensions: span spread 63 ft 0 in, fully swept 31 ft 11.4 in, length 76 ft 0 in, height 20 ft 0 in.
Weights: empty 55,275 lb, gross 88,948 lb.
Performance: max combat speed 1,377 mph, service ceiling with afterburning at combat weight 45,000 ft, combat radius with reserves 230–929 miles, according to mission.
Armament: none.

E-3 Sentry (AWACS)

AWACS is a mobile, flexible, survivable, and jamming-resistant surveillance and command control and communications (C^3) system capable of all-weather, long-range, high- or low-level surveillance of all air vehicles, manned or unmanned, above all kinds of terrain. A modified Boeing 707-320B (AWACS) carries an extensive complement of mission avionics, including computer, radar, IFF, communications, display, and navigation systems. The capability of AWACS is provided by its Westinghouse Electric Corporation look-down radar, which makes possible all-altitude surveillance over land or water, thus correcting a serious deficiency in earlier surveillance systems.

The E-3 serves a dual role within USAF: as a command and control center to support quick reaction deployment and tactical operations by TAC units and as a survivable early warning command and control center for identification, surveillance, and tracking of airborne enemy forces and for the command and control of NORAD forces over the continental USA.

Deliveries of the basic production version, designated **E-3A Sentry,** began in March 1977, when the first aircraft was handed over to TAC's 552d Airborne Warning and Control Wing at Tinker AFB, Okla. Twenty-four were built. Twenty-two of them, plus two prototypes, are being upgraded to **E-3B** configuration. Improvements include enhanced computer capabilities, antijam communications, an austere maritime surveillance capability, additional radio communications, and five additional display consoles. The first E-3B was redelivered to the 552d AWACW in July 1984.

A **US/NATO Standard E-3A** configuration was introduced starting with the 25th production USAF Sentry, delivered in December 1981. In this version, the data processing capability is improved and a maritime detection capability included. Nine were built for USAF, and one of the original E-3As was upgraded to this standard. NATO operates a further 18, purchased as part of a cooperative program to upgrade the command and control of NATO's air defense forces. Saudi Arabia has five E-3s; Britain's Royal Air Force and the French Air Force have also selected the E-3 for future service.

In 1984, the ten US Standard E-3A aircraft began their upgrade to **E-3C,** with additional command and control capability.

ESD has proposed a $425 million multistaged improvement program (MSIP) for the E-3, to be phased over five years. Eventually, all USAF and NATO E-3s will be equipped with the Joint Tactical Information Distribution System (JTIDS) for antijam digital communications. As a first step, Boeing was awarded a contract in May last year for E-3 improvements that include full-scale development and integration into US and NATO aircraft of an ESM system that will detect signals emitted by both hostile and friendly targets. Additional enhancements to US E-3s will include upgrading of JTIDS to TADIL-J (tactical digital information link-J) capability, computer upgrade, and ability to employ the GPS.

E-3s assumed a US continental air defense role in January 1979, when NORAD personnel began augmenting TAC E-3 flight crews on all operational NORAD missions by 28th Air Division's 552d AWACW from Tinker AFB. Overseas units of the 28th Air Division include the 960th, 961st, and 962d AWAC Squadrons based respectively at Keflavik, Iceland, Kadena AB, Japan, and Elmendorf AFB, Alaska. Deployments have been made to the Pacific, the Middle East, Southwest Asia, the Mediterranean area, and Europe. AWACS aircraft are also used in support of the US drug enforcement program.

Contractor: Boeing Aerospace Company.
Power Plant: four Pratt & Whitney TF33-PW-100/100A turbofans; each 21,000 lb thrust.
Accommodation: basic operational crew of 20, including 16 AWACS mission specialists.
Dimensions: span 145 ft 9 in, length 152 ft 11 in, height 41 ft 9 in.
Weight: gross 325,000 lb.
Performance: max speed 530 mph, service ceiling above 29,000 ft, endurance six hr on station 1,000 miles from base.

EC-135 refueling another EC-135

EF-111As

E-3

E-4B

E-4B

SAC is the Air Force single resource manager for the E-4 airborne command post aircraft, the main operating base for which is Offutt AFB, Neb. Three **E-4As** were built initially to support the National Emergency Airborne Command Post (NEACP). Each had a modified Boeing 747 airframe and provided an interim capability by utilizing existing EC-135 command control and communications (C^3) equipment. Four fully developed **E-4B** Airborne Command Post aircraft (three of them converted from E-4A) now support the NEACP mission. They are hardened against the effects of nuclear explosions, including electromagnetic pulse, equipped for in-flight refueling, contain a 1,200kVA electrical system designed to support advanced electronics, and have a wide variety of communications equipment. This includes a more powerful LF/VLF system, improved satellite communications system, and communications processing equipment. These systems have antijam features and will support operations in a nuclear environment over extended ranges. The E-4B system is capable of tying in to commercial telephone and radio networks and could, potentially, be used for radio broadcasts to the general population. Additional improvements, to include a data-processing capability and more survivable C^3, including initial Milstar modification, are programmed. The first E-4B entered service with SAC in January 1980, and the first operational mission was flown in March of that year.

Contractor: Boeing Aerospace Company.
Power Plant: four General Electric CF6-50E2 turbofans; each 52,500 lb thrust.
Dimensions: span 195 ft 8 in, length 231 ft 4 in, height 63 ft 5 in.
Weight: gross 800,000 lb.
Performance: unrefueled endurance in excess of 12 hours.

E-8A Joint STARS

In September 1985, Grumman received a $657 million contract for full-scale development of the USAF/US Army Joint Surveillance Target Attack Radar System (Joint STARS). Boeing has modified two 707-320 airframes as vehicles for the airborne equipment. Grumman is responsible for subsystems installation, integration, and flight testing of the equipment, which will include a Norden multimode side-looking radar antenna, some 25 ft long, faired into the belly of each aircraft. The radar will operate in synthetic aperture radar (SAR) mode to detect and locate stationary objects, such as parked tanks, and will alternate between SAR and Doppler to locate and track slow-moving targets. The Joint STARS system will then direct attack on the targets, via the Joint Tactical Information Distribution System (JTIDS).

The first modified airframe was delivered to Grumman last July, with the second scheduled for delivery in February of this year. First flight of a Joint STARS aircraft will take place this spring. The demonstration program is scheduled for completion by 1991, when a decision will be taken on whether to proceed to production of about ten operational E-8As and 107 ground stations to receive data from the aircraft. Each E-8A is expected to carry a crew of 17 US Army and USAF specialists.

Contractor: Grumman Melbourne Systems Division.

EC-18B/D

The **EC-18B Advanced Range Instrumentation Aircraft (ARIA)** is a modified former American Airlines Boeing 707-320 series transport, of which four are replacing the EC-135N ARIAs operated by ASD's 4950th Test Wing. In common with the EC-135 ARIAs, the 707s are being converted to house the world's largest airborne steerable antenna in a bulbous nose, with a probe antenna on each wingtip, and a completely new cockpit configuration. Range, cabin space, and fuel efficiency are all being increased to provide greater support for the expanding ARIA mission, including DoD and NASA space and missile programs. Following conversion, the first EC-18B was flown for the first time in February 1985 and entered operational service in January 1986. All four are expected to be fully operational this year. A sonobuoy missile impact location system (SMILS) of the kind fitted on some USN P-3s is currently under development for the EC-18B.

Currently at the stage of source selection, a projected **EC-18D Cruise Missile Mission Control Aircraft (CMMCA)** will provide a standalone asset for cruise missile testing through the year 2000 and permit testing to be undertaken off-range.

Contractor: Boeing Military Airplane Company.

WC-130E/H

Modified C-130 Hercules transports, designated **WC-130E** and **H,** are equipped for weather reconnaissance duties, including penetration of tropical storms to obtain data for forecasting of storm movements. They are assigned to the 41st Rescue and Weather Reconnaissance Wing of MAC's 23d Air Force and the 403d TAW of AFRES. (Data similar to C-130.)

X-29 Forward Swept Wing Demonstrator

Flight testing of the unique X-29 Forward Swept Wing (FSW) multitechnology demonstrator has been under way at NASA's Dryden Flight Research Center at Edwards AFB, Calif., since December 1984. First supersonic flight took place in December 1985, when preliminary data showed Mach 1.03 airspeed at an altitude of 40,000 ft. Day-to-day management of the program was handed over to NASA following acceptance of the aircraft by USAF's Aeronautical Systems Division in March 1985. USAF manages flight-test support.

The two X-29 demonstrators were built by Grumman. A standard Northrop F-5A forward fuselage and nose landing gear and many off-the-shelf components, such as F-16 main landing gear and control surface actuators, were utilized on each aircraft to reduce costs. Integrated with a "triplex" fly-by-wire flight-control system, the X-29's forward-swept wings, made of strong, lightweight graphite composites, and its stubby canards, which act as its main control surfaces, combine to enhance lift and reduce drag. In flight, the wings' trailing-edges change shape continuously to match flight conditions. The canards, flaperons, and strake flaps at the tail work together to enhance maneuverability.

X-29

The early phase of the flight program, following the installation of an improved backup flight-control system in the fall of 1985, was aimed at testing stability and control loads, flutter, and wing divergence up to 40,000 ft and at speeds up to Mach 1.5. This phase ended in December 1986 after 104 flights. Before commencement of the second phase, a calibrated engine with two thrust measuring systems for performance data, a NASA noseboom calibrated for air data measurements, and upgraded instrumentation were installed; this phase is due to end this summer.

Funding has been approved for preparation of the second X-29 to explore the low-speed, high-angle-of-attack side of the envelope. Work on design modification and installation of flight test instrumentation began last summer, and the first flight is anticipated this fall.

Contractor: Grumman Corporation.

Power Plant: one General Electric F404-GE-400 turbofan; 16,000 lb thrust class.

Accommodation: pilot only.

Dimensions: span 27 ft 2½ in, length overall 53 ft 11¼ in, height 14 ft 3½ in.

Weights: empty 13,800 lb, gross 17,800 lb.

Performance: max level speed approx Mach 1.6.

NASP/X-30

A **National Aero-Space Plane (NASP)** research program, initiated jointly by DoD and NASA, could lead to a new-generation, economical, reusable, hypersonic aircraft/spacecraft for military and civilian purposes in the twenty-first century. The Air Force has been assigned overall responsibility for the NASP research program; NASA is responsible for the overall technology maturation and commercial applications.

The current technology development phase of the program began in April 1986, when DoD and NASA announced the award of seven contracts for propulsion and airframe development. The propulsion contracts were awarded to General Electric and Pratt & Whitney; airframe proposals from Boeing and Lockheed were eliminated in 1987, when General Dynamics, McDonnell Douglas, and Rockwell International were selected to proceed into the three-year preliminary design phase.

A subscale experimental aircraft, designated **X-30,** will be used in the third phase of the program to develop, prove, and demonstrate Aero-Space Plane technologies throughout the flight envelope for hypersonic cruise and acceleration to low-earth orbit. Final selection of contractors for prototype manufacture is expected in late 1989, with a first flight of the X-30 anticipated in the mid-1990s.

Transports and Tankers

C-5 Galaxy

This long-range, air-refuelable, heavy logistics transport flew for the first time in June 1968. Deliveries of the basic **C-5A** to MAC began in December 1969, and all 81 of these aircraft had been received by May 1973. Each is capable of airlifting loads up to 291,000 lb, such as two M60 tanks or three CH-47 Chinook helicopters, over transoceanic ranges. Under a major modification program, Lockheed produced component kits to extend the service life of the C-5A's wings by 30,000 flight hours, without load restrictions. These kits replaced only the five main load-carrying wing boxes, to which other existing components were transferred. The use of 7175-T73511 aluminum alloy provided greater strength and resistance to corrosion. Flight testing of a prototype installation was completed successfully during 1980, the converted C-5A being redelivered to USAF early in 1981. Installation of production kits began in 1982, and all 77 aircraft in the inventory have now been modified. In December 1984, the 433d MAW at Kelly AFB, Tex., became the first AFRES unit to be equipped with "AFRES-owned" C-5As. ANG's 105th MAG at Newburgh, N. Y., received its first C-5As in July 1985. Last October, AFRES's 439th MAW at Westover AFB, Mass., also began replacing its C-130s with C-5As.

To meet an urgent need for additional heavy airlift capacity, USAF is acquiring 50 **C-5Bs,** generally similar to the C-5A, but embodying all the improvements that have been introduced since completion of C-5A production. These include the strengthened wings, General Electric TF39-GE-1C turbofans, and updated avionics, including Bendix color weather radar and Delco triple INS. The original MADAR (MAlfunction Detection Analysis and Recording) instrument units are replaced by the more advanced MADAR II. The first C-5B flew for the first time on September 10, 1985, and was delivered to Altus AFB, Okla., on January 8, 1986. Deliveries are scheduled for completion in mid 1989. (Data for C-5D.)

Contractor: LASC Georgia Division of Lockheed Corporation.

Power Plant: four General Electric TF39-GE-1C turbofans; each 41,100 lb thrust.

Accommodation: crew of five, rest area for 15 (relief crew, etc.); 75 troops and 36 standard 463L pallets or assorted vehicles, or additional 270 troops.

Dimensions: span 222 ft 8½ in, length 247 ft 10 in, height 65 ft 1½ in.

Weights: empty 374,000 lb, max operational payload 291,000 lb, gross (for 2*g*) 837,000 lb.

Performance: max speed at 25,000 ft 571 mph, service ceiling (at 615,000 lb) 35,750 ft, range with 200,000 lb payload 2,700 miles, range with max payload 830 miles.

C-5

C-9 Nightingale

Derived from the DC-9 Srs 30 commercial airliner, the **C-9A** is an aeromedical airlift transport, in service since August 1968. Modifications include a special-care compartment with separate atmospheric and ventilation controls. Delivery of 21 to MAC's 375th Aeromedical Airlift Wing was completed by February 1973; this unit is now augmented by the 73d AAS (Assoc) of AFRES, collocated at Scott AFB, Ill. The Nightingale also performs overseas theater aeromedical evacuation missions in Europe and the Pacific. Three specially configured **C-9Cs** were delivered to the 89th Military Airlift Wing at Andrews

AFB, Md., in 1975 for Presidential and other US governmental duties. (Data for C-9A.)

Contractor: Douglas Aircraft Company, Division of McDonnell Douglas Corporation.

Power Plant: two Pratt & Whitney JT8D-9 turbofans; each 14,500 lb thrust.

Accommodation: crew of three; 40 litter patients or 40 ambulatory patients, or a combination of both, plus five medical staff.

Dimensions: span 93 ft 3 in, length 119 ft 3 in, height 27 ft 6 in.

Weight: gross 108,000 lb.

Performance: max cruising speed at 25,000 ft 565 mph, ceiling 35,000 ft, range more than 2,000 miles.

C-12 Huron

Thirty military versions of the Beechcraft Super King Air 200 were delivered to USAF under the designation **C-12A.** Their role is to support attaché and military assistance advisory missions throughout the world. MAC uses two C-12As to train aircrews and to supplement support airlift. C-12As refitted with PT6A-42 engines are redesignated **C-12E.**

MAC uses 40 passenger/cargo-capable Super King Air B200Cs (**C-12Fs**) at eleven bases throughout CONUS, PACAF, and USAFE for the time-sensitive movement of people and cargo. The C-12Fs, along with the C-21A aircraft, replaced the CT-39 fleet. The ANG ordered six C-12Fs under FY '84 funding and six **C-12Js** (military versions of the 19-passenger Beechcraft 1900C) in FY '85, the first of which was delivered last September. (Data for C-12A.)

Contractor: Beech Aircraft Corporation.

Power Plant: two Pratt & Whitney Canada PT6A-38 turboprops; each 750 shp. (C-12F: 850 shp PT6A-42s.)

Accommodation: crew of two; up to eight passengers or 4,764 lb of cargo. Convertible to aeromedical evacuation configuration.

Dimensions: span 54 ft 6 in, length 43 ft 9 in, height 15 ft 0 in.

Weight: gross 12,500 lb.

Performance: max speed at 14,000 ft 301 mph, service ceiling 31,000 ft, range at max cruising speed 1,824 miles.

C-17

Funding for the first two production versions of the C-17 heavy-lift, air-refuelable cargo transport has recently been approved. Developed to meet US force projection requirements, the C-17 will provide intertheater and intratheater airlift of all classes of military cargo, including outsize. It will be able to operate routinely into small, austere airfields (3,000 ft × 90 ft) previously restricted to C-130s and provide the first capability to airland or airdrop/extract outsize cargo in the tactical environment. The C-17 will not only enhance US airlift capability across the board but will provide much needed force structure modernization. The C-17 will be based at active-duty locations as well as at Air Force Reserve and Air National Guard bases.

McDonnell Douglas was announced as the selected prime contractor in August 1981 and received a low-level research and development contract in the following July. This was intended to cover C-17 technologies that would also benefit other airlift programs while preserving the option to proceed to full-scale development (FSD) work on the C-17. FSD was approved in February 1985. Initial procurement funding was authorized in the FY '87 budget, together with continued R&D. The FY '88 budget approved $1.1 billion for continued R&D as well as procurement of the first two production aircraft. Four more are requested in the FY '89 budget proposals. A new plant at Macon, Ga., will produce major subassemblies. Subcontractors for the C-17 program include Beech Aircraft Corporation (composite winglets); Delco Electronics Corporation (mission computer and electronic display system); Grumman Aerostructures (ailerons, rudder, and elevators); GEC Avionics (advanced HUD); Lockheed (wing components); LTV Aircraft Products (vertical and horizontal stabilizers, engine nacelles); Honeywell Inc. (support equipment); and Sperry (electronic flight control system and air data computers).

Current plans envisage first flight in FY '90, with IOC for 12 aircraft in FY '92. Delivery of the planned buy of 210 C-17s would be completed by the year 2000. The 437th MAW at Charleston AFB, S. C., has been designated as the first C-17 unit.

Prime Contractor: Douglas Aircraft Company, Division of McDonnell Douglas Corporation.

Power Plant: four Pratt & Whitney F117-PW-100 turbofans; each 40,700 lb thrust.

Accommodation: normal flight crew of two, plus loadmaster. Provisions for the full range of military airlift missions.

Dimensions: span 165 ft, length 175 ft 2 in, height 55 ft 1 in.

Weights: max payload (2.25*g*) 172,200 lb, gross 570,000 lb.

Performance (estimated); normal cruising speed at height 518 mph (Mach 0.77), range with 167,000 lb payload 2,765 miles.

C-9

C-12

C-21A

C-20 Gulfstream III

USAF has acquired eleven off-the-shelf Gulfstream III transports, each with accommodation for five crew and 14 passengers, for VIP duties, to replace aging, fuel-inefficient C-140Bs. Three **C-20As** and one **C-20B,** delivered to the 89th Military Airlift Wing in FY '83 and FY '84 under a lease/purchase agreement, were subsequently purchased. Another seven C-20Bs, with advanced mission communications equipment and revised interior, were ordered in January 1986. As these were delivered to Andrews AFB, the original three C-20As were transferred to Ramstein AB, West Germany, in support of 58th MAS's special airlift mission in Europe. The C-20s provide the Special Airlift Mission (SAM) fleet with intercontinental range and ability to operate from short runways.

Contractor: Gulfstream Aerospace Corporation.

Power Plant: two Rolls-Royce F113-RR-100 turbofans; each 11,400 lb thrust.

Accommodation: crew of five; 14–18 passengers.

Dimensions: span 77 ft 10 in, length 83 ft 1 in, height 24 ft 4½ in.

Weight: gross 69,700 lb.

Performance: max cruising speed 561 mph, service ceiling 45,000 ft, range 4,050 miles.

C-21A

USAF operates 78 C-21A aircraft (military versions of the Learjet 35A). These aircraft, together with the C-12Fs, replaced the CT-39 fleet and are used to provide operational support airlift from 16 bases for time-sensitive movement of people and cargo throughout the United States and the Pacific and European theaters. Last summer, the ANG acquired four C-21As to replace its T-39s based at Andrews AFB, Md.

Contractor: Gates Learjet Corporation.

C-23

Power Plant: two Garrett TFE731-2A turbofans; each 3,500 lb thrust.

Accommodation: crew of two and up to eight passengers or 3,153 lb cargo. Convertible to aeromedical evacuation configuration.

Dimensions: span 39 ft 6 in, length 48 ft 8 in, height 12 ft 3 in.

Weight: gross 18,500 lb.

Performance: cruising speed Mach 0.81, service ceiling 45,000 ft, range with maximum passenger load 2,420 miles, with maximum cargo load 1,653 miles.

C-22B

Under the designation C-22B, four Boeing 727 commercial transports have been purchased and are being modified for use by ANG on operational support airlift missions. Two aircraft will be further modified to accommodate an additional 1,100 gallons of fuel, and landing gear rated for 170,000 lb gross landing weight.

C-23 Sherpa

Eighteen Sherpa light transports were delivered to USAF between November 1984 and December 1985. They are operated by MAC and controlled by CINCUSAFE, primarily to ferry aircraft spares and complete engines to bases throughout Europe.

First flown on December 23, 1982, the Sherpa is an all-freight version of the Shorts 330 regional airliner, with a 6 ft 6 in square cabin section over an unimpeded hold length of 29 ft. Through loading is provided via a large forward freight door, a full-width hydraulically operated rear ramp door, and removable roller conveyors. The USAF aircraft are used in the European Distribution System (EDS) aircraft program, centered on Zweibrücken, in Germany, with main warehousing facilities at RAF Kemble in the UK and Torrejon AB in Spain. In peacetime, the Sherpas service at least 20 USAF bases, in a system analogous to the civil air freight operation carried out by Federal Express in the US. They have reduced transit time on delivery of parts from as much as a week to only one to four days.

Contractor: Short Brothers PLC.

Power Plant: two Pratt & Whitney Canada PT6A-45R turboprops; each 1,198 shp.

Accommodation: crew of three; up to 7,000 lb of freight, including four LD3 containers, and engines the size of the F100 series.

Dimensions: span 74 ft 8 in, length 58 ft 0½ in, height 16 ft 3 in.

Weight: gross 22,900 lb.

Performance: max cruising speed at 10,000 ft 218 mph, range 789 miles with 2,800 lb payload.

VC-25A

USAF has assigned the military designation VC-25A to the two aircraft, based on Boeing 747-200B airframes, that will replace the current primary and backup Air Force One aircraft (C-137Cs). The new aircraft will have a Bendix Aerospace EFIS-10 electronic flight instrument system and state-of-the-art onboard communications equipment. Delivery to USAF is scheduled for November 1988 and May 1989 respectively.

Contractor: Boeing Military Airplane Company.

Power Plant: four General Electric F103-GE-102 turbofans; each 56,750 lb st.

Accommodation: crew of 23; up to 80 passengers.

Dimensions: span 195 ft 8 in, length 231 ft 10 in, height 64 ft 3 in.

Weight: long-range mission T-O weight 803,700 lb.

Performance: max cruising speed Mach 0.91, normal cruising speed Mach 0.84, unrefueled range in excess of 6,910 miles.

C-29A

Six commercially available business-jet type aircraft, each equipped with a state-of-the-art flight inspection system, are being acquired. The flight inspection mission provides worldwide, all-weather, certified instrument approaches, traffic control and landing system equipment, and air-ground communications during contingency or wartime operations. The six C-29As will replace the aging C-140s and T-39As currently accomplishing the mission. Source selection has yet to be announced.

CT-39 Sabreliner

Acquired in the late 1950s and early 1960s, the CT-39 Sabreliner became increasingly less cost-effective and has been replaced in MAC by the C-12F and C-21A. The few CT-39A/B basic utility and training aircraft still in the inventory are in service with AFSC and with MAC facility checking squadrons, which use two Sabreliners, together with four C-140As, to evaluate communications and navigation aids at Air Force bases. In addition, ATC has acquired CT-39As in support of the Air Force Instrument Flight Center.

Contractor: Sabreliner Division of Rockwell International Corporation.

Power Plant: two Pratt & Whitney J60-P-3 turbojets; each 3,000 lb thrust.
Accommodation: crew of two; four to seven passengers.
Dimensions: span 44 ft 5 in, length 43 ft 9 in, height 16 ft 0 in.
Weights: empty 9,300 lb, gross 17,760 lb.
Performance: max speed at 36,000 ft 595 mph, service ceiling 39,000 ft, range 1,950 miles.

C-130 Hercules

Designed originally to a specification issued by TAC some 37 years ago, the remarkable, and aptly named, C-130 Hercules remains in production, with basic and specialized versions continuing to perform a diversity of roles worldwide, including airlift support, DEW Line and Arctic ice cap resupply, aeromedical missions, aerial spray missions, and fire fighting duties for the US Forest Service. The initial production model was the **C-130A,** first flown in April 1955, with 3,750 ehp Allison T56-A-11 or -9 turboprops; 219 were ordered, and deliveries began in December 1956. The last of the original "Roman nose" C-130As recently underwent modification to its radome to accommodate a solid-state radar. Two **DC-130As** (originally GC-130As) were built as drone launchers/directors for ARDC (now AFSC), carrying up to four drones

MC-130E

on underwing pylons. All special equipment was removable, permitting the aircraft to be used as freighters, assault transports, or ambulances, as required. The **C-130B** introduced 4,050 ehp Allison T56-A-7 turboprops; the first of 134 entered USAF service in April 1959. Six C-130Bs were modified in 1961 for airsnatch recovery of classified USAF satellites by the 6593d Test Squadron at Hickam AFB. Twelve **C-130Ds** were modified C-130As for use in the Arctic, with wheel-ski landing gear, increased fuel capacity, and provision for JATO. The **C-130E** is an extended-range development of the C-130B, with large underwing fuel tanks; 389 were ordered for MAC and TAC, with deliveries beginning in April 1962. Wing modification presently under way to correct fatigue and corrosion on USAF's current force of 492 C-130B/Es will extend the life of the aircraft well into the next century. C-130A wing repairs will allow operation into the 1990s. Fourteen C-130Es were modified to **MC-130E (Combat Talon I)** standard and equipped for use in low-level deep-penetration tactical missions by the 1st, 7th, and 8th Special Operations Squadrons based in the Philippines, West Germany, and Florida, respectively. This version is being supplemented by the improved, night/adverse weather, low-level **MC-130H (Combat Talon II),** of which 11 had been funded by FY '87, with seven more requested in FY '88 and four in FY '89. By 1991, the inventory is expected to include 24 of these aircraft, equipped with terrain-following radar, precision navigation/airdrop, in-flight refueling, the Fulton STAR midair recovery system, and self-protection systems. Generally similar to the E, the basic **C-130H** has uprated T56-A-15 turboprop engines, a redesigned outer wing, updated avionics, and other, minor improvements; delivery began in April 1975; by last year 297 C-130Hs and derivatives had been ordered for the US services. Four **LC-130Hs,** modified with wheel-ski gear, have been acquired by AFRES. Other variants include **HC-130H/N/P** for MAC's 23d Air Force and MAC-gained units of the ANG and Reserve, and the **AC-130A/H** and **WC-130E/H,** described separately. ANG C-130s acquired a new role in 1987, when about nine aircraft were assigned to ANG fighter wings and groups to provide support for jet fighter units on deployments. (Data for C-130H.)
Contractor: LASC Georgia Division of Lockheed Corporation.
Power Plant: four Allison T56-A-15 turboprops; each 4,508 ehp.
Accommodation: crew of five; up to 92 troops, 64 paratroops, 74 litter patients, or up to five 463L standard freight pallets, etc.
Dimensions: span 132 ft 7 in, length 97 ft 9 in, height 38 ft 3 in.
Weights: operating empty 76,469 lb, max payload 50,000 lb, gross 175,000 lb.
Performance: max cruising speed at 20,000 ft 374 mph, service ceiling (at 175,000 lb) 23,000 ft, range with max payload, with 5% reserves and allowances for 30 min at S/L 2,356 miles.

HC-130

Constituting a major element of MAC's 23d Air Force, the **HC-130H** is an extended-range version of the C-130, ordered in 1963, with uprated T56-A-15 engines and specialized search-and-rescue equipment for the recovery of aircrews and retrieval of space hardware. This includes advanced direction-finding equipment and air-to-air recovery (ATAR) systems. Initial flight was made in December 1964, and 43 were delivered. Crew complement is ten to 12. An update program announced in spring 1987 includes a self contained navigation system (SCNS), night-vision goggles lighting, and new communications and navigation equipment for 31 HC-130Hs, 21 of which will also be equipped for in-flight refueling. Seventeen **HC-130Ps** are similar, but adapted to refuel helicopters in flight. Four **JHC-130H** conversions were fitted with equipment for aerial recovery of reentering space capsules. Under a 1974 USAF contract, another HC-130H was modified by LAS to **DC-130H** standard, with four pylons each capable of carrying a 10,000 lb new-generation RPV. Fifteen **HC-130Ns,** a search-and-rescue version of the HC-130P with advanced direction-finding equipment, were ordered in 1969; these aircraft are also capable of in-flight refueling of helicopters. (Other data similar to C-130.)

HC-130H

KC-135R

C-141

C-131 Samaritan

A few Convair C-131 twin-engine transports with an average age of around 30 years remain in service with the ANG for support airlift, although some are being replaced by C-130 Hercules.

KC-135 Stratotanker

As single manager of all USAF KC-135 tanker aircraft, SAC supports its own refueling requirements as well as aerial refueling requirements of other Air Force commands, the US Navy and Marines, and other nations. Although similar in size and appearance to commercial 707 aircraft, the KC-135 was designed to military specifications, incorporates different structural details and materials, and was designed to operate at high gross weights. The KC-135 fuel tankage is located in the "wet wings" and in fuel tanks below the floor in the fuselage. First flight of the **KC-135A** was in August 1956, and by 1966 a total of 732 had been built. Five hundred and ninety-four remain in operational service, though many have been modified to later standards in three programs initiated to enhance the KC-135's capability and extend its operational utility beyond the year 2000. First, the selection of 22,000 lb thrust General Electric/SNECMA F108-CF-100 (CFM56) fuel-efficient engines for retrofit of the KC-135 fleet was announced in 1980. Reengined aircraft are designated **KC-135R** and have a gross weight of 322,500 lb. They embody modifications to 25 major systems/subsystems and not only carry more fuel farther but also have reduced maintenance costs, are able to operate from shorter runways, and are less pollution-prone. The first KC-135R flight was in August 1982, and first deliveries were to SAC in July 1984, the 100th reengined aircraft was delivered last October. USAF plans to acquire 375 modification kits by FY '92. Second, the JT3D reengining program upgraded the 134 KC-135As serving in thirteen ANG and three AFRES units to **KC-135E** standard; the JT3D turbofan engines, removed from surplus commercial 707s, permit an increased gross weight of 299,000 lb. Finally, the Life Extension Structural Modification provides for renewal of the lower wing skin, enabling the aircraft to remain fully operational past the year 2020. Development of new and improved aerial refueling systems is also under way. The first camouflaged KC-135 made its debut early last summer. (Data for KC-135A.)
Contractor: Boeing Military Airplane Company.
Power Plant: four Pratt & Whitney J57-P-59W turbojets; each 13,750 lb thrust.
Accommodation: crew of four or five; up to 80 passengers.
Dimensions: span 130 ft 10 in, length 136 ft 3 in, height 38 ft 4 in.
Weights: empty 98,466 lb, gross 297,000 lb.
Performance: max speed at 30,000 ft 585 mph, service ceiling 50,000 ft, range with 120,000 lb of transfer fuel 1,150 miles, ferry mission 9,200 miles.

C-135 Stratolifter

Thirteen C-135 transports and variants, without the KC-135's refueling equipment, remain operational with MAC. They were ordered originally to serve as interim jet passenger/cargo transports, pending delivery of C-141s. Three converted KC-135s were followed by 45 production Stratolifters in two versions: the **C-135A** with J57-P-59W turbojet engines and **C-135B** with Pratt & Whitney TF33-P-5 turbofans. Eleven Bs were retrofitted with revised interior for VIP transportation; others became **WC-135B** and **RC-135E/M.** Additionally, a C-135 belonging to ASD's 4950th Test Wing is to be permanently modified as a Laser Communications Airborne Test-bed. Data similar to KC-135, except:
Dimension: length 134 ft 6 in.
Weights (C-135B): operating weight empty 102,300 lb, gross 275,500 lb.
Accommodation (C-135B): 60 passengers.
Performance (C-135B): max speed 600 mph, range with 54,000 lb payload 4,625 miles.

C-137 Stratoliner

Five specially modified Boeing 707 transports are operated by MAC's 89th Military Airlift Wing from Andrews AFB, Md., for VIP duties. Best known is *Air Force One,* a **C-137C** for use by the President. It is basically a 707-320B with a special VIP interior. A second C-137C is also

operated, together with three smaller 707-120s, originally designated VC-137As but later modified to **C-137B** standard by the installation of turbofan engines. Both *Air Force One* and its backup are to be replaced within the next year by modified Boeing 747-200Bs (VC-25As).

Contractor: The Boeing Company.
Power Plant: four Pratt & Whitney JT3D-3 turbofans; each 18,000 lb thrust.
Dimensions: C-137B span 130 ft 10 in, length 144 ft 6 in, height 42 ft 0 in; C-137C span 145 ft 9 in, length 152 ft 11 in, height 42 ft 5 in.
Weights: C-137B gross 258,000 lb; C-137C gross 322,000 lb.
Performance (C-137C): max speed 627 mph, service ceiling 42,000 ft, range 5,150 miles.

C-140 JetStar

Just four C-140A JetStars remain in service, used by MAC to evaluate landing systems, navigational aids, radar approach control equipment, and controllers and tower operators.

Contractor: Lockheed-Georgia Company.
Power Plant: four Pratt & Whitney J60-P-5A turbojets; each 3,000 lb thrust.
Accommodation: crew of five.
Dimensions: span 54 ft 11 in, length 60 ft 5 in, height 20 ft 5 in.
Weight: gross 40,920 lb.
Performance: max cruising speed at 20,000 ft 550 mph, ceiling above 45,000 ft, range with reserves 2,280 miles.

C-141 StarLifter

The **C-141A** began operations with MAC in April 1965. Two hundred and eighty-five were built, some of which were structurally modified to accommodate the 82,207 lb Minuteman ICBM. During operational use, it became clear that the cargo compartment was often fully loaded without the aircraft's maximum payload capability being utilized. In order to realize the C-141's full potential, USAF funded modification of the entire force of 270 (now 267) aircraft to **C-141B** standard, except for four AFSC aircraft used for test purposes. The fuselage was lengthened by 23 ft 4 in, and an in-flight refueling capability was added. The first production C-141B was delivered to USAF in December 1979, and the final modified StarLifter was obtained in June 1982, ahead of schedule and below projected cost. The modification significantly increased MAC's airlift capability, giving USAF the equivalent of 90 additional C-141A aircraft. Other C-141 modifications include the installation of new digital flight data recorders, enhanced station keeping equipment capability, 50 kHz VOR/ILS receivers, and secure voice capability on UHF and HF radios. Under a recent contract, LASC's Georgia Division will prepare a preliminary design for a modernized flight station; a number of improvements already planned for the C-141 will be included. In addition, 13 437th MAW C-141Bs will have electroluminescent (EL) light panels installed on the flight deck for use in the wing's Special Operations Low Level (SOLL) mission.

Two C-141s are being used in ASD's Mark XV IFF program to test the US and NATO services' next generation of IFF equipment.

During 1986–87, 16 C-141s were transferred from the active force, eight to AFRES's 459th TAW at Andrews AFB, Md., and eight to ANG's 172d TAG at Jackson MAP, Miss. A total of 80 aircraft will be transferred by 1997. (Data for C-141B.)

Contractor: Lockheed-Georgia Company.
Power Plant: four Pratt & Whitney TF33-P-7 turbofans; each 21,000 lb thrust.
Accommodation: crew of five; cargo on 13 standard 463L pallets. Alternative freight or vehicle payloads, 200 fully equipped troops, 155 paratroops, or 103 litter patients plus attendants.
Dimensions: span 159 ft 11 in, length 168 ft 3½ in, height 39 ft 3 in.
Weights: operating 149,000 lb, max payload 89,000 lb, gross 343,000 lb.
Performance: max cruising speed 566 mph, range with max payload 2,293 miles (range significantly increased if air refueling used).

KC-10A Extender

Sixty KC-10As have been funded by USAF, although the fleet will total only 59 due to the loss of one airframe through fire. The final two KC-10s are being delivered in April and November this year. The November aircraft will be fitted with new, removable wingtip refueling pods, ordered under a contract awarded to McDonnell Douglas last June, which will modify the KC-10A to three-point tanker configuration. All other aircraft will be modified subsequently to accept the pods, of which 39 more sets will be ordered. This Class V modification should be complete by mid-1993. Further modification includes the purchase of an on-board loader that will allow loading and transport of pallet-sized loads without prepositioning wide-body aircraft cargo loading equipment. Installation should be complete by the end of 1991.

KC-10

The KC-10 was conceived to meet USAF requirements for an Advanced Tanker/Cargo Aircraft (ATCA); it is based on the commercial DC-10 Series 30CF, modified to include body bladder fuel cells in the lower cargo compartments, a boom operator's station, an aerial refueling boom, a refueling receptacle, and military avionics. In its primary role of increasing US air mobility on a worldwide scale, a single KC-10A is able to combine the tasks of tanker and cargo aircraft by refueling fighters and simultaneously carrying the fighters' support equipment and support personnel on overseas missions. It can refuel strategic transports, such as the C-5 and C-141, nearly doubling, for example, the nonstop range of a fully loaded C-5. It can refuel strategic offensive and reconnaissance aircraft during long-range conventional operations, and it can augment cargo-carrying capability on a selected basis. The range of refueling equipment installed also enables the KC-10A to service USN, USMC, and NATO aircraft. In terms of active deployment, the KC-10A's refueling capabilities and long range will, in many situations, dispense with the need for forward bases, while also leaving vital fuel supplies in the theater of operations untouched. In addition, similarity to the civilian DC-10 has led to a system whereby the Extender can use commercial facilities for most maintenance. The manufacturer orders parts and handles heavy repairs; only routine and flight-line maintenance is done by the Air Force.

The first KC-10A made its maiden flight in July 1980, and delivery of the first KC-10A to enter service took place in March 1981 for operation by SAC. USAF units equipped with KC-10As include the 9th ARS at March AFB, Calif., the 32d ARS at Barksdale AFB, La., and the 344th ARS and 911th ARS at Seymour Johnson AFB, N. C.; AFRES's 79th ARS (Associate) at March AFB, 78th ARS (Associate) at Barksdale AFB, and 77th ARS (Associate) at Seymour Johnson AFB share the aircraft with the active-duty squadrons at their respective bases.

A KC-10A demonstrated its capability in February 1985 by making a nonstop unrefueled flight of 8,982 miles from Riyadh, Saudi Arabia, to March AFB, Calif., in 17.8 hours.

Contractor: Douglas Aircraft Company, Division of McDonnell Douglas Corporation.
Power Plant: three General Electric CF6-50C2 turbofans; each 52,500 lb thrust. Design fuel capacity 356,065 lb.
Accommodation: crew of three on flight deck; seating for ilmited number of essential support personnel; max 25/27 pallets; max cargo payload is 169,409 lb.
Dimensions: span 165 ft 4.4 in, length 181 ft 7 in, height 58 ft 1 in.
Weight: gross 590,000 lb.
Performance: max speed at 42,000 ft 528 mph, service ceiling 42,000 ft, max range with max cargo 4,370 miles; or delivery of 200,000 lb of transfer fuel to a receiver 2,200 miles from its home base and return.

T-37B

T-38A

Trainers

T-33A Shooting Star

All T-33As will be phased out of the USAF inventory by 1989. Derived from the F-80 Shooting Star jet fighter, the T-33A was used latterly for combat support missions and for proficiency and radar target evaluation training. Combat armament was replaced by an all-weather "navigational nose."

Contractor: Lockheed Aircraft Corporation.
Power Plant: one Allison J33-A-35 turbojet; 4,600 lb thrust.
Accommodation: crew of two in tandem.
Dimensions: span 38 ft 10½ in, length 37 ft 9 in, height 11 ft 4 in.
Weights: empty 8,084 lb, gross 15,100 lb.
Performance: max speed at 25,000 ft 543 mph, service ceiling 47,500 ft.
Armament: two 0.50-caliber machine guns on some early aircraft only.

T-37B Tweet

USAF's first purpose-built jet trainer, the T-37 is Air Training Command's standard two-seat primary trainer. The original T-37A was superseded in November 1959 by the T-37B, and all A models were converted subsequently to B standard. Following the cancellation of the T-46A, planning is under way for a complete Service Life Extension Program (SLEP) of the T-37 fleet, with a requested $11.8 million in the FY '88 budget. Well over 1,000 T-37s were built, of which more than 600 remain in USAF's inventory.

Contractor: Cessna Aircraft Company.
Power Plant: two Continental J69-T-25 turbojets; each 1,025 lb thrust.
Accommodation: two, side-by-side.
Dimensions: span 33 ft 9.3 in, length 29 ft 3 in, height 9 ft 2.3 in.
Weights: empty 3,870 lb, gross 6,600 lb.
Performance: max speed at 25,000 ft 426 mph, service ceiling 35,100 ft, range at 360 mph with standard tankage 870 miles.

T-38A and AT-38B Talon

Almost identical in structure to the F-5A export tactical fighter, the **T-38A** lightweight twin-jet advanced trainer is capable of flying well above supersonic speed in level flight. First flown in April 1959, it was in continuous production from 1956 to 1972 and entered operational service in March 1961. Of 1,187 T-38s built, more than 1,100 were delivered to USAF, and about 850 remain in service throughout the Air Force. Most are used by ATC; others fly with SAC and with the 479th Tactical Training Wing at Holloman AFB, N. M., where a slightly different version designated **AT-38B**, with a gunsight and practice bomb dispensers, is used for Lead-In Fighter Training (LIFT).

An ongoing program called Pacer Classic, the T-38 SLEP (Service Life Extension Program), is integrating ten modifications, including major structural renewal, into one program. As a result, the service life of the T-38s should extend to the year 2010.

Contractor: Northrop Corporation.
Power Plant: two General Electric J85-GE-5 turbojets; each 2,680 lb thrust dry, 3,850 lb thrust with afterburning.
Accommodation: student and instructor, in tandem.
Dimensions: span 25 ft 3 in, length 46 ft 4½ in, height 12 ft 10½ in.
Weights: empty 7,164 lb, gross 12,093 lb.
Performance: max level speed at 36,000 ft more than Mach 1.23 (812 mph), ceiling above 55,000 ft, range, with reserves, 1,093 miles.

T-41 Mescalero

The **T-41A** trainer is a standard Cessna Model 172 light aircraft acquired by USAF for use in a preliminary flight screening program for USAF pilot candidates. An initial order for 170 aircraft in 1964 was supplemented by a further 34 in July 1967. More powerful **T-41Cs**, based on the Cessna Model R172E, are used for cadet flight training at the USAF Academy. (Data for T-41A.)

Contractor: Cessna Aircraft Company.
Power Plant: one Continental O-300-C piston engine; 145 hp. (210 hp Continental O-360-D in T-41C).
Accommodation: crew of two, side-by-side.
Dimensions: span 35 ft 10 in, length 26 ft 11 in, height 8 ft 9½ in.
Weights: empty 1,285 lb, gross 2,300 lb.
Performance: max speed at S/L 139 mph, service ceiling 13,100 ft, range 720 miles.

T-43A

Derived from the commercial Boeing Model 737-200, the T-43A navigation trainer made its first flight in April 1973. It was developed as a replacement for the piston-engined T-29 and was equipped with the same on-board avionics as the most advanced USAF operational aircraft of that time, including celestial, radar, and inertial navigation systems, LORAN, and other radio systems. Deliveries of the 18 aircraft ordered for ATC were completed in July 1974. Fourteen remain in the ATC inventory; the other four are assigned to the ANG.

Contractor: Boeing Aerospace Company.
Power Plant: two Pratt & Whitney JT8D-9 turbofans; each 14,500 lb thrust.
Accommodation: crew of two, 12 students, five advanced students, and three instructors.
Dimensions: span 93 ft 0 in, length 100 ft 0 in, height 37 ft 0 in.
Weight: gross 115,500 lb.
Performance: econ cruising speed at 35,000 ft Mach 0.7, operational range 2,995 miles.

UV-18B Twin Otter

The UV-18B is a military version of the DHC-6 Twin Otter STOL utility transport. Two were procured in FY '77 for use as parachute jump training aircraft at the Air Force Academy.

Contractor: The de Havilland Aircraft of Canada Ltd.
Power Plant: two Pratt & Whitney Canada PT6A-27 turboprops; each 620 ehp.
Accommodation: crew of two and up to 20 passengers.
Dimensions: span 65 ft 0 in, length 51 ft 9 in, height 19 ft 6 in.
Weight: gross 12,500 lb.
Performance: max cruising speed 210 mph, service ceiling 26,700 ft, range with 2,500 lb payload 806 miles.

Helicopters

TH/UH-1F, UH-1P, and HH-1H Iroquois

Basically a military version of the Bell Model 204, the **UH-1F** was developed for missile site support duties. USAF ordered 146, of which a few were modified to **UH-1Ps** for classified psychological missions in Vietnam. **TH-1F** is a version of the UH-1F for instrument training. In November 1970, USAF ordered 30 larger 12/15-seat **HH-1Hs**, based on the Model 205, for local base rescue duties. All four models continue in service. (Data for UH-1F.)

Contractor: Bell Helicopter Textron Inc.
Power Plant: one General Electric T58-GE-3 turboshaft; 1,272 shp (derated to 1,100 shp).
Accommodation: one pilot and 10 passengers; or two crew and 2,000 lb of cargo.
Dimensions: rotor diameter 48 ft 0 in, length of fuselage 39 ft 7½ in, height 14 ft 8 in.
Weight: gross 9,000 lb (9,500 lb for HH-1H).
Performance: max speed 138 mph, service ceiling at mission gross weight 13,450 ft, max range, no allowances, at mission gross weight 347 miles.

UH-1N Iroquois

The UH-1N is a twin-engine version of the UH-1 utility helicopter. Seventy-nine were ordered for USAF, most of

UH-1N

which remain in the inventory for combat rescue and Special Operations Forces duties with MAC's 23d Air Force.

Contractor: Bell Helicopter Textron Inc.
Power Plant: Pratt & Whitney Canada T400-CP-400 Turbo "Twin-Pac," consisting of two PT6 turboshafts coupled to a combining gearbox with a single output shaft; flat-rated to 1,290 shp.
Accommodation: pilot and 14 passengers or cargo; or external load of 4,000 lb.
Dimensions: rotor diameter (with tracking tips) 48 ft 2¼ in, length of fuselage 42 ft 4¾ in, height 14 ft 10¼ in.
Weight: gross and mission weight 11,200 lb.
Performance: max cruising speed at S/L 115 mph, service ceiling 13,000 ft, max range, no reserves, 261 miles.
Armament (optional): two General Electric 7.62-mm Miniguns or two 40-mm grenade launchers; two seven-tube 2.75-in rocket launchers.

CH-3E

This twin-engine amphibious transport helicopter, based on the US Navy's SH-3A Sea King, incorporates important design changes that permit speedier cargo handling and ease of maintenance, with built-in equipment for the removal and replacement of all major components in remote areas. The initial version was the CH-3C. Introduction of uprated engines led to the designation CH-3E in February 1966, applicable to 42 new production aircraft and 41 reengined CH-3Cs, of which 50 were adapted subsequently as HH-3Es *(see below)*. CH-3 missions include special operations duties, natural disaster relief, and evacuation.

Contractor: Sikorsky Aircraft, Division of United Technologies Corporation.
Power Plant: two General Electric T58-GE-5 turboshafts; each 1,500 shp.
Accommodation: crew of two or three; 25 fully equipped troops, 15 litters, or 5,000 lb of cargo.
Dimensions: rotor diameter 62 ft 0 in, length of fuselage

HH-3E

57 ft 3 in, height 18 ft 1 in.
Weights: empty 13,255 lb, gross 22,050 lb.
Performance: max speed at S/L 162 mph, service ceiling 11,100 ft, max range, with 10% reserve, 465 miles.
Armament: General Electric 7.62-mm machine gun.

HH-3E Jolly Green Giant

Modified version of the CH-3E for USAF's Aerospace Rescue and Recovery Service, originally to facilitate penetration deep into North Vietnam on rescue missions. Additional equipment includes self-sealing fuel tanks, armor, defensive armament, a rescue hoist, and a retractable in-flight refueling probe. HH-3s are now assigned primarily to rescue units of the Reserve and ANG. (Data basically similar to CH-3E above.)

HH-53B Super Jolly

This twin-turbine heavy-lift helicopter was ordered in September 1966 for USAF's Aerospace Rescue and Recovery Service to supplement the HH-3E. The HH-53B carries the same general equipment as the HH-3E, including the in-flight refueling probe and armament, but is faster and larger. The first flew in March 1967; delivery began in June the same year. After extensive use for rescue operations in Southeast Asia, HH-53Bs continue in first-line service, but all are being converted to MH-53J Pave Low III "Enhanced" standard *(see below)*.

Contractor: Sikorsky Aircraft, Division of United Technologies Corporation.
Power Plant: two General Electric T64-GE-7A turboshafts; each 4,325 shp.
Accommodation: crew of five; basic accommodation for 38 combat-equipped troops or 24 litters and four attendants.
Dimensions: rotor diameter 72 ft 3 in, length of fuselage (without refueling probe) 67 ft 2 in, height 24 ft 11 in.
Weights: empty 23,125 lb, gross 42,000 lb.
Performance: max speed at S/L 186 mph, service ceiling 18,400 ft, max range, with 10% reserve, 540 miles.

HH-53C and CH-53C

The **HH-53C**, an improved version of the HH-53B, was first delivered to USAF in August 1968. With a maximum speed of 196 mph, it can transport 38 passengers or 18,500 lb of freight and has an external cargo hook of 20,000 lb capacity. Other data basically as for HH-53B above. A total of 72 HH-53B/Cs was built. Eight generally similar **CH-53Cs** are used to provide battlefield mobility for the Air Force mobile Tactical Air Control System. All 33 remaining H/CH-53s are being converted to MH-53J Pave Low III "Enhanced" standard *(see below)*.

MH-53H/J Pave Low

Under USAF's Pave Low III program, nine HH-53Cs were modified for night and adverse weather operations and redesignated **MH-53H**; two lost in accidents in 1984 were replaced subsequently. Equipment includes a stabilized FLIR installation mounted below the refueling boom, an inertial navigation system, a new Doppler navigation system, and the computer-projected map display and radar from the A-7D, with the radar installed in an offset "thimble" fairing on the nose. The first of the MH-53Hs was delivered to Hurlburt Field, Fla., in March 1979, and the last in 1980, for special operations duties.

In a program initiated in 1986 to upgrade the Special Operations Forces, Sikorsky is undertaking a major modification of the 33 remaining HH/CH-53B/C helicopters. Designated **MH-53J**, these **Pave Low III "Enhanced"** aircraft are equipped with an integrated digital avionics suite that includes terrain-following and terrain-avoidance radar, GPS terminals, secure communications, an advanced ECM system, titanium armor plating, and mounts for .50-caliber machine guns and/or 7.62-mm Miniguns. Eleven are scheduled for delivery in FY '88, with remaining deliveries to be completed by December 1989.

UH-60A Black Hawk and MH-60G Pave Hawk

As an interim remedy for its shortfall in rescue helicopters, USAF acquired ten **UH-60A Black Hawks** in standard US Army configuration, including a rescue hoist, deicing system, and winterization and air transportability kits. These were delivered to the 55th Aerospace Rescue and Recovery Squadron at Eglin AFB, Fla., during 1982–83.

Under the Credible Hawk contract, Sikorsky is modifying these UH-60As to incorporate an aerial refueling probe, auxiliary fuel tank, and fuel management panel. The first Credible Hawk aircraft was delivered to USAF in February last year. Additional aircraft are to be acquired, and all will be upgraded eventually to **MH-60G Pave Hawk** standard, with precision low-level tactical navigation, and improved communications and weapon systems, for day/night VMC missions including marginal weather operations. Sixteen MH-60Gs are being acquired in FY '88, with six more requested in FY '89, for USAF's special operations fleet and combat rescue inventory.

Front to rear: MH-60G, MH-53J, and MH-53H

Contractor: Sikorsky Aircraft, Division of United Technologies Corporation.
Power Plant: two General Electric T700-GE-700 turboshafts; each 1,560 shp.
Accommodation: crew of two or three; 11–14 troops, up to six litters, or internal or external cargo.
Dimensions: rotor diameter 53 ft 8 in, length of fuselage 50 ft 0¾ in, height 16 ft 10 in.
Weights: empty 10,624 lb, gross 16,260–20,250 lb.
Performance: max speed 184 mph, service ceiling 19,000 ft, max range, with reserves, 373 miles (internal fuel), 1,380 miles (external tanks).

CV-22A Osprey

Under a contract awarded in May 1986, Boeing Helicopter Company and Bell Helicopter Textron are prime contractors in a seven-year full-scale development (FSD) program for the V-22 Osprey, which resulted from the US government's Joint Services Advanced Vertical Lift Aircraft (formerly JVX) proposal. The USN and USAF are currently participating in the program, with the former as executive service. This tilt-rotor, multimission aircraft, based on Bell's XV-15, is designed to have the maneuverability and lift capability of a helicopter and speed of a fixed-wing aircraft. Boeing has overall responsibility for the aircraft's tail unit, overwing fairings, and fuselage, while Bell provides the wing, nacelles, transmissions, and rotor hub assemblies. Under subcontracts, Grumman is responsible for design and manufacture of the V-22's tail unit, General Electric the digital fly-by-wire flight-control system, LMSC-Georgia the wing control surfaces and fixed trailing-edge, and Menasco of Canada and Dowty of Canada, respectively, the nose and main landing gear. Allison provides the aircraft's two 6,000 shp T406-AD-400 turboshaft engines.

USAF requires 55 long-range versions of the aircraft (designated **CV-22A**) for special operations to carry 12 troops or up to 2,880 lb of internal cargo over an 806-mile mission radius at 288 mph, with capability to hover OGE at 5,000 ft.

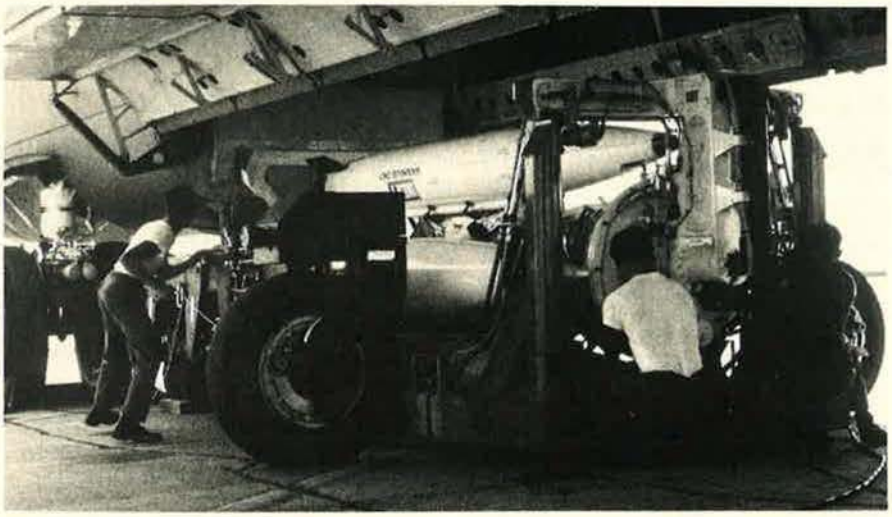
First flight of the V-22 Osprey is planned for June this year, with production deliveries to the Marine Corps beginning in December 1991 (MV-22). Deliveries to the USN (HV-22) and USAF (CV-22) will begin in late 1992; the US Army is expected to receive its multimission version (MV-22) in mid-1993. The following data are provisional:
Dimensions: rotor diameter (each) 38 ft 0 in, length 57 ft 4 in, height over tail fins 17 ft 4 in.
Weights: gross, STOL 59,000 lb, VTOL 47,500 lb.
Performance: max cruising speed 391 mph.

Minuteman III *Peacekeeper*

LGM-118A Peacekeeper

Initiated in response to the improved hardness of Soviet strategic forces, this program continues on schedule and within budgeted cost. The US is deploying 50 Peacekeeper missiles in existing Minuteman III silos near F. E. Warren AFB, Wyo., and is currently developing and proposing the rail-garrison basing mode as an alternative for the deployment of another 50 missiles; a decision on whether or not to proceed to FSD was expected this spring. Sixty-six missiles were funded in FY '84–87, with 12 more authorized in FY '88 and 12 requested in FY '89. Initial operational capability for the first ten Peacekeepers was achieved in December 1986; full IOC with 50 missiles is scheduled for late this year.

Peacekeeper is a four-stage ICBM that carries up to ten independently targetable reentry vehicles. It has many advantages over other missile weapon systems currently in the US inventory. Peacekeeper is more accurate, carries more warheads, and has greater range and target flexibility than the Minuteman ICBMs. In addition, its greater resistance to nuclear effects and its more capable guidance system provide Peacekeeper with a much improved ability to destroy very hard targets. The prompt retaliation made possible by these factors is intended to provide a decisive deterrent to any Soviet first strike.
Basing: Boeing Aerospace Company.
Assembly and Test: Martin Marietta, Denver Aerospace.
Power Plant: first three stages solid-propellant, fourth stage storable liquid; by Thiokol, Aerojet, Hercules, and Rocketdyne, respectively.
Guidance: inertial; integration by Rockwell, IMU by Northrop.



SRAM on rotary launcher for B-52

Strategic and Tactical Nuclear Missiles

LGM-30F/G Minuteman

Minuteman remains a key element of the US strategic deterrent posture despite its 25 years of operational service. It is a three-stage, solid-propellant ICBM, housed in underground silos for which an upgrade program was completed in 1980 to provide increased launch facility protection. Minuteman silos and launch control centers are currently undergoing a depot level maintenance refurbishment, known as Rivet Mile, to correct existing, and retard future, age-related deterioration of facilities. The current versions are:

LGM-30F Minuteman II: similar in configuration to the original Minuteman I, Minuteman II has increased range and targeting coverage; also increased accuracy and payload capacity. Operational since 1965, it is based at Malmstrom AFB, Mont.; Ellsworth AFB, S. D.; and Whiteman AFB, Mo. In late summer of 1985, Minuteman IIs at Malmstrom and Whiteman AFBs were equipped with a command data buffer capability to permit rapid remote targeting, as in Minuteman III.

LGM-30G Minuteman III: third-stage motor with fluid-injection thrust vector control gives longer range and, allied to MIRV capability, enables this version to place warheads on three targets with a high degree of accuracy. First test launch was made in 1968, and Minuteman III is operational at Minot AFB, N. D.; F. E. Warren AFB, Wyo.; Grand Forks AFB, N. D.; and Malmstrom AFB, Mont. A command data buffer system permits rapid missile retargeting. Deployment of the larger-yield Mk 12A RV was completed in 1983.

Of the original force of 450 Minuteman IIs and 550 Minuteman IIIs, 50 are being displaced by Peacekeeper missiles. However, enhancements and modifications under way will maintain the viability of the force well beyond the year 2000. On the missile itself, the second-stage motors on both versions are being washed out and repoured; the third-stage motors on Minuteman III are being remanufactured. In addition, Minuteman III's guidance has been upgraded to improve its accuracy by almost 30 percent. The ICBM Integrated Electronics Upgrade will ensure long-term supportability of the aging electronics components and will modify the Launch Control Center, enabling real-time status information on the weapons and communications nets to correct operability problems, improve responsiveness to launch directives, and provide rapid retargeting capability. A program to provide penetration aids for Minuteman III has been terminated as "not affordable."
Assembly and Checkout: Boeing Aerospace Company.
Power Plant: first stage: Thiokol M-55 solid-propellant motor, 210,000 lb thrust; second stage: Aerojet-General SR19-AJ-1 solid-propellant motor, 60,300 lb thrust; third stage: LGM-30F: Hercules, Inc., solid-propellant motor; LGM-30G: Thiokol SR73-AJ-1 solid-propellant motor: 17,000 lb thrust (LGM-30), 34,400 lb thrust (LGM-30G).
Guidance: Autonetics Division of Rockwell International inertial guidance system.
Dimensions: length LGM-30F 55 ft 10 in; LGM-30G 59 ft 10 in, diameter of first stage 5 ft 6 in.
Weights: launch weight (approx) LGM-30F 73,000 lb, LGM-30G 78,000 lb.
Performance: speed at burnout more than 15,000 mph, highest point of trajectory approx 700 miles, range with max operational load LGM-30F more than 6,000 miles; LGM-30G more than 7,000 miles.
Warheads: 10 Avco Mk 21 reentry vehicles.
Dimensions: length 71 ft, diameter 7 ft 8 in.
Weight: approx 195,000 lb.

Small ICBM (SICBM)

Under the amended FY '88–89 DoD budget proposals forwarded by the President on February 18, the Small ICBM program was terminated. The budget includes $200 million to keep the ICBM on life support should the next President desire to revive it. Details of the Small ICBM can be found on pages 40–41 of the February 1988 AIR FORCE Magazine.

AGM-69A SRAM

This defense suppression and primary attack missile was deployed initially with the B-52Gs of SAC's 42d Bombardment Wing (Heavy) at Loring AFB, Me., in 1972. USAF contracts covering the production of 1,500 AGM-69As were authorized, and deliveries to equip 17 B-52 wings and two FB-111 wings at 18 SAC bases were completed in July 1975.

Armed with a nuclear warhead, the supersonic air-to-surface SRAM was designed to attack and neutralize enemy terminal defenses, such as surface-to-air missile sites. An inertial guidance system makes the missile impossible to jam. SAC B-1Bs can carry 24 AGM-69As internally; B-52G/Hs can carry eight AGM-69As on a rotary dispenser in the aft bomb bay, together with up to four nuclear bombs; and FB-111As can carry four AGM-69As on swiveling underwing pylons and two internally. When carried externally, a tailcone, 22.2 in long, is added to reduce drag.
Contractor: Boeing Aerospace Company.
Power Plant: Lockheed Propulsion Company LPC-415

restartable solid-propellant two-pulse rocket engine.
Guidance: General Precision/Kearfott inertial system, permitting attack at high or low altitude and dogleg courses.
Warhead: nuclear, of similar yield to that of single Minuteman III warhead.
Dimensions: length 14 ft 0 in, body diameter 1 ft 5½ in.
Weight: launch weight approx 2,230 lb.
Performance: speed up to Mach 2.5, range 100 miles at high altitude, 35 miles at low altitude.

SRAM II

Full-scale development (FSD) is under way of this nuclear-capable air-to-surface missile intended to augment, and eventually replace, the aging AGM-69A. SRAM II will arm B-1Bs and B-2s and will be capable of penetrating advanced defense systems from standoff ranges to strike hardened, heavily defended, and mobile targets. It will use existing propulsion, guidance, and airframe technology to make possible significant performance improvements without unacceptable program risk. Major program activities include development of a new Hercules rocket motor to provide higher missile velocities and increased range; development by Litton of a guidance system that will ensure greater accuracy, even with extended range; and incorporation of a new warhead with modern safety features. Like the AGM-69A, SRAM II will be supersonic.

Following the system definition phase, which involved Boeing Aerospace, Martin Marietta, and McDonnell Douglas Astronautics, a request for full-scale development proposals was issued to industry. Source selection was completed in December 1986, and Boeing was announced the winner. Initial production of 400 missiles of a planned procurement of 1,633 is due to begin next year, to give an IOC in March 1992.

AGM-86B ALCM

The AGM-86B air-launched cruise missile is a small, unmanned winged air vehicle capable of sustained subsonic flight following launch from a carrier aircraft. It has a turbofan engine and a nuclear warhead and is programmed for precision attack on surface targets. When launched in large numbers, each of the missiles would have to be countered, making defense against them both costly and complicated. Additionally, by diluting defenses, the ability of manned aircraft to penetrate to major targets is improved. Small radar signature and low-level flight capability enhance the missile's effectiveness. Delivery of the last of 1,715 production models was accomplished in October 1986. USAF completed deployment of AGM-86s on 98 on-line B-52Gs in 1984, with 12 missiles fitted externally to each aircraft. ALCM-equipped units include SAC's 416th Bombardment Wing at Griffiss AFB, N. Y., the 379th Bomb Wing at Wurtsmith AFB, Mich., the 319th Bomb Wing at Grand Forks AFB, N. D., and bomb wings at Fairchild AFB, Wash., Blytheville AFB, Ark., Carswell AFB, Tex., and Barksdale AFB, La. B-52Hs are undergoing a similar conversion, scheduled for completion in FY '90. Ultimately, each B-52H is intended to be modified further to have a bomb-bay common strategic rotary launcher (CSRL) for eight more ALCMs, eight SRAMs, or a mix of both. The B-1B can carry 12 cruise missiles on underfuselage stores stations, with provision for a further eight carried internally on a CSRL.
Contractor: Boeing Aerospace Company.
Power Plant: Williams International Corporation/Teledyne CAE F107-WR-100 turbofan; 600 lb thrust.

ALCM

Guidance: inertial plus Tercom, by Litton.
Warhead: W80-1 nuclear.
Dimensions: length 20 ft 9 in, body diameter 2 ft 0½ in, wing span 12 ft.
Weight: 3,200 lb.
Performance (approx): speed 500 mph, range more than 1,500 miles.

AGM-129A (ACM)

Convair Division of General Dynamics was selected in April 1983 to develop and manufacture an air-launched advanced cruise missile (ACM) to arm the B-52H and B-1B. In addition, McDonnell Douglas was awarded a contract last November for technology transfer leading to second-source capability for this advanced system. It is expected to enter production in time to permit initial deployment to K. I. Sawyer AFB, Mich., in 1989 or 1990. The ACM will have improved range, accuracy, survivability, and targeting flexibility compared with the AGM-86B, notably through embodiment of low-observability technology. It will be powered by a Williams International F112 turbofan.

BGM-109G Tomahawk GLCM

The GLCM is a small, mobile, ground-to-ground cruise missile developed to modernize NATO's intermediate-range nuclear forces (INF). Its characteristics include a small radar cross-section, very low altitude flight profile, and all-weather capabilities; it is designed to complicate the enemy's targeting and defenses, thereby helping the survivability of other allied systems.

Deployment of the GLCM has been under way for some time, with the first base operational at RAF Greenham Common, UK, since December 1983; the second operational at Comiso AB, Sicily, since March 1984; a third at Florennes AB, Belgium, since August 1984; a fourth at Wueschheim AB, West Germany, since March 1986; and a fifth at RAF Molesworth, UK, since November 1987. A GLCM mobile flight comprises four transporter-erector-launchers, each carrying four missiles, and two launch control centers. Deployment of a total of 464 missiles was planned by 1988, but was halted at 19 flights with the signing of the INF Treaty.
Contractor: General Dynamics (Convair)/McDonnell Douglas Astronautics.
Power Plant: Williams International Corporation/Teledyne CAE F107-WR-400 turbofan; 600 lb thrust. Atlantic Research Corporation solid-propellant booster.
Guidance: inertial plus Tercom, by Litton.
Warhead: W84 nuclear.
Dimensions: length 20 ft 6 in, diameter 1 ft 8½ in, wing span 8 ft 7 in.
Weight: with booster, 3,250 lb.
Performance: max speed high subsonic, range 1,500 miles.

F-15 firing AIM-7 Sparrow

Airborne Tactical and Defense Missiles

AIM-4F/G Super Falcon

These developed versions of the original AIM-4A/C Falcon were introduced simultaneously in 1960 to provide reduced susceptibility to enemy countermeasures and higher performance. The Super Falcon arms the F-106 Delta Dart, on which a mixed armament of four AIM-4F/Gs is carried internally.
Contractor: Hughes Aircraft Company.
Power Plant: Thiokol M46 two-stage solid-propellant rocket motor; first-stage rating of 6,000 lb thrust.
Guidance: AIM-4F: Hughes semiactive radar homing guidance; AIM-4G: infrared homing system.
Warhead: high-explosive, weighing 9 lb.
Dimensions: length AIM-4F 7 ft 2 in; AIM-4G 6 ft 9 in, body diameter 6.6 in, wing span 2 ft 0 in.
Weights: launch weight AIM-4F 150 lb; AIM-4G 145 lb.
Performance: max speed Mach 2.5, max range 7 miles.

AIM-7 Sparrow

Sparrow is a radar-guided air-to-air missile with all-weather, all-altitude, and all-aspect capability. Approximately 34,000 AIM-7C, D, and E versions were produced. The **AIM-7E** is standard armament of the F-4 Phantom and is also used as a Sea Sparrow version against shipping targets. The **AIM-7E-2** is an improved version, providing better maneuverability and "dogfight" capability. A later version is the advanced solid-state **AIM-7F,** with larger motor, Doppler guidance, improved ECM, and better capability over both medium and "dogfight" ranges; this version currently equips USAF and USN F-4, F-14, F-15, and F/A-18 aircraft and will equip the F-16(ADF) in the future. Approximately 5,400 AIM-7Fs were produced. A monopulse version of Sparrow designated **AIM-7M,** aimed at reducing cost and improving performance in the ECM and look-down clutter regions, entered production in FY '80 and began operational service during FY '83. Procurement continues, with $84.5 million for 558 missiles for USAF approved in the FY '88 budget, and funding for a further 354 missiles requested in FY '89. (Data for AIM-7F.)
Contractors: Raytheon Company/General Dynamics Pomona Division.
Power Plant: Hercules Mk 58 Mod 0 boost-sustain rocket motor.
Guidance: Raytheon semiactive Doppler radar homing system.
Warhead: high-explosive, blast fragmentation, weighing 86 lb.
Dimensions: length 11 ft 10 in, body diameter 8 in, wing span 3 ft 4 in.
Weight: launch weight 504 lb.
Performance (estimated): max speed more than Mach 3.5; range AIM-7E 14 miles, AIM-7F more than 25 miles.

AIM-9 Sidewinder

The AIM-9 Sidewinder is a close-range air-to-air missile using infrared guidance. Versions currently in production for USAF or in service are:

AIM-9E: modification by Philco of original production AIM-9B, with improved guidance and control. Production completed, with more than 3,000 in service.

AIM-9H: version with improved close-range capability, produced for USN; one-time procurement of 800 by USAF in FY '76. Solid-state guidance, off-boresight acquisition/launch capability. Lead bias function moves missile impact point forward to more vulnerable area on target aircraft.

AIM-9J: conversion of AIM-9B/E, with increased range and new "front end" to improve maneuvering capability for dogfighting. About 14,000 were delivered to USAF by Ford Aerospace in 1977–78 to equip the F-15 and other Sidewinder-compatible aircraft.

AIM-9P: improved version of AIM-9J, produced by Ford Aerospace by conversion of existing AIM-9Es and -9Js. Increased target-acquisition envelope, solid-state electronics, and increased lethality due to seeker improvements.

AIM-9P-3: improved version of AIM-9P, with increased lethality due to fuze improvements and a new rocket motor, providing reduced smoke and increased range.

AIM-9P-4: improved version of AIM-9P-3 developed by Ford Aerospace. A new guidance control unit provides

an increased target acquisition envelope. The AIM-9P-4 is being qualified by USAF for Foreign Military Sales.

AIM-9L: third-generation Sidewinder for USAF and USN, with all-aspect intercept capability. New motor. Double-delta nose fins for improved inner boundary performance and maneuverability. AM-FM conical scan for increased seeker sensitivity and improved tracking stability. Annular blast fragmentation warhead and active optical fuze for increased lethality and low susceptibility to countermeasures. This version arms USAF F-15 and F-16 aircraft and features in USAF plans to provide self-defense capability for its A-7s, A-10s, F-4s, and F-111s.

AIM-9M: improved version of AIM-9L, with increased IRCCM capability, improved background discrimination, and reduced-smoke rocket motor. Full production began in FY '81 with an order for approximately 1,850 missiles. FY '88 budget approved $61.1 million for 956 missiles, with a further 760 missiles requested in FY '89. Final USAF procurement is planned for FY '90.

AIM-9R: development of AIM-9M, with improved control and guidance section for greater target acquisition range and better resistance to ECM. FSD started in 1986. (Data for AIM-9M.)

Contractor: Raytheon Company/Ford Aerospace and Communications Corporation.
Power Plant: Thiokol Hercules Mk 36 Mod 11 solid-propellant rocket motor.
Guidance: solid-state infrared homing guidance.
Warhead: high-explosive, weighing 20.8 lb.
Dimensions: length 9 ft 5 in, body diameter 5 in, fin span 2 ft 1 in.
Weight: launch weight 191 lb.
Performance: max speed above Mach 2; range more than 10 miles.

AGM-45A Shrike

Twelve versions of this supersonic air-to-surface missile were produced for USAF and USN, differing primarily in the frequency coverage of the front end detachable seeker sections. Designed to home automatically on enemy radar installations, the AGM-45 entered operational service in Vietnam during 1965. Thereafter, it played an important part in the US air offensive, becoming a standard penetration aid on US tactical aircraft. More than 13,000 were delivered to USAF between 1965 and 1978, and Shrikes continue to equip "Wild Weasel" F-4Gs and defense suppression F-4Es and F-16Cs. Modification under the Shrike gravity bias modification program will result in improved capabilities at low altitude.

Contractor: Naval Weapons Center.
Power Plant: Rocketdyne Mk 39 Mod 7 or Aerojet Mk 53 solid-propellant rocket motor.
Guidance: passive homing head by Texas Instruments.
Warhead: high-explosive fragmentation, weighing 145 lb.
Dimensions: length 10 ft 0 in, body diameter 8 in, span 3 ft 0 in.
Weight: launch weight 400 lb.
Performance (estimated): range more than 3 miles.

AGM-65 Maverick

The basic **AGM-65A** Maverick is a launch-and-leave TV-guided air-to-surface missile that enables the pilot of the launch aircraft to seek other targets or leave the target area once it has been launched. Production was initiated in 1971, following successful test launches over distances ranging from a few thousand feet to many miles and from high altitudes down to treetop level. Maverick missiles were first employed by USAF in Vietnam and are now carried by the A-7D, A-10, F-4D/E/G, F-5E/F, F-111F, and F-16, singly or in three-round underwing clusters, for use against pinpoint targets, such as tanks and columns of vehicles. Orders totaled 19,000.

AGM-65B has a "scene magnification" TV seeker that enables the pilot to identify and lock on to smaller or more distant targets.

To overcome limitations of the TV Maverick, which can be used only in daylight clear-weather conditions, a new version was developed:

AGM-65D: with imaging infrared seeker (IIR). AFOTEC and TAC conducted operational flight testing with 25 live launches from A-7, A-10, F-4E, F-4G, and F-16 aircraft at Nellis AFB, Nev., in September 1986, resulting in 24 direct hits on a variety of vehicles. IIR Maverick became operational on A-10s at RAF Bentwaters, UK, in February 1986. A total of 3,224 IIR Mavericks was ordered for USAF in FY '87, a further 2,700 approved in FY '88, and 2,931 requested in FY '89. Raytheon is second source supplier.

AGM-65G: uses the IIR seeker with an alternate 298 lb blast fragmentation warhead for use against hardened targets. First successful launch took place last November. USAF plans, initially, to acquire 600 G models. (Data for AGM-65A.)

Contractor: GM-Hughes, Missile Systems Group.
Power Plant: Thiokol TX-481 solid-propellant rocket motor.
Guidance: self-homing electro-optical guidance system.
Warhead: high-explosive, shaped charge.

AIM-9P Sidewinder

Shrike

AGM-65D Maverick

Dimensions: length 8 ft 2 in, body diameter 1 ft 0 in, wing span 2 ft 4½ in.
Weight: launch weight 462 lb.
Performance: range of 0.6 to 14 miles.

AGM-88A HARM

The lethality of USAF's F-4G "Wild Weasel" is greatly enhanced by the availability of HARM (High-speed Anti-Radiation Missile), which achieved IOC in September 1984. The emphasis on high speed reflects experience gained in Vietnam, where Soviet-built surface-to-air missile radar systems sometimes detected the approach of first-generation Shrikes and ceased operation before the missiles could lock on them. HARM can cover a wide range of frequency spectra through the use of programmable digital processors in both the aircraft's avionics equipment and the missile. An integration program is ongoing to equip F-16s in the defense suppression role with HARM. The missile is also suitable for adaptation to the EF-111A, B-52, and F-15. A software upgrade under research and development is aimed at improving performance against new radars. By the end of 1986, a total of 658 HARMs had been delivered. USAF plans to have acquired 7,058 by the time production ends in 1990. Of these, 1,410 were ordered in FY '87, 1,645 approved in FY '88, and 893 requested in FY '89.

Contractor: Texas Instruments, Inc.
Power Plant: Thiokol smokeless dual-thrust solid-propellant rocket motor. Hercules second source.
Guidance: passive homing guidance system, using seeker head that homes on enemy radar emissions.
Warhead: high-explosive.
Dimensions: length 13 ft 8½ in, body diameter 10 in, wing span 3 ft 8½ in.
Weight: 807 lb.
Performance: cruising speed supersonic, altitude limits S/L to 40,000 ft, range more than 10 miles.

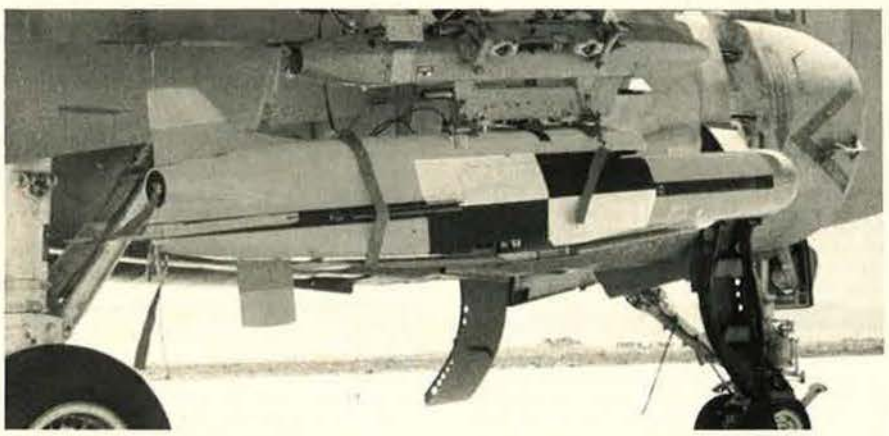
AGM-136A Tacit Rainbow

Designed to complement the AGM-88A HARM, the AGM-136A Tacit Rainbow is a low-cost, programmable, loitering, antiradiation weapon system that can be air-launched to seek out autonomously and destroy enemy radars. The missile features a single-piece, spring-loaded wing that is stored under the fuselage before launch and rotates and locks into place on release. The horizontal stabilizers and a dorsal tail come out after launch. Carrier aircraft will be the B-52G for USAF and the A-6E for the USN. FSD is scheduled for completion during FY '88, with subsequent production under USAF contract for both the Air Force and the Navy to be centered in a new plant at Perry, Ga. Major supporting contractors include Boeing Military Airplane Company, Delco, Singer Kearfott, Texas Instruments, and Williams International.

Dimensions: length 8 ft 4 in, height 2 ft 3 in, wing span 5 ft 1½ in.

GBU-15 and AGM-130

The **GBU-15** is an air-launched cruciform-wing glide bomb fitted with a guidance system designed to give it



Tacit Rainbow

pinpoint accuracy from low or medium altitudes over short standoff ranges. Development began in 1974, based on experience gained in Vietnam with the earlier Pave Strike GBU-8 HOBO modular weapon program. The GBU-15 is intended for tactical use to suppress enemy defenses and to destroy heavily defended targets. The target-detecting device is carried on the front of the warhead; the control module, with autopilot and data link module, attaches to the rear.

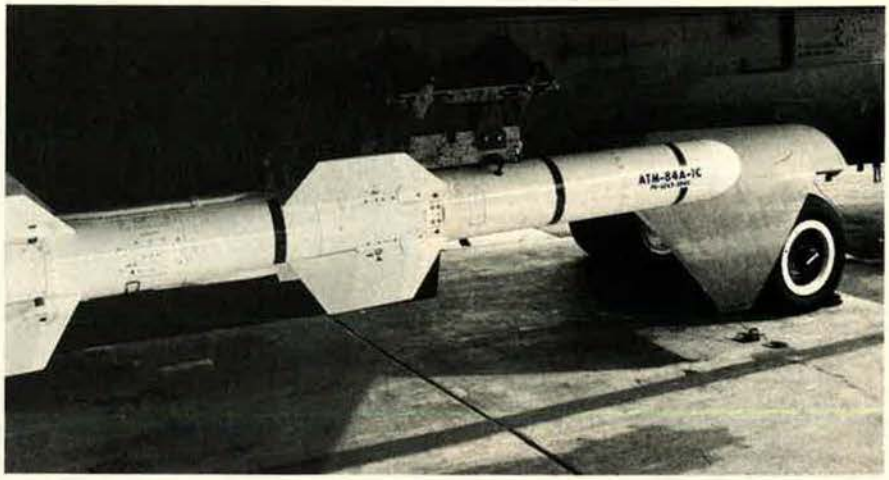
The weapon offers two modes of attack. In direct attack, the weapon is locked on to the target before launch and flies a near line-of-sight profile to impact. In the indirect mode, the seeker can be locked on to the target after launch, or the operator can fly the weapon manually to impact, using guidance updates provided through the data link. This profile uses a midcourse glide phase and extends standoff range. Successful launches have been achieved from F-4s and F-111s. The **GBU-15(V)1/B** TV-guided variant qualified for operational service in 1983; the **GBU-15(V)2/B** imaging infrared (IIR) version entered operational service last year.

Development of the **AGM-130** rocket-powered version of the GBU-15 was terminated under the amended FY '88–89 budget requests. (Data for GBU-15.)

Contractor: Rockwell International Corporation.
Guidance: TV or imaging infrared seeker.
Warhead: Mk 84 bomb (2,000 lb unitary).
Dimensions: length 12 ft 10½ in, body diameter 1 ft 6 in, wing span 4 ft 11 in.
Weight: 2,450 lb.
Performance: cruising speed subsonic.

ASAT

Further development of this small, high-technology, air-launched antisatellite (ASAT) weapon was terminated under the amended FY '88–89 budget proposals, because of Congress's unwillingness to permit testing to complete the program. The Administration does not agree with this position and is ready to restart the program if the congressional ban on ASAT testing is lifted. Details of ASAT can be found in the 1987 "Gallery of USAF Weapons."



Harpoon

AGM-84A Harpoon

USAF has procured sufficient Harpoon all-weather antiship missiles to equip two 15-aircraft B-52G squadrons for maritime duties in support of Navy antisurface warfare operations. Compatibility testing began in spring 1983, and full operational capability was achieved that October. Modified aircraft are located at Loring AFB, Me., for Atlantic operations and at Andersen AFB, Guam, for Pacific operations. Each B-52G carries eight to 12 missiles.

Contractors: Hughes Aircraft Company/Raytheon Company.
Guidance: inertial midcourse, with active radar terminal homing.
Dimensions: length 12 ft, body diameter 7 in, span of tail control fins 2 ft 1 in.
Weight: 340 lb.
Performance: cruising speed approx Mach 4.

AMRAAM

AIM-120A (AMRAAM)

Intended as a replacement for the AIM-7 Sparrow, this advanced medium-range air-to-air missile (AMRAAM) is described as the "number-one tactical priority." It will provide an all-weather, all-environment capability for USAF's F-15 and F-16 and the Navy's F-14 and F/A-18 fighters. Full-scale development has been under way since December 1981.

Designated AIM-120A, AMRAAM has inertial midcourse guidance and active radar terminal homing that provides launch-and-maneuver capability. There are significant improvements in operational effectiveness over the AIM-7 Sparrow, including increased average velocity, reduced miss distance, improved fuzing, increased warhead lethality, multiple target engagement capability, improved clutter rejection in low-altitude environments, improved ECCM capability, increased maximum launch range, reduced-smoke motor, and improved maintenance and handling.

A leader/follower program has been under way (Hughes/Raytheon), with the preproduction effort (producibility and qualification) in FY '86 and low-rate initial production in FY '87 (180 missiles). First deliveries are scheduled for FY '88 and IOC for 1989. Budget requests are for 400 AMRAAMs in FY '88 and 1,470 in FY '89.

Contractor: McDonnell Douglas Astronautics Company.
Power Plant: Teledyne CAE J402-CA-400 turbojet; 660 lb thrust.
Guidance: sea-skimming cruise monitored by radar altimeter, active radar terminal homing.
Warhead: penetration high-explosive blast type, weighing 488 lb.
Dimensions: length 12 ft 7½ in, body diameter 1 ft 1½ in, wing span 3 ft.
Weight: 1,145 lb.
Performance: speed high subsonic, range more than 57 miles.

HVM

Under a USAF contract awarded in March 1985, Vought Missiles and Advanced Programs Division of LTV is demonstrating a guided air-to-surface hypervelocity missile (HVM) system capable of defeating all types of vehicles in an armored assault force. The system will consist of a FLIR/laser fire control system and podded launchers for up to 12 HVMs per pod. Each HVM will carry an inert, high-density warhead. Simultaneous multiple target engagement is an important requirement, and the small low-cost missiles will rely on kinetic energy derived from their speed for penetration. Initial ground-launched flight tests demonstrated the missile's ability to receive laser guidance signals through the rocket motor plume and its ability to respond to signals from a ground-based laser and then maneuver to its target. HVM will reach a speed of more than 5,000 fps and is expected to weigh approximately 70 lb. Estimated range is greater than 10,000 ft. This is a joint USAF/Marine/Army program. Six HVMs, built under USAF contract, were to be tested at Eglin AFB, Fla., last fall.

Rapier

Rapier is unusual in that US land-based antiaircraft missiles are normally operated by the Army. Under a decision confirmed by an initial contract for 32 fire units in February 1981, British-built Rapier missile systems are deployed at seven USAF bases in the UK to protect Air Force installations. The last unit became operational in July 1986. Manned by RAF Regiment personnel, the USAF version of Rapier is intended primarily for defense against fast (Mach 1+) maneuvering, low-flying targets by day and night. The four-round fire unit, Blindfire radar, and a trailer of reload missiles are towed by Land Rovers loaded with support equipment.

Under a similar agreement, the government of Turkey agreed to locate Rapiers procured by DoD to defend two US air bases in that country.

Contractor: British Aerospace PLC, Army Weapons Division.
Power Plant: IMI two-stage solid-propellant rocket motor.
Guidance: Racal-Decca surveillance radar and command to line-of-sight guidance. Optional Marconi DN181 Blindfire radar or optical target tracking, according to conditions.
Warhead: semi armor-piercing, with impact fuze.
Dimensions: length 7 ft 4 in, body diameter 5 in, wing span 1 ft 3 in.
Weight: approx 94 lb.
Performance: max speed more than Mach 2, range 4 miles.

Roland

Roland is a highly mobile, short-range, all-weather missile system for defense against medium-, low-, and very-low-altitude aircraft and helicopter attack. All operational weapon system equipment and functions can be packaged into a single vehicle, including surveillance radar, tracking radar, optical sight, command computer, and command-transmitter link. Two launch tubes each contain a single missile, with eight reload missiles stored in a magazine. After firing one or both missiles, reloading can be accomplished in about ten seconds.

Under a bilateral agreement, the West German government agreed to provide and operate 27 Roland fire units to protect three US air bases in Germany.

Contractor: Euromissile GIE.
Power Plant: two-stage solid-propellant rocket motor.
Guidance: pulse-Doppler surveillance radar on launch vehicle and command to line-of-sight guidance. Radar or optical target tracking, according to conditions.
Warhead: high-explosive with proximity and impact fuzes, weighing 14.3 lb.
Dimensions: length 7 ft 10½ in, body diameter 6.3 in, wing span 1 ft 7¾ in.
Weight: 147 lb.
Performance: speed Mach 1.5, range 3.7 miles.

Launch Vehicles

Atlas Launchers

With nearly 500 launches since 1957, the Atlas and Atlas/Centaur vehicles have built up a success rate of nearly 95 percent in launching commercial and military satellites as well as manned space vehicles. There are currently two versions of the Atlas available, and both retain the "stage-and-a-half" configuration of the long-retired Atlas ICBM. Each version has a central sustainer section and two side boosters.

Atlas E: As of early 1988, nine Atlas Es remained in the USAF inventory. The Atlas E is a modified ICBM and is used to launch various USAF, Navy, and NOAA satellites.

Atlas G/Centaur: With the capability to boost 5,200 lb of payload into geosynchronous transfer orbit, the Atlas G/Centaur combination is the largest Atlas booster. In early 1988, only one Atlas G/Centaur remained in the NASA inventory. However, the producer has announced plans to build at least 18 more Atlas G/Centaurs and provide commercial launch service to users. Currently, the launcher has a 10 ft-diameter payload fairing system, but larger fairings are planned.

Prime Contractor: General Dynamics Corporation, Convair Division.

Power Plant: uprated Rocketdyne MA-5 propulsion system, comprising central sustainer motor and two boosters. Total thrust (Atlas E) 392,000 lb; (Atlas G/Centaur) 439,000 lb.

Dimensions: length (Atlas E without upper stage or payload) 67 ft 0 in; (Atlas G/Centaur) 137 ft 0 in (Atlas G by itself is 72 ft); max body diameter 10 ft 0 in.

Launch Weight: (Atlas G/Centaur) 360,000 lb.

Performance: (Atlas E) capable of delivering a payload of 3,800 lb into a low-earth polar orbit; (Atlas G/Centaur) capable of putting 13,500 lb into low-earth polar orbit and a payload of 5,200 lb into geosynchronous transfer orbit.

Centaur

Centaur was the first US high-energy upper stage and first to utilize liquid hydrogen as a propellant. Its multiburn and extended coast capability were first used operationally during the 1977 Mariner Jupiter/Saturn missions. The **D-1A** version used with the Atlas has demonstrated widely ranging applications and capabilities. The nose section of Atlas is modified to a constant 10 ft diameter to accommodate the Centaur, which, in turn, provides most of the electronic command and control systems for the launch vehicle. A 10 ft diameter fairing protects payloads for Centaur D-1A.

The modified **Centaur G-prime** upper stage will be used with the Titan IV, creating the greatest weight-to-altitude capability of any US launch vehicle, by placing a 10,200 lb payload into geosynchronous orbit.

Prime Contractor: General Dynamics Corporation, Convair Division.

Power Plant: two Pratt & Whitney RL 10A-3 liquid oxygen/liquid hydrogen rocket engines; each 16,500 lb thrust.

Guidance: inertial guidance system.

Dimensions (Centaur D-1A only): length 30 ft 0 in, diameter 10 ft 0 in.

Launch Weight (D-1A, approx): 35,000 lb; (G-prime-mod, approx): 53,000 lb.

Scout

Scout was designed to enable NASA and DoD to conduct space, orbital, and reentry research at comparatively low cost, using off-the-shelf major components where available. The basic current version, with an improved fourth stage, was launched successfully for the first time in August 1965. In addition to increasing the payload, this version can be maneuvered in yaw and can send a 100 lb payload more than 16,000 miles into space. Using the Algol IIIA first-stage motor, Scouts can put 377 lb payloads into a 310-mile polar orbit and have been used to launch many unmanned spacecraft, including satellites, for DoD, NASA, and international groups.

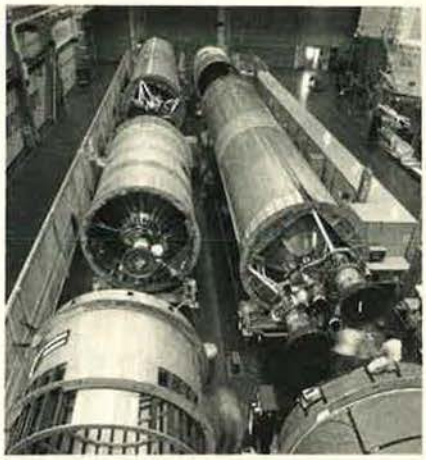
Prime Contractor: LTV Aerospace and Defense Company (subsidiary of LTV Corporation).

Power Plant: first stage: CSD Algol IIIA, 109,000 lb thrust; second stage: Thiokol Castor IIA solid-propellant motor, 64,000 lb thrust; third stage: Thiokol Antares IIIA solid-propellant motor, 18,700 lb thrust; fourth stage: Thiokol Altair IIIA solid-propellant motor, 5,800 lb thrust.

Guidance: simplified Honeywell gyro guidance system.

Dimensions: height overall 75 ft 5 in, max body diameter 3 ft 9 in.

Launch Weight: 47,619 lb.



Refurbishing Titan IIs

Titan II

USAF plans to refurbish and reactivate Titan II ICBMs for use as space launch vehicles. Able to place payloads of more than 4,200 lb into polar orbit, the Titan IIs are suitable for launch-on-demand missions. The first will enter the inventory in the middle of this year. The Titan II will support a variety of DoD users, including DMSP, NROSS, and the space test program. As of early 1988, 17 of the 56 available Titan II missiles are scheduled for conversion to space launch vehicles.

Prime Contractor: Martin Marietta Denver Aerospace.

Power Plant: first and second stages: Aerojet liquid hypergolic propellants: first stage 474,000 lb thrust; second stage 100,000 lb thrust.

Guidance: Delco inertial guidance system.

Dimensions: first and second stages: height 110 ft 9½ in, diameter 10 ft; payload fairing heights 20, 25, and 30 ft, diameter 10 ft.

Launch Weight: 408,000 lb.

Performance: 4,200 lb to low-earth polar orbit.

Atlas G/Centaur

Titan 34D

Titan 34D and Titan IV

The basic **Titan 34D** has an uprated version of the two-stage Titan II ICBM as its core section, plus two five-and-a-half segment solid strap-on boosters, and either the Boeing Inertial Upper Stage developed for the Shuttle or Transtage, an upper stage capable of functioning both in the boost phase of flight and as a restartable space propulsion vehicle. It can place a 4,000 lb payload into geosynchronous orbit or 27,000 lb into low-earth polar orbit. Sixteen Titan 34Ds have been ordered to date by USAF. The first of them was launched from Cape Canaveral in October 1982. However, the launch program was seriously interrupted by the successive failure of two Titan 34Ds in August 1985 and April 1986. AFSC Space Division's subsequent reassessment of the 34D was completed in the summer of 1987, and the rocket was launched successfully in October and again in November the same year.

In March 1985, the upgraded Titan 34D-7, now called **Titan IV,** was selected to augment the Space Shuttle and to allow greater flexibility in launching critical military payloads. It has stretched first and second stages, seven-segment solid boosters, and either the Centaur G-prime upper stage, enabling it to place a 10,200 lb payload into geosynchronous orbit or 31,100 lb into low polar orbit, or the Inertial Upper Stage (IUS), which can place 5,300 lb into geosynchronous orbit. USAF has contracted for 23 Titan IVs, and the capability to launch a satellite into equatorial orbit from Cape Canaveral, Fla., will be available from October of this year. Launches of satellites into transpolar orbits from Vandenberg AFB are scheduled to begin late in 1989, and the first Titan IV/Centaur launch capability of a payload into geosynchronous orbit from Cape Canaveral is scheduled for early 1990. Further delays in the Space Shuttle's return to flight status have increased the Air Force's requirements for Titan IV launches, with an additional 25 launches planned through 1995.

Prime Contractor: Martin Marietta Denver Aerospace.

Power Plant: Titan 34D first and second stages: Aerojet liquid-propellant engines: first stage 526,000 lb thrust; second stage 102,000 lb thrust; Transtage: Aerojet twin-chamber liquid-propellant engine; 16,000 lb thrust; two CSD five and one-half segment solid-propellant booster rocket motors; each more than 1,150,000 lb thrust. (Titan IV: first stage 546,000 lb thrust; second stage 104,000 lb thrust; two SRBs total 3,200,000 lb thrust.)

Dimensions: Titan 34D first and second stages of core; height 101 ft, diameter 10 ft; Transtage: height 14 ft 8 in, diameter 10 ft.

Launch Weight (approx): (Titan 34D) 1,400,000 lb; (Titan IV) 1,900,000 lb.

Performance: (Titan 34D/Transtage): 4,000 lb to geosynchronous orbit; (Titan IV/Centaur): 10,200 lb to geosynchronous orbit.

Space Transportation System

Further flights of the Space Shuttle have been delayed until not earlier than July/August this year, pending completion of testing of design changes to comply with recommendations of the Presidential inquiry following the explosion that led to the loss of the Orbiter *Challenger* and its crew on January 28, 1986.

Developed for use by both DoD and NASA, the Space Shuttle is the first reusable space vehicle. It consists of an Orbiter, similar in configuration to a delta-wing airplane but powered by liquid-propellant rocket motors; a large jettisonable tank carrying the fuel for these motors, which is attached to the Orbiter at liftoff; and two solid-propellant rocket boosters, mounted on each side of the fuel tank for liftoff.

The Shuttle is launched vertically, with all engines firing in both the Orbiter and the boosters. At an altitude of approximately 28 miles, the booster stages separate and descend by parachute into the ocean for recovery and eventual reuse. The Orbiter then continues under its own power, jettisoning the external fuel tank just before attaining orbit. The Orbiter is provided with a series of smaller rocket engines for maneuvering and attitude control, and these ensure insertion of the vehicle into the final desired orbit. Its main tasks are to place satellites into orbit, retrieve satellites from orbit, and repair and service satellites in orbit. On completion of a mission, the Orbiter flies back into the atmosphere and, once through the reentry phase, lands like an airplane, but without power.

Four operational Orbiters, named *Columbia, Challenger, Discovery,* and *Atlantis,* were built. A new Orbiter to replace *Challenger* is under construction. The first of four test flights (STS-1) was made by *Columbia* from Kennedy Space Center, Fla., in April 1981. The first operational mission deployed two satellites into space in November 1982. First payload deployment for DoD, using an IUS booster, took place in January 1985. However, following the loss of *Challenger,* military payloads will be carried on fewer than a third of the Shuttle flights now scheduled over the next few years. Shuttle facilities at the Vandenberg AFB launch and landing site have been placed in mothball status pending a return in Orbiter performance (payload weight to orbit) and a West Coast launch requirement.

Prime Contractors: Rockwell International (Orbiter), Martin Marietta (propellant tank), Thiokol (boosters), Lockheed Space Operations (Shuttle processing).

Power Plant: three Rocketdyne main engines, each 375,000 lb thrust at liftoff. Two Thiokol solid-propellant rocket boosters, each 2,700,000 lb thrust at liftoff.

Guidance: automatic and manual control.

Dimensions: Orbiter: length 122 ft, wing span 78 ft 0.7 in, height 56 ft 7 in.

Launch Weights: Shuttle complete approx 4,500,000 lb, Orbiter (empty) 165,000 lb, external tank (full) 1,655,600 lb, boosters (2) each 1,292,000 lb.

Inertial Upper Stage (IUS)

Used for the first time in October 1982, the IUS is intended to serve as an upper stage for both the Titan 34D/IV and the Space Shuttle. Consisting of an aft skirt, an aft-stage solid rocket motor, an interstage, a forward-stage solid rocket motor, and an equipment support structure, it has the capability of boosting 4,000 lb into geosynchronous orbit when used with Titan 34 or 5,300 lb on Titan IV.

Prime Contractor: Boeing Aerospace Company.
Power Plant: aft-stage solid rocket motor 21,400 lb thrust, forward-stage solid rocket motor 18,500 lb thrust.
Guidance: inertial, plus star tracker.
Dimensions: length 17 ft, diameter 9 ft 2¼ in.
Launch Weight: 32,500 lb.

PAM-D II

The original PAM (Payload Assist Module) was developed as a commercial venture in 1976 to improve the load-carrying capability of the Delta and Atlas launch vehicles and for use on the Space Shuttle. An improved motor in PAM-D II enables it to boost a 4,200 lb satellite into geosynchronous orbit. It was selected by USAF to put all 28 Navstar GPS satellites into 10,900 nautical mile, twelve-hour orbits from the Shuttle, under a multiyear purchase agreement to procure 28 of the upper stages in 1985–90. It is still hoped to launch 22 of the satellites by October 1991, but 12 of them will now be put into orbit by Delta II MLVs and only ten by Shuttle. A spring-loaded mechanism will eject each spinning PAM-D II and satellite from the Shuttle cargo bay. The spinning motion will stabilize the package from initial deployment to positioning in orbit.
Contractor: McDonnell Douglas Astronautics Company.

Delta II (MLV I)

On January 21 last year, McDonnell Douglas was selected by USAF to build 20 of a modified version of its Delta rocket to launch the Navstar Global Positioning System (GPS) satellites. The Delta II is slightly larger than the earlier Delta in order to satisfy USAF's medium-payload requirement. All 20 rockets are to be launched by 1991, the contract containing harsh financial penalties should any fail.

Delta II is a three-stage booster surrounded by nine solid-propellant, graphite epoxy motors (GEMs). The GEMs are currently under development and will not be available for the first nine GPS flights. These flights will, therefore, employ a modified version of the current Delta's Castor IV engine, the Castor IVA. Delta II will differ from the earlier version in having a twelve-foot stretch in the first-stage tanks and, from flight No. 10, an increased expansion ratio on the first-stage engine.
Prime Contractor: McDonnell Douglas Astronautics Corporation.
Power Plant: first stage: Rocketdyne RS-27A liquid-propellant engine, 237,000 lb thrust; second stage: Aerojet IT1P liquid-propellant engine, 9,400 lb thrust; third stage: Morton Thiokol SGS II derivative, 15,400 lb thrust; strap-on GEM solid rocket motors, 143, 235 lb thrust.
Dimensions: length 130 ft, diameter 8 ft; bulbous payload fairing, max diameter, 9 ft 6 in.
Liftoff Weight: 509,000 lb.
Performance: 11,110 lb to 100 nm.

MLV II

The Air Force has identified a requirement for a new medium-class launch vehicle (MLV II) to accommodate missions offloaded from the Shuttle as a result of launch schedule changes. The MLV II will be capable of launching approximately 13,000 lb to low-earth orbit. A competition will be held among viable candidates for at least a ten-vehicle buy.

Delta

Remotely Piloted Vehicles (RPVs)

MQM-107B/D Streaker

A longer, reengined version of the earlier MQM-107A, originally ordered for the US Army in 1975, the **MQM-107B** is a recoverable, variable-speed target drone. Improvements tested and proven on the A version are incorporated on the B version. MQM-107Bs assigned to Tyndall AFB, Fla., and Wallace AS in the Philippines are used to test and evaluate air-to-air missiles. An initial order for ten each for USAF and the US Army was supplemented in April 1983, with major production orders for both services. Deliveries were made between August 1984 and May 1985, but it is planned to continue procurement of the MQM-107B as USAF's standard subscale target drone.

Streaker

Also in use with USAF, the **MQM-107D** is similar to the B version but is powered by a Teledyne CAE 373-8 engine (960 lb st). (Data for MQM-107B.)
Contractor: Beech Aircraft Corporation.
Power Plant: one Microturbo TRI 60-2 Model 074 turbojet; 831 lb thrust.
Guidance and Control: analog or digital, for both ground control and preprogrammed flight. High-*g* autopilot provisions.
Dimensions: length 18 ft 1 in, body diameter 1 ft 3 in, span 9 ft 10 in.
Weight: launch weight (incl booster) 1,090 lb.
Performance: operating speed 230–594 mph, operating height 50–40,000 ft, endurance 2 hr 18 min.

BQM-34 Firebee

Since initial development of the **BQM-34A** in the late 1950s, more than 6,000 of these jet target vehicles have been delivered to support weapon system and target research, development, test, evaluation, quality assurance, training, and annual service practices by all three of the US services and foreign governments. The BQM-34s deployed at Wallace AS in the Philippines and Tyndall AFB, Fla., are used in the testing and evaluation of air-to-air missiles. In addition, the BQM-34A and supersonic **BQM-34F** Firebee II are used as targets in the William Tell exercise held every two years at Tyndall AFB. Procurement of the BQM-34A ended in 1985. This target is to be replaced by the MQM-107B.

However, last September, USAF placed an order for 50 new Firebee drones. These will be equipped with an uprated General Electric J85-17C engine, which provides a thrust to weight ratio of 1:1 and will feature higher climb rates and 6*g* maneuvering capability. A new microprocessor flight control system (MFCS) will provide a prelaunch and in-flight self-test capability. The new targets will be used for weapon system evaluation at Tyndall AFB, starting in 1989. (Data for BQM-34A.)
Contractor: Teledyne Ryan Aeronautical.
Power Plant: one Teledyne CAE J69-T-29 turbojet; 1,700 lb thrust; later models have one General Electric J85-GE-7 turbojet; 2,450 lb thrust.
Guidance and Control: remote control methods include choice of radar, radio, active seeker, and automatic navigator developed by Teledyne Ryan; Vega DTCS (drone tracking and control system); microwave command and guidance system also available.
Dimensions: length 22 ft 10.8 in, body diameter 3 ft 1.2 in, span 12 ft 10.8 in.
Weight: launch weight 2,500 lb.
Performance: max level speed at 6,500 ft 690 mph, operating height range 20 ft to more than 60,000 ft, max range 796 miles.

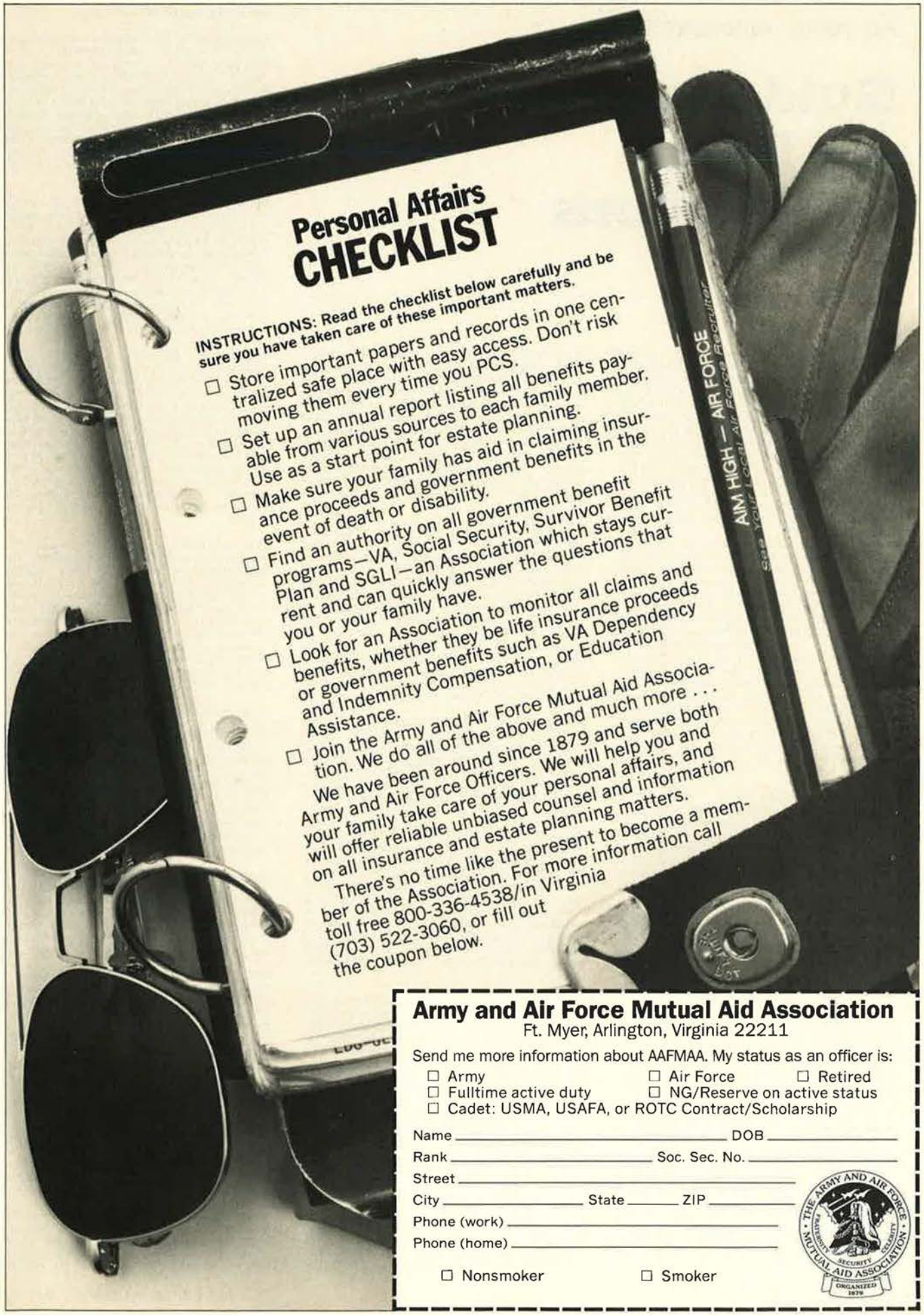
AQM-34M Firebee

Eighteen AQM-34 Firebee drones are being reactivated for tests of the over-the-horizon backscatter (OTH-B) radar system. The first was successfully tested last September. The drones, which had been stored at the Warner Robins (Ga.) Air Logistics Center for ten years, are being reactivated by the 6514th Test Squadron at Hill AFB, Utah. The OTH-B tests are being conducted out of NAS Roosevelt Roads, Puerto Rico, starting early this year.
Contractor: Teledyne Ryan Aeronautical.
Power Plant: one J69-T-41A turbojet; 1,920 lb st.
Guidance and Control: Preprogrammed digital computer, with Doppler guidance system.
Dimensions: length 30 ft, body diameter 3 ft 1.2 in, wing span 14 ft 6 in.
Weight: max launch weight 3,113 lb.

QF-100

A full-scale aerial target (FSAT) program is in hand to convert USAF/ANG F-100 fighter-bombers to QF-100 RPV configuration. This multiservice target provides air-to-air and ground-to-air missile evaluation and combat crew training.
Contractor: initial deliveries (from 1981) Sperry Corporation; follow-on (from 1984) FSI.
Power Plant: one Pratt & Whitney J57-P-21A turbojet; 16,950 lb st.
Guidance and Control: Dual Vega command guidance and telemetry systems.
Dimensions: length 54 ft 3 in, height 16 ft 2⅔ in, wing span 38 ft 9⅓ in.
Weight: mission operational T-O weight 31,000 lb.
Performance: max speed at altitude Mach 1.3, operating height range 200–50,000 ft, nominal range 138 miles.

Firebee



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AIR FORCE MAGAZINE'S

Guide to Major Air Force Installations

Altus AFB, Okla. 73523-5000; within Altus city limits. Phone (405) 482-8100; AUTOVON 866-1110. MAC base. 443d Military Airlift Wing (Training); 340th Air Refueling Wing (SAC); 2002d Communications Sqdn. (AFCC); Field Training Det. 403; 71st Flying Training Wing, OLK ACE Det. (ATC), T-37 aircraft operations; Det. 4, 17th Weather Sqdn.; Det. 3, 1600th Management Engineering Sqdn.; Det. 4, 1365th Audiovisual Sqdn. Base activated Jan. 1943; inactivated May 1945; reactivated Jan. 1953. Area 3,582 acres, plus 818 leased. Altitude 1,376 ft. Military 3,552; civilians 957; approximately 400–500 TDY students (officer and enlisted) in training per month. Payroll $130 million. Housing: 133 officer; 667 NCO; 365 VAQ, 158 VOQ, 11 transient family units. 25-bed hospital.

Andrews AFB, Md. 20331-5000; 11 mi. SE of Washington, D. C. Phone (301) 981-9111; AUTOVON 858-1110. MAC base. Hq. Air Force Systems Command (AFSC) provides aerospace systems, equipment, and initial spare parts for the Air Force's operational and support commands. 1776th Air Base Wing; 89th Military Airlift Wing; 113th Tactical Fighter Wing (ANG); 459th Military Airlift Wing (AFRES); 2045th Communications Gp. (AFCC); Det. 11, 1361st Audiovisual Sqdn.; Naval Air Facility; Marine Aircraft Gp. 41, Det. A. Base activated May 1943; named for Lt. Gen. Frank M. Andrews, military air pioneer and WW II commander of the European theater, killed in aircraft accident May 3, 1943, in Iceland. Area 4,982 acres (including easements). Altitude 281 ft. Military 8,958; civilians 2,620. Payroll $285.5 million. Housing: 390 officer; 1,694 NCO; 212 mobile home spaces; 339 transient (incl. 68 temporary living quarters for incoming personnel, 79 DV suites, 136 VOQ, 56 TAQ). 320-bed hospital.

Arnold AFB, Tenn. 37389; approx. 7 mi. SE of Manchester. Phone (615) 454-3000; AUTOVON 340-5011. AFSC base. Site of Arnold Engineering Development Center, free world's largest complex of wind tunnels, jet and rocket engine test cells, space simulation chambers, and hyperballistic ranges. AEDC supports the acquisition of new aerospace systems by conducting research, development, and evaluation testing for USAF, other services, and government agencies. Base activated Jan. 1, 1950; named for Gen. H. H. "Hap" Arnold, wartime Chief of the AAF. Area 40,118 acres. Altitude 950–1,150 ft. Military 186; civilians 220; contractor employees 3,600. Payroll $142.2 million. Housing: 24 officer; 16 NCO; 45 transient. Medical aid station.

Barksdale AFB, La. 71110-5000; in Bossier City. Phone (318) 456-2252; AUTOVON 781-1110. SAC base. Hq. 8th Air Force; 2d Bomb Wing, B-52G, KC-135, and KC-10 aircraft operations; 1st Combat Evaluation Gp.; 46th Communications Gp. (AFCC); Det. 1, 307th Civil Engineering Sqdn. RED HORSE (AFRES); Det. 1, 14th Flying Training Wing (ATC), T-37 aircraft operations; Det. 5, 3904th Management Engineering Sqdn.; 26th Weather Sqdn. (MAC); Det. 3, 1401st Military Airlift Sqdn. (MAC), CT-39 aircraft operations; 49th Test Sqdn.; 3097th Aviation Depot Sqdn. (AFLC); Det. 2, 4200th Test Sqdn.; 3903d School Sqdn. (SAC NCO Academy); 745th Air Force Band Sqdn.; 78th Air Refueling Sqdn. (AFRES), KC-10 aircraft operations; 917th Tactical Fighter Gp. (AFRES), A-10 operations. Also home of the 8th Air Force Museum. The 917th TFG trains all ANG and AFRES pilots in the 46th Tactical Fighter Training Sqdn. Base named for Lt. Eugene H. Barksdale, WW I airman killed Aug. 1926 in crash near Wright Field, Ohio. Base activated Feb. 2, 1933. Area 22,000 acres (20,000 acres reserved for recreation). Altitude 166 ft. Military 7,000; civilians 1,207. Payroll $145.3 million. Housing: 205 officer; 828 NCO; 29 transient. 70-bed hospital.

Beale AFB, Calif. 95903-5000; 13 mi. E of Marysville. Phone (916) 634-3000; AUTOVON 368-1110. SAC base. 14th Air Div.; 9th Strategic Recon Wing; 7th Missile Warning Sqdn. (AFSPACECOM); 1883d Information Services Sqdn. (AFCC). Aircraft include the SR-71, U-2, and TR-1 reconnaissance aircraft, KC-135 aerial tankers, and T-38 trainers. Originally US Army's Camp Beale. Became Air Force installation Apr. 1948; became AFB Nov. 1951. Named for Brig. Gen. E. F. Beale, Indian agent in California prior to Civil War. Area 22,944 acres. Altitude 113 ft. Military 4,422; civilians 528. Payroll $147.7 million. Housing: 211 officer; 1,501 NCO; 103 transient. 30-bed hospital.

Bergstrom AFB, Tex. 78743-5002; 7 mi. SE of downtown Austin. Phone (512) 479-4100; AUTOVON 685-1100. TAC base. 67th Tactical Reconnaissance Wing, RF-4C reconnaissance operations; Hq. 12th Air Force; Hq. 10th Air Force (AFRES); 924th Tactical Fighter Gp. (AFRES), F-4D fighter operations; TAC NCO Academy West; 602d Tactical Air Control Gp.; Det. 1, 4400th Management Engineering Sqdn.; Det. 12, Tactical Communications Div. Base activated Sept. 22, 1942; named for Capt. John A. E. Bergstrom, first Austin serviceman killed in WW II; died Dec. 8, 1941, at Clark Field, Philippines. Area 3,999 acres. Altitude 541 ft. Military 5,188; civilians 1,007. Payroll $167.5 million. Housing: 79 officer; 640 enlisted; 154 transient (90 VOQ, 64 VAQ). 35-bed hospital.

Blytheville AFB, Ark. 72315-5000; 4 mi. NW of Blytheville. Phone (501) 762-7000; AUTOVON 721-1110. SAC base. 42d Air Div.; 97th Bomb Wing; aircraft include B-52s and KC-135s. Base activated June 1942; inactivated Feb. 1947; reactivated Aug. 1955. Area 3,287 acres. Altitude 254 ft. Military 3,143; civilians 345. Payroll $69.9 million. Housing: 196 officer; 732 NCO; 69 transient. 20-bed hospital.

Bolling AFB, D. C. 20332-5000; 3 mi. S of US Capitol. Phone (202) 545-6700; AUTOVON 227-0101. Air Force District of Washington. 1100th Air Base Gp.; US Air Force Honor Guard; US Air Force Band; Air Force Office of Scientific Research (AFSC); Air Force Chief of Chaplains; Air Force Surgeon General; Air Force Office of History; Hq. Air Force Office of Special Investigations. Activated Oct. 1917; named for Col. Raynal C. Bolling, first high-ranking Air Service officer killed in WW I. Area 604 acres. Military 2,800; civilians 1,000. Payroll $112 million. Housing: 405 officer; 990 NCO; 257 transient. Clinic.

Brooks AFB, Tex. 78235; in SE San Antonio. Phone (512) 536-1110; AUTOVON 240-1110. AFSC base. Human Systems Div.; USAF School of Aerospace Medicine; USAF Occupational and Environmental Lab; USAF Drug Testing Lab; USAF Human Resources Lab; 6570th Air Base Gp. Tenant units include 6575th School Sqdn. (Systems Acquisition School); Air Force Office of Medical Support; Hq. AFSC Det. 20, Directorate of Professional Development; 2199th Communications Sqdn. (AFCC); Det. 16, 6592d Management Engineering Sqdn.; 6906th Electronic Security Sqdn. (ESC). Base activated Dec. 8, 1917; named for Cadet Sidney J. Brooks, Jr., killed Nov. 13, 1917, on his commissioning flight. Area 1,210 acres. Altitude 606 ft. Military 1,576; civilians 1,063. Payroll $70 million. Housing: 70 officer; 100 NCO; 8 transient. Clinic.

Cannon AFB, N. M. 88103-5000; 7 mi. W of Clovis. Phone (505) 784-3311; AUTOVON 681-1110. TAC base. 27th Tactical Fighter Wing, F-111D fighter operations. Base activated Aug. 1942; named for Gen. John K. Cannon, WW II commander of all Allied air forces in the Mediterranean theater. Area 25,663 acres. Altitude 4,295 ft. Military 3,650; civilians 782. Payroll $116 million. Housing: 149 officer; 862 enlisted. 40-bed hospital.

Carswell AFB, Tex. 76127-5000; 7 mi. WNW of downtown Fort Worth. Phone (817) 782-5000; AUTOVON 739-1110. SAC base. 19th Air Div.; 7th Bomb Wing (SAC); 301st Tactical Fighter Wing (AFRES); aircraft include B-52s, KC-135s, and AFRES F-4s. T-37 Accelerated Copilot Enrichment Program. Base activated Aug. 1942; named Jan. 30, 1948, for Maj. Horace S. Carswell, Jr., native of Fort Worth, WW II B-24 pilot, and posthumous Medal of Honor recipient. Area 3,274 acres. Altitude 650 ft. Military 5,171; civilians 1,764. Payroll $160 million. Housing: 98 officer; 709 NCO; 44 VOQ, 22 TLF, 80 VAQ. 140-bed regional hospital.

Castle AFB, Calif. 95342-5000; 8 mi. NW of Merced. Phone (209) 726-2011; AUTOVON 347-1110. SAC base. 93d Bomb Wing. Conducts training of all SAC B-52 and KC-135 aircrews. Also houses Det. 1, 318th Fighter Interceptor Sqdn. Site of Castle Air Museum. Base activated Sept. 1941; named for Brig. Gen. Frederick W. Castle, WW II B-17 pilot and Medal of Honor recipient. Area 2,700 acres. Altitude 188 ft. Military 5,419; civilians 671. Payroll $172.6 million. Housing: 92 officer; 842 NCO; 432 transient (incl. 88 VAQ, 272 VOQ, 12 family quarters, 24 distinguished visitor quarters). 25-bed hospital.

Chanute AFB, Ill. 61868-5000; 14 mi. N of Champaign at Rantoul. Phone (217) 495-1110; AUTOVON 862-1110. ATC base. Chanute Technical Training Center provides training in missile and aircraft mechanics, aerospace ground equipment, life support, metallurgy and nondestructive inspection, weather forecasting, weather equipment, and fire protection and rescue. Display center and historical aircraft park make up a base museum. Base activated May 1, 1917; named for Octave Chanute, aeronautical engineer and glider pioneer who died in 1910. Area 2,125 acres. Altitude 735 ft. Military 7,433; civilians 1,072. Payroll $131.7 million. Housing: 154 officer; 1,168 NCO; 196 VOQ, 944 VAQ, 32 TLF. 35-bed hospital.

Charleston AFB, S. C. 29404-5000; located in North Charleston 10 mi. from downtown Charleston. Phone (803) 554-0230; AUTOVON 583-0111. MAC base. Joint-use airfield. 437th Military Airlift Wing; 315th MAW (AFRES Assoc.); 1968th Communications Sqdn.; Det. 1, 107th Fighter Interceptor Gp. (TAC); Det. 7, 1361st Audiovisual Sqdn. Base activated Dec. 1941; inactivated Feb. 1946; reactivated 1952. Area 6,314 acres (incl. an auxiliary airfield). Altitude 45 ft. Military 7,790 (incl. AFRES); civilians 1,378. Payroll $149.2 million. Housing: 127 officer; 850 NCO; 75 trailer spaces; 497 transient (127 VOQ, 370 VAQ). Medical clinic.

Cheyenne Mountain Complex, Colo. 80914-5515; 6 mi. S of Colorado Springs. Phone (719) 554-7321; AUTOVON 692-7011. AFSPACECOM base. Host unit is 3d Space Support Wing (AFSPACECOM). Cheyenne Mountain Support Group; North American Aerospace Defense Command (NORAD) Command Post; US Space Command operations centers. Base activated 1966. Area 4.5 acres located primarily inside Cheyenne Mountain. Altitude 7,200 ft. More than 1,400 people representing US Army, Navy, and Air Force; the Canadian Forces; and civilian technicians. No housing or transient quarters. Medical aid station.

Columbus AFB, Miss. 39701-5000; 10 mi. NNW of Columbus. Phone (601) 434-7322; AUTOVON 742-1110. ATC base. 14th Flying Training Wing, undergraduate pilot training. Base activated 1941 for pilot training. Area 6,013 acres. Altitude 214 ft. Military 2,000; civilians 1,040 (incl. 625 contract civilians). Payroll $75 million (FY '87). Housing: 234 officer; 586 NCO; 61 transient. 20-bed hospital.

Davis-Monthan AFB, Ariz. 85707-5000; within the city limits of Tucson. Phone (602) 750-3900; AUTOVON 361-1110. TAC base. 836th Air Div.; 355th Tactical Training Wing, A-10 combat crew training; 602d Tactical Air Control Wing, headquarters for OA-37, OV-10, and ground FAC tactical air control operations; 868th Tactical Missile Training Gp., ground-launched cruise missile training operations; 41st Electronic Combat Sqdn. (EC-130H); Det. 1, 120th Fighter Interceptor Gp. (Mont-ANG); 71st Special Operations Sqdn. (AFRES), HH-3 and CH-3 Jolly Green Giant helicopter operations. Also site of AFLC's Military Aerospace Maintenance and Regeneration Center. Base activated 1927; named for two local early aviators—1st Lt. Samuel H. Davis, killed Dec. 28, 1921, and 2d Lt. Oscar Monthan, killed Mar. 27, 1924. Area 11,000 acres. Altitude 2,620 ft. Military 5,503; civilians 1,372. Payroll $156.8 million. Housing: 133 officer; 1,102 enlisted; 8 guest; 680 transient. 65-bed hospital.

Dover AFB, Del. 19902-5000; 3 mi. SE of Dover. Phone (302) 678-7011; AUTOVON 455-1110. MAC base. 436th Military Airlift Wing; 512th MAW (AFRES Assoc.). Dover operates the largest aerial port facility on the East Coast. Base activated Dec. 1941; inactivated 1946; reactivated

Major Active Air Force Installations in the US

An AIR FORCE Magazine Map

Feb. 1951. Area 3,734 acres. Altitude 28 ft. Military 4,574; civilians 1,358. Payroll $205.5 million. Housing: 107 officer; 1,449 enlisted; 670 transient (512 VAQ, 158 VOQ), 14 TLF. 30-bed hospital.

Dyess AFB, Tex. 79607-5000; WSW border of Abilene. Phone (915) 696-0212; AUTOVON 461-1110. SAC base. 12th Air Div.; 96th Bomb Wing; Det. 1, 4201st Test Sqdn. (SAC); 463d Tactical Airlift Wing; Det. 4, 1722d Combat Control Sqdn. (MAC); 1993d Communications Sqdn. (AFCC); Field Training Det. 417; 12th Flying Training Wing ACE Det. OLC; B-1B Site Activation Task Force (AFSC); B-1B FOT&E Test Team (AFOTEC). B-1B, KC-135, C-130, T-38 operations. First base to activate an operational B-1B wing and conduct B-1 combat crew training for the Air Force. First B-1B arrived June 1985; wing met initial operational capability Oct. 1986. Base activated Apr. 1942; deactivated Dec. 1945; reactivated as Abilene AB Sept. 1955. In Mar. 1956, renamed for Lt. Col. William E. Dyess, WW II fighter pilot known best for his escape from a Japanese prison camp, killed in P-38 crash at Burbank, Calif., Dec. 1943. Area 6,405 acres. Altitude 1,789 ft. Military 5,760; civilians 448. Payroll $182 million. Housing: 122 officer; 873 NCO; 209 BAQ/VOQ, 40 TLF. 35-bed hospital.

Edwards AFB, Calif. 93523; 20 mi. E of Rosamond. Phone (805) 277-1110; AUTOVON 527-1110. AFSC base. Site of Air Force Flight Test Center (AFFTC), which conducts developmental and follow-on testing and evaluation of manned and unmanned aircraft and related avionics flight-control and weapon systems. AFFTC also operates the USAF Test Pilot School, which trains test pilots, flight-test engineers, and flight-test navigators. Also site of USAF Astronautics Laboratory, US Army Aviation Engineering Flight Activity, the NASA Ames-Dryden Flight Research Facility, and the Jet Propulsion Laboratory's test facility. Edwards is the primary landing site for future Space Shuttle missions. Base activities began in Sept. 1933. Originally Muroc Army Air Field; renamed for Capt. Glen W. Edwards, killed June 5, 1948, in crash of a YB-49 "Flying Wing." Area 301,000 acres. Altitude 2,302 ft. Military 5,369 (including tenant units); government and contractor civilians 8,447. Payroll $394.1 million (incl. tenant units and contractors). Housing: 534 officer (incl. BOQ); 3,241 enlisted (incl. 1,466 dormitory spaces and 196 bachelor NCO quarters); 218 transient (70 VAQ, 97 VOQ, 51 TLF); 188 mobile home park units. 25-bed hospital.

Eglin AFB, Fla. 32542; 2 mi. SW of the twin cities of Niceville and Valparaiso; 7 mi. NE of Fort Walton Beach. Phone (904) 881-6668; AUTOVON 872-1110. AFSC base. Eglin is the free world's largest air force base in terms of land area, covering an area roughly two-thirds the size of Rhode Island. Air Force Armament Division (host); Air Force Armament Lab; 33d Tactical Fighter Wing; 39th Aerospace Rescue & Recovery Wing; Tactical Air Warfare Center; 1972d Communications Gp.; 919th Special Operations Gp. (AFRES); 20th Surveillance Sqdn.; 55th Aerospace Rescue & Recovery Sqdn.; 728th Tactical Control Sqdn.; US Army Florida Ranger Camp; a US Navy Explosive Ordnance Disposal School; Air Force Armament Museum. Base activated 1935; named for Lt. Col. Frederick I. Eglin, WW I flyer killed in aircraft accident Jan. 1, 1937. Area 464,980 acres. Altitude 85 ft. Work force (excl. Hurlburt Field): military 11,007; civilians 3,991; contractor 894. Payroll $408.5 million (incl. Hurlburt Field). Housing: 263 officer; 2,072 enlisted; 227 trailer spaces (officer and enlisted); 88 transient. 155-bed USAF regional hospital. AFSC clinic at Hurlburt Field.

Eielson AFB, Alaska 99702-5000; 26 mi. SE of Fairbanks. Phone (907) 377-1178; AUTOVON (317) 377-1110. AAC base. 343d Tactical Fighter Wing (host); 343d Combat Support Gp.; 18th Tactical Fighter Sqdn.; 25th Tactical Air Support Sqdn. Major tenants include 6th Strategic Wing (SAC); 1995th Communications Sqdn. (AFCC); Arctic Survival School (ATC); 168th AREFS (ANG). Base activated Oct. 1944; named for Carl Ben Eielson, Arctic aviation pioneer who died Nov. 1929. Area 23,500 acres (approx.). Altitude 534 ft. Military 3,365; civilians 618. Payroll $69.7 million. Housing: 164 officer; 1,296 NCO; 90 transient. Clinic.

Ellsworth AFB, S. D. 57706-5000 11 mi. ENE of Rapid City. Phone (605) 385-1000; AUTOVON 675-1000. Largest operational base in Strategic Air Command. 44th Strategic Missile Wing (host), Minuteman II operations; 28th Bombardment Wing, two B-1 squadrons, one each KC-135R, EC-135; Det. 2, 37th Aerospace Rescue & Recovery Sqdn., Huey HH-1H; OLA, 84th Flying Training Wing (ATC); Det. 17, 9th Weather Sqdn.; 2148th Communications Sqdn. (AFCC). Home of the South Dakota Air and Space Museum. Base activated July 1942 as Rapid City Army Air Base; named for Brig. Gen. Richard E. Ellsworth, killed Mar. 18, 1953, in crash of RB-36 in Newfoundland. Area 4,906 acres. Altitude 3,200 ft. Military 6,700; civilians 800. Payroll $126.4 million. Housing: 331 officer; 1,526 NCO; 173 transient. 30-bed hospital.

Elmendorf AFB, Alaska 99506-5000; bordering Anchorage. Phone (907) 552-1110; AUTOVON (317) 552-1110. Hq. Alaskan Air Command; Hq. Alaskan NORAD Region; 21st Tactical Fighter Wing (host); 21st Combat Support Gp.; 11th Tactical Control Gp.; 1931st Communications Wing; NORAD Region Operations Control Center; Rescue Coordination Center; 43d Tactical Fighter Sqdn.; 54th Tactical Fighter Sqdn.; 962d AWACS (TAC); 6981st Electronic Security Sqdn. (ESC); 616th Military Airlift Gp. (MAC); 17th Tactical Airlift Sqdn. (MAC); 71st Aerospace Rescue & Recovery Sqdn. (MAC); 11th Weather Sqdn. (MAC); plus varied US Army, Navy, and Marine activities. Base activated July 1940; named for Capt. Hugh Elmendorf, killed Jan. 13, 1933, at Wright Field, Ohio, while flight-testing a new pursuit plane. Area 13,130 acres. Altitude 118 ft. Military 7,333; civilians 1,721. Payroll $225 million. Housing: 232 officer; 1,638 NCO; transient incl. 52 family units (no pets), 140 VOQ, 230 VAQ. 95-bed hospital.

England AFB, La. 71311-5004; 5 mi. W of Alexandria. Phone (318) 448-2100; AUTOVON 683-1110. TAC base. 23d Tactical Fighter Wing, A-10 fighter operations. Base activated Oct. 1942; named for Lt. Col. John B. England, WW II P-51 pilot and ace credited with 17.5 victories, killed Nov. 17, 1954, in F-86 crash in France. Area 2,282 acres. Altitude 89 ft. Military 3,057; civilians 667. Payroll $44 million. Housing: 109 officer; 508 NCO; transient incl. 18 VAQ double rooms with 2 rooms for SNCOs and a chief's suite, 34 VOQ single rooms, 6 VIP suites, limited number of family rooms (reservations required). 25-bed hospital.

Fairchild AFB, Wash. 99011-5000; 12 mi. WSW of Spokane. Phone (509) 247-1212; AUTOVON 352-1110. SAC base. 92d Bomb Wing (SAC); 3636th Combat Crew Training Wing (ATC); 141st Air Refueling Wing (ANG); Det. 24, 40th Aerospace Rescue & Recovery Sqdn. (MAC); Det. 1, 1000th Satellite Operations Gp. (AFSPACECOM); 2039th Communications Sqdn. (AFCC). Base activated Jan. 1942; named for Gen. Muir S. Fairchild, USAF Vice Chief of Staff at his death in 1950. Area 6,127 acres. Altitude 2,462 ft. Military 4,859; civilians 610. Payroll $150 million for civilian and active-duty military; $16 million for ANG. Housing: 502 officer; 1,079 NCO; transient incl. 69 VOQ and 29 VAQ, no family transient quarters. 45-bed hospital.

Falcon AFB, Colo. 80912-5000; 9 mi. E of Colorado Springs. Phone (719) 550-4113; AUTOVON 560-1110. AFSPACECOM base. 2d Space Wing. Host unit is 3d Space Support Wing (AFSPACECOM). Strategic Defense Initiative National Test Facility. Base activated July 1985. Area 640 acres. Altitude 6,267 ft. Military active-duty 1,200; civilians 170; contractors 1,434. No housing or transient quarters. Medical aid station.

Francis E. Warren AFB, Wyo. 82005-5000; adjacent to Cheyenne. Phone (307) 775-1110; AUTOVON 481-1110. SAC base. 4th Air Div.; 90th Strategic Missile Wing; 90th Combat Support Gp.; 37th Aerospace Rescue & Recovery Sqdn. (MAC). Warren is the only base with the Peacekeeper missile system; 50 are scheduled to be deployed in Minuteman III silos by Dec. 1988. Base activated as Fort D. A. Russell July 4, 1867; under Army jurisdiction until 1947, when reassigned to USAF. Base renamed in 1930 for Francis Emory Warren, Wyoming senator and early governor. The oldest continuously active military base in the Air Force. Home of the first Atlas-D ICBM missile wing (1960–65). Area 5,866 acres, plus 200 Peacekeeper and Minuteman III missile sites distributed over 12,600 sq. mi. in Wyoming, Colorado, and Nebraska. Altitude 6,160 ft. Military 3,940; civilians 602. Payroll $104.7 million. Housing: 114 officer; 507 NCO; 210 airmen/NCO/Wherry; 57 transient. 35-bed hospital.

George AFB, Calif. 92394-5000; 6 mi. NW of Victorville. Phone (619) 269-1110; AUTOVON 353-1110. TAC base. 831st Air Div.; 37th Tactical Fighter Wing, home of TAC's Wild Weasel F-4G squadrons; 35th Tactical Training Wing, F-4 transitional and upgrade training; German Air Force training in F-4; OLAD, 144th Fighter Interceptor Wing (TAC); 27th Tactical Air Support Sqdn., OV-10; 207th Communications Sqdn. (AFCC). Base activated 1941; named for Brig. Gen. Harold H. George, WW I fighter ace killed Apr. 29, 1942, in aircraft accident in Australia. Area 5,347 acres. Altitude 2,875 ft. Military 5,527; civilians 516. Payroll $197.48 million. Housing: 145 officer; 176 senior NCO; 1,320 NCO; 63 transient. 30-bed hospital.

Goodfellow AFB, Tex. 76908-5000; 2 mi. SE of San Angelo. Phone (915) 657-3231; AUTOVON 477-3231. ATC base. Goodfellow Technical Training Center provides cryptologic training for all services. Designated a technical training center Mar. 1, 1985. Will house all Air Force intelligence training by 1989 under the Intelligence Training Consolidation program. Major units include 3480th Technical Training Wing (ATC); 3480th Technical Training Gp. (ATC); 3490th Technical Training Gp. (ATC); 3495th Technical Training Gp. (ATC); 8th Missile Warning Sqdn. (at nearby Eldorado AFS, the location of the Southwest Pave Paws radar site) (AFSPACECOM); Det. 6, USAF Occupational Measurement Center (USAFOMC); 2081st Communications Sqdn. (AFCC); Det. 12, 3314th Management Engineering Sqdn. (ATC); NCO Professional Military Education Center (ESC); 3d Battalion, 112th Military Intelligence Brigade (US Army); Naval Technical Training Center Detachment; Marine Corps Administrative Detachment. Base activated Jan. 1941; named for Lt. John J. Goodfellow, Jr., WW I fighter pilot killed in combat Sept. 14, 1918. Area 1,127 acres. Altitude 1,877 ft. Military 3,415; civilians 414. Payroll $68.8 million. Housing: 3 officer; 96 NCO; 617 transient (581 VAQ, 36 VOQ), 12 TLF. Clinic.

Grand Forks AFB, N. D. 58205-5000; 16 mi. W of Grand Forks. Phone (701) 747-3000; AUTOVON 362-1110. SAC base. 319th Bomb Wing (KC-135R and B-1B); 321st Strategic Missile Wing (Minuteman III). Base activated 1956; named after the city of Grand Forks, whose citizens bought the property for the Air Force. Area 6,912 acres. Missile complex covers an additional 7,500 sq. mi. Altitude 911 ft. Military 5,325; civilians 571. Payroll $159.1 million. Housing: 442 officer; 1,835 NCO; 136 transient. 35-bed hospital.

Griffiss AFB, N. Y. 13441-5000; 1 mi. NE of Rome. Phone (315) 330-1110; AUTOVON 587-1110. SAC base. 416th Bomb Wing. Other major units are Rome Air Development Center (AFSC); 485th Engineering Installation Gp. (AFCC); Hq. 24th Air Div (TAC); Northeast Air Defense Sector (TAC); 933d Civil Engineering Sqdn. (AFRES). Base activated Feb. 1, 1942; named for Lt. Col. Townsend E. Griffiss, killed in aircraft accident Feb. 15, 1942 (the first US airman to lose his life in Europe during WW II while in the line of duty). Area 3,896 acres. Altitude 504 ft. Military 4,523; civilians 3,204. Payroll $267 million. Housing: 169 officer; 566 NCO; 50 trailers; 109 transient. 20-bed hospital.

Grissom AFB, Ind. 46971-5000; 7 mi. S of Peru. Phone (317) 689-5211; AUTOVON 928-1110. SAC base. 305th Air Refueling Wing; 930th Tactical Fighter Gp. (AFRES); 434th Air Refueling Wing (AFRES). Activated Jan. 1943 for Navy flight training; reactivated June 1954 as Bunker Hill AFB; renamed May 1968 for Lt. Col. Virgil I. "Gus" Grissom, killed Jan. 27, 1967, at Cape Kennedy, Fla., with other Astronauts Edward White and Roger Chaffee in Apollo capsule fire. Area 3,000 acres. Altitude 800 ft. Military 2,350; civilians 1,056. Payroll $53.1 million (SAC only). Housing: 276 officer; 1,852 NCO; 138 transient. Clinic, outpatient care only.

Gunter AFB, Ala. 36114; 4 mi. NE of Montgomery. Phone (205) 279-1110; AUTOVON 446-1110. AU base. Hq. Standard Systems Center (AFCC); Air Force Logistics Management Center (AFLC); USAF Extension Course Institute; USAF Senior NCO Academy. Base activated Aug. 27, 1940; named for William A. Gunter, longtime mayor of Montgomery and airpower advocate, died 1940. Area 368 acres. Altitude 220 ft. Military 1,619; civilians 968. Payroll included in Maxwell entry. Housing: 118 officer; 206 NCO; 378 transient (107 VOQ, 268 VAQ, 3 TLF).

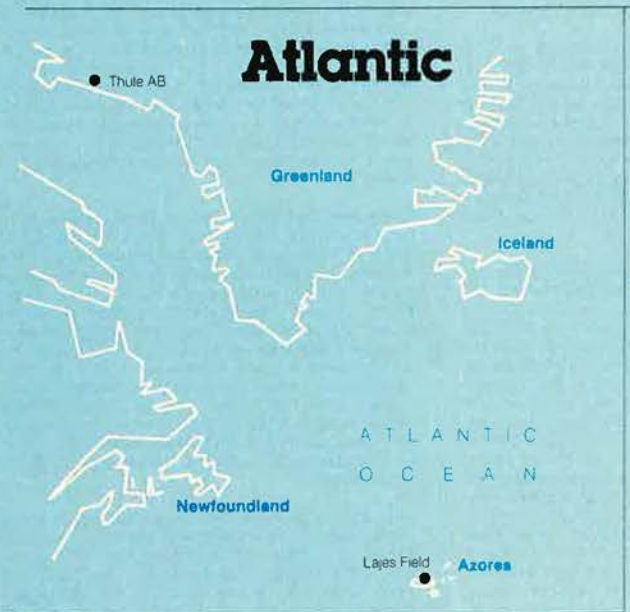
Hanscom AFB, Mass. 01731; 17 mi. NW of Boston. Phone (617) 861-4441; AUTOVON 478-5980. AFSC base. Hq. Electronic Systems Div. (AFSC) manages development and acquisition of command control communications and intelligence (C^3I) systems. Also site of Air Force Geophysics Lab, center for research and exploratory development in the terrestrial, atmospheric, and space environments. Base has no flying mission; transient USAF aircraft use runways of Laurence G. Hanscom Field, state-operated airfield adjoining the base. Named for a pre-WW II advocate of private aviation, killed in a lightplane accident in 1941. Area 846 acres. Altitude 133 ft. Military 2,300; civilians 3,000. Payroll $170 million. Housing: 418 officer; 441 NCO; 30-unit TLF, 754 BOQ/VOQ. Clinic.

Hickam AFB, Hawaii 96853-5000; 10 mi. W of Honolulu. Phone (808) 422-0531 (Oahu military operator); AUTOVON 449-0111. PACAF base. Hq. Pacific Air Forces. Host unit 15th Air Base Wing, supporting Air Force units and installations in Hawaii and throughout the Pacific; subordinate unit 9th Airborne Command and Control Sqdn. Major associate units include 834th Airlift Div. (MAC); Hq. Pacific Communications Div. (AFCC); 1st Weather Wing (MAC); 154th Composite Gp. (ANG); 619th Military Airlift Support Sqdn. (MAC); Det. 1, 89th Military Airlift Wing (MAC). Base activated Sept. 1938; named for Lt. Col. Horace M. Hickam, air pioneer killed in crash Nov. 5, 1934, at Fort Crockett, Tex. Area 2,694 acres. Altitude sea level. Military 3,612; civilians 1,961. Payroll $332 million (includes Hickam and Wheeler AFBs and Bellows AFS). Housing: 535 officer; 1,920 enlisted. Clinic (15th Medical Gp.).

Hill AFB, Utah 84056-5990; 5 mi. S of Ogden. Phone (801) 777-7221; AUTOVON 458-1110. AFLC base. Hq. Ogden Air Logistics Center furnishes logistics support for Min-

Europe

USAF's Major Installations Overseas



Central America

uteman, Peacekeeper, and Small ICBM missiles; Maverick air-to-ground missiles; laser and electro-optical guided bombs; F-4 and F-16 systems manager; air munitions; aircraft landing gear including wheels, brakes and struts, tires, and tubes; photographic and aerospace training equipment. Other units include 388th Tactical Fighter Wing (TAC); 419th Tactical Fighter Wing (AFRES); 729th Tactical Control Sqdn.(TAC); 6545th Test Gp. (AFSC), which oversees management of Utah Test and Training Range and RPV test programs. Base activated Nov. 1940; named for Maj. Ployer P. Hill, killed Oct. 30, 1935, test-flying the first B-17. Area 6,666 acres; manages 961,012 acres. Altitude 4,788 ft. Military 5,100; civilians 15,300. Payroll $586 million. Housing: 263 officer; 882 NCO; 45 transient. 35-bed hospital.

Holloman AFB, N. M. 88330-5000; 8 mi. SW of Alamogordo. Phone (505) 479-6511; AUTOVON 867-1110. TAC base. 833d Air Div.; 49th Tactical Fighter Wing, F-15 operations; 479th Tactical Training Wing, lead-in fighter training; 4449th Mobility Support Sqdn., Harvest Bare; 82d and 83d Tactical Control Flights; 6585th Test Gp. (AFSC) conducts test and evaluation of aircraft and missile systems. Twenty-one other tenant units located at Holloman, including 1877th Communications Sqdn., 4th Satellite Communications Sqdn. (AFSPACECOM), 1984th Communications Sqdn., Air Force Geophysical Laboratory detachment, and a US Army unit. Base activated 1942; named for Col. George Holloman, guided-missile pioneer, killed in B-17 crash on Formosa Mar. 19, 1946. Area 50,697 acres. Altitude 4,093 ft. Military 6,352; civilians 1,756. Payroll $225 million. Housing: 191 officer; 1,360 NCO; 255 transient. 35-bed hospital.

Homestead AFB, Fla. 33039-5000; 5 mi. NNE of Homestead. Phone (305) 257-8011; AUTOVON 791-0111. TAC base. 31st Tactical Fighter Wing, F-4D and F-16 fighter operations and training; site of ATC sea-survival school; 726th Tactical Control Sqdn. (TAC); Naval Security Group Activity; 482d Tactical Fighter Wing (AFRES); 301st Aerospace Rescue & Recovery Sqdn. (AFRES); OLAA, 125th Fighter Interceptor Gp. (TAC). Base activated Sept. 1942. Area 3,345 acres. Altitude 7 ft. Military 7,200; civilians 10,200. Payroll $320 million. Housing: 321 officer; 1,294 NCO; 359 transient. 80-bed hospital.

Hurlburt Field, Fla. 32544-5000; 5 mi. W of Fort Walton Beach. Phone (904) 881-6668; AUTOVON 579-1110. MAC base, though located on the Eglin AFB (AFSC) reservation. Home of Hq. 23d Air Force, which is the focal point for all special operations matters for USAF. Under its responsibility is the 1st Special Operations Wing, Hurlburt Field, equipped with MC-130E (Combat Talon), AC-130H (Spectre Gunship), and MH-53J (Pave Low III); the USAF Special Operations School; 1723d Special Operations Combat Control Sqdn.; Special Operations Weather Team; 6th Weather Sqdn. and 7th Weather Wing; 1st Special Operations Sqdn., Clark AB, the Philippines, and 7th Special Operations Sqdn., Rhein-Main AB, Germany. Tenant units assigned to Hurlburt Field include the Special Missions Operational Test and Evaluation Center; the 4442d Tactical Control Gp., which includes the US Air Force Air Ground Operations School and the 727th Tactical Control Sqdn.; the 823d Civil Engineering Sqdn. RED HORSE; Det. 8, 1361st Audiovisual Sqdn. Base activated 1943; named for Lt. Donald W. Hurlburt, WW II pilot killed Oct. 2, 1943, in a crash on Eglin reservation. Altitude 35 ft. Military 4,200; civilians 400. Payroll $126 million. Housing: 36 officer; 344 NCO; 212 transient rooms with 282 beds. Medical clinic only at Hurlburt, but 160-bed hospital at Eglin Regional Hospital located 12 mi. away.

Keesler AFB, Miss. 39534-5000; located in Biloxi. Phone (601) 377-1110; AUTOVON 868-1110. ATC base. Hq. Keesler Technical Training Center (avionics, communications, electronics, radar systems, computer and command and control systems, personnel and administrative courses); Keesler USAF Medical Center. Hosts MAC and AFRES weather reconnaissance units; AFRES tactical airlift unit; TAC airborne command and control sqdn.; AFCC engineering installation gp.; AFCC NCO Academy/Leadership School; USAF First Sergeant's Academy. Base activated June 12, 1941; named for 2d Lt. Samuel R. Keesler, Jr., WW I aerial observer, killed in action Oct. 9, 1918, near Verdun, France. Area 3,600 acres. Altitude 26 ft. Military 13,300; civilians 3,312. Payroll $362 million. Housing: 291 officer; 1,666 NCO; 51 trailer spaces; 76 transient (376 VOQ and 1,348 VAQ units on space availability, technical training students may occupy many units). 350-bed hospital.

Kelly AFB, Tex. 78245-5000; 5 mi. SW of San Antonio. Phone (512) 925-1110; AUTOVON 945-1110. AFLC base. Hq. San Antonio Air Logistics Center provides logistics management, procurement, and distribution support for such USAF aircraft as the C-5A and C-5B, C-17, C-9, F-5, O-2, OV-10, and T-38. As a specialized repair activity, SA-ALC modernizes and performs heavy depot maintainance on the entire USAF fleet of C-5s, a significant portion of Strategic Air Command's B-52s, Military Airlift Command C-130s, and various engines, including the TF39, TF56, and F100. SA-ALC also manages more than half of the Air Force's engine inventory, all fuel lubricants used by the Air Force and NASA, the Air Force's fleet of boats and ships, and the Department of Defense Working Dog Program. Other major units include Hq. Electronic Security Command; Air Force Electronic Warfare Center; Air Force Cryptologic Support Center; Joint Electronic Warfare Center; Air Force Service Information and News Center; Hq. Air Force Commissary Service; 433d Military Airlift Wing (AFRES); 149th Tactical Fighter Gp. (ANG); 1923d Communications Gp.; 1827th Electronics Installation Sqdn.; Defense Reutilization and Marketing Office; Air Force Audit Agency Office. Dating from Nov. 21, 1916, Kelly AFB is the oldest continuously active air base in the US. Named for Lt. George E. M. Kelly, first Army pilot to lose his life in a military aircraft, killed May 10, 1911. Area 4,660 acres. Altitude 689 ft. Military 4,988; civilians 18,970. Payroll $467 million. Housing: 46 officer; 368 NCO. Clinic.

Kirtland AFB, N. M. 87117-5000; S of Albuquerque. Phone (505) 844-0011; AUTOVON 244-0011. MAC base. 1606th Air Base Wing. Major agencies and units include Air Force Contract Management Div. (AFSC); Air Force Operational Test and Evaluation Center; Air Force Space Technology Center (AFSC); Air Force Weapons Laboratory (AFSC); Air Force Office of the Chief of Security Police; New Mexico ANG; 1550th Combat Crew Training Wing (MAC); Defense Nuclear Agency Field Command; Naval Weapons Evaluation Facility, Sandia National Laboratories; Lovelace Biomedical and Environmental Research Institute; Department of Energy's Albuquerque Operations Office; AFSC NCO Academy; Air Force Directorate of Nuclear Surety; 150th Tactical Fighter Gp. (ANG); 1960th Communications Sqdn. (AFCC); 3098th Aviation Depot Sqdn.; Det. 1, 1369th Audiovisual Sqdn. These agencies furnish contract management; nuclear and laser research, development, and testing; operational test and evaluation services; advanced helicopter training; HC-130 search and rescue training; and para-rescue training. Other major units are AFLC Nuclear Support Office; Albuquerque Seismological Laboratory; Command Control Communications Countermeasures Joint Test Force; University of New Mexico Civil Engineering Research Facility; the Interservice Nuclear Weapons School. Base activated Jan. 1941; named for Col. Roy S. Kirtland, air pioneer and commandant of Langley Field in the 1930s, died May 2, 1941. Area 52,450 acres. Altitude 5,352 ft. Military 4,984; civilians 14,223. Payroll $750 million. Housing: 350 officer; 1,784 NCO; 399 transient (274 VOQ, 125 VAQ). 40-bed hospital.

K. I. Sawyer AFB, Mich. 49843-5000; 20 mi. S of Marquette. Phone (906) 346-6511; AUTOVON 472-1110. SAC base. 410th Bomb Wing; ELF Transmitter Facility (Navy); 2001st Communications Sqdn. (AFCC). Base activated 1959; named for Kenneth I. Sawyer, who proposed site for county airport, died 1944. Area 5,278 acres. Altitude 1,220 ft. Military 3,637; civilians 610. Payroll $98.8 million. Housing: 279 officer; 1,414 NCO; 199 trailer spaces; 26 BNCOQ; 22 BOQ; 59 transient (incl. 20 fully furnished TLFs, 22 VAQ, 17 VOQ). 15-bed hospital.

Lackland AFB, Tex. 78236-5000; 8 mi. WSW of San Antonio. Phone (512) 671-1110; AUTOVON 473-1110. ATC base. Provides basic military training for active-duty, Air National Guard, and Air Force Reserve airmen; technical training for basic and advanced security police/law enforcement personnel; cryptographic maintenance operators and technicians; patrol dog-handler courses; training of instructors, recruiters, and social actions/drug abuse counselors; Officer Training School; Defense Language Institute English Language Center; Wilford Hall USAF Medical Center (Air Force's largest medical center, with 1,000 beds, conducts medical education and clinical research); ATC NCO Academy; military training instructor reserve squadron; 539th Air Force Band; Det. 40, Air Force Logistics Center. Base activated 1941; named for Brig. Gen. Frank D. Lackland, early commandant of Kelly Field flying school, died 1943. Area 6,783 acres, incl. 3,872 acres at Lackland Training Annex. Altitude 745 ft. Military 19,522; civilians 6,671. Payroll $646.7 million. Housing: 106 officer; 619 NCO; 831 transient. 1,000-bed medical center.

Langley AFB, Va. 23665-5000; 3 mi. N of Hampton. Phone (804) 764-9990; AUTOVON 574-1110. TAC base. Hq. Tactical Air Command. 1st Tactical Fighter Wing, host unit, F-15 fighter operations; Hq. 1st Air Force (TAC); Hq. CONUS NORAD region; 2d Aircraft Delivery Gp. (TAC); 480th Reconnaissance Technical Gp.; 1913th Communications Gp. (AFCC); 1912th Computer Systems Gp. (AFCC); 564th Air Force Band (TAC); US Army TRADOC Flight Det.; 48th Fighter Interceptor Sqdn. (TAC); Low Intensity Conflict Center; 20 other tenant units. Base activated Dec. 30, 1916. Langley is the second oldest continuously active air base in the US; named for aviation pioneer and scientist Samuel Pierpont Langley, who died in 1906. NASA Langley Research Center is located across base. Area 3,439 acres. Altitude 10 ft. Military 9,581; civilians 3,000. Payroll $308.6 million. Housing: 384 officer; 1,255 NCO; 304 transient rooms to include VOQ, VAQ, VIP, and senior enlisted distinguished visitors. 75-bed USAF regional hospital.

Laughlin AFB, Tex. 78843-5000; 6 mi. E of Del Rio. Phone (512) 298-3511; AUTOVON 732-1110. ATC base. 47th Flying Training Wing, undergraduate pilot training. Base activated Oct. 1942; named for 1st Lt. Jack T. Laughlin, Del Rio native, B-17 pilot killed over Java on Jan. 29, 1942. Area 4,008 acres. Altitude 1,080 ft. Military 2,738; civilians 790 (347 contract civilians). Payroll $106.1 million. Housing: 202 officer; 401 NCO; 37 transient, 24 temporary family lodging facilities. 20-bed hospital.

Laurence G. Hanscom AFB *(see Hanscom AFB).*

Little Rock AFB, Ark. 72099-5000; 15 mi. NE of Little Rock. Phone (501) 988-3131; AUTOVON 731-1110. MAC base. 314th Tactical Airlift Wing, only C-130 training base in DoD, training crew members from all branches of service and some foreign countries. Tenants include Hq. Joint Readiness Training Center, a high-priority US Army Center (JRTC trains all nonmechanized units within the Army, using Fort Chaffee, Ark., as the training ground); 189th Tactical Airlift Gp. (ANG); 2151st Communications Sqdn.; 22d Air Force NCO Leadership School. Base activated 1955. Area 6,898 acres. Altitude 310 ft. Military 6,000; civilians 748. Payroll $147 million. Housing: 313 officer; 1,222 NCO; 387 transient (162 VAQ, 225 VOQ). 30-bed hospital.

Loring AFB, Me. 04751-5000; 4 mi. W of Limestone. Phone (207) 999-1110; AUTOVON 920-1110. SAC base. 42d Bomb Wing was activated here Feb. 25, 1953, as Limestone AFB; renamed for Maj. Charles Loring, Jr., F-80 pilot killed Nov. 22, 1952, in North Korea; posthumously awarded Medal of Honor. Area more than 9,000 acres. Altitude 756 ft. Military 3,763; civilians 582. Payroll $74.2 million. Housing: 303 officer; 1,481 NCO; 122 transient; 4 VIP. 23-bed hospital, with a new 20-bed hospital to be completed this year.

Los Angeles AFB, Calif. 90009-2960; in metropolitan Los Angeles area, city of El Segundo, 3 mi. S of Los Angeles IAP. Phone (213) 643-1000; AUTOVON 833-1110. AFSC base. Headquarters of AFSC's Space Division, which manages the design, development, acquisition, and launch of DoD's space program. Support unit is 6592d Air Base Gp. 24 tenant units on base; also provides support to 41 off-base units/activities. Activated Dec. 14, 1960, as Los Angeles AFS. Area 96 acres at Los Angeles AFB and 96 acres at Fort MacArthur Annex. Altitude 95 ft. Military 2,109; civilians 2,278. Payroll $116.6 million. Housing at Fort MacArthur Annex in San Pedro: 370 officer and enlisted townhomes; general officer houses; 27 enlisted dormitory rooms; 60 visiting and unaccompanied officer quarters. 23 TLF units. Clinic, commissary, child-care center, and Air Force Family Support Center.

Lowry AFB, Colo. 80230-5000; on border between Denver and Aurora. Phone (303) 370-1110; AUTOVON 926-1110. ATC base. Technical Training Center; Air Force Accounting and Finance Center; Air Reserve Personnel Center; 3320th Correction and Rehabilitation Sqdn. Lowry Technical Training Center conducts training in avionics, space operations, munitions, logistics, and audiovisual fields. Base activated Oct. 1, 1937; named for 1st Lt. Francis B. Lowry, killed in action Sept. 26, 1918, near Crepion, France, while on a photo-reconnaissance mission. Area 1,863 acres. Altitude 5,400 ft. Military 12,693; civilians 4,395. Payroll $293.4 million. Housing: 87 officer; 780 NCO; 240 VOQ, 585 VAQ, 40 TLF. USAF clinic on base, with Fitzsimons Army Medical Center 15 minutes away.

Luke AFB, Ariz. 85309-5000; 20 mi. WNW of Phoenix. Phone (602) 856-7411; AUTOVON 853-1110. TAC base. 832d Air Div.; 405th Tactical Training Wing, F-15 operations; 58th Tactical Training Wing, F-16 operations; 944th Tactical Fighter Gp. (AFRES). Luke, the largest fighter training base in the free world, conducts training of USAF and foreign pilots in the F-15, F-16, and F-5 through the 425th Tactical Fighter Training Sqdn. at nearby Williams AFB. Base activated 1941; named for 2d Lt. Frank Luke, Jr., observation balloon-busting ace of WW I and first flyer to receive the Medal of Honor, killed in action Sept. 29, 1918, near Murvaux, France. Area 4,197 acres, plus 2,700,000-acre range at Gila Bend. Altitude 1,090 ft. Military 5,543; civilians 1,450. Payroll $253 million. Housing: 95 officer; 779 NCO; 265 transient (180 VOQ, 85 VAQ), 40 temporary family lodging facilities. 105-bed hospital.

MacDill AFB, Fla. 33608-5000; adjacent to Tampa city limits. Phone (813) 830-1110; AUTOVON 968-1110. TAC base. 56th Tactical Training Wing, F-16 operations; Hq. Special Operations Command; Hq. US Central Command; Joint Communication Support Element. 56th Tac-

tical Training Wing conducts replacement training in the F-16. Base activated Apr. 15, 1941; named for Col. Leslie MacDill, killed in an aircraft accident Nov. 8, 1938, near Washington, D. C. Area 5,631 acres. Altitude 6 ft. Military 7,031; civilians 1,777. Payroll $199 million. Housing: 58 officer; 746 enlisted; 360 transient. 75-bed 56th Tactical Training Wing hospital.

Malmstrom AFB, Mont. 59402-5000; 1.5 mi. E of Great Falls. Phone (406) 731-9990; AUTOVON 632-1110. SAC base. 341st Strategic Missile Wing; 301st Air Refueling Wing. Base activated Dec. 15, 1942; named for Col. Einar A. Malmstrom, WW II fighter commander killed in air accident Aug. 24, 1954. Site of SAC's first Minuteman wing. Area 3,573 acres, plus about 23,000 sq. mi. of missile complex. Altitude 3,525 ft. Military 3,768; civilians 520. Payroll $122 million. Housing: 258 officer; 1,148 NCO; 120 transient. 29-bed hospital.

March AFB, Calif. 92518-5000; 9 mi. SE of Riverside. Phone (714) 655-1110; AUTOVON 947-1110. SAC base. Hq. 15th Air Force; 22d Air Refueling Wing; Southwest Air Defense Sector (TAC); 22d Strategic Hospital; 452d Air Refueling Wing (AFRES); 943d Tactical Airlift Gp.; 163d Tactical Fighter Gp. (ANG). Base activated Mar. 1, 1918; named for 2d Lt. Peyton C. March, Jr., who died in Texas of crash injuries Feb. 18, 1918. Area 7,703 acres. Altitude 1,530 ft. Military 4,034; civilians 2,171. Payroll $261 million. Housing: 103 officer; 608 NCO; 215 transient. 105-bed hospital.

Mather AFB, Calif. 95655-5000; 12 mi. ESE of Sacramento. Phone (916) 364-1110; AUTOVON 828-1110. ATC base. DoD executive agent for Specialized Undergraduate Navigator Training (SUNT); USAF, Navy, and Marine Corps basic navigator training. Provides navigator training for 2d German Air Force and 90 other countries. Only navigator training base; also trains USAF electronic warfare officers. 323d Flying Training Wing (ATC); 320th Bomb Wing (SAC), B-52G operations; 940th Air Refueling Gp. (AFRES), KC-135E operations; 323d Air Base Gp. (ATC); 3506th Recruiting Gp. (ATC); 2034th Communications Sqdn. (AFCC); USAF Civil Air Patrol Pacific Liaison Region. Base activated 1918; named for 2d Lt. Carl S. Mather, killed in midair collision Jan. 30, 1918, in Texas. Area 5,800 acres. Altitude 96 ft. Military 5,410; civilians 2,079. Payroll $242.3 million. Housing: 452 officer; 820 NCO; 208 transient. 70-bed hospital.

Maxwell AFB, Ala. 36112; 1 mi. WNW of Montgomery. Phone (205) 293-1110; AUTOVON 875-1110. AU base. 3800th Air Base Wing; Hq. Air University, professional military education center for USAF; Air War College; Air Command and Staff College; Center for Aerospace Doctrine, Research, and Education; Ira C. Eaker Center for Professional Development; Squadron Officer School; Air Force Historical Research Center; Hq. Air Force ROTC (ATC); Hq. Civil Air Patrol-USAF; Community College of the Air Force (ATC); 908th Tactical Airlift Gp. (AFRES). (The Senior NCO Academy and Extension Course Institute are at Gunter AFB.) Base activated 1918; named for 2d Lt. William C. Maxwell, killed in air accident Aug. 12, 1920, in the Philippines. Area 2,524 acres. Altitude 168 ft. Military 4,326; civilians 1,632. Payroll $296.5 million. Housing: 264 officer; 436 NCO; 1,102 transient (1,029 VOQ, 43 VAQ, 30 TLF). 60-bed hospital.

McChord AFB, Wash. 98438-5000; 8 mi. S of Tacoma. Phone (206) 984-1910; AUTOVON 976-1110. MAC base. 62d Military Airlift Wing; Hq. 25th Air Div. (TAC); Northwest Air Defense Sector (TAC); 318th Fighter Interceptor Sqdn. (TAC); Region Operations Control Center (NORAD); 446th Military Airlift Wing (AFRES Assoc.). Base activated May 5, 1938; named for Col. William C. McChord, killed Aug. 18, 1937, while attempting to make a forced landing at Maidens, Va. Area 4,609 acres. Altitude 322 ft. Military 5,562; civilians 1,982. Payroll $141 million. Housing: 111 officer; 870 NCO; 284 transient. Dispensary.

McClellan AFB, Calif. 95652; 9 mi. NE of Sacramento. Phone (916) 643-2111; AUTOVON 633-1110. AFLC base. Hq. Sacramento Air Logistics Center provides logistics management, procurement, maintenance, and distribution support for such USAF weapon systems as F-111, FB-111, A-10, A-7, and EF-111 and for surveillance and warning systems, the Space Transportation System, communication-electronics equipment, radar sites, and generators, and maintenance support for F-4 aircraft. Other major units include 41st Rescue and Weather Reconnaissance Wing (MAC); 2049th Communications Gp. and 1849th Electronics Installation Sqdn. (AFCC); Technical Operations Division, Air Force Technical Applications Center (AFSC); Test and Evaluation Center (TAC); Hq. 4th Air Force (AFRES); Defense Logistics Agency; US Coast Guard Air Station, Sacramento (DOT). Named for Maj. Hezekiah McClellan, pioneer in Arctic aeronautical experiments who was killed in crash May 25, 1936. Area 2,917 acres. Military 3,859; civilians 13,593. Payroll $555 million. Housing: 132 officer; 343 NCO; 21 transient. Clinic.

McConnell AFB, Kan. 67221-5000; 5 mi. SE of Wichita. Phone (316) 652-6100; AUTOVON 743-1130. SAC base. 384th Bomb Wing; 184th Tactical Fighter Gp. (ANG). First B-1B arrived Feb. 1988. Base activated June 5, 1951; named for Capt. Fred J. McConnell, WW II B-24 pilot who died in crash of a private plane Oct. 25, 1945, and for his brother, 2d Lt. Thomas L. McConnell, also a WW II B-24 pilot, killed July 10, 1943, during attack on Bougainville in the Pacific. Area 3,066 acres. Altitude 1,371 ft. Military 3,057; civilians 691. Payroll $80 million. Housing: 96 officer; 493 NCO; 92 transient (26 VOQ, 41 VAQ, 25 TLF). 15-bed hospital.

McGuire AFB, N. J. 08641-5000; 18 mi. SE of Trenton. Phone (609) 724-1100; AUTOVON 440-0111. MAC base. 438th Military Airlift Wing; Hq. 21st Air Force; New Jersey ANG; New Jersey Civil Air Patrol; 170th Air Refueling Gp. (ANG); 108th Tactical Fighter Wing (ANG); 514th Military Airlift Wing (AFRES Assoc.); MAC NCO Academy East; Air Force Band of the East; OLB, 1361st Audiovisual Sqdn. Base adjoins Army's Fort Dix; formerly Fort Dix Army Air Base. Activated as AFB 1949; named for Maj. Thomas B. McGuire, Jr., P-38 pilot, second leading US ace of WW II, recipient of Medal of Honor, killed in action Jan. 7, 1945, in the Philippines. Area 3,552 acres. Altitude 133 ft. Military 5,258; civilians 1,592. Payroll $170 million. Housing: 194 officer; 1,560 NCO; 620 transient (186 VOQ, 244 VAQ, 160 transient family units, 30 other transient). 300 enlisted housing units are being renovated; expected date of completion is spring 1989. Dispensary and 150-bed hospital at Fort Dix.

Minot AFB, N. D. 58705-5000; 13 mi. N of Minot. Phone (701) 723-1110; AUTOVON 344-1110. SAC base. 57th Air Div.; 91st Strategic Missile Wing, Minuteman III operations; 5th Bomb Wing, B-52H and KC-135 operations; 2150th Communications Sqdn. (AFCC); Det. 7, 37th Aerospace Rescue & Recovery Sqdn. (MAC), UH-1 operations; 64th Flying Training Wing OLB (ATC), T-38 operations; Det. 21, 9th Weather Sqdn. (AWS); AFOSI Det. 1312; Det. 35, 3904th Management Engineering Sqdn.; Det. 520, Air Force Audit Agency; 15th Air Force NCO Leadership School. Base activated Jan. 1957; named after the city of Minot, whose citizens donated $50,000 toward purchase of the land for the Air Force. Area 5,085 acres, plus additional 19,324 acres for missile sites. Altitude 1,668 ft. Military 6,106; civilians 980. Payroll $142.3 million. Housing: 469 officer; 2,001 NCO; 153 private trailer spaces; 138 transient (incl. 52 VOQ, 46 VAQ, 40 TLF). 47-bed hospital.

Moody AFB, Ga. 31699-5000; 10 mi. NNE of Valdosta. Phone (912) 333-4211; AUTOVON 460-1110. TAC base. 347th Tactical Fighter Wing, F-16 fighter operations. Base activated June 1941; named for Maj. George P. Moody, killed May 5, 1941, while test-flying Beech AT-10. Area 6,050 acres. Altitude 233 ft. Military 3,493; civilians 664. Payroll $97 million. Housing: 36 officer; 268 NCO; 76 transient. 25-bed hospital.

Mountain Home AFB, Idaho 83648-5000; 10 mi. SW of Mountain Home. Phone (208) 828-2111; AUTOVON 857-1110. TAC base. 366th Tactical Fighter Wing, F-111 fighter and EF-111A electronic countermeasures operations; 2036th Communications Sqdn. (AFCC); 513th Field Training Det. (ATC); OLAF, 4444th Operations Sqdn.; Det. 2, USAF Fighter Weapons School; Det. 3, Tactical Air Warfare Center; AFOSI Det. 2007; Det. 454, Air Force Audit Agency; Det. 11, 4400th Management Engineering Sqdn.; Det. 18, 25th Weather Sqdn. Base activated Apr. 1942. Area 9,147 acres. Altitude 3,000 ft. Military 3,929; civilians 473. Payroll $82 million. Housing: 152 officer; 1,369 NCO; 121 transient, 16 TLF. 30-bed hospital.

Myrtle Beach AFB, S. C. 29579-5000; in south Myrtle Beach. Phone (803) 238-7211; AUTOVON 748-1110. TAC base. Shares runway with Myrtle Beach Jetport. 354th Tactical Fighter Wing, A-10 fighter operations; 2066th Communications Sqdn. (AFCC); 301st Field Training Det. (ATC); 1816th Reserve Advisor Sqdn.; Det. 3, 3d Weather Sqdn.; Det. 12, 440th Management Engineering Sqdn. (ATC); Det. 2105 (AFOSI); 73d Tactical Control Flight (TAC). Army air base 1941–47; USAF base since 1956. Area 3,793 acres. Altitude 25 ft. Military 3,500; civilians 760. Payroll $85 million. Housing: 95 officer; 682 NCO; 65 trailer lots; 117 transient. 20-bed hospital.

Nellis AFB, Nev. 89191-5000; 8 mi. NE of Las Vegas. Phone (702) 643-1800; AUTOVON 682-1800. TAC base. USAF Tactical Fighter Weapons Center, F-5E, F-15, F-16, F-111, A-10, T-38; 57th Fighter Weapons Wing, F-5E Aggressor operations; USAF Air Demonstration Sqdn. (Thunderbirds); 4440th Tactical Fighter Training Gp. (Red Flag); 554th Operations Support Wing; 554th Range Gp.; 474th Tactical Fighter Wing, F-16 operations; 4450th Tactical Training Gp.; 820th Civil Engineering Sqdn. RED HORSE; 3096th Aviation Depot Sqdn.; 2069th Communicatlons Gp. Base activated July 1941; named for 1st Lt. William H. Nellis, WW II P-47 fighter pilot, killed Dec. 27, 1944, in Europe. Area 11,274 acres, with ranges totaling 3,012,770 acres. Altitude 1,869 ft. Military 10,171; civilians 1,200. Payroll $443 million. Housing: 107 officer; 1,367 enlisted; 100 trailer spaces; 364 transient (153 officer, 211 enlisted), 60 TLF. 40-bed hospital.

Newark AFB, Ohio 43057; 1 mi. SW of Newark. Phone (614) 522-2171; AUTOVON 580-2171. AFLC base. Aerospace Guidance and Metrology Center repairs inertial guidance and navigation systems for most of the Air Force's missiles and aircraft as well as a variety of inertial systems for other branches of the armed forces. Also manages the Air Force's worldwide measurement and calibration program, providing the link between the National Bureau of Standards and the Air Force's 130 precision measurement equipment laboratories at bases around the world. 5 tenant units. Activated as an Air Force station Nov. 7, 1962. Military 45; civilians 2,600. Payroll $83 million.

Norton AFB, Calif. 92409-5000; 59 mi. E of Los Angeles, within San Bernardino corporate limits. Phone (714) 382-1110; AUTOVON 876-1110. MAC base. 63d Military Airlift Wing; Hq. Air Force Inspection and Safety Center; Hq. Air Force Audit Agency; Hq. Aerospace Audiovisual Service (MAC); Ballistic Missile Office (AFSC); 445th Military Airlift Wing (AFRES Assoc.); MAC NCO Academy West and 22d Air Force NCO Leadership School. Base activated Mar. 2, 1942; named for Capt. Leland F. Norton, native of San Bernardino, WW II A-20 attack bomber pilot, killed in action May 27, 1944, near Amiens, France. Area 2,430 acres. Altitude 1,156 ft. Military 8,912 (incl. AFRES); civilians 2,626. Payroll $502 million. Housing: 56 officer; 208 NCO; 400 transient. Clinic.

Offutt AFB, Neb. 68113-5000; 8 mi. S of Omaha. Phone (402) 294-1110; AUTOVON 271-1110. SAC base. Hq. Strategic Air Command; 55th Strategic Reconnaissance Wing; 544th Strategic Intelligence Wing; Air Force Global Weather Central (MAC); 3d Weather Wing (MAC); 3902d Air Base Wing; Hq. Strategic Communications Division (AFCC); 1st Aerospace Information Systems Wing (AFCC); 1000th Satellite Operations Gp. (AFSPACECOM); 6949th Electronic Security Sqdn. (ESC); 702d Air Force Band. Base activated 1896 as Army's Fort Crook; landing field named in 1924 for 1st Lt. Jarvis J. Offutt, WW I pilot, died Aug. 13, 1918, from injuries received at Valheureux, France. Area 1,914 acres (incl. housing area and off-base sites). Altitude 1,048 ft. Military 12,932; civilians 3,506 (incl. 513 contractor personnel). Payroll $481 million. Housing: 513 officer; 2,167 NCO; 60 transient. 93-bed hospital.

Onizuka AFB, Calif. 94088-3430; 37 mi. S of San Francisco at Sunnyvale. Phone (408) 752-3110; AUTOVON 359-3110. AFSPACECOM base. 1004th Space Support Gp.; 2d Satellite Tracking Gp.; Consolidated Space Test Center (AFSC); 1999th Communications Sqdn. (AFCC). Base activated Dec. 2, 1959, as Sunnyvale AFS, renamed for Lt. Col. Ellison S. Onizuka, killed Jan. 28, 1986, in the Space Shuttle *Challenger* accident. Area 23 acres. Altitude 34 ft. Military 950, civilians 300, contractor 2,000. Housing: 20 officer, 80 NCO (located at NAS Moffett Field). No transient housing.

Patrick AFB, Fla. 32925; 2 mi. S of Cocoa Beach. Phone (305) 494-1110; AUTOVON 854-1110. AFSC base. Operated by the Eastern Space and Missile Center in support of DoD, NASA, and other agency missile and space programs. Major tenants are Defense Equal Opportunity Management Institute; Air Force Technical Applications Center; 549th Tactical Air Support Gp.; 2d Combat Communications Gp. (AFCC). Base activated 1940; serves as airhead for Cape Canaveral AFS. CCAFS has supported more than 2,400 launches since 1950. Named for Maj. Gen. Mason M. Patrick, chief of AEF's Air Service in WW I and chief of the Air Service/Air Corps, 1921–27. Area 2,341 acres. Altitude 9 ft. Military 4,552; civilians 1,516. Payroll $187.8 million (military, Civil Service). Housing: 157 officer; 1,419 NCO. 20-bed hospital.

Pease AFB, N. H. 03803-5000; 3 mi. W of Portsmouth. Phone (603) 430-0100; AUTOVON 852-1110. SAC base. 45th Air Div.; 509th Bomb Wing (FB-111 medium bomber and KC-135 tanker operations); 541st Air Force Band; 1916th Communications Sqdn. (AFCC); 3519th USAF Recruiting Sqdn. (ATC); 157th Air Refueling Gp. (ANG). Base activated 1956; named for Capt. Harl Pease, Jr., WW II B-17 pilot and Medal of Honor recipient, killed Aug. 7, 1942, during attack on Rabaul, New Britain Island. Area 4,254 acres. Altitude 101 ft. Military 3,678; civilians 474. Payroll $71.7 million. Housing: 196 officer; 1,015 NCO (plus 50 trailer spaces); 124 transient (incl. 41 VOQ, 55 VAQ, 28 TLF). 70-bed hospital.

Peterson AFB, Colo. 80914-5000; E of Colorado Springs. Phone (303) 554-7321; AUTOVON 692-7011. AFSPACECOM base. Hq. Air Force Space Command. Host unit is 3d Space Support Wing (AFSPACECOM). Hq. North American Aerospace Defense Command; Hq. US Space Command; Cheyenne Mountain Complex located 17 mi. SW of Colorado Springs; 1st Space Wing; 302d

Tactical Airlift Wing (AFRES); 2d Space Wing located 9 mi. E at Falcon AFB. Base activated 1942; named for 1st Lt. Edward J. Peterson, who was killed Aug. 8, 1942, in aircraft crash at the base. Area 1,176 acres. Altitude 6,200 ft. Military active-duty 5,604; reserves 1,204; civilians 3,737. Payroll $254 million. Housing: 112 officer; 387 NCO; 199 transient (70 VOQ, 89 VAQ, 40 TLF). Clinic.

Plattsburgh AFB, N. Y. 12903-5000; adjacent to Plattsburgh. Phone (518) 565-5000; AUTOVON 689-5000. SAC base. 380th Bomb Wing, medium bomber and tanker operations with FB-111 and KC-135. 530th Combat Crew Training Sqdn. trains all FB-111 combat crews for SAC. 8th Air Force NCO Leadership School; FOLE, 71st Flying Training Wing (ATC); 2042d Communications Sqdn. (AFCC); 210th Field Training Det. Second oldest active military installation in the US, established 1814; AFB since 1955. Area 4,879 acres. Altitude 235 ft. Military 4,160; civilians 451. Payroll $124 million. Housing: 222 officer; 1,421 NCO. 20-bed hospital.

Pope AFB, N. C. 28308-5000; 12 mi. NNW of Fayetteville. Phone (919) 394-0001; AUTOVON 486-1110. MAC base. USAF Airlift Center; 317th Tactical Airlift Wing; 1st Aeromedical Evacuation Sqdn.; 1943d Communications Sqdn.; 53d Mobile Aerial Port Sqdn. (AFRES); 1721st Combat Control Sqdn.; OLC, 1361st Audiovisual Service and 1724th Special Tactics Sqdn. Base adjoins Army's Fort Bragg and provides intratheater airlift support for airborne forces and other personnel, equipment, and supplies. Base activated 1919; named for 1st Lt. Harley H. Pope, WW I flyer, killed Jan. 7, 1917, when his JN-4 "Jenny" ran out of fuel and crashed near Fayetteville. Area 1,750 acres. Altitude 218 ft. Military 4,357; civilians 800. Payroll $160 million. Housing: 89 officer; 370 NCO; 218 transient. Clinic.

Randolph AFB, Tex. 78150-5000; 17 mi. ENE of San Antonio. Phone (512) 652-1110; AUTOVON 487-1110. ATC base. Hq. Air Training Command; 12th Flying Training Wing, T-37 and T-38 pilot instructor training; Air Force Military Personnel Center; USAF Occupational Measurement Center; Civilian Personnel Management Center; Hq. Joint Military Medical Command; Hq. USAF Recruiting Service. Base activated June 1930; named for Capt. William M. Randolph, killed Feb. 17, 1928, when his AT-4 crashed on takeoff at Gorman, Tex. Area 2,901 acres. Altitude 761 ft. Military 5,791; civilians 2,898. Payroll $282 million. Housing: 225 officer; 625 NCO; 165 transient. Clinic.

Reese AFB, Tex. 79489-5000; adjacent to Lubbock. Phone (806) 885-4511; AUTOVON 838-1110. ATC base. 64th Flying Training Wing, undergraduate pilot training. Base activated 1942; named for 1st Lt. Augustus F. Reese, Jr., P-38 fighter pilot killed in Sardinia May 14, 1943. Area 2,467 acres. Altitude 3,338 ft. Military 2,751; civilians 810. Payroll $100.1 million. Housing: 104 officer; 258 NCO (50 under renovation); 65 transient (8 suites, 25 TLF, 14 BOQ, 18 VAQ). 15-bed hospital.

Robins AFB, Ga. 31098; 18 mi. SSE of Macon at Warner Robins. Phone (912) 926-1110; AUTOVON 468-1110. AFLC base. Hq. Warner Robins Air Logistics Center provides worldwide logistics management for the F-15, C-7A, C-20, C-130, C-140, and C-141. Also manages utility helicopters, remotely piloted vehicles, and air-to-air, air-to-ground, and ground-to-ground missiles. Responsible for the management and repair of electronic components, including airborne communications and navigation equipment, airborne bomb and gun directing systems, and all Air Force airborne electronic warfare equipment. Other major units include Hq. Air Force Reserve (AFRES); 2853d Air Base Gp.; 19th Air Refueling Wing (SAC); 5th Combat Communications Gp. (AFCC); 3503d Recruiting Gp.; 1926th Communications Sqdn. (AFCC); 9th Missile Warning Sqdn. Base activated Mar. 1942; named for Brig. Gen. Augustine Warner Robins, an early Chief of the Materiel Division of the Air Corps, died June 16, 1940. Area 8,879 acres. Altitude 294 ft. Military 4,083; civilians 16,323. Payroll $626 million. Housing: 245 officer; 1,151 NCO; 40 TLF, 141 VOQ, 120 VAQ; 100 trailer spaces. 20-bed hospital.

Sawyer AFB *(see K. I. Sawyer AFB).*

Scott AFB, Ill. 62225-5000; 6 mi. ENE of Belleville. Phone (618) 256-1110; AUTOVON 576-1110. MAC base. Hq. Military Airlift Command; Hq. Air Force Communications Command; US Transportation Command; Hq. Aerospace Rescue & Recovery Service; Hq. Air Weather Service; Defense Commercial Communications Office; Environmental Technical Applications Center; USAF Medical Center, Scott; 7th Weather Wing; 375th Aeromedical Airlift Wing; 932d Aeromedical Airlift Gp. (AFRES Assoc.); Airlift Communications Div.; 375th Air Base Gp. Base activated June 14, 1917; named for Cpl. Frank S. Scott, first enlisted man to die in an air accident, killed Sept. 28, 1912, at College Park, Md. Area 3,000 acres. Altitude 453 ft. Military 7,108; civilians 3,274. Payroll $388.3 million. Housing: 393 officer; 1,386 NCO; 193 spaces for privately owned trailers; 300 transient. 185-bed hospital; 100-bed aeromedical staging facility.

Seymour Johnson AFB, N. C. 27531-5000; in city limits of Goldsboro. Phone (919) 736-5400; AUTOVON 488-1110. TAC base. 4th Tactical Fighter Wing, F-4E fighter operations; 68th Air Refueling Wing (SAC); 916th Air Refueling Gp. (AFRES); 2012th Communications Sqdn. (AFCC); OLAD, 191st Fighter Interceptor Gp. (MichANG). Base activated June 12, 1942; named for Navy Lt. Seymour A. Johnson, Goldsboro native killed Mar. 5, 1941, in an aircraft accident in Maryland. Area 3,320 acres. Altitude 109 ft. Military 4,763; civilians 814. Payroll $149.4 million. Housing: 154 officer; 1,543 enlisted; 83 VAQ, 46 VOQ, 8 BOQ, 98 UNCOQ, 27 transient family units. 30-bed hospital.

USAF's Major Installations Overseas

Andersen AFB, Guam
APO San Francisco 96334-5000
AUTOVON 322-1110
Hq. 3d Air Division, SAC
43d Bombardment Wing, SAC
605th Military Airlift Support Squadron, MAC
54th Weather Reconnaissance Squadron, MAC
27th Communications Squadron, AFCC
Det. 11, 2d Aircraft Delivery Group, TAC

Aviano AB, Italy
APO New York 09292-5000
AUTOVON 632-1110
40th Tactical Group, USAFE
2387th Communications Group, AFCC
Support base, USAFE

Bitburg AB, W. Germany
APO New York 09132-5000
AUTOVON 453-1110
36th Tactical Fighter Wing, USAFE

Clark AB, Republic of the Philippines
APO San Francisco 96274-5000
AUTOVON 860-1110 (Direct 39X-XXXX)
Hq. 13th Air Force, PACAF
3d Tactical Fighter Wing, PACAF
374th Tactical Airlift Wing, MAC
1961st Communications Group, AFCC
6200th Tactical Fighter Training Group, PACAF
6922d Electronic Security Squadron, ESC
1st Special Operations Squadron, MAC
9th Aeromedical Evacuation Squadron, MAC
31st Aerospace Rescue and Recovery Squadron, MAC
600th Air Force Band, PACAF

Comiso AB, Italy
APO New York 09694-5000
AUTOVON 628-8110
487th Tactical Missile Wing, USAFE

Florennes AB, Belgium
APO New York 09188-5000
AUTOVON 791-3255
485th Tactical Missile Wing, USAFE

Hahn AB, W. Germany
APO New York 09122-5000
AUTOVON 450-1110
50th Tactical Fighter Wing, USAFE

Hellenikon AB, Greece
APO New York 09223-5000
AUTOVON 662-1110
7206th Air Base Group, USAFE
2140th Communications Group, AFCC
Support, communications, USAFE

Howard AFB, Panama
APO Miami 34001-5000
AUTOVON 284-1110
Hq. USAF Southern Air Division, TAC

Incirlik AB, Turkey
APO New York 09289-5000
AUTOVON 676-1110
39th Tactical Group, USAFE
628th Military Airlift Support Squadron, MAC
USAF Hospital Incirlik
Support base, USAFE

Iraklion AB, Crete
APO New York 09291-5225
AUTOVON 668-1110
7276th Air Base Group, USAFE
Support base, USAFE

Kadena AB, Okinawa, Japan
APO San Francisco 96239-5000
AUTOVON 630-1110
313th Air Division, PACAF
18th Tactical Fighter Wing, PACAF
376th Strategic Wing, SAC
1962d Communications Group, AFCC
6990th Electronic Security Group, ESC
961st Airborne Warning and Control Squadron, TAC
400th Munitions Maintenance Squadron (Theater), PACAF
18th Combat Support Wing, PACAF

Kunsan AB, Republic of Korea
APO San Francisco 96264-5000
AUTOVON 272-2345
8th Tactical Fighter Wing, PACAF

Lajes Field, Azores
APO New York 09406
AUTOVON 723-1410
1605th Military Airlift Support Wing, MAC
Airlift support base, MAC

Lindsey AB, W. Germany
APO New York 09634-5000
AUTOVON 339-1110
Hq. 65th Air Division, USAFE
7100th Combat Support Wing, USAFE
USAF Regional Medical Center (Wiesbaden)
1st Combat Communications Group, AFCC
Support base, USAFE

Misawa AB, Japan
APO San Francisco 96519-5000
AUTOVON 248-1101
432d Tactical Fighter Wing, PACAF
6920th Electronic Security Group, ESC

Osan AB, Republic of Korea
APO San Francisco 96570-5000
AUTOVON 284-4110
Hq. 7th Air Force, PACAF
51st Tactical Fighter Wing, PACAF
5th Tactical Air Control Group, PACAF
6th Tactical Intelligence Group, PACAF
2146th Communications Group, AFCC
6903d Electronic Security Group, ESC
611th Military Airlift Support Group, MAC
554th Civil Engineering Squadron (RH), PACAF
38th Aerospace Rescue and Recovery Squadron, MAC

RAF Alconbury, United Kingdom
APO New York 09238-5000
AUTOVON 223-1110
10th Tactical Fighter Wing, USAFE
17th Reconnaissance Wing, SAC

Shaw AFB, S. C. 29152-5000; 10 mi. WNW of Sumter. Phone (803) 668-8110; AUTOVON 965-1110. TAC base. 363d Tactical Fighter Wing, F-16 fighter and RF-4C reconnaissance operations; T-37 trainer aircraft; Hq. 9th Air Force (TAC); 507th Tactical Air Control Wing, manages 407L/485L tactical air control systems. Base activated Aug. 30, 1941; named for 2d Lt. Ervin D. Shaw, one of the first Americans to see air action in WW I, killed in action in France on July 9, 1918, when his Bristol fighter was shot down during a reconnaissance mission. Area 3,363 acres; supports another 8,078 acres. Altitude 244 ft. Military 6,125; civilians 1,666. Payroll $176 million. Housing: 389 officer; 1,315 NCO; 189 transient. 40-bed hospital.

Shemya AFB, Alaska (APO Seattle 98736-5000); located at western tip of the Aleutian Islands chain, midway between Anchorage, Alaska, and Tokyo, Japan. Phone (907) 392-3000; AUTOVON (317) 392-3000. AAC base. 5073d Air Base Gp. (AAC), host unit; 16th Surveillance Sqdn. (AFSPACECOM); Det. 1, 6th Strategic Wing (SAC). Base activated 1943. Shemya was used as a bomber base in WW II. The International Date Line has been bent around Shemya so that the local date is the same as elsewhere in the US. Island area about 11.25 sq. mi. Altitude 270 ft. Military 585; civilian contract employees 399. Payroll $8.8 million. Housing: 70 transient. Dispensary.

Sheppard AFB, Tex. 76311-5000; 4 mi. N of Wichita Falls. Phone (817) 851-2511; AUTOVON 736-1001. ATC base. Sheppard Technical Training Center includes the 3700th Technical Training Wing, which conducts courses in aircraft maintenance, civil engineering, communication, comptroller, transportation, and instructor training; School of Health Care Science, which provides training in biomedical sciences, dentistry, health service administration, medical readiness, medicine, and nursing; and the 3785th Field Training Wing, which provides training on specific weapon systems and on-the-job training advisory service at 77 field training detachments, 19 operating locations, and 1 field training flight worldwide; 80th Flying Training Wing (ATC), which conducts T-37 and T-38 undergraduate pilot training and instructor pilot training for 12 nations in the Euro-NATO Joint Jet Pilot Training Program; 2054th Communications Sqdn. (AFCC). Base activated June 14, 1941; named for US Sen. Morris E. Sheppard of Texas, who died April 9, 1941. Area 5,500 acres. Altitude 1,015 ft. Military 7,650; civilians 1,349. Payroll $286 million. Housing: 200 officer; 1,287 NCO; 318 VOQ, 623 VOQ, 50 TLF. 140-bed regional hospital.

Tinker AFB, Okla. 73145-5990; 8 mi. SE of Oklahoma City. Phone (405) 732-7321; AUTOVON 884-4360. AFLC base. Hq. Oklahoma City Air Logistics Center furnishes logistics support for bombers, jet engines, instruments, and electronics. Other major units include Engineering Installation Div. (AFCC); 3d Combat Communications Gp. (AFCC); 28th Air Div. (TAC); 507th Tactical Fighter Gp. (AFRES). Base activated Mar. 1941; named for Maj. Gen. Clarence L. Tinker, whose LB-30 (an early model B-24) apparently went down at sea after attacking a retreating enemy ship at the end of the Battle of Midway. Area 4,790 acres. Altitude 1,291 ft. Military 7,767; civilians 18,233. Payroll $672 million. Housing: 108 officer; 622 NCO. 40-bed hospital.

Travis AFB, Calif. 94535-5000; 50 mi. NE of San Francisco at Fairfield. Phone (707) 438-4011; AUTOVON 837-1110. MAC base. Hq. 22d Air Force; 60th Military Airlift Wing; 349th Military Airlift Wing (AFRES Assoc.); David Grant Medical Center; OLC, 1369th Audiovisual Sqdn. Base activated May 17, 1943; named for Brig. Gen. Robert F. Travis, killed Aug. 5, 1950, in a B-29 accident. Area 7,580 acres. Altitude 62 ft. Military 13,404; civilians 3,386. Payroll $279.5 million. Housing: 272 officer; 1,103 Jr. NCO; 204 Sr. NCO; 766 transient (incl. 40 TLF, 170 VOQ, 428 VAQ, 26 DVQ, 4 Sr. NCO suites, 68 aerial port quarters with cooking facilities, 69 aerial port quarters without). 283-bed hospital.

Tyndall AFB, Fla. 32403-5000; 12 mi. E of Panama City. Phone (904) 283-1113; AUTOVON 523-1113. TAC base. USAF Air Defense Weapons Center; primary units are the 325th Tactical Training Wing, 475th Weapons Evaluation Gp., and 325th Combat Support Gp. Provides DoD a centralized location for operational and technical advice on air defense concepts and tactics and combat readiness training for tactical and strategic air defense aircrews and weapons controllers. Provides training of F-15 aircraft pilots and weapons controllers, centralized training for all F-15 maintenance personnel, and special training to enhance air-to-air combat skills. Single-point management for all continental USAF subscale and full-scale drone aerial target operations. TAC units include Southeast Air Defense Sector, home of Southeast Sector Operations Control Center, 4702d Computer Services Sqdn.; Det. 1, 48th Fighter Interceptor Sqdn.; TAC NCO Academy East. Tenant units include Air Force Engineering and Services Center; 3625th Technical Training Sqdn. (ATC); 2021st Communications Sqdn. (AFCC). Base activated Dec. 7, 1941; named for 1st Lt. Frank B. Tyndall, WW I fighter pilot killed July 15, 1930, in crash of P-1 near Mooresville, N. C. Area 29,115 acres. Altitude 18 ft. Military 4,623; civilians 1,695. Payroll $246.4 million. Housing: 139 officer; 814 NCO. 50-bed hospital.

US Air Force Academy, Colo. 80840-5000; N of Colorado Springs. Phone (303) 472-3110; AUTOVON 259-3110. Direct Reporting Unit. Established Apr. 1, 1954. First class entered Lowry AFB, Colo., July 1955. Moved to permanent location Aug. 1958. Tenant units include 1876th Communications Gp.; Frank J. Seiler Research Lab (AFSC); DoD Medical Exam Review Board; Det. 470, Air Force Audit Agency. Area 18,000 acres. Altitude 7,280 ft. Military 2,723; cadets 4,469; civilians 2,363. Payroll $185 million. Housing: 445 officer; 772 enlisted; 76 transient, 26 temporary family quarters. 70-bed hospital.

RAF Bentwaters, United Kingdom
APO New York 09755-5000
AUTOVON 225-1110
81st Tactical Fighter Wing, USAFE

RAF Chicksands, United Kingdom
APO New York 09193-5000
AUTOVON 234-1110
7274th Air Base Group, USAFE
6950th Electronic Security Group, ESC
Support base, USAFE

RAF Fairford, United Kingdom
APO New York 09125-5000
AUTOVON 247-1110
7020th Air Base Group, USAFE
11th Strategic Group, SAC
KC-135 refueling support base, USAFE

RAF Greenham Common, United Kingdom
APO New York 09150-5000
AUTOVON 266-1110
501st Tactical Missile Wing, USAFE

RAF Lakenheath, United Kingdom
APO New York 09179-5000
AUTOVON 226-1110
48th Tactical Fighter Wing, USAFE

RAF Mildenhall, United Kingdom
APO New York 09127-5000
AUTOVON 238-1110
Hq. 3d Air Force, USAFE
513th Airborne Command and Control Wing, USAFE
306th Strategic Wing, SAC (Rotational)
313th Tactical Airlift Group, MAC (Rotational)
2147th Communications Wing, AFCC

RAF Molesworth, United Kingdom
APO New York 09236-0006
AUTOVON 268-1110
303d Tactical Missile Wing, USAFE

RAF Upper Heyford, United Kingdom
APO New York 09194-5000
AUTOVON 263-1110
20th Tactical Fighter Wing, USAFE
42d Electronic Combat Squadron, USAFE

RAF Woodbridge, United Kingdom
APO New York 09405-5000
AUTOVON 225-1110
81st Tactical Fighter Wing, USAFE
67th Aerospace Rescue and Recovery Squadron, MAC

Ramstein AB, W. Germany
APO New York 09094-5000
AUTOVON 480-1110
Hq. USAFE (APO New York 09094-5001)
Hq. AAFCE, NATO
316th Air Division, USAFE
86th Tactical Fighter Wing, USAFE
377th Combat Support Wing, USAFE
608th Military Airlift Group, MAC
1856th Communications Group, AFCC
1964th Communications Group, AFCC
7455th Tactical Intelligence Wing, USAFE
Hq. European Electronic Security Division, ESC
7th Air Division, SAC
322d Airlift Division, MAC
2d Weather Wing, MAC

Rhein-Main AB, W. Germany
APO New York 09097
AUTOVON 330-1110
435th Tactical Airlift Wing, MAC
435th Combat Support Group, MAC
1945th Communications Group, AFCC
Tactical airlift base, MAC

San Vito dei Normanni AB, Italy
APO New York 09240
AUTOVON 622-1110
7275th Air Base Group, USAFE
Support base, USAFE

Sembach AB, W. Germany
APO New York 09316-5000
AUTOVON 496-1110
Hq. 17th Air Force, USAFE (APO New York 09316-5002)
66th Electronic Combat Wing, USAFE
601st Tactical Control Wing, USAFE
2005th Communications Wing, AFCC
Allied Tactical Operations Center
USAFE Air-Ground Operations School
Command control communications, electronic combat

Soesterberg AB, The Netherlands
APO New York 09292-5000
(Call Sembach, AUTOVON 497-1110; ask for Soesterberg AB.)
32d Tactical Fighter Squadron, USAFE

Spangdahlem AB, W. Germany
APO New York 09126-5000
AUTOVON 452-1110
52d Tactical Fighter Wing, USAFE

Thule AB, Greenland
APO New York 09023-5000
(Call AUTOVON 834-1211; ask for Thule AB.)
Support base, AFSPACECOM

Torrejon AB, Spain
APO New York 09283
AUTOVON 723-1110
Hq. 16th Air Force, USAFE
401st Tactical Fighter Wing, USAFE
1989th Communications Wing, AFCC

Wueschheim AB, W. Germany
APO New York 09109-5000
AUTOVON 474-1110
38th Tactical Missile Wing, USAFE

Yokota AB, Japan
APO San Francisco 96328-5000
AUTOVON 248-1101
Hq. US Forces, Japan
Hq. 5th Air Force, PACAF
475th Air Base Wing, PACAF
316th Tactical Airlift Group, MAC
1956th Communications Group, AFCC
1837th Electronics Installation Squadron, AFCC

Zaragoza AB, Spain
APO New York 09286-5000
AUTOVON 724-1110
406th Tactical Fighter Training Wing, USAFE
Tactical fighter training base, USAFE

Zweibrücken AB, W. Germany
APO New York 09860-5000
AUTOVON 498-1110
26th Tactical Reconnaissance Wing, USAFE
10th Military Airlift Squadron, MAC

Vance AFB, Okla. 73705-5000; 3 mi. SSW of Enid. Phone (405) 237-2121; AUTOVON 962-7110. ATC base. 71st Flying Training Wing, undergraduate pilot training. Base activated Nov. 1941; named for Lt. Col. Leon R. Vance, Jr., Enid native, 1939 West Point graduate, and Medal of Honor recipient; killed July 26, 1944, when air-evac plane returning him to the US went down in the Atlantic near Iceland. Area 1,811 acres. Altitude 1,307 ft. Military 1,300; civilians 1,320 (1,200 contract employees). Payroll $75 million. Housing: 132 officer; 98 enlisted; 26 transient, 10 TLF. Clinic.

Vandenberg AFB, Calif. 93437-5000; 8 mi. NNW of Lompoc. Phone (805) 866-1611; AUTOVON 276-1110. SAC base. 1st Strategic Aerospace Div. (SAC); Space and Missile Test Organization (AFSC); Western Space and Missile Center (AFSC); Shuttle Test Group (AFSC). Host command conducts missile crew training and provides facilities and support for operational ballistic missiles in the SAC deterrent force. The Space and Missile Test Organization (SAMTO) is responsible for management of field-test and launch operations for all DoD-directed space programs as well as long-range ballistic missile research and development. SAMTO also develops, manages, and operates, through the Eastern and Western Space and Missile Centers, the National Test Ranges. The Western Test Range supports ballistic and space test operations as well as East Coast Space Shuttle flights and other aeronautical tests employing the same sensors and data-gathering equipment. The Western Space and Missile Center (WSMC) provides launch and launch support of research and development ballistic missile tests and polar-orbiting space launches for DoD, USAF, and NASA. WSMC plans and executes Peacekeeper research and development, supports antisatellite missile development, and will provide support for West Coast Space Shuttle operations scheduled to begin in 1992. Originally Army's Camp Cooke. Activated Oct. 1941. Base was taken over by USAF June 7, 1957; renamed for Gen. Hoyt S. Vandenberg, USAF's second Chief of Staff. Area 98,400 acres. Altitude 400 ft. Military 3,824; civilians 1,479; civilian contractors 4,992. Payroll $121.1 million (military and civilians); $181.3 million (contractors). Housing: 511 officer; 1,567 NCO; 172 mobile trailer spaces; 400 transient. 45-bed hospital.

Warren AFB *(see Francis E. Warren AFB).*

Wheeler AFB, Hawaii 96854-5000; near center of the island of Oahu, adjacent to the Army's Schofield Barracks. Phone (808) 422-0531; AUTOVON 449-0111. PACAF base. Host unit 15th Air Base Sqdn. Associate units include 326th Air Div. (Hawaii Regional Operations Control Center); 22d Tactical Air Support Sqdn.; US Army aviation units from Schofield Barracks. Base activated Feb. 1922; named for Maj. Sheldon H. Wheeler, commanding officer of Luke Field, Hawaii, in 1919; killed there July 13, 1921, when his biplane crashed during an aerial exhibition. Area 1,369 acres. Altitude 845 ft. Military 1,069; civilians 125. Payroll included in entry for Hickam AFB. Housing: 102 officer; 390 enlisted. Dispensary run by 15th Medical Group.

Whiteman AFB, Mo. 65305-5300; 1.5 mi. S of Knob Noster. Phone (816) 687-1110; AUTOVON 975-1110. SAC base. 351st Strategic Missile Wing. Whiteman AFB is scheduled to receive the first B-2 bombers when they become operational. Base activated 1942; named for 2d Lt. George A. Whiteman, shot down while taking off in a fighter from Wheeler Field, Hawaii, on Dec. 7, 1941—the first Army Air Forces airman to be shot down in WW II. Area 3,384 acres, plus missile complex of about 10,000 sq. mi. Altitude 869 ft. Military 3,362; civilians 757. Payroll $120 million. Housing: 200 officer; 791 NCO; 46 transient (incl. 4 guest houses, 24 VAQ, 18 VOQ). 30-bed hospital.

Williams AFB, Ariz. 85240-5000; 10 mi. E of Chandler. Phone (602) 988-2611; AUTOVON 474-1001. ATC base. 82d Flying Training Wing, largest undergraduate pilot training base; also provides F-5 combat crew training for foreign students via the 425th Tactical Fighter Training Sqdn. (TAC); 1992d Communications Sqdn. (AFCC); home of AFSC Human Resources Laboratory/Flying Training Div., which carries out extensive research on flight simulators. Base activated July 1941; named for 1st Lt. Charles L. Williams, killed in bomber crash near Fort DeRussy, Hawaii, July 6, 1927. Area 4,761 acres. Altitude 1,385 ft. Military 2,967; civilians 1,469. Payroll $229 million. Housing: 248 officer; 453 NCO; 40 transient. 25-bed hospital.

Wright-Patterson AFB, Ohio 45433; 10 mi. ENE of Dayton. Phone (513) 257-1110; AUTOVON 787-1110. AFLC base. Hq. Air Force Logistics Command ; Hq. Aeronautical Systems Div. (AFSC); Foreign Technology Div. (AFSC); Air Force Institute of Technology; USAF Medical Center, Wright-Patterson; US Air Force Museum; Air Force Acquisition Logistics Center; Logistics Operations Center; Logistics Management Systems Center; AFLC International Logistics Center; 2750th Air Base Wing (AFLC); 906th Tactical Fighter Gp. (AFRES); more than 90 other DoD activities and government agencies. Originally separate, Wright Field and Patterson Field were merged and redesignated Wright-Patterson AFB on Jan. 13, 1948. Named for aviation pioneers Orville and Wilbur Wright and for 1st Lt. Frank S. Patterson, killed June 19, 1918, in the crash of a DH-4. The Wright brothers did much of their early flying on Huffman Prairie, now in Area C of present base. Area 8,145 acres. Altitude 824 ft. Military 9,500; civilians 17,500; contracted service and contractor employees 6,000. Payroll $852 million. Housing: 736 officer; 1,627 NCO. 314-bed hospital.

Wurtsmith AFB, Mich. 48753-5000; 3 mi. NW of Oscoda. Phone (517) 739-2011; AUTOVON 623-1110. SAC base. 40th Air Div.; 379th Bomb Wing. Base activated 1924 as Camp Skeel, gunnery camp for Selfridge Field; became Oscoda Army Air Field during WW II; renamed in 1953 for Maj. Gen. Paul B. Wurtsmith, killed Sept. 13, 1946, in a B-25 crash near Asheville, N. C. Base assigned to SAC Apr. 1, 1960. Area 5,221 acres. Altitude 634 ft. Military 3,368; civilians 718. Payroll $72.8 million. Housing: 224 officer; 1,125 NCO; 7 transient. 20-bed hospital. ■

Guide to USAF's Minor Installations

USAF has a number of minor installations throughout the US and overseas. These Air Force stations (AFS) and air stations (AS) perform varied missions, including air defense and missile warning. Here is a listing of such installations with state (or APO), ZIP code, and major command. When an installation can be reached by a general-purpose AUTOVON number, such a number (AV) is also listed. If it can be reached by NORAD Tactical AUTOVON System (NTAS), that number is listed. In some cases, the designation air base (AB) is used because of political sensitivities.

Ankara AS, APO New York 09254-5000 (USAFE)	AV 672-1110
Avon Park AFS, Fla. 33825 (TAC)	AV 968-1110
Calumet AFS, Mich. 49913 (TAC)	NTAS 640-1301
Cape Canaveral AFS, Fla. 32925-5000 (AFSC)	AV 467-1110
Cape Cod AFS, Mass. 02532-1419 (AFSPACECOM)	AV 557-2277
Cavalier AFS, N. D. 58220-5000 (AFSPACECOM)	AV 330-3297
Clear AFS, APO Seattle 98704-5000 (AFSPACECOM)	AV 317-585-6409
Duke Field AFS, Fla. 32542 (MAC)	AV 872-1110
Eldorado AFS, Tex. 76936-5000 (AFSPACECOM)	AV 477-4279
Fort Fisher AFS, N. C. 28449 (TAC)	NTAS 652-2265
Galena Airport AFS, APO Seattle 98723 (AAC)	AV 317-446-3311
Gila Bend AFS, Ariz. 85337-5000 (TAC)	AV 853-5220
Hessisch-Oldendorf AS, APO New York 09669-5000 (USAFE)	AV 331-1110
High Wycombe AS, APO New York 09241-5000 (USAFE)	AV 232-1110
Indian Springs AFS, Nev. 89018-5000 (TAC)	AV 682-6201
Izmir AS, APO New York 09224-5000 (USAFE)	AV 675-1110
Kwangju AB, APO San Francisco 96264-5000 (PACAF)	AV 272-2345
Makah AFS, Wash. 98357 (TAC)	NTAS 490-6343
Pirinclik AS, APO New York 09294-5000 (USAFE)	AV 679-1110
Port Austin AFS, Mich. 48467 (TAC)	NTAS 779-3345
Pruem AS, APO New York 09692-5000 (USAFE)	AV 453-1110
RAF Croughton, APO New York 09378-5000 (USAFE)	AV 236-1110
RAF Wethersfield, APO New York 09120-5000 (USAFE)	AV 224-1110
Sondrestrom AB, APO New York 09121-5000 (AFSPACECOM)	AV 834-1211
Suwon AB, APO San Francisco 96461-5000 (PACAF)	AV 284-4110
Taegu AB, APO San Francisco 96213-5000 (PACAF)	AV 284-4110
Tempelhof Central Airport AS, APO New York 09611-5000 (USAFE)	AV 332-1100
Woomera AS, APO San Francisco 96287-5000 (AFSPACECOM)	AV 629-1636

Guide to ANG and AFRES Bases

NOTE: This section consolidates major Air National Guard (ANG) and Air Force Reserve (AFRES) bases into a single listing. Most ANG locations are listed alphabetically, according to the city where they are located. AFRES units are listed by the names of their bases and are designated as AFRES facilities. There are, in addition, some ANG and AFRES units that are located on active-duty bases. These may be found in the main "Guide to Major Air Force Installations."

Anchorage, Alaska (Kulis ANG Base at Anchorage International Airport) 99502. Phone (907) 243-1145; AUTOVON (317) 626-1444. 176th Tactical Airlift Gp. (ANG); 144th Tactical Airlift Sqdn. (ANG). Base named for Lt. Albert Kulis, killed in training flight in 1954. Area 129 acres. Altitude 124 ft. Military 848, technicians 165. Payroll $18.8 million. 6-bed hospital.

Atlanta, Ga. (McCollum Airport, Kennesaw, Ga.) 30144; 27 mi. N of Atlanta, 10 mi. from Dobbins AFB. Phone (404) 422-2500; AUTOVON 925-2474. 129th Tactical Control Sqdn. Area 13 acres. Altitude 1,060 ft. Military 263, technicians 38. Payroll through Dobbins AFB.

Atlantic City International Airport, N. J. (400 Langley Rd., Pleasantville) 08232-9500; 10 mi. W of Atlantic City. Phone (609) 645-6000; AUTOVON 445-6000. 177th Fighter Interceptor Gp. (ANG). Area 268 acres. Altitude 76 ft. Military 926, full-time support 316. Payroll $13.8 million.

Baltimore, Md. (Glenn L. Martin State Airport) 21220-2899; 8 mi. E of Baltimore. Phone (301) 687-6270; AUTOVON 235-9210. 175th Tactical Fighter Gp. (ANG); 135th Tactical Airlift Gp. (ANG). Area 175 acres. Altitude 24 ft. Military 1,873, technicians 310. Payroll $20.9 million. Clinic.

Bangor ANG Base, Me. 04401-3099; 4 mi. NW of Bangor. Phone (207) 947-0571; AUTOVON 476-6210. 101st Air Refueling Wg. (ANG); 776th Radar Sqdn. (TAC). Area 299 acres. Altitude 192 ft. Military 1,024, technicians 273. Payroll $15 million. Small BX-Foodland.

Battle Creek, Mich. 49015-1291; adjacent to W. K. Kellogg Airport. Phone (616) 963-1596; AUTOVON 580-3210. 110th Tactical Air Support Gp. (ANG). Area 241 acres. Altitude 941 ft. Military 950, technicians 165. Payroll $10.7 million.

Birmingham Municipal Airport, Ala. 35217. Phone (205) 841-9200; AUTOVON 694-2260. 117th Tactical Recon Wg. (ANG). Area 86 acres. Altitude 650 ft. Military 1,221, technicians 256. Payroll $16.8 million.

Boise Air Terminal, Idaho (Gowen Field) 83707; 6 mi. S of Boise. Phone (208) 389-5011; AUTOVON 941-5011. 124th Tactical Recon Gp. (ANG). Also host to ARNG (Army field training site) and Marine Corps Reserve. Airport named for Lt. Paul R. Gowen, killed in B-10 crash in Panama July 11, 1938. Area 1,994 acres. Altitude 2,858 ft. Military 1,388, technicians 272. Payroll $19.5 million. Limited transient facilities available during Army National Guard camps.

Bradley ANG Base, Conn. 06026-5000; 15 mi. N of Hartford at East Granby, adjacent to Bradley International Airport. Phone (203) 623-8291; AUTOVON 636-8310. 103d Tactical Fighter Gp. (ANG); Army National Guard aviation battalion. Base named for Lt. Eugene M. Bradley, killed in P-40 crash Aug. 1941. Area 125 acres. Altitude 173 ft. Military 989, technicians 208. Payroll $13.1 million.

Buckley ANG Base, Colo. 80011; 8 mi. E of Denver. Phone (303) 366-5363; AUTOVON 877-9011. 140th Tactical Fighter Wg. (ANG); 154th Tactical Control Gp.; Hq. Colorado ANG. Also host to Navy Reserve, Marine Corps Reserve, ARNG, and Air Force units. Base activated Apr. 1, 1942, as a gunnery training facility. ANG assumed control from US Navy in 1959. Base named for Lt. John H. Buckley, National Guardsman, killed in the Argonne, France, Sept. 27, 1918. Area 3,897 acres. Altitude 5,663 ft. Military 1,493, technicians 278. Payroll $25.9 million. Dispensary.

Burlington, Vt. (Burlington International Airport) 05401; 3 mi. E of Burlington. Phone (802) 658-0770; AUTOVON 689-4310. 158th Tactical Fighter Gp. (ANG). Area 241 acres. Altitude 371 ft. Military 1,095, technicians 238. Payroll $13.3 million.

Charleston, W. Va. (Yeager Airport) 25311-5000; 4 mi. NE of Charleston. Phone (304) 357-5100; AUTOVON 366-9210. 130th Tactical Airlift Gp. (ANG). Airport named for Brig. Gen. Charles "Chuck" Yeager, first man to break the sound barrier. Area 56 acres. Altitude 981 ft. Military 903, technicians 167. Payroll $11.2 million. Dispensary, clinic.

Charlotte, N. C. (Charlotte/Douglas Municipal Airport) 28208. Phone (704) 399-6363; AUTOVON 583-9210. 145th Tactical Airlift Gp. (ANG). Area 69 acres. Altitude 749 ft. Military 1,256, technicians 233. Payroll $14 million. Clinic.

Cheyenne, Wyo. (Cheyenne Municipal Airport) 82001. Phone (307) 772-6201; AUTOVON 943-6201. 153d Tactical Airlift Gp. (ANG). Area 67 acres. Altitude 6,156 ft. Military 1,017, technicians 179. Payroll $11.5 million.

Chicago, Ill. (O'Hare Air Reserve Forces Facility) 60666; 22 mi. NW of Chicago's Loop. Phone (312) 694-6000; AUTOVON 930-1110. AFRES base. 928th Tactical Airlift Gp. (AFRES); 126th Air Refueling Wg. (ANG); Defense Contract Administration Services Region. Base activated Apr. 1946; named for Lt. Cmdr. Edward H. "Butch" O'Hare, USN Medal of Honor recipient, killed Nov. 26, 1943, during battle for Gilbert Islands. Area 391 acres. Altitude 643 ft. Reservists 1,500, technicians and civilians (all units) 1,440, Illinois ANG 1,414, technicians 253. Payroll for total facility $43.3 million ($16 million for ANG).

Dallas Naval Air Station, Tex. (Hensley Field) 75211. Phone (214) 266-6111; AUTOVON 874-6111. 136th Tactical Airlift Wg. (ANG). Area 49 acres. Altitude 495 ft. Military 975, technicians 185. Payroll $12.4 million.

Des Moines Municipal Airport, Iowa 50321; in city of Des Moines. Phone (515) 285-7182; AUTOVON 939-8210. 132d Tactical Fighter Wg. (ANG). Area 112 acres. Altitude 957 ft. Military 1,142, technicians 252. Payroll $13.9 million.

Dobbins AFB, Ga. 30069-5000; 2 mi. S of Marietta, 16 mi. NW of Atlanta. Phone (404) 421-5000; AUTOVON 925-1110. AFRES base. Hq. 14th Air Force (AFRES); 94th Tactical Airlift Wg. (AFRES); 116th Tactical Fighter Wg. (ANG). Base activated 1943; named for Capt. Charles Dobbins, WW II pilot killed in action near Sicily. Area 1,800 acres. Altitude 1,068 ft. AFRES: military 248, technicians 148, civilians 837, Reservists 2,900. Payroll $29.5 million. ANG: military 1,202, technicians 211. Payroll $18.1 million. Housing: 3 officer, 5 NCO. Dispensary.

Duluth International Airport, Minn. 55811-5000; 5 mi. NW of Duluth. Phone (218) 727-6886; AUTOVON 825-7210. 148th Fighter Interceptor Gp. (ANG). Area 409 acres. Altitude 1,429 ft. Military 1,058, technicians 250 (+ 25 civilians). Payroll $15.8 million.

Ellington ANG Base, Tex. 77034-5586; adjacent to Ellington Field, a City of Houston Airport 17 mi. SE of downtown Houston. Phone (713) 929-2221; AUTOVON 954-2110. 147th Fighter Interceptor Gp. (ANG). Other tenants include NASA Flight Operations, US Coast Guard, Army National Guard, FAA. Base named for Lt. Eric L. Ellington, a pilot killed Nov. 1913. Area 213 acres. Altitude 40 ft. Military 1,062, technicians 287. Payroll $18.9 million.

Fargo, N. D. (Hector Field) 58105-5536. Phone (701) 237-6030; AUTOVON 362-8110. 119th Fighter Interceptor Gp. (ANG). Area 133 acres. Altitude 900 ft. Military 1,108, technicians 276. Payroll $15.1 million.

Forbes Field, Kan. 66619-5000; 2 mi. S of Topeka. Phone (913) 862-1234; AUTOVON 720-1234. 190th Air Refueling Gp. (ANG). Area 200 acres. Altitude 1,079 ft. Military 960, technicians 216 (+ 43 civilians). Payroll $13.4 million.

Fort Smith Municipal Airport, Ark. 72906. Phone (501) 646-1601; AUTOVON 962-8210. 188th Tactical Fighter Gp. (ANG). Area 98 acres. Altitude 468 ft. Military 961, technicians 226. Payroll $12.6 million.

Fort Wayne, Ind. (Fort Wayne Municipal Airport) 46809-5000; 5 mi. SSW of Fort Wayne. Phone (219) 478-3210; AUTOVON 786-1210. 122d Tactical Fighter Wg. (ANG). Area 87 acres. Altitude 800 ft. Military 1,381, technicians 269. Payroll $15.7 million.

Fresno Air Terminal, Calif. 93727-2199; 5 mi. NE of Fresno. Phone (209) 454-5155; AUTOVON 949-9210. 144th Fighter Interceptor Wg. (ANG); 194th Fighter Interceptor Sqdn. (ANG). Area 139 acres. Altitude 332 ft. Military 1,046, technicians 291. Payroll $15.5 million.

General Mitchell International Airport, Wis. 53207; downtown Milwaukee. AFRES base. Altitude 722 ft. ANG and AFRES have separate phones and facilities. ANG phone (414) 747-4410; AUTOVON 580-8410. 128th Air Refueling Gp. (ANG). ANG area 111 acres. Military 1,094, technicians 209. Payroll $13.9 million. AFRES phone (414) 481-6400; AUTOVON 786-9110. 440th Tactical Airlift Wg. (AFRES). AFRES area 100 acres. Military 6, technicians 154, Reservists 985, civilians 219. Payroll $15 million.

Greater Peoria Airport, Ill. 61607-1498; 7 mi. SW of Peoria. Phone (309) 633-3000; AUTOVON 724-9210. 182d Tactical Air Support Gp. (ANG). Area 385 acres. Altitude 624 ft. Military 1,012, technicians 173. Payroll $11.1 million. Dispensary.

Greater Pittsburgh International Airport, Pa. 15231-0459; 15 mi. NW of Pittsburgh. Altitude 1,203 ft. AFRES base. ANG and AFRES have separate phones and facilities. 171st Air Refueling Wg. (ANG); phone (412) 268-8402, AUTOVON 277-8402. 112th Tactical Fighter Gp. (ANG); phone (412) 269-8441, AUTOVON 277-8441. ANG area 94 acres. Military 1,860, technicians 362. Payroll $22.3 million. AFRES phone (412) 269-8000; AUTOVON 277-8000. 911th Tactical Airlift Gp. (host unit). AFRES area 165 acres. Military 21, technicians 133, civilians 209, Reservists 1,050. Payroll $11.5 million. Other units include 1998th Communications Installation Gp. (AFCC). Base activated 1943. Housing: 50 VOQ, 230 enlisted qtrs.

Great Falls International Airport, Mont. 59401-5000; 5 mi. SW of Great Falls. Phone (406) 727-4650; AUTOVON 279-2301. 25th NORAD Region and 25th Air Div. (TAC); 120th Fighter Interceptor Gp. (ANG). Area 139 acres. Altitude 3,674 ft. Military 1,009, technicians 281. Payroll $17.7 million. Dispensary.

Gulfport-Biloxi Regional Airport, Miss. 39501; within city limits of Gulfport. Phone (601) 868-6200; AUTOVON 363-8200. Training site; also host to 255th Combat Communications Sqdn., the Army National Guard Transportation Repair Shop, and 173d Civil Engineering Flt. An air-to-ground gunnery range is located 70 mi. due N of site. Area 206 acres. Altitude 28 ft. ANG military 496, technicians 20. Payroll $3.4 million. 2-bed dispensary.

Harrisburg International Airport, Middletown, Pa. 17057; 10 mi. E of Harrisburg. Phone (717) 948-2201; AUTOVON 454-9201. 193d Special Operations Gp. (ANG). ANG area 72 acres. Altitude 310 ft. Military 1,092, technicians 222. Payroll $16.4 million.

Jackson, Miss. (Allen C. Thompson Field) 39208-0810; 7 mi. E of Jackson. Phone (601) 939-3633; AUTOVON 731-9310. 172d Military Airlift Gp. (ANG). ANG area 84 acres. Altitude 346 ft. Military 1,193, technicians 213. Payroll $13.2 million. 6-bed dispensary.

Jacksonville International Airport, Fla. 32229; 15 mi. NW of Jacksonville. Phone (904) 757-1360; AUTOVON 460-7210. 125th Fighter Interceptor Gp. (ANG). Area 332 acres. Altitude 26 ft. Military 1,003, technicians 255. Payroll $17.7 million. 5-bed dispensary.

Kingsley Field, Ore. 97603-0400; 5 mi. SE of Klamath Falls. Phone (503) 883-6350; AUTOVON 830-6350. 114th Tactical Fighter Training Sqdn. (ANG); 142d OLAD (ANG). Field named for Lt. David R. Kingsley of Oregon, WW II Medal of Honor winner, who was killed June 23, 1944, over Ploesti, Romania. Area 1,034 acres. Altitude 4,000 ft. Military 359, technicians 72. Payroll $11.5 million. Clinic.

Knoxville, Tenn. (McGhee Tyson Airport) 37901; 10 mi. SW of Knoxville. Phone (615) 970-3077; AUTOVON 588-8210. Host unit is 134th Air Refueling Gp. (ANG). Tenants include 228th Combat Communications Sqdn. and ANG's I. G. Brown Professional Military Education Center. Area 271 acres. Altitude 980 ft. Military 1,150, technicians 258 (+ 4 civilians). Payroll $15.1 million. Dispensary.

Lincoln Municipal Airport, Neb. 68524-1897; 1 mi. NW of Lincoln. Phone (402) 473-1326; AUTOVON 720-1210. 155th Tactical Recon Gp. (ANG). Also hosts Army National Guard unit. Area 175 acres. Altitude 1,207 ft. Military 1,124, technicians 239. Payroll $13.8 million. Tactical clinic.

Louisville, Ky. (Standiford Field) 40213. Phone (502) 566-9400; AUTOVON 989-4400. 123d Tactical Recon Wg. (ANG). Area 65 acres. Altitude 497 ft. Military 1,192, technicians 233. Payroll $15.1 million.

Mansfield Lahm Airport, Ohio 44901-5000; 3 mi. N of Mansfield. Phone (419) 522-9355; AUTOVON 696-6210. 179th Tactical Airlift Gp. (ANG). Airport named for nearby city and aviation pioneer Brig. Gen. Frank P. Lahm. Area 210 acres. Altitude 1,296 ft. Military 930, technicians 167. Payroll $10.9 million. Clinic. Limited dependent ID card service. Coast Guard exchange.

Martinsburg, W. Va. (Shepherd Field) 25401; 4 mi. S of Martinsburg. Phone (304) 267-5100; AUTOVON 242-9210. 167th Tactical Airlift Gp. (ANG). Area 346 acres. Altitude 556 ft. Military 1,209, technicians 214. Payroll $12.9 million. Dispensary.

McEntire ANG Base, S. C. 29044; 12 mi. E of Columbia. Phone (803) 776-5121; AUTOVON 583-8201. 169th Tactical Fighter Gp. (ANG). Also host to 240th Combat Communications Sqdn. (ANG) and Army Guard aviation unit. Base named for ANG Brig. Gen. B. B. McEntire, Jr., killed in an F-104 accident in 1961. Area 2,473 acres. Altitude 250 ft. Military 1,386, technicians 245. Payroll $15.2 million. Dispensary.

Memphis International Airport, Tenn. 38181-0026; within Memphis city limits. Phone (901) 369-4111; AUTOVON 966-8210. 164th Tactical Airlift Gp. (ANG). ANG area 85 acres. Altitude 332 ft. Military 948, technicians 176. Payroll $11.2 million. Clinic.

Meridian, Miss. (Key Field) 39302-1825; located at municipal airport near Highways 20 and 59. Phone (601) 693-5031; AUTOVON 694-9210. 186th Tactical Recon Gp. (ANG); host to 238th Combat Communications Sqdn. (ANG). Area 64 acres. Altitude 297 ft. Military 1,291, technicians 254. Payroll $15.2 million. 2-bed dispensary.

Minneapolis-St. Paul International Airport, Minn. 55450; in Minneapolis, near confluence of the Mississippi and Minnesota Rivers. AFRES base. Altitude 840 ft. ANG and AFRES have separate phones and facilities. ANG phone (612) 725-5011; AUTOVON 825-5681. 133d Tactical Airlift Wg. (ANG). ANG area 126 acres. Military 1,410, technicians 239. Payroll $15.3 million. AFRES phone (612) 725-5011; AUTOVON 825-5100. 934th Tactical Airlift Gp. (AFRES). AFRES area 300 acres. Reservists 1,067, technicians 126, civilians 226. Payroll $15 million. Other units include 210th Engineering and Installation Sqdn. (ANG); 237th Air Traffic Control Flt. (ANG); 133d Field Training Flt. (ANG); Navy Readiness Comd., Region 16; Naval Air Reserve Center; Marine Wg. Support Gp., Det. 47; Defense Investigative Service; USAF-CAP/NCLR and CAP MNLO; Det. 3, 1974th Teleprocessing Gp. (USAF).

Moffett Naval Air Station, Calif. 94035; 2 mi. N of Mountain View. ANG phone (415) 966-4700; AUTOVON 462-4700. 129th Aerospace Rescue and Recovery Gp. (ANG). Area 12 acres. Altitude 34 ft. Military 768, technicians 176. Payroll $12.7 million.

Montgomery, Ala. (Dannelly Field) 36196; 7 mi. SW of Montgomery. Phone (205) 284-7210; AUTOVON 742-9210. 187th Tactical Fighter Gp. (ANG). Hosts 232d Combat Communications Sqdn. Field named for Ens. Clarence Dannelly, Navy pilot killed at Pensacola, Fla., during WW II. Area 42 acres. Altitude 221 ft. Military 1,203, technicians 281. Payroll $16.1 million. Dispensary.

Nashville Metropolitan Airport, Tenn. 37217-0267; 6 mi. SE of Nashville. Phone (615) 361-4600; AUTOVON 446-6210. 118th Tactical Airlift Wg. (ANG). Area 84 acres.

Altitude 597 ft. Military 1,419, technicians 287. Payroll $16.6 million.

New Orleans Naval Air Station, La. (Alvin Callender Field) 70143-5000; 15 mi. S of New Orleans. Altitude 3 ft. ANG and AFRES have separate phones and facilities. ANG phone (504) 393-3392; AUTOVON 363-3399. 159th Tactical Fighter Gp. (ANG). ANG military 1,178, technicians 270. Payroll $17.2 million. AFRES phone (504) 393-3293; AUTOVON 363-3293. 926th Tactical Fighter Gp. (AFRES). Military 820, technicians 177. Payroll $10 million. NAS New Orleans was the first joint Air Reserve Training Facility. Field named for Alvin A. Callender, who served with the British Royal Flying Corps during WW I and who was shot down over France in 1918. Area 3,245 acres. Dispensary.

Niagara Falls International Airport, N. Y. 14304-5000; 6 mi. E of Niagara Falls. Phone (716) 236-2000; AUTOVON 489-3011. AFRES base. 914th Tactical Airlift Gp. (AFRES); 107th Fighter Interceptor Gp. (ANG). Base activated Jan. 1952. Area 979 acres. Altitude 590 ft. AFRES: 129 technicians, 255 civilians, 1,045 Reservists. Payroll $15.2 million. ANG: 1,023 military, 270 technicians. Payroll $15.3 million.

Ontario International Airport, Ontario, Calif. 91761. Phone (714) 984-2705; AUTOVON 898-1895. 148th Combat Communications Sqdn. (ANG). Area 39 acres. Altitude 900 ft. Military 176, technicians 16. Payroll $0.9 million.

Otis ANG Base, Mass. 02542-5001; 7 mi. NNE of Falmouth. Phone (617) 968-4003; AUTOVON 557-4003. 102d Fighter Interceptor Wg. (ANG); 567th USAF Band (ANG); 101st and 202d Weather Flts. (ANG). Adjacent installations and organizations include Cape Cod AFS (6th Missile Warning Sqdn., 2165th Communications Sqdn.); US Coast Guard Air Station Cape Cod; Camp Edwards Army National Guard Training Site; 26th Aviation Brigade (ARNG); 1st Battalion, 25th Marines (Reserve); Massachusetts National Cemetery (VA). Base named for 1st Lt. Frank J. Otis, flight surgeon and pilot killed in 1937 crash. Area 3,858 acres. Altitude 132 ft. ANG military 1,144, ANG technicians 320 (+ 281 Title 5 Civil Service). Payroll $23.9 million.

Phelps Collins ANG Base, Alpena, Mich. 49707; 7 mi. W of Alpena. Phone (517) 354-6291; AUTOVON 741-3500. Training site detachment. Facilities used by ANG and AFRES units for annual field training and by ARNG and Marine Reserve for special training. Base named for Capt. W. H. Phelps Collins, American Flying Corps, killed in France Mar. 1918. Area 2,735 acres. Altitude 689 ft. Military 57, civilian full-time support 31. Payroll $1.8 million. Housing: 1,500 personnel. 14-bed hospital. Dispensary.

Phoenix, Ariz. (Sky Harbor International Airport) 85034. Phone (602) 244-9841; AUTOVON 853-9211. 161st Air Refueling Gp. (ANG). Area 51 acres. Altitude 1,230 ft. Military 940, technicians 202. Payroll $13.8 million.

Portland International Airport, Portland, Ore. 97218-2797. Phone (503) 288-5611; AUTOVON 891-1701. 142d Fighter Interceptor Gp. (ANG); 244th Combat Communications Sqdn. (ANG); 244th Combat Communications Flt. (ANG); 116th Tactical Control Sqdn. (ANG); Det. 5, 2036th Communications Sqdn. (AFCC); 12th Special Forces Gp. (USAR); Oregon Wg., CAP. Also host to 939th Aerospace Rescue and Recovery Gp. (AFRES) and 83d Aerial Port Sqdn. (AFRES). Area 232 acres. Altitude 26 ft. Military 1,489, technicians 309 (+ 96 civilians). Payroll $22.8 million.

Providence, R. I. (Quonset Point State Airport) 02852; 20 mi. S of Providence. Phone (401) 885-3960; AUTOVON 476-3210. 143d Tactical Airlift Gp. (ANG). Area 60 acres. Altitude 9 ft. Military 997, technicians 181. Payroll $13.1 million.

Puerto Rico International Airport, Puerto Rico (Muniz ANG Base) 00914; E of San Juan. Phone (809) 728-5450; AUTOVON 860-9210. 156th Tactical Fighter Gp. (ANG). Base named for Lt. Col. José A. Muniz, killed in an aircraft accident July 4, 1960. Area 86 acres. Altitude 10 ft. Military 1,297, technicians 209. Payroll $15.2 million.

Reno-Cannon International Airport, Nev. (May ANG Base) 89502; 5 mi. SE of Reno at 1776 ANG Way. Phone (702) 788-4500; AUTOVON 830-4500. 152d Tactical Reconnaissance Gp. (ANG). Base named for Maj. Gen. James A. May, state Adjutant General. Area 123 acres. Altitude 4,411 ft. Military 1,090, technicians 222. Payroll $13.5 million. Dispensary.

Richards-Gebaur AFB, Mo. 64030-5000; 17 mi. S of Kansas City. Phone (816) 348-2000; AUTOVON 463-1110. 442d Tactical Fighter Wg. (AFRES); Navy and Army Reserve units. Base activated Mar. 1944; named for 1st Lt. John F. Richards and Lt. Col. Arthur W. Gebaur, Jr. Richards was killed Sept. 26, 1918, in France, while on an artillery spotting mission; Gebaur, an F-84 pilot, was killed Aug. 29, 1952, over North Korea during his 99th mission. Area 620 acres; another 120 acres occupied by non-Air Force military units and federal agencies. Joint-use airport facility with Kansas City, Mo. Altitude 1,090 ft. AFRES and active-duty USAF military 1,471, technicians/civilians 398. Payroll $13 million. On-base, Marine Corps-operated, all-service housing: 27 officer, 214 enlisted. Consolidated open mess and 300 transient quarters available.

Richmond, Va. (Byrd International Airport) 23150; 4 mi. SE of downtown Richmond. Phone (804) 222-8884; AUTOVON 274-8210. 192d Tactical Fighter Gp. (ANG). Airport named for Adm. Richard E. Byrd, famous Arctic and Antarctic explorer. Area 143 acres. Altitude 167 ft. Military 1,085, technicians 226. Payroll $13.9 million.

Rickenbacker ANG Base, Ohio 43217; 13 mi. SSW of Columbus. Phone (614) 492-8211; AUTOVON 950-1110. Base transferred from SAC to ANG Apr. 1, 1980. 121st Tactical Fighter Wg. (ANG); 907th Tactical Airlift Gp. (AFRES); 160th Air Refueling Gp. (ANG); 2032d Communications Sqdn. (AFCC); Naval Air Reserve and Naval Construction (USNR). Base activated 1942. Formerly Lockbourne AFB; renamed May 7, 1974, in honor of Capt. Edward V. Rickenbacker, top US WW I ace and Medal of Honor recipient who died July 23, 1973. Area 2,262 acres. Altitude 744 ft. ANG military 994, technicians 381. Payroll $33.2 million.

Roslyn ANG Station, Roslyn, N. Y. 11576-2399; 27 mi. E of New York City. Phone (516) 299-5201; AUTOVON 456-5201. 274th Combat Communications Sqdn.; 213th Engineering Installation Sqdn. Also hosts two Army National Guard units. Area 50 acres. Altitude 320 ft. Military 466, technicians 22. Payroll through Stewart IAP, N. Y.

Salt Lake City International Airport, Utah 84116; 3 mi. W of Salt Lake City. Phone (801) 521-7070; AUTOVON 790-9210. 151st Air Refueling Gp. (ANG). Also hosts ANG's 130th Engineering Installation Sqdn. and 106th and 109th Tactical Control Flts. Area 82 acres. Altitude 4,220 ft. Military 1,459, technicians 252 (+ 41 civilians). Payroll $18.4 million. Dispensary.

Savannah International Airport, Ga. 31402; 4 mi. NW of Savannah. Phone (912) 964-1941; AUTOVON 860-8210. 165th Tactical Airlift Gp. (ANG). Also field training site. Area 232 acres. Altitude 50 ft. Military 1,157, technicians 241. Payroll $15.4 million. Housing: 156 officer, 736 enlisted. 3-bed dispensary.

Schenectady County Airport, Scotia, N. Y. 12302-9752; 2 mi. N of Schenectady. Phone (518) 381-7300; AUTOVON 974-9221. 109th Tactical Airlift Gp. (ANG). Area 106 acres. Altitude 378 ft. Military 1,020, technicians 181. Payroll $11.2 million. Dispensary.

Selfridge ANG Base, Mich. 48045; 3 mi. NE of Mount Clemens. Phone (313) 466-4011; AUTOVON 273-0111. 127th Tactical Fighter Wg. (ANG); 191st Fighter Interceptor Gp. (ANG); 927th Tactical Airlift Gp. (AFRES). Also hosts Air Force, Navy Reserve, Marine Air Reserve, Army Reserve, Army units, and US Coast Guard Air Station for Detroit. Base activated July 1917; transferred to Michigan ANG July 1971. Named for 1st Lt. Thomas E. Selfridge, first Army officer to fly an airplane and first fatality of powered flight, killed Sept. 17, 1908, at Fort Myer, Va., when plane piloted by Orville Wright crashed. Area 3,727 acres. Altitude 583 ft. ANG military 2,135, ANG technicians 418 (+ 560 civilians). Payroll $43.7 million. Dispensary.

Sioux City Municipal Airport, Iowa 51110; 7 mi. S of Sioux City. Phone (712) 255-3511; AUTOVON 939-6210. 185th Tactical Fighter Gp. (ANG). Area 92 acres. Altitude 1,098 ft. Military 1,058, technicians 219. Payroll $12.2 million. Dispensary.

Sioux Falls, S. D. (Joe Foss Field) 57104; N side of Sioux Falls. Phone (605) 336-0670; AUTOVON 939-7210. 114th Tactical Fighter Gp. (ANG). Field named for Brig. Gen. Joseph J. Foss, WW II ace, former governor of South Dakota, former National President of AFA, and founder of the South Dakota ANG. Area 145 acres. Altitude 1,428 ft. Military 1,075, technicians 210. Payroll $11.8 million.

Springfield, Ill. (Capital Airport) 63707-5000; 2 mi. NW of Springfield. Phone (217) 753-8850; AUTOVON 892-8210. 183d Tactical Fighter Gp. (ANG). Area 91 acres. Altitude 592 ft. Military 1,117, technicians 264. Payroll $15.3 million. Dispensary.

Springfield-Beckley Municipal Airport, Ohio 45501-1780; 5 mi. S of Springfield. Phone (513) 323-8653; AUTOVON 346-2311. 178th Tactical Fighter Gp. (ANG); 251st Combat Information Systems Gp. (ANG). Area 113 acres. Altitude 1,052 ft. Military 1,371, technicians 242. Payroll $15.4 million. 6-bed dispensary.

St. Joseph, Mo. (Rosecrans Memorial Airport) 64503; 4 mi. W of St. Joseph. Phone (816) 271-1300; AUTOVON 720-9210. 139th Tactical Airlift Gp. (ANG). Area 298 acres. Altitude 724 ft. Military 891, technicians 176. Payroll $11.9 million.

St. Louis International Airport, Mo. (Lambert Field) 63145. Phone (314) 263-6356; AUTOVON 693-6356. 131st Tactical Fighter Wg. (ANG). Area 50 acres. Altitude 589 ft. Military 1,594, technicians 306. Payroll $20.5 million.

Stewart ANG Base, N. Y. (Stewart International Airport) 12550-0031; 4 mi. W of Newburgh, 15 mi. N of USMA (West Point). Phone (914) 563-2000; AUTOVON 247-2000. Hq. New York ANG; 105th Military Airlift Gp. (ANG); USMA subpost airport. Stewart AFB until 1969; acquired by state of New York in 1970. ANG area 328 acres. Altitude 491 ft. ANG military 1,864, technicians 305. Payroll $18.3 million. Dispensary. Most military services available through West Point or subpost.

Suffolk County Airport, Westhampton Beach, N. Y. 11978-1294; within corporate limits of Westhampton Beach. Phone (516) 288-4200; AUTOVON 456-7210. 106th Aerospace Rescue and Recovery Gp. (ANG). Area 70 acres. Altitude 67 ft. Military 780, technicians 215. Payroll $11.5 million.

Syracuse, N. Y. (Hancock Field) 13211-7099; 5 mi. NE of Syracuse. Phone (315) 470-6100; AUTOVON 587-9100. 174th Tactical Fighter Wg. (ANG). Base operations for Hancock ANG Base. 152d Tactical Control Gp.; 108th and 113th Tactical Control Flts. Area 764 acres. Altitude 421 ft. Military 1,442, technicians 296. Payroll $16.6 million. Dispensary.

Terre Haute, Ind. (Hulman Regional Airport) 47803-5000; 5 mi. E of Terre Haute. Phone (812) 877-5210; AUTOVON 724-1210. 181st Tactical Fighter Gp. (ANG). Area 279 acres. Altitude 585 ft. Military 1,217, technicians 234. Payroll $14.6 million. 5-bed dispensary.

Toledo Express Airport, Swanton, Ohio 43558; 14 mi. W of Toledo. Phone (419) 866-2078; AUTOVON 580-2078. 180th Tactical Fighter Gp. (ANG). Area 79 acres. Altitude 684 ft. Military 1,120, technicians 225. Payroll $13.6 million. 4-bed clinic.

Truax Field, Madison, Wis. (Dane County Regional Airport) 53704-2591; 2 mi. N of Madison. Phone (608) 241-6200; AUTOVON 273-8210. 128th Tactical Fighter Wg. (ANG). Activated June 1942 as AAF base; taken over by Wisconsin ANG in Apr. 1968. Field named for Lt. T. L. Truax, killed in a P-40 training accident in 1941. Area 153 acres. Altitude 862 ft. Military 1,004, technicians 213. Payroll $12.7 million. Housing: 7 transient. Dispensary.

Tucson International Airport, Ariz. 85734; within Tucson city limits. Phone (602) 573-2210; AUTOVON 853-4210. 162d Tactical Fighter Gp. (ANG). Area 49 acres. Altitude 2,650 ft. Military 1,582, technicians 535. Payroll $28.1 million.

Tulsa International Airport, Okla. 74115. Phone (918) 832-5208; AUTOVON 956-5297. 138th Tactical Fighter Gp. (ANG); 219th Electronic Installation Sqdn. Area 78 acres. Altitude 676 ft. Military 1,255, technicians 226. Payroll $12.9 million.

Van Nuys, Calif. (Van Nuys Airport) 91409. Phone (213) 781-5980; AUTOVON 873-6310. 146th Tactical Airlift Wg. (ANG); 147th Combat Communications Sqdn. (Contingency). Area 62 acres. Altitude 799 ft. Military 1,518, technicians 327. Payroll $19.4 million.

Volk Field ANG Base, Wis. 54618-5001; 90 mi. NW of Madison. Phone (608) 427-1210; AUTOVON 798-3210. ANG field training site featuring air-to-air and air-to-ground gunnery ranges and providing training for ANG flying units. Base and field named for Lt. Jerome A. Volk, first Wisconsin ANG pilot killed in the Korean War. Area 2,336 acres. Altitude 910 ft. Military 60. Payroll $1.9 million. 6-bed dispensary.

Westfield, Mass. (Barnes Municipal Airport) 01085; 3 mi. N of Westfield. Phone (413) 568-9151; AUTOVON 636-1210/11. 104th Tactical Fighter Gp. (ANG). Area 133 acres. Altitude 270 ft. Military 1,028, technicians 199. Payroll $13.6 million.

Westover AFB, Mass. 01022-5000; 5 mi. NE of Chicopee. Phone (413) 557-1110; AUTOVON 589-1110. AFRES base. 439th Military Airlift Wg. (AFRES). Also home of Army, Navy, and Marine Corps Reserve and Massachusetts Army National Guard. Base dedicated Apr. 6, 1940; named for Maj. Gen. Oscar Westover, Chief of the Air Corps, killed Sept. 21, 1938, in crash near Burbank, Calif. Area 2,386 acres. Altitude 244 ft. Reservists 2,632, technicians (AFRES and tenant units) 211, civilians 744. Payroll $35.9 million. Housing: 300 family quarters, 360 VAQ rooms (656 beds), 44 VOQ (168 beds).

Willow Grove Air Reserve Facility, Pa. 19090; 14 mi. N of Philadelphia. Altitude 356 feet. ANG and AFRES have separate phones and facilities. ANG phone (215) 443-1500; AUTOVON 991-1500. 111th Tactical Air Support Gp. (ANG). ANG area 41 acres. Military 1,102, technicians 154. Payroll $11.3 million. AFRES phone (215) 443-1062; AUTOVON 991-1062. 913th Tactical Airlift Gp. (AFRES). AFRES area 162 acres. Reservists 856, technicians 147, civilians 122. Payroll $9.3 million. Other units include Army, Navy, and Marine Corps Reserve. Defense Contract Administration Services Region, Philadelphia; 92d Aerial Port Sqdn. (MAC) off-base tenant. Base activated Aug. 1958. Navy transient quarters available, but limited.

Will Rogers World Airport, 5624 Air Guard Dr., Oklahoma City, Okla. 73169-5000; 7 mi. SW of Oklahoma City. Phone (405) 686-5210; AUTOVON 956-8210. 137th Tactical Airlift Wg. (ANG). Area 71 acres. Altitude 1,290 ft. Military 1,179, technicians 190. Payroll $12.8 million.

Wilmington, Del. (Greater Wilmington Airport) 19720; 5 mi. S of Wilmington. Phone (302) 322-3361; AUTOVON 455-3000. 166th Tactical Airlift Gp. (ANG); Army National Guard aviation company. Area 57 acres. Altitude 80 ft. Military 1,064, technicians 170. Payroll $11.3 million. 2-bed dispensary.

Youngstown Municipal Airport, Ohio 44473-5000; 16 mi. N of Youngstown. Phone (216) 392-1000; AUTOVON 346-1000. AFRES base. 910th Tactical Airlift Gp. (AFRES); 757th Tactical Airlift Sqdn. (AFRES). Other units include OLC, 2046th Communications Gp.; Defense Contract Administration Services. Base activated 1952. Area 230 acres. Altitude 1,196 ft. Reservists 809, technicians 136, civilians 368. Payroll $10.7 million. ■

Guide to USAF's R&D Facilities

Principal AFSC R&D Facilities

From Air Force Systems Command headquarters at Andrews AFB, Md., Gen. Bernard P. Randolph, AFSC's Commander, directs the operations of the command's divisions, development and test centers, ranges, and laboratories. These organizations are described below.

Major Organizations

Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio—ASD directs the design, development, and acquisition of aerospace systems, such as fighters, bombers, transports, aerial tankers, tactical reconnaissance aircraft, manned vehicles, long- and short-range air-to-surface missiles, simulators, reconnaissance and electronic warfare systems, aircraft engines, and other aeronautical equipment. ASD comprises more than 11,000 military and civilians working in research, development, and acquisition programs. Scientists, engineers, logisticians, business and program managers, technicians, and support people make up the work force.

Current aircraft programs include the continuing effort to acquire, test, and deploy the new B-1B strategic bomber, development of the Advanced Tactical Fighter (ATF) for the mid-1990s and beyond, full-scale development of the C-17 airlift aircraft, continued production and improvements to the F-15 Eagle and F-16 Fighting Falcon fighters, development and production of the F-15E dual-role fighter, development of the Advanced Technology Bomber (ATB), continued production of the C-5B, acquisition of executive-configured 747s for two new *Air Force One* Presidential airlift aircraft, and development and production of the alternate fighter engine for F-15 and F-16 aircraft.

Missile systems efforts include development of the advanced cruise missile, production of the tactical infrared Maverick missile, which is capable of air strikes at night and in adverse weather, development of the new short-range attack missile (SRAM II) to replace the aging SRAM-A, and approval for high-rate production of the LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) system navigation pod and low-rate production for LANTIRN's targeting pod.

Technology modernization—an ASD strategy to help aerospace manufacturers modernize their facilities to improve productivity—is a demonstrated success and has been expanded to include most major weapon system programs at ASD and at other AFSC product organizations as well.

ASD's 4950th Test Wing operates and maintains most of AFSC's inventory of specially modified aircraft for conducting test flights and gathering and analyzing test results. More information on the wing can be found under the "Development and Test Organizations" section of this guide.

The Air Force Wright Aeronautical Laboratories, which report to ASD, conduct a research and development mission focused on integrating new technologies into Air Force systems. For more information, turn to the "Laboratories" section below.

Air Force Contract Management Division (AFCMD), Kirtland AFB, N. M.—AFCMD is responsible for DoD contract management activities in twenty-five major contractor plants and other contractor facilities assigned to the Air Force under the DoD National Plant Cognizance Program. AFCMD evaluates contractor performance and manages the administration of contracts executed by Air Force, Army, Navy, Defense Logistics Agency, NASA, and other government purchasing agencies.

Armament Division (AD), Eglin AFB, Fla.—The division plans, researches, develops, and acquires conventional air armament and tests and evaluates armament and electronic combat systems and related equipment.

The major mission areas assigned to AD are nonnuclear systems research, development, and acquisition, test and evaluation of armament and electronic combat systems, and host and base support. This full spectrum of missions gives AD cradle-to-grave responsibility for air armaments. The synergy is further enhanced by the operational command's tenant organizations assigned to Eglin AFB, Fla. While the division develops and tests weapon systems, the Air Force Tactical Air Warfare Center and the 33d Tactical Fighter Wing, collocated at Eglin AFB, offer their expertise in the tactical applications of those weapons.

The research and technology and systems development and acquisition mission areas are organized under a single manager, the Deputy Commander for Development and Acquisition. He controls the efforts of AD's Air Force Armament Laboratory and the development plans, systems, engineering, acquisition, and acquisition logistics organizations. This single focal point ties together the basic research, exploratory development, advanced development, master planning, and conceptual, validation, and full-scale engineering development, production, and deployment phases of acquisition. A joint AFSC and Air Force Logistics Command office provides integrated logistics support.

AD's 3246th Test Wing and 6585th Test Group manage test and evaluation activities. For more information, turn to the "Development and Test Organizations" section below.

The Air Force Armament Laboratory (AFATL), assigned to AD, conducts research and development in guided and unguided nonnuclear munitions. For more information, turn to the "Laboratories" section.

Ballistic Missile Office (BMO), Norton AFB, Calif.—BMO is responsible for planning, implementing, and managing Air Force programs to acquire land-based intercontinental ballistic missile systems and subsystems.

BMO is managing the development of the Peacekeeper intercontinental ballistic missile (ICBM), which is continuing its successful flight-test program at Vandenberg AFB, Calif. The Peacekeeper became operational in December 1986 at F. E. Warren AFB, Wyo.

BMO is also managing the research and development of the Air Force's newest ballistic missile, the Small ICBM. The single-warhead, land-based ICBM will be deployed in a tractor-trailer called the Hard Mobile Launcher. Initial deployment is scheduled for 1992 at Malmstrom AFB, Mont.

Another major BMO development program is the Advanced Strategic Missile Systems (ASMS). ASMS is responsible for providing advanced technology to ensure the effectiveness, survivability, and penetrability of strategic missile systems in response to evolving missions, threats, and technologies. ASMS provides support for operational systems, alternatives for future systems, and arms-control support.

BMO is also developing the Rail-Garrison basing mode for future missile deployment. The system involves placing missiles on railcars parked on military bases. In times of severe national need, the railcars would move out of the garrisons and onto the country's rail network.

Electronic Systems Division (ESD), Hanscom AFB, Mass.—ESD develops, acquires, and delivers electronic systems and equipment for the command control communications and intelligence functions of aerospace forces. More than 100 projects are currently under way, including modernization of the Worldwide Military Command and Control System, which is used by DoD to control its military forces; replacement of the Distant Early Warning (DEW) Line radars with new-technology sensors that require little on-site manning and that, in some cases, will operate unattended; radars in the four corners of the nation to detect attack by sea-launched ballistic missiles and to track satellites; upgrading of the Ballistic Missile Early Warning System in England, Greenland, and Alaska to meet the modern missile threat; an Air Force/Army radar to detect, track, and direct weapons against stationary or slow-moving ground and airborne targets; a triservice secure and survivable tactical communications network for air, ground, and sea forces; improvements to NORAD's Space Operations Center and Cheyenne Mountain Complex to facilitate the direction of the defense of North America; an unmanned, low-frequency radio network throughout the US to relay emergency messages should the electromagnetic pulse from high-altitude nuclear detonations disrupt normal communications; a worldwide chain of optical satellite-tracking stations; the E-3 Sentry airborne radar/direction center for the Air Force, North Atlantic Treaty Organization, and Saudi Arabia; and an over-the-horizon backscatter radar for long-range (out to 1,800 miles) warning of aircraft approaching North America.

ESD manages the Department of Defense Electromagnetic Compatibility Analysis Center at Annapolis, Md., and maintains an office at Kapaun Administrative Annex, Germany, for coordinating and managing many European C^3I programs. ESD also manages the Strategic Defense Initiative battle management C^3 National Test-bed.

The Rome Air Development Center, assigned to ESD, conducts Air Force research and development programs related to command control communications and intelligence (C^3I) functions. More information can be found in the "Development and Test Organizations" section below.

Foreign Technology Division (FTD), Wright-Patterson AFB, Ohio—To prevent possible technological surprise by a potential enemy, FTD works with other divisions, laboratories, and centers to acquire, evaluate, analyze, and disseminate information about foreign aerospace technology.

Information collected from a wide variety of sources is screened in unique data- and laboratory-processing equipment. Then, scientific and technical specialists analyze it and prepare reports, studies, and technical findings as well as assessments of possible hostile technological or operational environments in which Air Force weapon systems can be expected to operate. FTD provides foreign technology support for aerospace and other systems research and development activities.

Human Systems Division (HSD), Brooks AFB, Tex.—HSD is the primary Air Force organization that ensures that Air Force systems and operations are designed with human capabilities in mind. The division manages and conducts research, development, and acquisition and specialized operational support programs to support that mission. HSD focuses on integrating human operators into complex systems, protecting crews in hazardous situations, and preserving our human environment.

HSD's major organizational units include an acquisition office, an air base group, the USAF School of Aerospace Medicine, and four laboratories: the Air Force Human Resources Laboratory, the Air Force Drug Testing Laboratory, the USAF Occupational and Environmental Health Laboratory, and the Armstrong Aerospace Medical Research Laboratory. These organizations are discussed below in the "Laboratories" and "AFSC Schools" sections.

Space Division (SD), Los Angeles AFB, Calif.—SD provides and manages the majority of the nation's military space systems. SD's responsibilities include providing and maintaining space-based communications, meteorological, navigation, and surveillance systems in support of combat forces on the ground, at sea, and in the atmosphere; developing spacecraft, launch vehicles, and ground-terminal equipment to maintain and improve military space capabilities; launching and control-

ling on-orbit satellites for DoD and other government agencies; developing space defense and survivability technology to ensure protection of the nation's space assets; managing DoD activities in the national Space Transportation System (Space Shuttle); operating national test ranges and launch facilities to support space and missile programs for the Air Force, DoD, NASA, and other agencies; and operating a worldwide network of satellite tracking stations.

SD manages Detachment 2 at the Johnson Space Center in Houston, Tex., where personnel from the detachment and NASA work together on mission planning for Space Shuttle flights that carry military payloads.

The Space and Missile Test Organization (SAMTO) and the Air Force Space Technology Center (AFSTC) also report to SD. SAMTO provides test management for all DoD-directed ballistic and space programs, operates the Eastern and Western Space and Missile Centers, operates the consolidated Space Test Center, and conducts launch and on-orbit test operations from Vandenberg AFB, Calif., Cape Canaveral AFS, Fla., and Onizuka AFB, Calif.

AFSTC, a focal point for Air Force space research and technology programs, directs activities for three laboratories: the Air Force Astronautics, Geophysics, and Weapons Laboratories.

More information on these activities can be found in the "Development and Test Organizations" and "Laboratories" sections below.

To meet these global responsibilities, SD has 3,040 officer, 2,573 enlisted, and 4,623 civilian personnel. Aerospace Corp., headquartered adjacent to SD, also devotes the principal efforts of its highly qualified, 2,347-member technical staff to SD programs.

Development and Test Organizations

Air Force Engineering and Services Center, Engineering and Services Laboratory (AFESC/RD), Tyndall AFB, Fla.—AFESC/RD acts as Air Force Systems Command's agent in executing civil engineering and environmental quality research and development. The laboratory is the lead organization for all science and technology research that supports air base operational capability.

The civil engineering research program advances the state of the art in the areas of airfield pavements, air base infrastructure facilities and utilities, and fire-prevention equipment, vehicles, and rescue.

As the Air Force focal point for environmental quality research and development, the laboratory works closely with operational commands to develop new, cost-effective technologies to solve existing problems and to avoid environmental consequences from new Air Force weapon systems. In support of the Defense Environmental Restoration program, the laboratory develops and evaluates procedures to restore contaminated land and water.

Air Force Flight Test Center (AFFTC), Edwards AFB, Calif.—AFFTC conducts and supports flight testing and evaluation of manned aircraft, research vehicles, and related propulsion, flight-control avionics, and weapon systems in or entering the Air Force inventory. Similar tests and evaluation can also be carried out by AFFTC on aircraft belonging to other US military services and government agencies and aircraft and related systems of certain foreign governments.

AFFTC also tests and evaluates remotely piloted vehicles and Air Force versions of air- and ground-launched cruise missiles plus crew, cargo, and special mission parachutes and extraction systems.

Test programs currently under way at AFFTC include developmental flight testing and evaluation of the B-1B strategic bomber and its offensive and defensive systems, flight testing and evaluation of system improvements on the F-15 and F-16 fighters and the B-52 strategic bomber, and follow-on cruise missile testing and evaluation.

AFFTC operates the Air Force Test Pilot School at Edwards AFB, where experienced pilots and engineers are trained for flight-test and aerospace research work.

The center has management responsibility for the Utah Test and Training Range (UTTR), a 2,700-square-mile facility in northwest Utah where many test and development flights of remotely piloted vehicles and cruise missiles are carried out. Units administering the UTTR are located at Hill AFB, Utah.

AFFTC supports the Space Shuttle program with engineering support and analysis of the reentry and landing phases of the flights. Edwards AFB is also the primary landing site for future Space Shuttle missions.

Arnold Engineering Development Center (AEDC), Arnold AFB, Tenn.—AEDC operates the world's largest and most advanced complex of aerospace flight-simulation test facilities—some forty aerodynamic and propulsion wind tunnels, rocket motor and turbine engine test cells, space environmental chambers, arc heaters, ballistic ranges, and other specialized units. Twenty-seven of the center's test units have capabilities unmatched anywhere. Facilities can simulate flight conditions from sea level to altitudes around 1,000 miles and from subsonic velocities to those well over Mach 20 for some systems.

The center's mission is to test aircraft, missile, and space systems at the flight conditions experienced during an operational mission. Testing helps developers qualify the systems for flight, improve designs, and establish performance levels before production and assists in troubleshooting problems with operational systems.

Testing done at the center cannot completely replace a flight test, but can significantly reduce the amount of flight-test time and total development time and cost. Testing in ground-based facilities allows careful instrumentation of hardware and the precise control, observation, and repetition of test variables to determine impact on the test article. In most cases, a less-expensive model can be used in place of full-scale flight hardware. Failure cause can be determined and analysis carried out more easily with recoverable hardware. Moreover, flight tests can be conducted more safely and with greater confidence after the operational characteristics have been established during ground testing.

Arnold Center has contributed to practically every one of the nation's top-priority aerospace programs, including the Peacekeeper, Space Shuttle, F-15, and B-1. Customers include the National Aeronautics and Space Administration; the Federal Aviation Administration; the Air Force, Army, and Navy; private industry; allied foreign governments; and US government and educational institutions.

Rome Air Development Center (RADC), Griffiss AFB, N. Y.—RADC is the principal organization charged with conducting Air Force research and development programs related to C^{3}I (command control communications and intelligence). RADC mission areas include photonics research, communications, electromagnetic guidance and control, surveillance of ground and aerospace objects, intelligence data handling, information systems technology, artificial intelligence, battle management, ionospheric propagation, solid-state sciences, microwave physics, and electronic reliability, maintainability, and compatibility. RADC, which reports to ESD, Hanscom AFB, Mass., is also responsible for assisting in demonstrating and acquiring selected systems and subsystems within its areas of expertise. Two of RADC's seven mission directorates are located at Hanscom AFB.

Space and Missile Test Organization (SAMTO), Vandenberg AFB, Calif.—SAMTO has two specific functions. The first is to manage field-test and launch operations for all DoD-directed space programs and long-range ballistic research and development programs. The other is to develop, manage, and operate, through the Eastern and Western Space and Missile Centers, the national space test ranges. SAMTO reports to Space Division, Los Angeles AFB, Calif.

Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.—WSMC is responsible for conducting launch and launch support of research and development ballistic missile testing and polar-orbiting space launches for DoD, USAF, and other agencies. Stretching halfway around the world from the California coast to the Indian Ocean, the Western Test Range is operated in support of ballistic and space test operations. The Range also supports East Coast Space Shuttle operational flight tests and other aeronautical tests employing the same sensors and data-gathering equipment used for ballistic and space booster flights. WSMC is responsible for planning and subsequent execution of the Peacekeeper research and development flight tests and will provide support for West Coast Space Shuttle operations, starting in 1992.

Eastern Space and Missile Center (ESMC), Patrick AFB, Fla.—ESMC is responsible for conducting launch and launch support activities of manned and unmanned space launches and ballistic missiles for the Air Force, DoD, foreign governments, and other government agencies. Support includes the initial assembly, checkout, and ground processing for launch of the Inertial Upper Stage for the Space Shuttle, all space launches requiring geosynchronous orbits, and the Trident II and Pershing II missile programs. In addition, it operates Patrick AFB. The Eastern Test Range extends more than 10,000 miles down the Atlantic into the Indian Ocean, where it joins the Western Test Range to form a worldwide network. Tracking and data-gathering stations are located at Jupiter, Fla., and on Antigua and Ascension Islands.

Consolidated Space Test Center (CSTC), Onizuka AFB, Calif.—CSTC is responsible for planning and conducting launch support and on-orbit tests of DoD space and missile programs. Using the Air Force Satellite Control Network's worldwide tracking station network, CSTC performs on-orbit tracking, data acquisition, and command and control of DoD space vehicles. In addition, the CSTC operates satellite checkout facilities at Cape Canaveral AFS, Fla., and Vandenberg AFB, Calif., for prelaunch tests. Besides supporting DoD research and development spacecraft, the CSTC performs launch, checkout, test, and deployment support for DoD Space Shuttle payloads, upper stages, and experiments.

3246th Test Wing, Eglin AFB, Fla.—The wing, part of Armament Division at Eglin, operates and maintains the ranges and facilities for the test and evaluation of nonnuclear armaments and electronic combat systems. Support for testing and other range activities is provided to the Department of Defense, other governmental agencies, and commercial enterprises.

The wing manages the 724 square miles of Eglin land ranges while comanaging and using more than 86,500 square miles of range in the adjacent Gulf of Mexico. Major tests on or above these ranges cover all kinds of equipment, including aircraft systems, subsystems, missiles, guns, bombs, rockets, targets and drones, high-powered radars, and airborne electronic countermeasures equipment. Combat conditions are realistically simulated in a variety of environments.

To accomplish its mission, the wing operates a fleet of more than forty aircraft plus a multibillion-dollar complex of modern range instrumentation and one-of-a-kind facilities. The McKinley Climatic Laboratory, one of the wing's unique assets, tests hardware as large as the world's largest aircraft in simulated weather environments ranging from minus 65 to plus 165 degrees Fahrenheit with 100-mph winds, ice, clouds, rain, and snow.

The wing's 6585th Test Group, located at Holloman AFB, N. M., manages several unique facilities. The group tests and evaluates radar effects of dynamic flight conditions on aircraft, missiles, spacecraft, and crew ejection seats. A 50,000-foot sled track, capable of testing at speeds up to Mach 8, simulates dynamic flight conditions.

4950th Test Wing, Wright-Patterson AFB, Ohio—The wing conducts flight-test programs on military systems, subsystems, and components; operates and maintains assigned test aircraft and equipment; performs Class II (research and development) aircraft modification design, fabrication, and installation; provides research and development technical photographic services; and furnishes flight-test engineering support and technical data acquisition services for specialized missions on a worldwide basis.

The wing has the capability to plan, conduct, evaluate, and report on a wide range of research and development flight-test requirements. The aircraft types include the high-altitude, large-volume, long-range C-135, C-18, and C-141 aircraft and the smaller, short-range T-39. The EC-135 and EC-18B Advanced Range Instrumentation Aircraft (ARIA) are used as telemetry and voice relay stations to supplement land and marine receiver stations for space and missile programs. Other versions of the C-135 and C-18 test-bed aircraft are modified to meet diverse test program requirements. For such large test programs as the Mark XV Identification, Friend or Foe (IFF) system, the C-141 aircraft is more appropriate. The wing's primary small test-bed aircraft is the T-39. These cost-efficient flight-test platforms are used in a variety of tests, including IFF, communications, and electronic countermeasures programs.

Laboratories

DCS/Technology and Plans (XT), Andrews AFB, Md.—The DCS for Technology and Plans is a new AFSC headquarters organization that combines the former DCS/Science and Technology (DL) and DCS/Plans and Programs (XR). The merger strengthened management of basic research, exploratory research, and advanced research investments.

The XT mission is to identify and support technologies and advanced system concepts that have the strongest military potential for the user and to turn those system concepts into Air Force programs and accelerate them toward full-scale development.

The office focuses on research, development, and acquisition plans, science and technology investment strategies, and technology transition programs.

The DCS/Technology and Plans provides policy, planning, and technical direction for programs undertaken by the command's research and development laboratories. The following offices and laboratory report to XT:

Air Force Office of Scientific Research (AFOSR), Bolling AFB, D. C.—AFOSR is the single manager of Air Force basic research. It awards grants and contracts for basic research related directly to Air Force needs. Research is selected to support the search for new knowledge and the expansion of scientific principles. AFOSR is also responsible for the activities of the Frank J. Seiler Research Laboratory, the European Office of Aerospace Research and Development, and the AFOSR Liaison Office, Far East.

The Frank J. Seiler Research Laboratory (FJSRL), USAF Academy, Colo.—This laboratory is engaged in basic research in physical and engineering sciences, usually centering around chemistry, applied mathemat-

ics, and aerospace mechanics. The laboratory sponsors related research conducted by the faculty and cadets of the USAF Academy.

European Office of Aerospace Research and Development (EOARD), London, England—This unit links the Air Force and the scientific communities in Europe, Africa, and the Near East. It identifies foreign technology, engineering, and manufacturing advances that can be applied to USAF requirements.

The AFOSR Liaison Office, Far East (AFOSR/FE), Tokyo, Japan—This office is the Far East counterpart to the EOARD and provides liaison with the scientific and engineering communities of the Far East.

Air Force Armament Laboratory (AFATL), Eglin AFB, Fla.—AFATL is the principal Air Force laboratory for conducting research and development in guided and unguided nonnuclear munitions. Specific technologies under development include advanced seekers, missile airframes, guidance and control components, explosives, warheads, fuzes, guns, and ammunition. Additionally, kinetic energy launchers and guided projectiles are being developed to support the Strategic Defense Initiative. The laboratory also provides technical support to system program offices in such areas as hardware-in-the-loop missile simulations and warhead vulnerability and lethality analysis. AFATL is organizationally assigned to the Armament Division at Eglin AFB, Fla.

Air Force Harry G. Armstrong Aerospace Medical Research Laboratory (AAMRL), Wright-Patterson AFB, Ohio—The Harry G. Armstrong Aerospace Medical Research Laboratory conducts behavioral and biomedical research to enhance human performance under conditions of environmental stress. AAMRL also establishes design criteria and new biotechnology techniques to protect and sustain personnel in future aerospace systems. The four areas of laboratory research are occupational and environmental toxic hazards in Air Force operations, safety and aircrew effectiveness in mechanical force environments, man-machine integration technology, and manned weapon-system effectiveness. The laboratory reports to Human Systems Division, Brooks AFB, Tex.

Air Force Drug Testing Laboratory (AFDTL), Brooks AFB, Tex.—AFDTL is the only Air Force agency that implements the Army-Air Force drug abuse detection program. AFDTL analyzes more than 250,000 urine specimens annually. It tests samples from all Air Force members stationed in the CONUS, Alaska, and the Panama Canal Zone and from Army members stationed at nine installations in the south-central United States. The laboratory is organizationally assigned to Human Systems Division, also at Brooks AFB.

Air Force Human Resources Laboratory (AFHRL), Brooks AFB, Tex.—AFHRL manages and conducts research and exploratory and advanced development programs for manpower and personnel operations, technical training simulation, and logistics systems. The Manpower and Personnel and Training Systems Divisions are located at Brooks AFB. Other AFHRL divisions are the Logistics and Human Factors Division at Wright-Patterson AFB, Ohio, and the Operations Training Division at Williams AFB, Ariz. The laboratory reports to the Human Systems Division, also at Brooks AFB.

USAF Occupational and Environmental Health Laboratory (OEHL), Brooks AFB, Tex.—OEHL provides consultation and specialized laboratory services to support requirements of occupational, radiological, environmental health, and environmental quality programs. It reports to Human Services Division at Brooks AFB.

Air Force Space Technology Center (AFSTC), Kirtland AFB, N. M.—AFSTC integrates technology efforts to explore military space capabilities and the needs of future space systems.

AFSTC directs three Air Force Systems Command laboratories: Air Force Weapons Laboratory at Kirtland AFB, Air Force Astronautics Laboratory, Edwards AFB, Calif., and Air Force Geophysics Laboratory, Hanscom AFB, Mass. These labs are described below.

The expertise of AFSTC headquarters and laboratory staffs provides a focus for information about space-related developments in such diverse areas as electronics hardening, laser research, rocket propulsion, rail guns, infrared sensors, and the earth and space environment.

The center works through Air Force Systems Command and Space Command to provide research results for future systems needs and to identify key technology areas for long-range plans. In addition, AFSTC works closely with NASA and other military agencies on joint development programs.

Air Force Astronautics Laboratory (AFAL), Edwards AFB, Calif.—AFAL plans and executes research, advanced development, and exploratory programs involving space and rocket propulsion technologies. The lab's advances are applied to improve spacecraft, launch vehicle, launch, and in-space operations and logistics processes.

AFAL is the development center for all Air Force rocket propulsion technologies, including propellants, high-energy density materials, combustion, characterization of rocket exhaust plumes, and rocket propulsion materials and structures. It is also involved in the technical development of rocket propulsion systems, including solid-propellant rocket motors, liquid-propellant rocket feed systems, and engines and electric propulsion. The lab's research and development efforts are also improving rocket test techniques and instrumentation and the characterization and assessment of hazard phenomena.

AFAL's unique physical assets include static rocket test stands capable of supporting rocket motor firings of up to 10,000,000 pounds of thrust and altitude facilities in which space satellite thrusters can be continuously fired for up to seven hours. Other experimental areas conduct research to meet the Air Force's current and future needs. AFAL reports to AFSTC, described above.

Air Force Geophysics Lab (AFGL), Hanscom AFB, Mass.—AFGL is the center for research, exploratory development, and advanced technology development involving earth, atmosphere, and space environments. AFGL scientists study the effects of the space environment on Air Force space vehicles, the interactions of the ionosphere and upper atmosphere with Air Force systems, the optical properties of the atmosphere as both a transmission medium and an emitter of radiation, techniques for measurement of the earth's gravity field and its crustal motions to determine their effects on ballistic missiles, and new and better ways to predict the weather and measure weather elements. AFGL reports to AFSTC, described above.

Air Force Weapons Laboratory (AFWL), Kirtland AFB, N. M.—AFWL conducts Air Force Systems Command nonconventional weapons research and development in high-energy laser technology, advanced weapon concepts, and nuclear weapon technology, including nuclear survivability and vulnerability. AFWL also acts as the AFSC focal point for the technical aspects of nuclear safety and the development of nuclear hardness criteria for Air Force systems. AFWL reports to AFSTC, described above.

Air Force Wright Aeronautical Laboratories (AFWAL), Wright-Patterson AFB, Ohio—AFWAL was established to enhance the integration of technologies across what formerly existed as four independent laboratories. AFWAL conducts and supports research, exploratory development, and advanced technology development in many fields and is responsible for selected engineering development efforts as well as the Air Force's Manufacturing Technology program.

At AFWAL, two programs are under way to develop artificially intelligent "expert systems" to help aircrews deal with the complexities of future aircraft. These include work on an electronic "pilot's associate" and an automatic target recognizer. The laboratories are also developing technologies being considered for the ATF. These include such new materials as composites and advanced metallics, innovative electronics for advanced cockpit automation, integrated fire and flight controls, advanced radars and sensors, built-in test and support equipment, and low observables. AFWAL includes four major organizations—the Aero Propulsion, Avionics, Flight Dynamics, and Materials Laboratories.

Aero Propulsion Laboratory conducts research and development in the areas of aerospace power, air-breathing propulsion, and fuels and lubrication. Work is conducted primarily under contract, although an aggressive in-house program is pursued to maintain technical expertise, verify contract findings, and exploit new opportunities.

Advanced turbine engine compressor, combustor, turbine, and turbine engine concepts are assessed through advanced development programs and in-house research facilities. Nonpropulsive aerospace power for aeronautical systems include airborne high power and spacecraft power.

Areas of major emphasis include power generation, auxiliary power units, electrical generators, hydraulic pumps, solar cells and arrays, batteries, and fuel cells. Advanced propulsion concepts, ducted rockets, and ramjet engine technology for future Air Force weapon systems are analyzed for potential applications.

Fuels and lubrication research provides the petrochemical technology required for future systems. The lab's work in this area helps the user resolve operational problems and define essential operational products.

Advanced turbine engine technology provides superior turbo-propulsion for future aircraft applications in keeping with operational reliability, flexibility, and performance combined with reduced weight, fuel consumption, and cost. This High-Performance Turbine Engine Technology Program in coordination with the Army, Navy, and NASA will attempt to double performance of turbine engine propulsion by the year 2000. Advanced turbine engine components will be assessed within the Advanced Turbine Engine Gas Generator and Advanced Propulsion Subsystems Integration advanced development programs.

Avionics Laboratory conducts research and development in the areas of navigation, surveillance, reconnaissance, electronic warfare, fire control, weapon delivery, communications, system architecture, information and signal processing and control, subsystems integration software, and electromagnetic devices to provide a broad technology base for future systems and ensure application to Air Force aerospace needs. The term "avionics" is defined as all of the electronics aboard aviation and aerospace systems.

In the area of electromagnetic device research and development, the intensive Very-High-Speed Integrated Circuit (VHSIC) triservice effort led by the Avionics Laboratory is expected to yield great improvements in speed, size, power, and reliability and maintainability.

The laboratory's work on an automatic target recognizer is relying on expert systems and parallel processing to recognize and analyze shapes automatically. This program is part of a larger research effort called ADRIES (Advanced Digital Radar Imagery Exploitation System), which is sponsored jointly by ASD, the Defense Advanced Research Projects Agency (DARPA), and the Army.

Flight Dynamics Laboratory focuses primarily on developing flight-vehicle technologies, including structural design and durability, vehicle dynamics, vehicle equipment, environmental control, crew escape and recovery, survivability and vulnerability, flight control, crew station design, flight simulation, performance analysis, aerodynamics, configuration synthesis, and technology integration. Test-beds for flight-control and other technologies include the X-29A forward-swept wing (jointly with DARPA), AFTI/F-111 mission-adaptive wing, and AFTI/F-16. Additionally, design studies are under way for a Short Takeoff and Landing (STOL) and maneuver technology demonstrator, an F-15 being modified by McDonnell Douglas for flight testing at Edwards AFB.

Materials Laboratory conducts the total Air Force program in materials, exploratory development, and manufacturing technology. Areas of current emphasis include thermal protection materials; composites and metals for high-temperature applications; fluids, lubricants, and fluid-containment materials; protective coatings; electronic and electromagnetic materials; laser hardening materials; computer integrated manufacturing, robotics, smart processing, and flexible automated batch manufacturing; and nondestructive evaluation.

AFSC Schools

AFSC NCO Academy/Leadership School, Kirtland AFB, N. M.—The Air Force Systems Command (AFSC) Noncommissioned Officer Academy and the Leadership School are located at Kirtland AFB, N. M. The AFSC NCO Academy has been in continuous operation for more than thirty years—longer than any other Air Force NCO Academy. Both the Academy and Leadership School are important phases of the Air Force's four levels of professional military education offered to NCOs.

USAF School of Aerospace Medicine (USAFSAM), Brooks AFB, Tex.—The school's research mission includes both in-house and contractual work in the applied aspects of aeromedical research. The Crew Technology, Clinical Sciences, and Radiation Sciences Divisions are engaged in studies of biological, environmental, and dynamic conditions that may affect the health and efficiency of aircrews. The Epidemiology Division is a reference and consultant laboratory to Air Force medical facilities for disease assessment and surveillance. One of its principal responsibilities is to give advice and assistance in investigating disease outbreaks at Air Force installations. The school offers officer and enlisted aeromedical education courses ranging from a residency in aerospace medicine to a flight nurse program to a training program for Air Force bioenvironmental specialists. USAFSAM's Hyperbaric Medicine Division is the lead DoD agency for studying hyperbaric treatment. It also provides a twenty-four-hour worldwide consultation service.

The school is part of the Human Systems Division, also at Brooks AFB.

AFSC Systems Acquisition School (SAS), Brooks AFB, Tex.—Established in 1982, Air Force Systems Command's Systems Acquisition School provides academic instruction to help AFSC acquisition managers increase their expertise.

The school offers seven courses: Introduction to Systems Acquisition Management, Advanced Systems Acquisition Management, Computer Resources Acquisition, Advanced Computer Acquisition, Subcontracting Management for Systems Acquisition, Weapon Systems Supportability, and—for civilian general managers—General Manager Leadership. ■

Guide to NASA's Research Centers

The National Aeronautics and Space Administration (NASA) operates a number of research, development, test, and evaluation (RDT&E) field centers that frequently participate in or coordinate their work with USAF R&D programs. Following is a descriptive listing of key NASA installations.

Ames Research Center, Moffett Field, Calif.—Programs at Ames involve research and development in aeronautics, life sciences, space sciences and applications, space technology, and new science and technology growing from aerospace programs. The center's major program responsibilities are concentrated in theoretical and experimental fluid mechanics and aerodynamics, rotorcraft technology, high-performance aircraft technology, flight simulation, flight testing, computational fluid dynamics, fluid and thermal physics, space sciences, airborne sciences and applications, human factors and space biology, and ground and flight projects in support of aeronautics and space technology. Named for Dr. Joseph S. Ames (1864–1943), Chairman of the National Advisory Committee for Aeronautics (NACA) from 1927 to 1939.

Dryden Flight Research Facility, Edwards AFB, Calif.—Dryden Flight Research Facility, an element of the Ames Research Center, is concerned with manned flight within and outside the atmosphere, including low-speed supersonic, hypersonic, and reentry flight and aircraft operations. Flight testing includes HiMAT (Highly Maneuverable Aircraft Technology), RPRVs (Remotely Piloted Research Vehicles), pivot-wing subsonic aircraft, digital fly-by-wire flight-control systems, and wake vortex alleviation methods. Dryden serves as the primary landing site for the Space Shuttle. Named for Dr. Hugh L. Dryden (1898–1965), Director of NACA from 1949–58 and then Deputy Administrator of the new NASA.

Goddard Space Flight Center, Greenbelt, Md.—The Goddard Space Flight Center conducts a wide-ranging program in space science and applications. The GSFC manages the development of wholly integrated spacecraft, ranging from systems engineering to development, integration, and testing; the development and operation of both the ground network of tracking and data acquisition facilities and the Tracking and Data Relay Satellite System; scientific research, including both theoretical studies and development of significant scientific experiments flown on satellites; and the operation of a research airport located at Wallops Island, Va. Goddard is also the manager of the Delta launch vehicle. Named for Dr. Robert H. Goddard (1882–1945), the "father" of rocketry and of the space age.

Jet Propulsion Laboratory, Pasadena, Calif.—Jet Propulsion Laboratory is operated under contract for NASA by the California Institute of Technology. The Jet Propulsion Laboratory is primarily responsible for the conduct of NASA automated missions concerned with deep space scientific exploration; tracking, data acquisition, reduction, and analysis required by deep space flight; and development of advanced spacecraft propulsion, guidance, and control systems. The laboratory is also responsible for selected automated earth-orbital projects. Activities include a broad range of engineering, scientific, and management functions devoted to planetary exploration, physics and astronomy, space applications, spacecraft operations, operation of the Deep Space Network, and research and analysis.

Johnson Space Center, Houston, Tex.—The center designs, tests, and develops manned spacecraft and selects and trains astronauts. Mission control for manned spaceflight is located at the center, and responsibilities include operational planning, crew selection and training, flight control, experiment/payload flight control for the Space Transportation System, and major work on development of the Space Station. Definition and development of in-flight biomedical experiments are included in the life sciences research responsibilities of the center. The center is named for the late President Lyndon B. Johnson.

Kennedy Space Center, Fla.—The principal role of the center includes Space Shuttle launch preparation, launch, landing, and refurbishment, Spacelab and Spacelab payloads ground processing, cargo/experiment integration and processing, upper stages ground processing, and operation and maintenance of ground-support equipment. The center is also responsible for launch preparation, checkout, and launch of the current inventory of expendable launch vehicles. Kennedy is also responsible for the operation of the KSC Space Transportation System (STS) Resident Office, located at Vandenberg AFB, Calif. The Resident Office supports the Air Force in the design, construction, and activation of the Space Shuttle Vandenberg launch and landing site, provides support for all NASA Deployable Payload Operations, and assists the KSC Cargo Projects Office in planning for all STS cargo operations at Vandenberg. The two principal Shuttle launching and landing sites are at Kennedy and at Vandenberg AFB, Calif.

Langley Research Center, Hampton, Va.—Langley's primary mission is research and development of advanced concepts and technology for future aircraft and spacecraft systems, with particular emphasis on environmental effects, performance, range, safety, and economy. The aeronautical research program is directed at pursuing basic and applied research opportunities leading to increases in performance, efficiency, and capability. Major research disciplines include aerodynamics; operations and airworthiness; acoustics and noise reduction; structures and materials; flutter, aeroelasticity, dynamic loads, and structural response; fatigue and fracture; electronic and mechanical instrumentation; and flight dynamics and control. Named for Samuel P. Langley (1834–1906), astronomer and aerodynamicist who pioneered in the theory and construction of heavier-than-air craft.

Lewis Research Center, Cleveland, Ohio—Lewis Research Center was established as an aircraft engine research laboratory for aircraft propulsion systems. Since then, LeRC has developed many unique facilities for testing full-scale aircraft engines and engine components, chemical rocket engines, electric propulsion systems, space and terrestrial power generation systems, and space communication systems. Lewis is the lead center for aeronautical propulsion and power-transfer technologies, including engine materials and structures, tribology, bearings, seals, inlets, nozzles, propulsion system integration, compressors, turbines, transmissions, propellers, instrumentation, and controls. Lewis also manages the Atlas and Centaur launch vehicle systems and development of the Space Station power systems. Named for Dr. George W. Lewis (1882–1948), NACA Director of Aeronautical Research from 1924–47.

Marshall Space Flight Center, Huntsville, Ala.—Marshall serves as NASA's primary propulsion development center. It is also responsible for a wide range of space payloads, manned spaceflight systems, and space science activities. The Marshall Center has responsibility for the development, testing, and production of the Space Shuttle main engines, solid rocket boosters, and external tanks. It has NASA responsibility for upper stages, the Orbital Maneuvering Vehicle, and the Orbital Transfer Vehicle. Marshall manages Spacelab development activities for NASA and also manages Spacelab missions from control facilities at Marshall. It is NASA's lead center for the development and orbital verification of the Hubble Space Telescope. Marshall also has responsibility for development of the Space Station living quarters and laboratory modules. In addition, it has special capabilities in materials processing in space and for the development of space science experiments. It manages NASA's Michoud Assembly Facility in New Orleans and NASA's Slidell Computer Complex in Slidell, La. It is named for Gen. George C. Marshall, wartime Army Chief of Staff, Secretary of State, and winner of the Nobel Peace Prize.

National Space Technology Laboratories, Bay St. Louis, Miss.—NSTL is NASA's prime static test facility for large liquid-propellant rocket engines and propulsion systems. NSTL plays a key role in the development and acceptance testing of the Space Shuttle main engines and main propulsion system development testing and also conducts applied research and development in the fields of remote sensing, environmental sciences, and other selected applications. NSTL manages the installation and provides support and facilities to collocated elements of other agencies, including the Department of Defense, the Department of Interior, the Department of Commerce, the Environmental Protection Agency, and the Department of Transportation.

Wallops Flight Facility, Wallops Island, Va.—Wallops, a part of Goddard Space Flight Center, is responsible for managing NASA's suborbital sounding rocket projects from mission and flight planning to landing and recovery, including payload and payload carrier design, development, fabrication, and testing; experiment management support; launch operations; and tracking and data acquisition. Launch vehicles used by Wallops include the four-stage Scout rocket with orbital capability. Wallops also manages the NASA balloon program and is responsible for operating the National Scientific Balloon Facility at Palestine, Tex. ■

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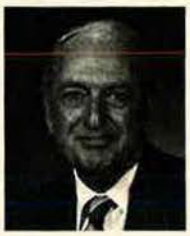
Viewpoint

Why the Airlift Succeeded

By Gen. T. R. Milton, USAF (Ret.), CONTRIBUTING EDITOR

The indomitable Bill Tunner made the Berlin Airlift work. But the B-29s in England made it possible. Their presence kept the Soviets from interfering.



Forty years ago this spring, the disintegration of America's military power was nearly complete. Headlong demobilization had left us with skeleton units, little sense of mission, and confusion over our future role in Europe. With the trust that our statesmen seem to reserve for the USSR from time to time, Berlin had been left in an ambiguous state. The United States, depending on the brand of glasnost then being dispensed by that genial monster, Stalin, had pulled its troops out of Germany's Soviet zone without extracting a guarantee of surface access to Berlin. Fortunately, some farsighted individuals at the Potsdam conference had secured written agreement on the air corridors.

When the Western allies decided to issue a new currency designed to put West Germany back on its feet, the Soviets strongly disapproved and responded with a blockade of the surface routes to Berlin. Our immediate reaction was to start a small airlift. Gen. Curtis LeMay put all the C-47s in his US Air Forces, Europe, to work in answer to a request from Gen. Lucius Clay, the military governor. The Gooney Birds could provide only a fraction of what was needed, and the city's stockpiles of coal and food were fast being depleted, but the airlift was considered only a stopgap until Washington decided what to do.

Actually, Washington merely dithered. Some thought Berlin militarily untenable and recommended pulling out. General Clay favored a direct military challenge. The Air Force had deep reservations about committing so much of its resources to a Berlin supply run.

Meanwhile, Maj. Gen. W. H. Tunner was pulling every string he could get his hands on to secure the job of running the airlift. He had commanded the celebrated Hump operation during several months of World War II and had developed an almost mystical belief in the efficacy of air transport.

When his orders to Germany finally came, Tunner was off within hours, together with a small staff pulled from the new Military Air Transport Service. I went along as Chief of Staff.

From the outset, the airlift had been a British and American affair, which left the third allied power, France, with little to do. Gallic pride asserted itself with a plan to build an airfield on a former Panzer training ground in Berlin. The French rounded up the local population to serve as its labor force and hauled in bomb rubble for aggregate. Yankee ingenuity provided the heavy equipment. Bulldozers, rockcrushers, and steamrollers were sliced up by acetylene torches in Frankfurt, flown piecemeal into Berlin, then welded back together.

The building of Tegel was an unforgettable sight: women in high heels pushing wheelbarrows, distinguished-looking old men wielding shovels, and all working with infectious enthusiasm. The field was finished in a remarkably short time—ramps, buildings, everything ready to go.

One serious obstacle to Tegel's usefulness was a tall radio tower precisely in the traffic pattern. Since it belonged to a Soviet-controlled station in East Berlin, the US proposed negotiating its removal. To the French, this was unrealistic nonsense. Accordingly, one fine morning, a platoon of French engineers marched out to the tower and blew it flat. A champagne celebration followed, and Tegel was open for business.

The months passed, and the tonnage to Berlin continued to mount until the city was receiving more by air than it had via all routes before the blockade. We hauled everything—newsprint, cabbage, sugar—all sorts of commodities. Mostly, though, it was coal, sacked in 100-pound bags, ten tons to a C-54. I remember one cold winter night in the Gatow control tower when an unmistakably American voice gave a position report that enlivened the evening for Gatow's British air controllers:

> Here comes a Yankee
> With a blackened soul
> Heading for Gatow
> With a load of coal.

Fun aside, however, a lot hung in the balance. If the airlift failed, there seemed to be no middle ground: either give up on Berlin or go to war. And the only kind of war we were prepared to fight was one with atomic bombs.

There were a number of reasons why this improbable solution to the Berlin crisis worked. One was Bill Tunner, whose almost fanatical drive got more out of everything, airplanes and men, than seemed possible. He made enemies along the way, but he didn't care; in fact, the fights were almost a form of recreation. Air traffic control reached a new level of efficiency during the airlift, and weather minimums were as low as they are today.

The whole, disciplined, precise flow of airplanes into and out of Berlin reflected Tunner's passion for detailed perfection.

Still, the airlift was hopelessly vulnerable. Even radio jamming would have put us out of business, to say nothing of fighters and flak. The Soviets never interfered, in a serious way, thanks to sixty B-29s that had quietly deployed to England.

Forty years later, we can look back with a certain satisfaction that we met the test. We are still in Berlin, and NATO, along with a rejuvenated West Germany, is the direct result of that successful if unlikely venture.

It is also worth remembering that we got into that fix by failing to realize that the Russians, however cordial they may seem now and then, don't negotiate on the basis of personal relationships. Power is what they respect. The B-29s in England made the airlift possible; Bill Tunner made it work. ■

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Airman's Bookshelf

Weapon of the Century

The Bombers, by Robin Cross. Macmillan Publishing Co., New York, N. Y., 1987. 244 pages with illustrations and index. $22.95.

The bomber has been surrounded by controversy since its infancy during the early part of the twentieth century. Moral and practical arguments about the proper use of bombing as a military tool are still with us today. Nevertheless—though it is suspect in the minds of some defense critics—the bomber survives.

As a matter of fact, the bomber debate is likely to continue for some time to come, given the continuing B-2 Advanced Technology Bomber program.

Even so, the history of the bomber from its emergence in specialized use during World War I to the present day is a fascinating one.

What distinguishes *The Bombers* from other historical accounts on this subject is its detailed analysis of the difficulties associated with learning how to use the bomber in military operations.

For instance, in 1939, the officers of the Royal Air Force (RAF) Bomber Command were convinced that the fast modern bombers, bristling with power-operated turrets, would be able to fight their way to and from any target. But the British government adopted a cautious approach to the employment of airpower. In the opening months of the war, the RAF confined its bombing operations to attacks on the German Navy.

But as operations expanded and the war progressed, the concept of how bombers were to be used changed dramatically. Heavy losses of unescorted RAF Vickers Wellington bombers contributed particularly to that change in RAF thinking. The belief that bomber formations would be able to repel enemy fighters had collided head-on with reality and had been revealed as, Cross says, "an illusion."

Cross traces bomber development throughout the 1930s, when key, yet cautious, experiments were taking place in the United States and elsewhere that would drastically change the shape of bomber forces worldwide. One example of that development was the Boeing YB-9 (a forerunner of the B-10), an all-metal, cantilever, low-wing monoplane that carried its 2,260-pound bomb load entirely enclosed within its semimonocoque fuselage.

The author credits Russia with es-

tablishing the heavy bomber tradition prior to World War I. Igor Sikorsky's giant *Il'ya Muromets* typified Russian interest in heavy bombers. Another milestone was the TB-3, the standard Soviet heavy bomber up to 1941, which was an ideal platform for carrying and dropping paratroops. The Russians pioneered airborne techniques, but did little during the war to exploit the expertise they had gained in the 1930s.

Cross stresses that the RAF policy to pursue area bombing instead of the bombing of specific targets came in February 1942. After analyzing the effects of the German raids on the British, it was concluded that the British could destroy the homes of one-third of the population of Germany. The purpose of this savage strategy was to break the spirit of the German people. Morale, rather than oil plants or transportation and communications systems, was to be the principal RAF target.

The Korean, Vietnam, and Falkland Islands Wars were crucial test grounds for new weapons and new tactics in the use of bombers. In a landmark strike for the future of bomber tactics, a laser-guided "smart" bomb carried by an F-4 Phantom successfully destroyed the legendary Thanh Hoa Bridge, one of the most stubborn targets in North Vietnam, on April 27, 1972.

Cross cites the B-52 as the supreme example of the durability and adaptability of a strategic bomber's airframe. The B-52 was planned in 1948 as a turboprop and emerged in 1952 as a jet because of the availability of the advanced J57 engine. By 1962, the last of 744 aircraft had been delivered in eight main versions. The aircraft still serves today as a significant component of US strategic airpower.

The crucial importance of electronic warfare (EW) to bombing operations cannot be overlooked. During the Vietnam War, modified F-105Fs formed the backbone of the "Wild Weasel" countermeasures program designed to improve USAF's electronic warfare capability. Cross points to the April 1986 raid on Libya as demonstrating the effectiveness of EW and bomber tactics. He warns that this relationship must continue if future bombing missions are to be as successful.

What of the B-1B? At the time of Cross's writing, doubt had been cast on the aircraft's ability to perform its mission. Last January, the 100th aircraft rolled off the assembly line, ahead of schedule and below cost. Even so, if developments in Soviet air defenses seriously threaten the survivability of the B-1B, then it may, according to Cross, prove no more than a bridge to the bomber of the future.

Cross, who has written extensively on the social and military history of the 1930s and World War II as well as on such recent conflicts as the wars in Vietnam and the Falklands, has produced a well-documented book. *The Bombers* is based on an extensive study of the people who designed and flew them, the fighter pilots whose business it was to shoot them down, and the civilians who were thrust into the front lines with their use. One bonus of the book is a series of superb panoramas, specially commissioned to illustrate crucial bombing operations, and this is supplemented by many photographs and diagrams.

The Bombers will appeal to the serious student of military affairs. Readers can expect to gain an invaluable understanding of the roots of one of the principal weapons of twentieth-century warfare.

—Reviewed by Maj. Michael B. Perini, USAF. Major Perini, a former Contributing Editor of this magazine, is now PACAF's Deputy Director of Public Affairs.

Advisors for the total AFA picture.

THE AFA COUNCILS

BY TONI KUZMA
COUNCIL COORDINATOR/MILITARY RELATIONS

AFA President Sam E. Keith, Jr., has selected the following volunteers to serve as advisors during 1988 because of their demonstrated expertise and judgment in areas significant to AFA's mission:

Brig. Gen. Robert A. Buethe, Jr., Medical Advisor; Maj. Gen. William L. Copeland, USAFR, Air Force Reserve Advisor; Dr. Kenneth Daly, Junior AFROTC Advisor; Lt. Gen. John P. Flynn, USAF (Ret.), Veterans Advisor; Capt. Joel R. Maynard, Junior Officer Advisor; CMSAF Sam E. Parish, USAF (Ret.), Retiree Council Advisor; CMSgt. Norman T. Parnes, Enlisted Advisor; Col. David S. Penniman, Senior AFROTC Advisor; Kenneth A. Rowe, Civil Air Patrol Advisor; Pat L. Schittulli, Civilian Personnel Advisor; and Brig. Gen. Wilbert T. Stewart, Air National Guard Advisor.

In addition, the Junior Officer Advisory Council (JOAC) and the Enlisted Council, constituted primarily of active-duty members who represent each of the major commands, will offer their advice to AFA. Included in the Enlisted Council are the Air Force's Outstanding Airmen from the previous year.

These Councils meet throughout the year to work on projects geared to meet the needs of their peers and to compile information on Air Force personnel issues. During the AFA National Convention, AFA's elected leadership relies on their data in drafting the Defense Manpower Policy Paper, which spells out AFA's position on the issues directly concerning Air Force personnel.

Additionally, the Junior Officer Advisory Council will be working a

AFA Presidential Advisors

Buethe Copeland Daly Flynn Maynard

Parish Parnes Penniman Rowe Schittulli Stewart

project to try to improve the communication lines between the Council and other active-duty junior officer groups.

The Enlisted Council hopes to put the finishing touches on a first-of-its-kind booklet detailing information on all Order of the Sword recipients.

The Enlisted Council includes CMSgt. Norman T. Parnes (Chairman), DIA; TSgt. Sterling R. Abney, PACAF; SrA. Debra J. Anderson, MAC; CMSgt. Deborah S. Canjar (Vice Chairman), ATC; SMSgt. Donald L. Carlock, ANG; CMSgt. (selectee) James R. Craig (Liaison), Hq. USAF; MSgt. James H. Daniels, SAC; MSgt. Joey W. Davis, AU; MSgt. Debra L. Garza, USAFE; MSgt. Charles R. Grove, Jr., ATC; TSgt. Frank J. Hall (Recorder), MAC; MSgt. Raymond S. Harris, SAC; MSgt. Randall A. Hodges, AAC; SMSgt. Robert E. Johnson, AFSPACECOM; SMSgt. James E. Lokovic, ESC; MSgt. Dianne Lomas, TAC; MSgt. Denise L. Low, AFRES; Sgt. Laurent R. McDonald, PACAF; CMSgt. (selectee) David L. Pennoyer, AFSC; TSgt. Daniel R. Santos, AFLC; SSgt. Richard E. Toczek, AFCC; MSgt. Samuel Whalum, SAC; and MSgt. Thomas W. Wharton, TAC. CMSAF James C. Binnicker, a former AFA Enlisted Council Chairman, now serves as the Enlisted Council Advisor.

The Junior Officer Advisory Council includes Capt. Joel R. Maynard (Chairman), MAC; Capt. Richard W. Aldrich (Vice Chairman), ATC; Capt. Robin R. Caillouet, AAC; Capt. Dennis L. Daley, AFRES; Capt. Roger L. Davis, AU; 1st Lt. Kathryn A. Day, ESC; Capt. David L. Gray, PACAF; Capt. Kimberley A. Jones, USAFE; Capt. Raymond L. Lynn, SAC; Capt. Michael P. McEwen, AFCC; Capt. Michael J. McGrevey (Liaison), Hq. USAF; Capt. James K. McLaughlin, AFSPACECOM; Capt. John W. McLendon, TAC; Capt. Sammy G. Payne, AFSINC; Capt. David R. Phillips, AFMPC; 1st Lt. Thomas P. Poole, ANG; Capt. Steven A. Simon, USAFA; Capt. M. LaFaye Thigpen, AFLC; and Capt. Paul A. Willard II (Recorder), AFSC. Brig. Gen. Maralin K. Coffinger, USAF Director of Personnel Plans, is the JOAC Advisor. ■

Enlisted Council

Parnes Abney Anderson Canjar Carlock Craig

Daniels Davis Garza Grove Hall Harris

Hodges Johnson Lokovic Lomas Low McDonald

Pennoyer Santos Toczek Whalum Wharton Binnicker

Junior Officer Advisory Council

Maynard Aldrich

Caillouet Daley Davis Day Gray Jones

Lynn McEwen McGrevey McLaughlin McLendon Payne

Phillips Poole Simon Thigpen Willard Coffinger

Sandy Superb

Never mind impossible weather and battle damage. Mission commander Arnie Clarke refused to abandon the downed airmen.

BY JOHN L. FRISBEE
CONTRIBUTING EDITOR

THREE weeks after the 354th Tac Fighter Wing arrived at Korat Royal Thai AFB in mid-October 1972, the wing, USAF's first A-7D outfit committed to combat, was handed a job for which it hadn't trained—the Sandy mission, locating and protecting downed aircrews and coordinating action in the pickup area. The 354th set up a crash training program, using former Sandy and FAC pilots as the nucleus of its new search-and-rescue unit. About a week later, an F-105 Wild Weasel, also from Korat, was downed at night near Thanh Hoa on the coast, about ninety miles south of Hanoi. The next morning, flying in very bad weather, three of the wing's Sandys located the crew part way up a ridge line. Pickup was set by the Rescue Coordination Center for dawn the next day.

At 0430 hours on November 17, five 354th Sandys, followed shortly by six A-7 smoke birds, lifted off the runway at Korat, led by Maj. Colin A. "Arnie" Clarke, the mission commander and a former F-100 Misty FAC with more than 800 hours of combat time in three previous SEA tours. They rendezvoused with HH-53 Jolly Green rescue helicopters above an overcast about seventy miles west of Thanh Hoa. Major Clarke told the HH-53s to hold while he and his wingmen, Capts. Don Cornell and Dave Sawyer, looked vainly for a break in the clouds. Clarke made several instrument letdowns into narrow valleys, using his Projected Map Display (PMD) and radar altimeter. Each time the ceiling was too low and the valley too narrow to turn in. There were no passes open from the west.

Maj. Arnie Clarke smiles for the camera as he steps down from his A-7 after his last Korat mission.

Clarke then took his wingmen out over the Gulf of Tonkin, where the two held as he worked his way down through heavy AA, automatic weapons, and SAM defenses. No HH-53 could make it past those missiles and guns, but Clarke was able to pinpoint the Weasel crew and mark their location on his PMD. Back on top, he picked up his wingmen and the smoke birds and then flew down again to show them where the men were hiding. The A-7s, particularly Clarke's, took many .51-caliber hits in the pickup area.

Major Clarke knew what was going through the survivors' minds. He had been there twice himself on earlier SEA tours. He also knew that the downed men would be found by the enemy before long. It was now or never. Flying up a valley from the east under increasingly lower clouds, he orbited and called one of the HH-53s to do a direction-finding (DF) letdown on him. The Jolly pilot came in, but, low on fuel, had to leave. It was now six hours into the mission.

A frustrated Clarke climbed up through the overcast to refuel and regroup his forces for another attempt. Returning above the clouds, he learned that the pickup would have to be made without delay because the second Jolly was short of fuel. There was no time to search for an open pass.

Without hesitation, Clarke dove into a valley filled with broken clouds down to the deck and called the second HH-53 to DF down on him. Flying 360-degree turns to stay with the Jolly, he led it to a point near the survivors, using terrain masking to protect the chopper from guns in the pickup area. He told the pilot to hold while he and his wingmen went in to quiet the guns and direct the smoke birds to lay a screen.

Then came an unpleasant surprise. He spotted another .51 gun only a few feet above the survivors. It had to be knocked out before the chopper came in.

At this point, the HH-53 pilot, who apparently thought he had been cleared in, picked up both survivors and started to climb out directly past the gun. Clarke called the pilot to stay low and turn while he hosed the gun pit with 20-mm shells, flying so low he took a ZPU round in the A-7's nose. On his final pass as the chopper made it safely out of the area, Clarke was hit "by something that felt like a 57-mm." All his instruments went out.

Flying on instinct, he pulled up through the overcast, joined another A-7, and made an IFR landing at Da Nang, flying on the A-7's wing. The "57-mm" turned out to be a .51 incendiary that exploded an empty wing tank, blowing in the side of the A-7's fuselage.

For Maj. Arnie Clarke, it had been a grueling mission filled with world-class flying, great leadership, and courageous determination to save two fellow airmen. The Air Force Cross he was awarded for a superb performance during those 8.8 action-filled hours was well-earned that day. ■

Calling All AFA Members. . .

. . .Your Membership Is Needed

As a member of the Air Force Association, you believe in the importance of adequate aerospace power and its role in perpetuating national security and world peace. For more than forty years, AFA has been informing its members and concerned citizens about this role.

Much of that important work has been accomplished through the educational outreach programs of AFA's **Aerospace Education Foundation.** AEF members believe that America must remain on the forefront of technological development in the free world and that we must educate ourselves, our leaders, and our youth about this nation's rich aerospace heritage and the increasingly important role aerospace technology plays in our lives.

Since 1956, the Aerospace Education Foundation has been concerned about the educational preparation of our future generation of Air Force and civilian leaders. By sponsoring varied educational outreach programs, including symposia, educator workshops, seminars, and Roundtable discussions, the Foundation has accomplished much to increase the scientific and technological literacy of our nation. However, the need is great, and ***AEF NEEDS YOUR HELP*** to continue to support the educational mission of the Air Force Association effectively.

As an AFA Member, you are encouraged to become a ***Sustaining Member*** of the Aerospace Education Foundation.

Sustaining Members receive a distinctive membership card and a quarterly newsletter to keep them informed of current Foundation and aerospace activities. A gold, joint life membership pin (*pictured above*) is available to those individuals who are life members of ***BOTH*** AFA and AEF. Your membership contribution and all contributions to AEF are fully **tax-deductible.**

AFA is ***your Association***, and the Aerospace Education Foundation is ***your Foundation***. We must work together to ensure that the Foundation's programs grow to meet the educational needs of our future generations so that they are better prepared to keep America's citizens alive and free. ***BECOME AN AEF SUSTAINING MEMBER TODAY!***

Application for Sustaining Membership in the Aerospace Education Foundation

I wish to become a Sustaining Member of the Air Force Association's Aerospace Education Foundation and support its educational goals and objectives. I understand that contributions to the Aerospace Educational Foundation are tax-deductible and that I will receive the AEF National Newsletter every quarter.

Name _____
FIRST MIDDLE LAST

Address _____

City _____ State _____ Zip _____

Social Security Number _____ Date of Birth _____

Method of Payment

☐ Check Enclosed
☐ Charge
☐ Visa ☐ Mastercard

_____
Account No. Exp. Date

_____
Signature

Type of Membership

☐ Annual ($25)
☐ Life ($250)
☐ $250 Single Contribution
☐ $50 with application. Balance in four quarterly payments.

AEF LIFE Members who are also AFA LIFE Members will receive a joint membership pin. If you are an AFA Member, please indicate by checking the appropriate box and providing your membership number.

☐ AFA Life Member #AF_____

☐ AFA Annual Member #AF_____

Send to: AEROSPACE EDUCATION FOUNDATION • 1501 Lee Highway • Arlington, VA 22209-1198

STRATEGIC DETERRENCE

Announcing an AFA National Symposium, being conducted in conjunction with the Strategic Air Command, "The Elements of Strategic Deterrence. . . Status and Prospects."

This National Symposium will provide an authoritative examination of the policies, plans, and capabilities associated with successful strategic deterrence on a global scale. Strategic weapons and delivery systems—both nuclear and conventional—will be discussed. Major emphasis will be given to the Soviet threat, US strategic doctrine, survivable command and control, force modernization, and arms reduction.

Hotel accommodations have been reserved at the Red Lion Inn in Omaha. Call 1-800-574-8010 to make your reservations.

When: June 16–17, 1988.

Where: Red Lion Inn, Omaha, Neb.

Speaker: The Commander in Chief of the Strategic Air Command, Gen. John T. Chain, Jr., will keynote.

Other invited speakers include:

Sen. J. James Exon
Chairman of the Strategic Forces and Nuclear Deterrence Subcommittee of the Senate Armed Services Committee

The Hon. Lawrence Woodruff
Deputy Under Secretary of Defense for Strategic and Theater Nuclear Forces

The Hon. Ronald F. Lehman
Assistant Secretary of Defense, International Security Policy

Gen. John R. Galvin, USA, SACEUR

Gen. Bernard P. Randolph, USAF
Commander, Air Force Systems Command

Lt. Gen. Aloysius G. Casey, USAF
Commander, Space Division, Air Force Systems Command

Vice Adm. Clyde R. Bell, USN
Vice Director, Joint Strategic Target Planning Staff

Make your plans now to attend. For further information, call Jim McDonnell or Dottie Flanagan at (703) 247-5800.

Name (Print) _____

Title _____

Affiliation _____

Address _____

City, State, Zip _____

Telephone (Area Code) _____ (No.) _____

My check covering the Symposium fee for AFA individual or Industrial Associate member of $225.00, payable to the Air Force Association, is enclosed. This fee includes one (1) Reception/Buffet ticket. (Note: Fee for nonmember is $250.)

☐ Mark here if an extra guest Reception/Buffet is desired. Enclose $65 for the additional ticket.

Registration closes Friday, June 10, 1988. No refunds can be made for cancellations after that date.

Mail this form to:
Air Force Association
Attention: Miss Flanagan
1501 Lee Highway
Arlington, Va. 22209-1198
(703) 247-5805

NOTE: AFA's AK-SAR-BEN Chapter will sponsor a golf tournament on June 15. The fee is $50. For information, call Bill Ernst, 402-292-0101.

Intercom

By Robin Whittle, DIRECTOR OF COMMUNICATIONS

On the Scene

Longtime AFA leader **Leo K. Thorsness,** who received the Medal of Honor for valor in Vietnam and who was a prisoner of war for six years, has a lot to say about "Living Life Today."

In December, he took his message to Greater Seattle Chapter members and a few months later to AFA's Sacramento crowd. According to Washington State President **Al Lloyd** and Sacramento Communications Vice President **Doug Baldwin,** the talk was riveting. Drawing on experiences that few ever have, Mr. Thorsness said his captivity forced him to learn how to communicate with his fellow prisoners and to appreciate even the most basic message from them. He learned in a most profound way to set goals, make commitments, and draw up a "roadmap" by which to achieve those goals. The brutality and isolation failed to smother a budding faith that helped him survive and that has carried through to the present, enriching his life.

At the Seattle event, a framed print of the aerial battle for which Thorsness earned the Medal of Honor was raffled off in support of Chapter aerospace education activities. The print, signed by Thorsness and aviation artist **Matthew Waki** of Salt Lake City, Utah, was won by **TSgt. Robert Gurunlian,** a quality-control specialist with the 62d Civil Engineering Squadron at McChord AFB. Mr. Lloyd reported that several other former POWs attended the event, including **Don Sachs,** a B-17 pilot who was shot down over enemy territory just before Christmas 1944.

Seattle Chapter President **Joe Jackson,** also a Medal of Honor recipient from the Vietnam War, emceed the event. On hand for the well-attended function was AFA National Director **Sherm Wilkins.**

After his talk in Sacramento, Mr. Thorsness was presented a commemorative plaque by Chapter President **Roger Stiles.**

Lt. Gen. Thomas Hickey, DCS/Personnel, was honored at the Donald W. Steele, Sr., Chapter's February luncheon in Virginia, one in a continuing series of luncheons honoring Air Staff members. The capacity crowd, made up of Chapter members and key DCS/Personnel staff, listened intently as the General described the potential effects of impending cuts on force levels and the Total Force and outlined specific retention problems.

In addition to a well-deserved round of applause, Medal of Honor recipient Leo K. Thorsness, right, is congratulated with a Chapter plaque from Sacramento Chapter President Roger Stiles for his stirring address at a recent Chapter function. (See the accompanying item for additional details.)

Chapter President **R. E. Kavanagh** continued the Chapter's tradition of scheduling the address prior to the luncheon to enable participants to leave quickly after the meal. "It works well, and everyone appreciates the time it saves for those on tight schedules," he said. In appreciation for the General's talk, **Mary Anne Thompson,** Steele Chapter leader, announced that a contribution had been made to General Hickey's favorite charity—another Chapter innovation to solve the dilemma of an appropriate "speaker's gift."

Corporate sponsors of the luncheon, listed in the luncheon program, were Electrospace Systems, Inc.; Emerson Electric Co.; Honeywell Corp.; General Electric Co.; IBM Corp.; Martin Marietta Corp.; McDonnell Douglas Corp.; Quality Systems, Inc.; Sanders Inc.; Systems Research and Applications Corp.; Texas Instruments, Inc.; TRW, Inc.; United Technologies Corp.; Vitro Corp.; and Westinghouse Electric Corp.

More than 250 Langley, Va., Chapter members, Community Partners, and guests feasted on steaks and fourteen bushels of fresh Rappahannock River oysters at last fall's annual oyster roast and golf tournament at the Eaglewood Golf Course at Langley AFB. Event chairmen **Tom Fowler** and **Pete Nicolos** reported that the program raised $1,000 for the Air Force Enlisted Widows Home Foundation. Teeing off in the first foursome were **Rep. Herbert Bateman** (R-Va.); **Gen. Robert D. Russ,** TAC Commander; **Mrs. Jean Russ;** and **Jim Cvik,** Langley Chapter President.

Charles L. Donnelly, Jr., center, assumes the executive directorship of AFA and the Aerospace Education Foundation on May 1. Welcoming him aboard are National President Sam E. Keith, Jr., right, and John Gray, who has served as Executive Director since last October when David L. Gray stepped down.

Colorado AFA President **Jack Powell** addressed a recent meeting of the Pueblo, Colo., Chamber of Commerce Military Affairs Committee, and an announcement was published in the Pueblo *Chieftain,* circulation 50,500.

In other news, Joe Walker Chapter leaders contacted the West Newton, Pa., *Times-Sun* with news of their latest AFA Community Partner. A write-up appeared in the January 27 edition under the headline, "D-Labs Named AFA Partner." Pennsylvania AFA Vice President **Ron Chromulak,** an active Chapter leader, and Chapter President **Jim Cain** were both quoted in the article on AFA's Community Partner program and the recognition that affiliation brings to participating companies. D-Labs, a dental appliance manufacturer, "has demonstrated its support of education of the public on issues of national concern. This recognition by a national organization reflects the professionalism of this company," a Chapter spokesperson was quoted as saying. The Chapter now has fourteen Community Partners—and counting.

In other Community Partner news, Enid, Okla., Chapter Secretary and Past President **Oscar Curtis** recently signed up the Northcutt Chevrolet/Buick dealership as a Community Partner and presented the plaque to owner **Leonard Northcutt.** "We're in a town of about 50,000, and we've got more than 1,100 AFA members and sixty-six Community Partners," Mr. Curtis said. In fact, at last September's National Convention, the Enid Chapter was honored with a Gold Community Partner award for recruiting a total number of Community Partners equal to or greater than two percent of the overall Chapter membership. A chapter must have a minimum of ten Community Partners to be eligible for the award.

John E. "Jet" Turner, President of AFA's Abilene, Tex., Chapter, was written up in the *Reporter-News* recently. People in Abilene know him as weatherman "Stubby Baldwin" through his morning broadcasts on KFMN-FM. He's done it all in radio news, but aviation is his specialty. In 1965, his feature on KNIT radio about the death of the Atlas missile was judged the best documentary in Texas. Mr. Turner says it's because he was "here when they came and here when they went and down in the hole in between." In fact, he's covered aviation in Abilene for thirty-five years, and when Dyess AFB was dedicated, he carried it live. He counts flying in a B-52 "when we took a bird at 400 feet doing 400 mph" as one of the most exciting experiences he's had. Another was eating lunch in a B-52 over Nova Scotia during bomb comps. Then there were the times he met **Jimmy Doolittle** and **Charles Lindbergh.** Mr. Turner attended his first AFA National Convention in 1964 and has been dedicated to AFA and the Air Force ever since. If he had it all to do over again, "I'd be an Air Force pilot," he says. "Or a crop duster. Just as long as I was flying."

Col. John M. Hoffman, Vice Commander of the Air Force Flight Test Center at Edwards AFB, Calif., recently addressed AFA's Dale O. Smith Chapter in Reno, Nev., on the center's mission. A 1964 Air Force Academy graduate, Colonel Hoffman logged 124 missions in the F-105 Thunderchief in Vietnam and was the top graduate in his class at the USAF Test Pilot School in 1973. He served thirteen years as a test pilot and test manager at the Flight Test Center at Edwards and has five years of test experience and more than 700 hours in the F-15 Eagle. He's pulled three tours at Edwards, serving as Test Di-

Honored with Jimmy Doolittle Fellowships at the H. H. Arnold Chapter's Military Ball were Brig. Gen. Thomas W. Honeywell, second from left, who's in the office of the Assistant Secretary of the Air Force for Acquisition, and Rep. G. J. Hochbrueckner (D-N. Y.). Doing the honors were Ruth Miller, left, Chapter Vice President, and Chapter President Morty Grossman, right.

rector for the F-15 and A-10 flight-test programs and as a staff member of the USAF Test Pilot School. He's a graduate of the Armed Forces Staff College and the Air War College and in 1983 received the Kincheloe Award as "Test Pilot of the Year" for his work on the F-15E dual-role fighter development test program.

In other Smith Chapter news, the Chapter namesake, retired Air Force **Maj. Gen. Dale O. Smith,** presented a belated Distinguished Flying Cross to the Chapter's latest Community Partner, **Lincoln Piazzo,** who had earned it some forty-two years ago for leading low-level bombing missions against heavily defended Japanese-held targets in the Philippines and Formosa. Mr. Piazzo, who owns a sporting-goods store in Reno, finally got his well-earned medal at a Rotary Club luncheon that attracted some 200 members and guests.

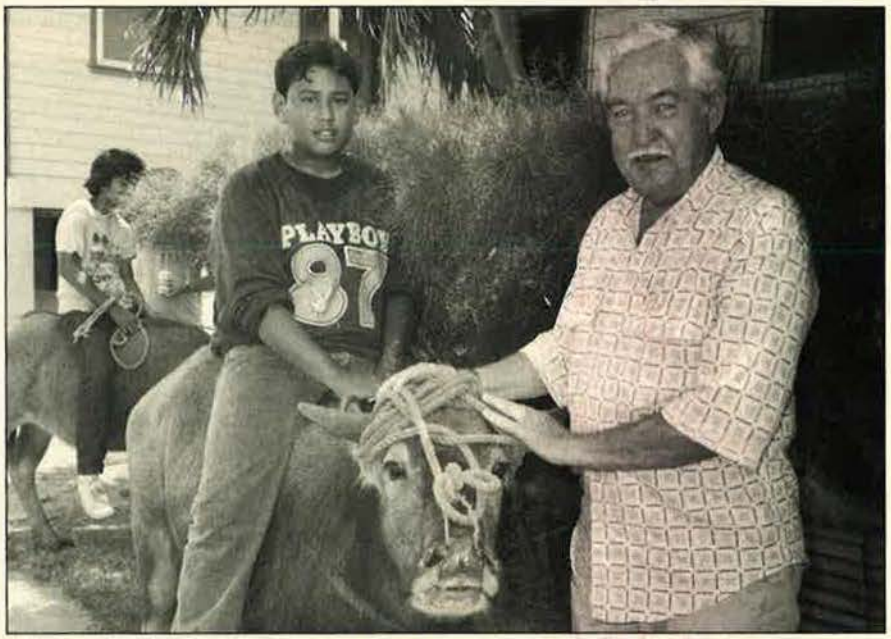
Then-Captain Piazzo, a B-25 pilot with Fifth Air Force, had been recommended for the honor by his squadron commander in the summer of 1945. Mr. Piazzo received a copy of the award recommendation, but somehow the official paperwork never got completed in the demobilization after the war. At an AFA function last fall, Mr. Piazzo happened to mention the recommendation to General Smith and Nevada AFA Vice President **Clarence Becker,** who followed up on it with the Air Force Military Personnel Center.

It's not often that an AFA national leader visits Guam. That's why a visit by **Tom Henderson** last spring to AFA's Arc Light Chapter is still the talk of the island. As then-National Vice President of AFA's Far West Region, Mr. Henderson had jurisdiction over the Chapter and wanted to see how it was faring and also to present an AFA national Medal of Merit to Past Chapter President **Lee Webber.** A reception, dinner, and board meeting were held at the Cliff Hotel to welcome the AFA national leader, who is now a National Director. He briefed the board on AFA objectives and local chapter operations and offered solutions to typical chapter problems.

The following day, Mr. Henderson met with Chapter members and guests at a general meeting that included special guests **Maj. Gen. Donald Marks,** Commander, 3d AD (SAC); **Col. Grover R. Southerland,** Commander, 43d BW; and **Col. Charles E. Tatum,** Commander, 43d CSG, from Andersen AFB. General Marks outlined the relationship of AFA to the active-duty force and expressed appreciation to the Arc Light Chapter for its support.

The third day, Mr. Henderson got an in-depth introduction to island life. He was escorted by Chapter members on a tour of the island that began with the Inarajan Village Fiesta, during which he visited a typical home, sampled native delicacies, and met with doctors, lawyers, educators, and government officials as well as with residents who had journeyed to the quaint southern village for the festivities. As a dignitary from the States and AFA, he had the opportunity to congratulate the winner of the traditional "Carabao Race" in which youngsters ride "carabao" (water buffalo) in a race around the village. Later that day, the AFA leader attended a fund-raising event sponsored by the local public broadcasting station at the Governor's Conference Room, where he met Guamanian business and professional leaders.

The following day, then Arc Light Chapter President **Mike Wilkins** joined Mr. Henderson on a tour of Andersen AFB that included a luncheon at the Officers' Club held in honor of "Law Day." Following the luncheon, Mr. Henderson conducted an infor-



During his five-day visit to AFA's Arc Light Chapter on Guam, then AFA National Vice President and current National Director Tom Henderson got to know the people and culture through various activities that included the annual carabao race in the village of Inarajan. Here he congratulates the winner.

In Reno, Nev., Chapter namesake retired Maj. Gen. Dale O. Smith, right, admires Chapter Community Partner Lincoln Piazzo's DFC, which General Smith and Nevada AFA Vice President Clarence Becker, left, helped Mr. Piazzo get some forty-two years after low-level bombing missions against heavily defended Japanese targets. Presentation was at a Rotary Club luncheon. (For more on General Smith, see p. 70.)

mal business meeting for officers and board members and later had dinner with AFA members and spouses.

The next day's activities provided Mr. Henderson with a "bird's-eye" view of the island via an aerial tour in a Navy Aero Club Cessna 172 by tour guide and pilot **Chuck McManus.** Former Chapter President **Joe Gyulavics** accompanied them.

Florida AFA President **Roy Whitton** reports that at the state executive committee meeting in January, an oil painting depicting the fortieth anniversary of the Air Force, painted by Sarasota artist and Gulf Coast AFA Chapter member **Bob Weiler,** was presented to AFA national headquarters. Accepting the painting were then-Executive Director **John O. Gray** and Board Chairman **Martin H. Harris.**

Former **Rep. Gunn McKay** and his wife were among the dignitaries at a Rocky Mountain Chapter birthday party that included, in addition to Chapter leaders and guests, the Chapter's Community Partners, AFA National Vice President/Rocky Mountain Region **William "Hoot" Gibson** and his wife, Utah AFA President **Marc Williams,** and Clearfield Chamber of Commerce President **Colleen Mann,** reports Rocky Mountain Chapter President **Willis Cohu.**

AFA's Metro Philadelphia Chapter has lined up a series of interesting meetings with speakers on a variety of subjects, including the Civil Air Patrol, FAA accident investigations, flying satellites, and, in September, POW/MIAs, reports Chapter President **John Gross.** Each Chapter newsletter carries all the vital information so that members can plan on being involved.

Longtime Ohio AFA and Capt. Eddie Rickenbacker Memorial Chapter leader **Dick Hoerle** is heading up an effort to get the US Postal Service's Citizens Stamp Advisory Committee to issue a stamp on October 8, 1990, to commemorate Capt. Eddie Rickenbacker's 100th birthday.

In other Rickenbacker Chapter

Former US Rep. Gunn McKay, left, is presented a copy of the book* Wings *by Rocky Mountain Chapter President Willis Cohu after he addressed a recent Chapter function that included many dignitaries and the Chapter's Community Partners among the members of the audience.

Retiring Air Force Auditor General Jerome Stolarow, second from left, is honored with an AFA Presidential Citation from National Director Ed Stearn, far right, representing President Sam Keith. California AFA President Hal Strack, second from right, presented a California AFA Achievement Award during the ceremonies. At left is USAF Comptroller Lt. Gen. Claudius E. Watts III.

Coming Events

May 7, **Massachusetts State Convention,** Hanscom AFB . . . May 12–14, **Tennessee State Convention,** Memphis . . . June 3–4, **Louisiana State Convention,** New Orleans . . . June 10–11, **Oklahoma State Convention,** Tinker AFB . . . June 10–12, **Washington State Convention,** Seattle . . . June 17–19, **Georgia State Convention,** Athens . . . June 17–19, **New Jersey State Convention,** Cape May . . . June 17–19, **Ohio State Convention,** Columbus . . . July 8–9, **Missouri State Convention,** Springfield . . . July 15–16, **Mississippi State Convention,** Columbus . . . July 15–17, **Pennsylvania State Convention,** Pittsburgh . . . July 22–24, **Texas State Convention,** Kerrville . . . July 23–24, **North Carolina State Convention,** Raleigh . . . July 29–30, **Colorado State Convention,** Lowry AFB . . . July 29–31, **Florida State Convention,** Fort Lauderdale . . . August 4–6, **California State Convention,** San Diego . . . August 5–7, **New York State Convention,** Long Island . . . August 12–13, **Illinois State Convention,** Chicago . . . August 18–20, **Delaware State Convention,** Dover AFB . . . August 26, **Arkansas State Convention,** Little Rock . . . September 19–22, **AFA National Convention and Aerospace Development Briefings and Displays,** Washington, D. C.

The Twenty-Ninth Annual Outstanding Squadron Dinner

MAY 28, 1988, AT THE BROADMOOR, COLORADO SPRINGS, COLO.

Saluting the 1988 Outstanding Squadron at the United States Air Force Academy. Co-sponsored by the Air Force Association and its Colorado Springs-Lance Sijan Chapter.

More than 700 guests—including parents and friends of the cadets, together with aerospace, AFA, and government leaders from throughout the country—will pay tribute to the top Academy Squadron, selected for excellence in all elements of cadet life, from academic standings and military leadership to intramural athletics. This is the Academy's most prestigious award of the year.

Reception 6:00 p.m., Dinner 6:45 p.m.; The International Center of The Broadmoor.

Dress: Black tie for civilians
Mess Dress for military
Cost: $ 70 single
$130 per couple

Hotel reservations may be made direct with: The Broadmoor, Colorado Springs, Colo. 80901, telephone 800-634-7711. Singles from $135 to $175, Doubles from $145 to $185; or the Red Lion Inn, 1775 E. Cheyenne Mountain Blvd., Colorado Springs, Colo. 80906, telephone 800-574-8010. Singles or Doubles from $60 to $65. All hotels subject to 7.6% tax. Be sure to mention AFA when writing or calling for reservations.

A golf tournament will be conducted at The Broadmoor on Friday, May 27. Please write AFA for details.

DINNER RESERVATION FORM

Please make the following reservations for me at AFA's 1988 Outstanding Squadron Dinner:

_____ Singles @ $70 $ _____

_____ Doubles @ $130 $ _____

Enclosed is my check for $ _____

Please send information on the golf tournament:

Return to Air Force Association, 1501 Lee Highway, Arlington, Va. 22209-1198

Attn: D. Flanagan

Note: AFA and AEF Board and Committee members should refer to their separate mailing for registration/reservation information. Do not use this form.

Name _____

Address _____

City _____ State _____ Zip _____

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This Is AFA

The Air Force Association is an independent, nonprofit, aerospace organization serving no personal, political, or commercial interests; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES: The Association provides an organization through which we as a free people may unite to address the defense responsibilities of our nation imposed by the dramatic advance of aerospace technology; to educate the members and the public at large in what that technology can contribute to the security of free people and the betterment of mankind; and to advocate military preparedness of the United States and its allies adequate to maintain the security of the United States and the free world.

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news, Chapter President **Mel Gerhold** reports that **Sgt. Helen Ogles,** a recent graduate of the Ohio Air National Guard NCO Preparatory Course, received the Rickenbacker Memorial Chapter Leadership Award in ceremonies at the 160th Air Refueling Group Briefing Room. On hand were **Col. Donald W. Easley,** Commander, 160th AREFG; **Lt. Col. Mike Harold,** Comptroller, Ohio ANG; and **MSgt. Dave Tussey,** Course Manager of the Ohio ANG NCO Preparatory Course.

AFA National Director **Ed Stearn,** representing AFA National President **Sam E. Keith, Jr.,** and California AFA President **Hal Strack** presented an AFA Presidential Citation and California AFA Distinguished Civilian Achievement Award to retiring Air Force Auditor General **Jerome H. Stolarow,** who retired in January after thirty-one years of service, seven and a half as Auditor General. Assisting in the presentations was Air Force Comptroller **Lt. Gen. Claudius E. "Bud" Watts III.**

A retirement dinner held in Santa Ana, Calif., following an Air Force Audit Agency executive session, attracted such guests as Air Force Secretary **Edward C. "Pete" Aldridge,** DoD Inspector General **June Brown,** new Air Force Auditor General **John W. Boddie,** Air Force Deputy Auditor General **Brig. Gen. Basil H. Pflumm,** 63d Military Airlift Wing Commander **Brig. Gen. Marvin S. Ervin,** General Accounting Office Deputy Director **Bill Thurman,** DoD Assistant Inspector General **James H. Curry,** DoD Assistant Inspector General **Stephen A. Trodden,** US Navy Deputy Auditor General **Capt. William F. Graeter,** USN, US Army Auditor General **Harold Stugart,** and former US Air Force Deputy Auditor General **Brig. Gen. Lynn Rans,** USAF (Ret.).

According to Mr. Stearn, Mr. Stolarow received awards, certificates, and plaques from the Air Force Historian, the Military Comptroller School, GAO, Air Force audit regions and directorates, and the Air National Guard. During the evening, he was also made an Honorary Air Force Chief Master Sergeant. ■

Unit Reunions

AAC Enlisted Pilots Ass'n
Army Air Corps enlisted pilots will hold a reunion on September 13–18, 1988, at the Grosvenor Resort Hotel at Walt Disney World in Orlando, Fla. **Contact:** William J. Albrecht, 1902 Beatrice Dr., Orlando, Fla. 32810. Phone: (305) 295-3098.

AFROTC Det. 840
AFROTC Detachment 840, Class of 1963, is hosting a twenty-fifth-year reunion on May 13–14, 1988, at Southwest Texas State University. Former faculty, alumni, and staff are invited. **Contact:** Reunion Staff, AFROTC Det. 840, Hines Academic Center, Room 108, Southwest Texas State University, San Marcos, Tex. 78666-4616. Phone: (512) 245-2182.

Air Weather Ass'n
Air Weather Service veterans will hold a reunion on September 14–18, 1988, in Sacramento, Calif. **Contact:** Maj. Gen. John W. Collins, USAF (Ret.), 5301 Reservation Rd., Placerville, Calif. 95667.

Bombardiers
World War II bombardiers will hold a reunion on May 19–21, 1988, in Denver, Colo. **Contact:** W. L. Loomis, 2660 S. Sheridan Blvd., Denver, Colo. 80227.

CBI Veterans Ass'n
CBI veterans will hold a reunion on May 27–29, 1988, at the Holiday Inn in Cocoa Beach, Fla. **Contact:** Homer R. Stephens, P. O. Box 643, Bradenton, Fla. 34206.

Combat Control Ass'n
The Combat Control Association will hold a reunion on June 16–17, 1988, in Fayetteville, N. C. **Contact:** Wayne Norrad, P. O. Box 515, Mary Esther, Fla. 32569-0515. Phone: (904) 884-2281. AUTOVON: 579-2281.

Hobbs Army Airfield
The Hobbs Chamber of Commerce is hosting a reunion on September 9–11, 1988, in Hobbs, N. M., for personnel stationed at Hobbs Army Airfield in 1942–45. **Contact:** April Westbrook, Hobbs Chamber of Commerce, 400 N. Marland, Hobbs, N. M. 88240. Phone: (505) 397-3202.

1st Observation Squadron
The 1st Observation Squadron will hold a reunion on September 9–11, 1988, at Offutt AFB, Neb. **Contact:** Col. Nester Cole, USAF (Ret.), 2732 Warwick Dr., Bloomfield Hills, Mich. 48013.

5th Combat Cargo Squadron
Former members of the 5th Combat Cargo Squadron will hold a reunion on June 3–5, 1988, in Palm Beach Gardens, Fla. **Contact:** Merl A. Lehenbauer, R. R. Box 26, Ames, Okla. 73718. Phone: (405) 753-4452.

5th Fighter Squadron
The 5th Fighter Squadron "Spitten Kittens" will hold a reunion on September 16–18, 1988, in St. Louis, Mo. **Contact:** J. O. Barge, 783 Woodward Dr., St. Louis, Mo. 63125. Phone: (314) 892-5735.

6th Bomb Group
Members of the 6th Bomb Group stationed on Tinian during World War II will hold a reunion on September 1–4, 1988, in Norfolk, Va. **Contact:** Newell W. Penniman, Jr., 6 Porter Lane, South Hamilton, Mass. 01982. Phone: (617) 468-2806.

7th Bomb Group Ass'n
The 7th Bomb Group will hold a reunion on June 22–24, 1988, at the Marriott Hotel in Salt Lake City, Utah. **Contact:** Dr. Sidney C. Birdsley, 1372 S. Main St., Salt Lake City, Utah 84115-5336. Phone: (801) 467-9120.

8th Fighter Group
The 8th Fighter Group will hold a reunion on August 25–28, 1988, at the Clarion Hotel in Colorado Springs, Colo. **Contact:** Vincent W. Steffanic, 1028 Main St., West Warwick, R. I. 02893.

9th Photo Squadron
Members of the 9th Photo Squadron will hold a reunion on September 21–28, 1988, in Hawaii. **Contact:** Bryant "Buzz" Neal, P. O. Box 1799, Honokaa, Hawaii 96727.

13th Bomb Squadron Ass'n
Members of the 13th Bomb Squadron "Grim Reapers" who served in Korea will hold a reunion on September 28–October

Reunion Notices

Readers wishing to submit reunion notices to "Unit Reunions" should mail their notices well in advance of the event to "Unit Reunions," AIR FORCE Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Please designate the unit holding the reunion, a time and location, and a contact for more information.

Unit Reunions

2, 1988, at the Embassy Suites in San Antonio, Tex. **Contact:** Tony Curto, 11211 Whispering Wind, San Antonio, Tex. 78230. Phone: (512) 492-9644.

19th Bombardment Ass'n
The 19th Bombardment Association will hold a reunion on September 5–10, 1988, at the Clarion Hotel in St. Louis, Mo. **Contact:** James A. Kiracofe, 274 Quinn Rd., West Alexandria, Ohio 45381. Phone: (513) 839-4441.

20th Air Force Ass'n
Former members of Twentieth Air Force who served during World War II will hold a reunion on August 29–September 5, 1988, at the Sheraton Hotel in Anaheim, Calif. **Contact:** John Misterly, 1400 S. Sunkist St., #88, Anaheim, Calif. 92806.

38th Bomb Group Ass'n
The 38th Bomb Group will hold a reunion on September 28–October 1, 1988, in Nashville, Tenn. **Contact:** James E. Gilliam, 25475 Jaclyn Ave., Moreno Valley, Calif. 92387. Phone: (714) 242-3394.

39th Fighter Squadron
Members of the 39th Fighter Squadron, 35th Fighter Group, Fifth Air Force (WW II, Korea, and Vietnam), will hold a reunion on September 23–25, 1988, at the Court of Flags Hotel in Orlando, Fla. **Contact:** CMSgt. Nelson C. Thompson, USAF (Ret.), 9170 E. 8th St., Tucson, Ariz. 85710. Phone: (602) 885-9782.

Class 41-E Ass'n
Members of Flying Class 41-E (Barksdale, Brooks, Kelly, Maxwell, Selma, and Stockton) will hold a reunion on September 26–October 1, 1988, in San Diego, Calif. **Contact:** Lt. Col. L. O. Berglund, USAF (Ret.), 1510 Tatum Dr., Arlington, Tex. 76012. Phone: (817) 861-2581.

Class 42-I
Class 42-I will hold a reunion on September 15–18, 1988, in Richmond, Va. **Contact:** Scruggs A. Colvin, 10325 Waltham Dr., Richmond, Va. 23233. Phone: (703) 740-0921.

Class 43-J
Class 43-J will hold a reunion on September 16–18, 1988, at Fort Stockton, Tex. **Contact:** Lt. Col. Ray C. Murray, USAF (Ret.), 11803 Nene Dr., Austin, Tex. 78750. Col. Horace W. Lehman, USAF (Ret.), 8101 Curry N. E., Albuquerque, N. M. 87109.

Class 54-G
Members of Pilot Class 54-G will hold a reunion on September 16–18, 1988, in Reno, Nev. **Contact:** Maj. Don Mikler, USAF (Ret.), P. O. Box 321, Hadlock, Wash. 98339. Phone: (206) 385-3826.

55th Strategic Reconnaissance Wing
The 55th Strategic Reconnaissance Wing (1948–88) will hold a reunion on June 2–5, 1988, in Omaha, Neb. **Contact:** Robert A. Dibbell, 8902 E. Maple Leaf Dr., Tucson, Ariz. 85710. Bill Ernest, 410 Greenbriar, Bellevue, Neb. 68005. Phone: (402) 292-1205.

57th Bomb Wing
Members of the 57th Bomb Wing, which comprised the 12th, 310th, 319th, 321st, and 340th Bomb Groups, and the 308th Signal Wing will hold a reunion on September 21–25, 1988, at the Holiday Inn in Orlando, Fla. **Contact:** Robert E. Evans, 1950 Cunningham Dr., Speedway, Ind. 46224-5341. Phone: (317) 247-7507.

AWC Class '57–58
Air War College Class '57–58 will hold a reunion on September 16–18, 1988, at the Ramada Beach Resort in Fort Walton Beach, Fla. **Contact:** Col. Bob Gates, USAF (Ret.), 254 Yacht Club Dr., Fort Walton Beach, Fla. 32548. Phone: (904) 244-5143 (work) or (904) 243-7465 (home).

Class 69-04
Members of UPT Class 69-04 "Dust Devils" (Webb AFB, Tex.) are planning to hold a reunion on August 5–7, 1988, in Atlanta, Ga. **Contact:** John C. Kapsaroff, 6145 River Chase Circle, Atlanta, Ga. 30328. Phone: (404) 980-0886. John R. Wiley III, 764 Old Paper Mill Dr. S. E., Marietta, Ga. 30067.

72d and 86th Air Service Squadrons
Veterans of the 72d and 86th Air Service Squadrons, 52d Air Service Group, who served in the China-Burma-India theater (1943–46) will hold a reunion on September 9–11, 1988, at the Radisson Hotel in St. Paul, Minn. **Contact:** Harold Weiss, 1134 Ivy Hill Dr., Mendota Heights, Minn. 55118. Phone: (612) 455-5842.

74th Bomb Squadron
Members of the 74th Bomb Squadron stationed in Guatemala (1942–45) will hold a reunion on September 9–11, 1988, at the Holiday Inn in Tucson, Ariz. **Contact:** M. L. Crabb, 911 Oakhill Dr., Killeen, Tex. 76541. Phone: (817) 634-5421 (day) or (817) 699-3264 (evening).

80th Fighter Squadron
Members of the 80th Fighter Squadron "Juvats/Headhunters" will hold a reunion on May 19–22, 1988, at the Best Western Patrick Henry Inn in Williamsburg, Va. **Contact:** M. L. Kirby, Box 368, Lampasas, Tex. 76550.

95th Bomb Group Ass'n
The 95th Bomb Group will hold a reunion on September 11–18, 1988, in Cincinnati, Ohio. **Contact:** Taylor C. Thurman, 3255 Cart Rd., Richmond, Ind. 47374.

98th Bomb Group Ass'n
The 98th Bomb Group will hold a reunion on September 11–13, 1988, in Nashville, Tenn. **Contact:** C. L. Montgomery, Jr., 18980 Burnt Leaf Way, Monument, Colo. 80132.

179th Tactical Airlift Group
Current and former members of the 179th Tactical Airlift Group (which traces its history from the 363d Fighter Squadron,

164th Fighter Squadron, and 164th Tactical Airlift Squadron to the present) will hold a reunion/airshow on June 24–25, 1988, at the Lahm Airport in Mansfield, Ohio. **Contact:** 40th Reunion, 179th Tactical Airlift Group, OhioANG, Mansfield Lahm Airport, Mansfield, Ohio 44901-5000. Phone: (419) 522-9355.

302d Troop Carrier Squadron
The 302d Troop Carrier Squadron will hold a reunion in conjunction with the 301st Troop Carrier Squadron on September 8–11, 1988, in Denver, Colo. **Contact:** Fred Trenck, 12006 E. Arizona Dr., Aurora, Colo. 80012. Phone: (303) 755-0411.

308th Bomb Wing
The 308th Bomb Wing (Hunter AFB, Ga.) will hold a reunion on June 16–19, 1988, in Reno, Nev. **Contact:** Roland Sabourin, 7717 Palmyra Dr., Fair Oaks, Calif. 95628.

319th Bomb Group Ass'n
Veterans of the 319th Bomb Group/Wing will hold a reunion on August 25–29, 1988, at the Seattle Marriott Hotel at Seattle-Tacoma IAP, Wash. **Contact:** Robert W. Cowan, 5207 S. W. 10th Ave., Cape Coral, Fla. 33914. Phone: (813) 945-2877.

339th Fighter Group Ass'n
The 339th Fighter Group, Eighth Air Force, will hold its annual reunion on August 31–September 4, 1988, at Valley Forge/King of Prussia, Pa. **Contact:** Chester Malarz, 2405 Kings Point Dr., Atlanta, Ga. 30338.

340th Fighter Squadron
Members of the 340th Fighter Squadron will hold a reunion on September 22–25, 1988, in Austin, Tex. **Contact:** William M. Chase, 678 Lake Rd., Webster, N. Y. 14580. Phone: (716) 671-4545.

345th Bomb Group Ass'n
Members of the 345th Bomb Group, which comprised the 498th, 499th, 500th, and 501st Bomb Squadrons, will hold their reunion on September 8–11, 1988, at the Holiday Inn Waterside in downtown Norfolk, Va. **Contact:** Sandy Cortesio, 906 Drake Ave., Centerville, Iowa 52544. Phone: (515) 856-6565. Ken McClure, 2770 E. Main St., Columbus, Ohio 43209. Phone: (614) 237-4251.

365th Fighter Group
Members of the 365th Fighter Group "Hell Hawks," comprising the 386th, 387th, and 388th Fighter Squadrons, will hold a reunion on September 28–October 2, 1988, in Louisville, Ky. **Contact:** Bob Keefe, 2130 W. Ridge Rd., Gary, Ind. 46408.

367th Fighter Group
Veterans of the 367th Fighter Group, which comprised the 392d, 393d, and 394th Fighter Squadrons, will hold a reunion on July 28–31, 1988, in Dayton, Ohio. **Contact:** Jack T. Curtis, 437 Cedar Dr., Beaver Shores, Rogers, Ark. 72756. Phone: (501) 925-1796.

376th Bomb Group Ass'n
The 376th Heavy Bomb Group will hold a reunion on September 16–20, 1988, at the Embassy Suites Hotel in Colorado Springs, Colo. **Contact:** Bob James, 204 Summit Dr., Kenton, Ohio 43326. Phone: (419) 673-0337.

380th Bomb Group
The 380th Bomb Group "Flying Circus" will hold a reunion on September 14–18, 1988, in Seattle, Wash., and depart on September 18, 1988, for a tour of Australia. **Contact:** Lt. Col. Tommy Thompson, USAF (Ret.), 2401 Lakeview Dr., Heber Springs, Ark. 72543. Phone: (501) 362-2891.

385th Bomb Group Ass'n
Members of the 385th Bomb Group will return to England for a reunion tour of the United Kingdom on August 16–September 6, 1988. **Contact:** Allan B. Chealander, 10491 Barbara Anne St., Cypress, Calif. 90630. Phone: (714) 761-1682.

398th Bomb Group Ass'n
The 398th Bomb Group will hold its reunion on September 21–24, 1988, in Richmond, Va. **Contact:** George R. Hilliard, 7841 Quartermaine Ave., Cincinnati, Ohio 45236.

401st Bomb Group Ass'n
Members of the 401st Bomb Group will hold a reunion on September 15–17, 1988, in Dearborn, Mich. **Contact:** Ralph Trout, P. O. Box 22044, Tampa, Fla. 33622. Phone: (813) 884-6081.

450th Bomb Group Ass'n
The 450th Bomb Group will hold a reunion

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☐ Seats _____ driver _____ passenger _____ bench
Radio ☐ AM ☐ AM/FM Stereo
☐ AM/FM Stereo with cassette player
☐ AM/FM Stereo w/cassette & premium sound
Roof ☐ Full vinyl ☐ Other _____
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Program not available in the state of Louisiana.

Unit Reunions

on September 28–October 2, 1988, at the Boston Marriott Hotel in Newton, Mass. **Contact:** Ray Malley, P. O. Box 252, Foxboro, Mass. 02035.

459th Bomb Group Ass'n
The 459th Bomb Group will hold its reunion on September 15–18, 1988, at the Clarion Hotel in Colorado Springs, Colo. **Contact:** Frederick C. Roberts, 750 S. Alton Way, 10D, Denver, Colo. 80231. Phone: (303) 366-1409. John Devney, 90 Kimbark Rd., Rochester, N. Y. 14610. Phone: (716) 381-6174.

463d Bomb Group
Members of the 463d Bomb Group will hold a reunion on September 28–October 2, 1988, in Dayton, Ohio. **Contact:** Rev. Eugene Parker, P. O. Box 127, Edwardsport, Ind. 47528. Phone: (812) 735-5679.

483d Bomb Group
The 483d Bomb Group will hold its reunion on September 14–18, 1988, in Sacramento, Calif. **Contact:** Ray H. Whitaker, 712 Rivercrest Dr., Sacramento, Calif. 95831.

485th Bomb Group
Members of the 485th Bomb Group will hold their reunion on September 28–October 2, 1988, in St. Petersburg, Fla. **Contact:** E. L. Bundy, 5773 Middlefield Dr., Columbus, Ohio 43235.

505th Bomb Group
The 505th Bomb Group, 313th Bomb Wing, will hold a reunion on August 24–28, 1988, at the Omni International Hotel in Norfolk, Va. **Contact:** William J. Gibson, 5214 Pierce Ave., Ogden, Utah 84403. Phone: (801) 479-4885.

509th Bomb Group/Wing
Members of the 509th Bomb Group/Wing will hold a reunion on September 21–25, 1988, at the Red Lion Inn in Colorado Springs, Colo. **Contact:** Brig. Gen. Robert R. Scott, USAF (Ret.), 508 W. 27th St., Cheyenne, Wyo. 82001. Phone: (307) 635-3175.

511th Fighter Squadron
The 511th Fighter Squadron, 405th Fighter Group, will hold its reunion on September 8–10, 1988, at the Clarion Hotel in St. Louis, Mo. **Contact:** George W. Janovitz, 222 Azalea Ct., Fairfield, Calif. 94533. Phone: (707) 422-4429.

710th Military Airlift Squadron
The 710th Military Airlift Squadron (Associate) will hold its reunion on July 16, 1988, at Travis AFB, Calif. **Contact:** SMSgt. G. L. Peterson, USAF, 2702 Mankas Blvd., Fairfield, Calif. 94533.

Class 43-H
A reunion is in the planning stages for Class 43-H (OCS Miami Beach, Fla.), and I would like to hear from students who were assigned as radio operators, mechanics, and permanent personnel. I would also like to include personnel who worked at the Stevens and Congress Hotels, which were located in Chicago, Ill.

Please contact the address below.

Lt. Col. Andy M. Kmetz, USAF (Ret.)
1715 W. Haven Dr.
Champaign, Ill. 61820

Class 52-F
I would like to hear from members of Class 52-F (Bartow, Fla.) for the purpose of holding a reunion this fall or next spring in the Bartow or Winter Haven, Fla., area.

I am also interested in obtaining a copy of post-graduation orders or any document that would list all 52-F students.

Please contact the address below.

R. Eugene Rocque
220 Lee Ave.
Satellite Beach, Fla. 32937
Phone: (305) 777-0716 (home)
(305) 867-7401 (work)

Class 66-C
Members of Pilot Training Class 66-C (Webb AFB, Tex.) are planning to hold a reunion in the summer of 1989. Instructors, advisors, and Texas state patrolmen who knew and loved this fun bunch are also invited.

Please contact the address below.

Larry A. Wegner
420 Chisolm Trail
Hurst, Tex. 76054
Phone: (817) 498-3423

AFA's CHAMPLUS®. . . With the

Exceptional Basic Benefits

1. Four year basic benefit. Benefits for most injuries or illnesses are paid for up to a four-year period.

2. Up to 45 consecutive days of in-hospital care for mental, nervous or emotional disorders. Outpatient care for these disorders may include up to 20 visits by a physician or $500.00 per insured person each year.

3. Up to 30 days per year for each insured person confined in a Skilled Nursing Facility.

4. Up to 30 days per year (to a 60-day life-time maximum) for each insured person receiving care through a CHAMPUS-approved Residential Treatment Center.

5. Up to 30 days per year (to a 60-day life-time maximum) for each insured person receiving care through a CHAMPUS-approved Special Treatment Facility.

6. Up to five visits per year for each insured person to Marriage and Family Counselors under conditions defined by CHAMPUS.

And the New 'Expense Protector' Benefit

While CHAMPUS Supplement coverage was originally intended to cover the cost of medical services not provided by CHAMPUS, practitioners and service institutions may charge fees that are considerably greater than those approved for payment by CHAMPUS. And, because Supplement policies traditionally base their payments on the amount paid by CHAMPUS, the insured can be left with sizable out-of-pocket expenses. AFA's ChamPLUS® coverage includes a special feature which places a limit on these out-of-pocket expenses.

Called the 'Expense Protector' Benefit, this program limits out-of-pocket expenses for CHAMPUS covered charges in any single calendar year to $1,000 for any one insured person (or $2,000 for all insured family members combined). Once those out-of-pocket expense maximums are reached, ChamPLUS® will pay 100% of CHAMPUS covered charges for the remainder of that year.

An example of the way the 'Expense Protector' works follows. Assume you are hospitalized for 35 days, that the hospital charges you $330 per day and that this is $75 per day *more* than allowed by CHAMPUS. This would mean that you have an out-of-pocket expense of $2,625. With AFA's 'Expense Protector' benefit, your cost would be limited to $1,000. All covered costs over this amount—for the whole calendar year—would be paid by ChamPLUS®!

It's an important benefit that can mean significant savings to you and your family.

Who Is Eligible?

1. All AFA members under 65 years of age wh are currently receiving retired pay based upo their military service and who are eligible for benefits under Public Law 89-614 (CHAMPUS their spouses under age 65 and their unmarrie dependent children under age 21, or age 23 in college.

2. All eligible dependents of AFA members o active duty. Eligible dependents are spouses under age 65 and unmarried dependent chil dren under age 21 (or age 23 if in college). (There are some exceptions for older age chil dren. See "Exceptions and Limitations.")

Renewal Provision

As long as you remain eligible for CHAMPUS benefits and the Master Policy with AFA remair

AFA ChamPLUS® Benefit Schedule

Care	CHAMPUS Pays	AFA CHAMPLUS® PAYS
For Military Retirees Under Age 65 and Their Dependents		
Inpatient civilian hospital care	CHAMPUS pays 75% of allowable charges	CHAMPLUS® pays the 25% of allowable charges not paid by CHAMPUS . . . plus 100% of covered charges after out-of-pocket expenses exceed $1,000 per person (or $2,000 per family) during any single calendar year.
Inpatient military hospital care	The only charge normally made is a $7.55 per day subsistence fee, not paid by CHAMPUS.	CHAMPLUS® pays the $7.55 per day subsistence fee.
Outpatient care	CHAMPUS covers 75% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 25% of allowable charges not paid by CHAMPUS after the deductible has been satisfied . . . plus 100% of covered charges after out-of-pocket expenses exceed $1,000 per person (or $2,000 per family) during any single calendar year.
For dependents of Active Duty Military Personnel		
Inpatient civilian hospital care	CHAMPUS pays all covered services and supplies furnished by a hospital less $25 or $7.55 per day, whichever is greater.	CHAMPLUS® pays the greater of $7.55 per day or the $25 hospital charge not paid by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a $7.55 per day subsistence fee, not paid by CHAMPUS.	CHAMPLUS® pays the $7.55 per day subsistence fee.
Outpatient care	CHAMPUS covers 80% of outpatient care fees after an annual deductible of $50 per person ($100 maximum per family) is satisfied.	CHAMPLUS® pays the 20% of allowable charges not paid by CHAMPUS after the deductible has been satisfied . . . plus 100% of covered charges after out-of-pocket expenses exceed $1,000 per person (or $2,000 per family) during any single calendar year.

NOTE: Outpatient benefits cover emergency room treatment, doctor bills, pharmaceuticals, and other professional services. There are some reasonable limitations and exclusions for both inpatient and outpatient coverage. Please note these elsewhere in the plan description.

New 'Expense Protector' Benefit!

n force, termination of your coverage can occur nly if premiums for coverage are due and npaid, or if you are no longer an AFA member. our certificate cannot be terminated because f the number of times you receive benefits.

Exceptions and Limitations

Coverage will not be provided for conditions or which treatment has been received during he 12-month period prior to the effective date f insurance until the expiration of 12 consecutive months of insurance coverage without further treatment. After coverage has been in force for 24 consecutive months, pre-existing conditions will be covered regardless of prior treatment. Children of active duty members over age 21 (age 23 if in college) will continue to be eligible if they have been declared incapacitated and if they are insured under CHAMPLUS® on the date so declared. Coverage for these older age children will only be provided upon a) notification to AFA and b) payment of a special premium amount.

Plan 1
For Military Retirees and Dependents

QUARTERLY PREMIUM SCHEDULE

In-Patient Benefits Only

Member's Attained Age*	Member	Spouse	Each Child
Under 50	$22.97	$ 45.12	$16.34
50-54	$34.33	$ 56.21	$16.34
55-59	$50.32	$ 60.17	$16.34
60-64	$62.98	$ 69.27	$16.34

In-Patient and Out-Patient Benefits

Under 50	$33.90	$ 61.02	$40.84
50-54	$46.59	$ 69.87	$40.84
55-59	$64.41	$ 96.11	$40.84
60-64	$77.38	$102.15	$40.84

*Note: Premium amounts increase with the member's attained age

Plan 2
For Dependents of Active Duty Personnel

ANNUAL PREMIUM SCHEDULE

In-Patient Benefits Only

	Member	Spouse	Each Child
All Ages	None	$ 9.68	$ 5.94

In-Patient and Out-Patient Benefits

All Ages	None	$38.72	$29.70

CHAMPLUS®

Coverage After Age 65

Upon attainment of age 65, the coverage of members insured under CHAMPLUS® will automatically be converted to AFA's Medicare Supplement program so that there will be no lapse in coverage. Members not wishing this automatic coverage should notify AFA prior to their attainment of age 65.

Exclusions

This plan does not cover and no payment shall be made for:

- routine physical examinations or immunizations
- domiciliary or custodial care
- dental care (except as required as a necessary adjunct to medical or surgical treatment)
- routine care of the newborn or well-baby care
- injuries or sickness resulting from declared or undeclared war or any act thereof
- injuries or sickness due to acts of intentional self-destruction or attempted suicide, while sane or insane
- treatment for prevention or cure of alcoholism or drug addiction
- eye refraction examinations
- prosthetic devices (other than artificial limbs and artificial eyes), hearing aids, orthopedic footwear, eyeglasses and contact lenses
- expenses for which benefits are or may be payable under Public Law 89-614 (CHAMPUS)

APPLICATION FOR AFA CHAMPLUS*

Group Policy GMG-FC70
Mutual of Omaha Insurance Company
Home Office: Omaha, Nebraska

Full name of Member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of Birth _____ Current Age ____ Height ____ Weight ____ Soc. Sec. No. _____
Month/Day/Year

This insurance coverage may only be issued to AFA members. Please check the appropriate box below:

☐ I am currently an AFA Member.

☐ I enclose $21 for annual AFA membership dues (includes subscription ($18) to AIR FORCE Magazine).

PLAN & TYPE OF COVERAGE REQUESTED

Plan Requested (Check One)
☐ AFA CHAMPLUS* PLAN I (for military retirees & dependents)
☐ AFA CHAMPLUS* PLAN II (for dependents of active-duty personnel)

Coverage Requested (Check One)
☐ Inpatient Benefits Only
☐ Inpatient and Outpatient Benefits

Person(s) to be insured (Check One)
☐ Member Only
☐ Spouse Only
☐ Member & Spouse
☐ Member & Children
☐ Spouse & Children
☐ Member, Spouse & Children

PREMIUM CALCULATION

All premiums are based on the attained age of the AFA member applying for this coverage. Plan I premium payments are normally paid on a quarterly basis but, if desired, they may be made on either a semi-annual (multiply by 2), or annual (multiply by 4) basis.

Quarterly (annual) premium for member (age ____) $_____

Quarterly (annual) premium for spouse (based on member's age) $_____

Quarterly (annual) premium for ____ children @ $ $_____

Total premium enclosed $_____

If this application requests coverage for your spouse and/or eligible children, please complete the following information for each person for whom you are requesting coverage.

Names of Dependents to be Insured	Relationship to Member	Date of Birth (Month/Day/Year)

(To list additional dependents, please use a separate sheet.)

In applying for this coverage, I understand and agree that (a) coverage shall become effective on the last day of the calendar month during which my application together with the proper amount is mailed to AFA, (b) only hospital confinements (both inpatient and outpatient) or other CHAMPUS-approved services commencing after the effective date of insurance are covered and (c) any conditions for which I or my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within 12 months prior to the effective date of this insurance coverage will not be covered until the expiration of 12 consecutive months of insurance coverage without medical treatment or advice or having taken prescribed drugs or medicine for such conditions. I also understand and agree that all such pre-existing conditions will be covered after this insurance has been in effect for 24 consecutive months.

Date _____, 19 ____ _____
Member's Signature

Form 6173GH App.
5/88

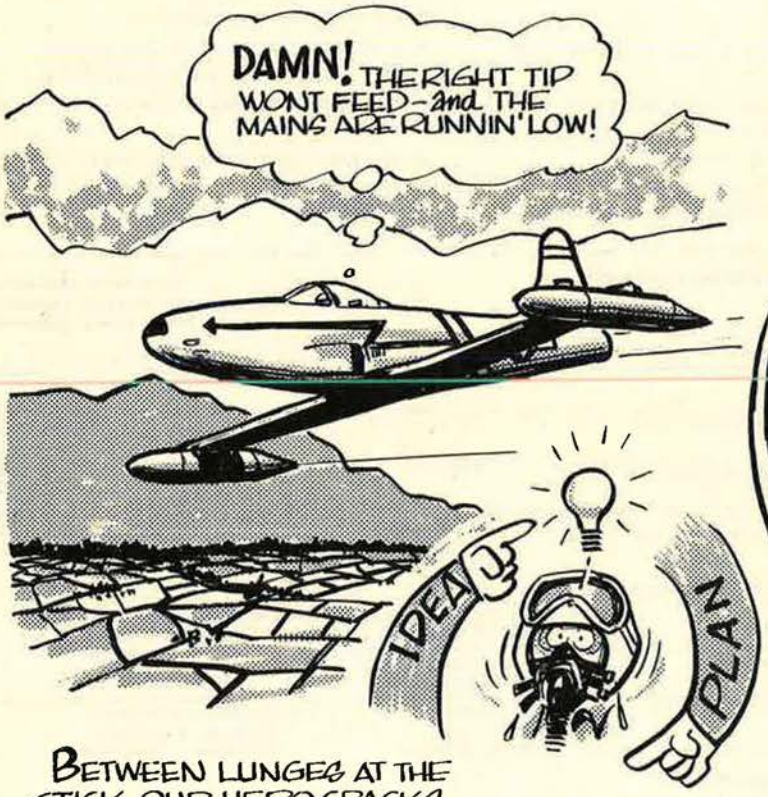
Application must be accompanied by a check or money order. Send remittance to: Air Force Association, Insurance Division, 1501 Lee Highway, Arlington, VA 22209-1198

Bob Stevens'

"There I was..."

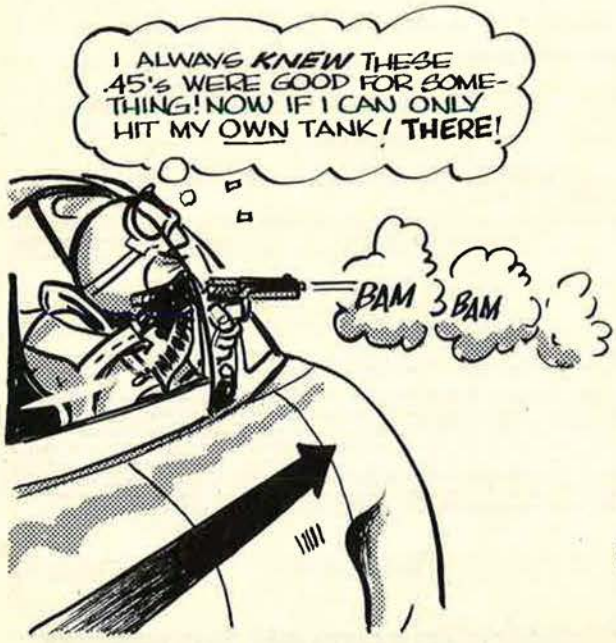
NOT EVERYTHING IN THIS SPACE IS FUNNY—YOU KNOW, *FUNNY* FUNNY. THIS TRUE STORY IS, HOWEVER, INTERESTING. BESIDES BEING ENTERTAINING, IT DEMONSTRATES AMERICAN INGENUITY—WHICH, AFTER ALL, WAS THE "X FACTOR" IN WINNING MANY THINGS WE COULD HAVE LOST—

A YOUNG 1ST JOHN IS ON A RECCE MISSION OVER UNFRIENDLY PEOPLE IN NO. KOREA...



EVENTUALLY HE ABORTS and IS ABLE TO JETTISON ONLY HIS LEFT EMPTY TANK.

BETWEEN LUNGES AT THE STICK, OUR HERO CRACKS THE CANOPY and ...



SLIPSTREAM DID THE REST, THE TANK WAS SCAVENGED ALMOST DRY!

"Without the Osprey, the hostages might still have been with the hijackers."

"First word of the hijacking set a fast chain of events into motion . . .

"Although the airport was many miles away, the Air Force CV-22s slipped up on them quickly, quietly. In fact, we were on top of them before they could react. The Ospreys gave us clandestine precision and surgical accuracy. There was not one casualty among the hostages.

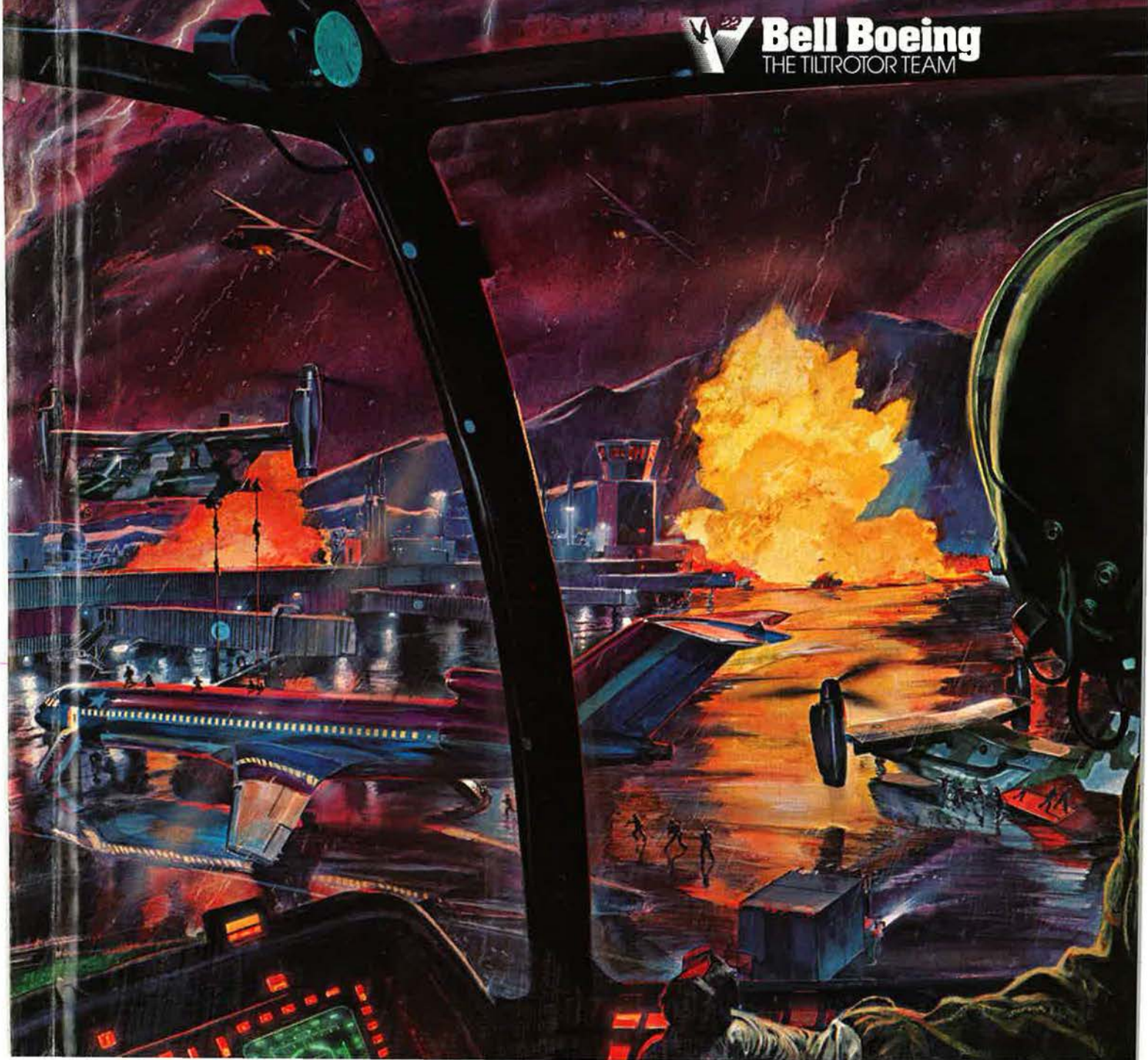
"Maybe, just maybe, this kind of response will send terrorists a message: Using innocent people for your purposes just won't work any more."

It's possible. This Department of the Navy program is producing an aircraft that streaks forward at turboprop speeds, providing unmatched rapid-response capability at very long ranges. Yet, it takes off, hovers and maneuvers like a helicopter.

Credit the Bell Boeing TiltRotor Team for turning a challenging concept into a startling reality. The TiltRotor will bring speed and range you'd need in a fast combat transport. It can reach up high or race across the terrain at treetop level.

And it will rewrite mission profiles like no other aircraft in the world, ushering in a new era in special operations aviation.

Bell Boeing
THE TILTROTOR TEAM



GUARDIAN OF THE GOLD STANDARD.

The T-45 Training System is designed to polish the skills of Naval Aviators as bright as their Wings of Gold.

T45TS is a totally integrated training system, combining all the essential training elements including logistics support. It will help maintain the tradition of excellence in Naval Aviation through the 1990s and beyond while reducing the cost of training by almost 50 percent.

T45 TRAINING SYSTEM

From the McDonnell Douglas and British Aerospace team