JUNE 1982 / $1

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

USAF IN SPACE:

SPACE IS A PLACE

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GENERAL ELECTRIC

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

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This Month

JUNE 1982 • VOLUME 65, NUMBER 6

USAF in Space

ABOUT THE COVER

Shuttle Orbiter OV-102 Columbia makes its approach for landing on Northrup Strip at the White Sands Missile Range in New Mexico after its third test mission. A special "USAF in Space" section begins on p. 36 of this issue. (Photo by Mark Usciak)

Departments

How do you monitor foreign missile tests that cannot be tracked by land-based radars? The Air Force's answer is this shipborne radar, Cobra Judy. Developed and built by Raytheon, it is one of the most sophisticated detection and tracking radars in the world. Located inside a 4-story, 250-ton, mechanically rotatable turret on the stern of the USNS *Observation Island,* the system will give the U.S. Air Force more accurate information about foreign missile tests.

Developed for the U.S. Air Force's Electronic Systems Division, Cobra Judy is the latest refinement of Raytheon's phased array radar technology. Initial systems tests in the Atlantic were recently completed more than three months ahead of government schedule.

In the Pacific, Cobra Judy will gather data on foreign missile tests. With its thousands of computer-controlled antenna elements, the radar will track the missiles automatically.

It's no surprise that Raytheon was chosen to build a radar of this importance and complexity. Our leadership in phased array technology has already been demonstrated on such vital projects as Cobra Dane, a large radar on Shemya

Cobra Judy: the Air Force goes to sea for a better view o

Island in the Aleutians that monitors foreign missile development flights, and Pave Paws, the Air Force's early warning system for submarine-launched ballistic missiles.

For more information on our phased array radar systems, please write Raytheon Company, Government Marketing, 141 Spring Street, Lexington, Massachusetts 02173.

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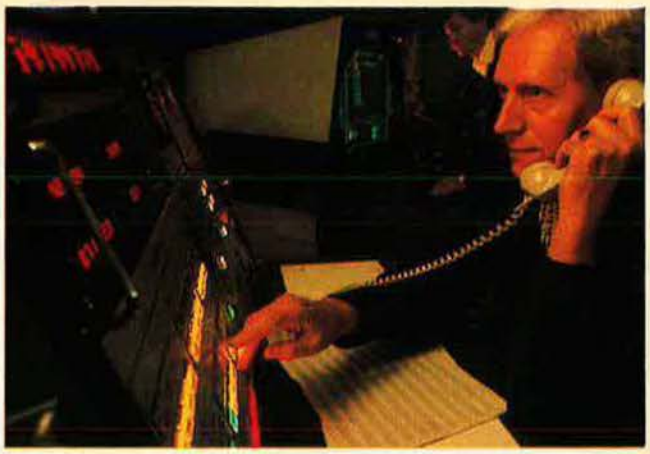

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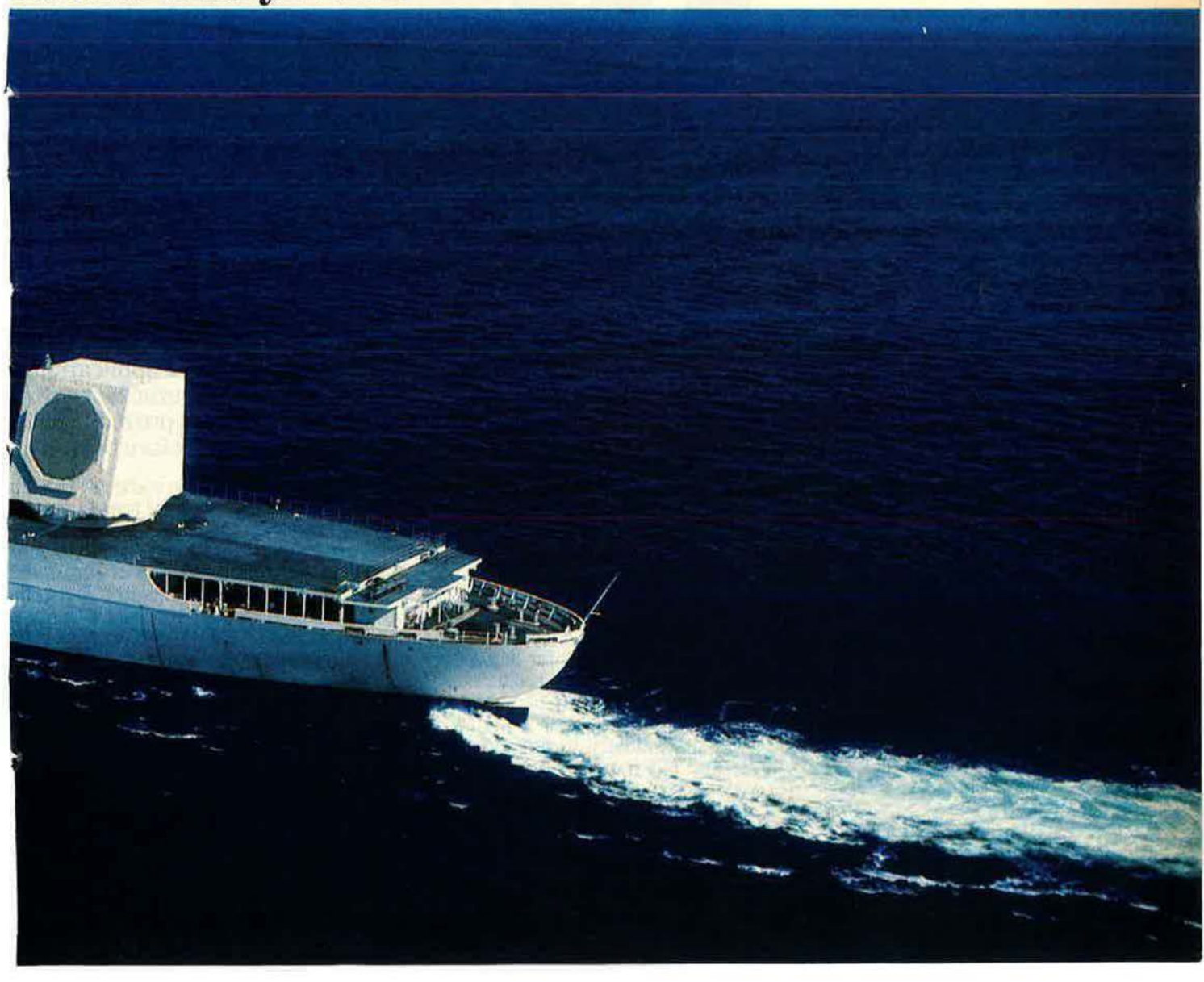
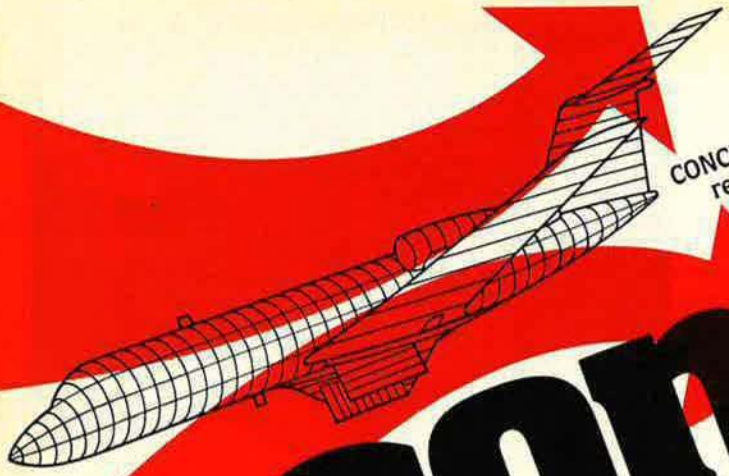




CONCEPT: A space shuttle that reenters and lands safely.

concept reality

REALITY: Grumman Data Systems proved an altered aircraft can behave like the space shuttle. Test after test verified ...it's a GO!

By unique application o sophisticated computer technolog Grumman Data Systems proved feasible what had never before been trie

Early in the '70s, NASA needed to find out whether a powerless space shuttle could reenter the earth's atmosphere under complete control. The task called for special test sy tems and equipment installed in an aircraft converted to fly as the shuttle. How would reentry stresses affect the aircraft's functioning? The pilot's perform ance? ☐ Grumman Data Systems found out. We devised a series of automated test systems that accurately predetermined, in perfectly simulated flight, the shuttle's performance through descent and landing. And the pilot's ability t control the powerless craft smoothly and safely. ☐ Result: NASA pilots cond tioned and ready far in advance for the realities of shuttle reentry flight. ☐ Today's demanding production and performance pressures in any industry make Grumman a great partner to have for instant answers to complex question The entire emphasis is on data acquisition and analysis systems, born in the aer space industry, designed to keep your program working at peak efficiency. T find out more about Grumman Automated Test Systems, including facilitie management, consulting, software systems, or complete turn-key system contact **GRUMMAN DATA SYSTEMS CORPORATION at 150 Crossways Par West, Woodbury, L.I., NY 11797. Telephone (516) 349-5111 or 1600 Wilson Blv Arlington, VA 22209. Telephone (703) 528-5900.**

GRUMMA

AN EDITORIAL

Learning Lessons

THE Falkland Islands crisis, like all conflicts, should contain useful lessons for the future, if carefully analyzed. Events are still unfolding, so definitive "lessons learned" will not be worked out for a while yet. We can be sure that analysts of military and diplomatic affairs worldwide began the evaluation process as the crisis unfolded and continued. They can be relied upon to dissect the events of this crisis in detail.

However, it is unnecessary to wait for definitive studies in order to learn useful lessons from this latest conflict. Indeed, advocates of pet systems have already begun to make selective use of the scanty information at hand to push their own cases. And public officials worldwide, the US included, continue to show their unfortunate tendencies to put their feet firmly in their mouths by making predictions or assertions. For instance, Navy Secretary John F. Lehman, Jr., told reporters that an enemy jet such as the Argentine plane that knocked out *HMS Sheffield* with an Exocet missile "would not have gotten anywhere near" a US battle fleet. Assertions such as that have an unfortunate tendency to be refuted by reality. One hopes Mr. Lehman is proved right in the next conflict involving US ships.

It is not necessary to wait for the next conflict to state the first lesson to be learned. It seems always to have to be relearned, unfortunately. The lesson is this: Crises and conflicts do not always occur in the expected places, nor do they unfold according to the scenarios devised by the planners and soothsayers. In fact, as the days since April 2 have passed, events have developed a direction and momentum all their own, quite independent of man's attempts to direct them according to his scripts. It has been ever thus, and persons who ignore this basic lesson delude themselves.

Another lesson that can be stated with confidence: Military power is considered and applied not by itself, but in the context of political, diplomatic, and economic variables. When the Royal Navy task force shoved off from Portsmouth, American bankers holding Argentine loans tensed up, just as did the diplomats in the American Embassy in Buenos Aires awaiting Secretary Haig's next visit. And when *Sheffield* was abandoned, the mood in the House of Commons and on London streets shifted perceptibly from the one that prevailed a few days earlier after the Royal Navy had sunk Argentina's cruiser *General Belgrano*.

Yet another useful lesson: When a crisis hits, the forces must go to war as they are, not as they'd like to be. That's why uniformed military leaders keep saying their units must train and maintain constantly—it is because they do not know when the politicians will commit them to action, and must try to be ready all the time. When several years pass without conflict, the politicians grow complacent. They cut back on flying hours, steaming days, and maneuvers. Or they cut spares, as was done during the past decade in the US. Both the British and the Argentines have discovered the awful penalties of training and spares shortages in this conflict. Unfortunately for the young men who have died, eventual corrections of these deficiencies will not return them to life. Fortunately for USAF, its shortages are being addressed. Pray that the remedies take effect before our men are committed to sustained combat.

The importance of sustainability has once again been demonstrated. When politicians commit forces as instruments of national strategy, they must expect to have to support them in the field (or afloat or in the air) for an unpredictable, but probably long, period of time. That means stockpiling consumables such as ammunition, food, and fuels in large quantities. That does not come cheap, but is essential if national leaders are to make credible use of the armed services in shaping global events.

The need for sufficient airlift and sealift to carry out national purposes has once more been demonstrated. The British had to requisition cruise ships *Canberra* and *Queen Elizabeth 2* for sealift, and engage commercial air freighters to haul cargo, because their armed forces did not have the wherewithal. Given the woefully deficient state of US airlift and sealift, the US Navy, Air Force, and Congress ought to use this latest case as justification to do something other than jabber about the shortages. One senior Air Force officer, citing the deficiencies, says the initials RDF really stand for "Rhetorical Deployment Force" until the deficiencies are made up. He's right.

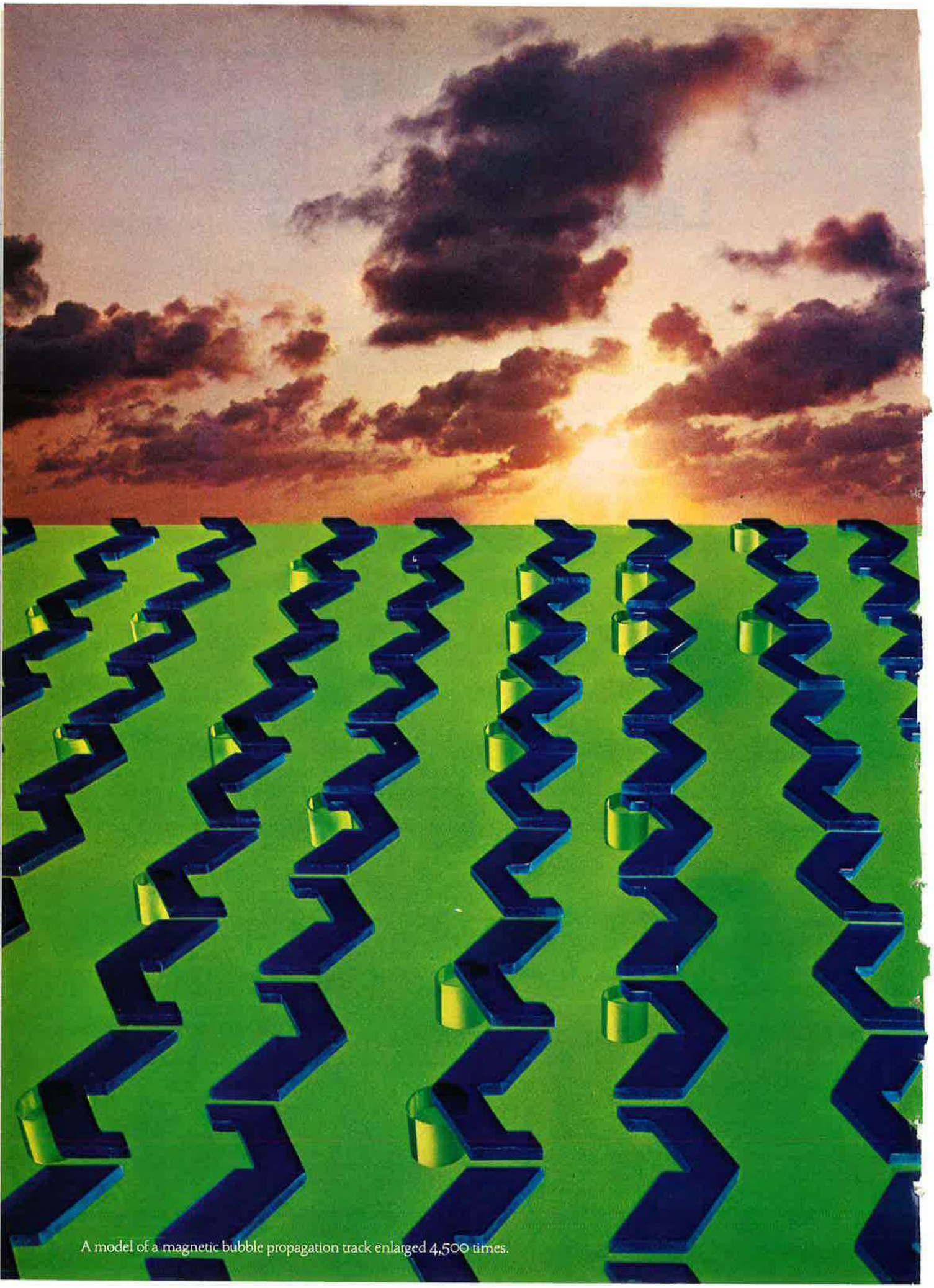
Other lessons can be stated, but that is enough to start. One final point: The Falklands crisis demonstrates anew that airpower is an essential element of a maritime strategy. That suggests that the US Navy and US Air Force should accelerate and broaden their cooperative efforts to reinforce, supplement, and complement each other's capabilities in executing the missions required for national strategy.

—F. CLIFTON BERRY, JR., EDITOR IN CHIEF

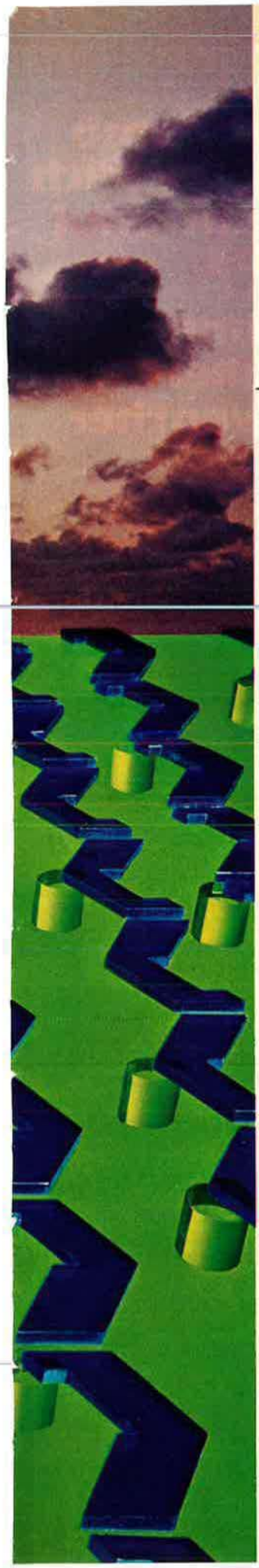
Correction

Last month's editorial strongly advocated accuracy in reporting the continuing debate on military reform. That argument was much weakened by labeling Hon. G. William Whitehurst, a Republican member of Congress from Virginia Beach, Va., as a Democrat. Apologies are due—and tendered—to Mr. Whitehurst and readers of the magazine for that inaccuracy.

—F.C.B., Jr.



A model of a magnetic bubble propagation track enlarged 4,500 times.



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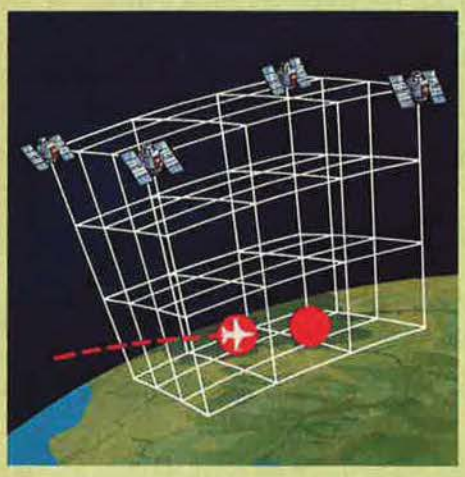

When it comes to increasing force effectiveness, Navstar GPS is right on target. How? Navstar GPS provides three-dimensional accuracies to 16 meters, velocity to 0.1ft/sec, and time to billionths of a second. Weapons delivery and navigation accuracy are enhanced dramatically; recent blind bombing tests prove it. Six deliveries were made at 10,000, 5,000 and 2,000-ft altitudes and at 300-kts IAS. Five impacted within ten meters of the target; one within 30 meters.

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Program completion will mean a whole new set of advantages; better target acquisition, search and rescue and close air support, to name just a few.

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AIRMAIL

The Fighter Mafia

I am continually amazed at the support given the "Fighter Mafia" by advocates of military reform.

Military reform, at least as I understand it, is predicated on relational maneuver warfare. Strategists like Edward Luttwak and John Boyd have always stressed the "indirect approach" as the route to victory.

And yet the "Fighter Mafia" has called for defensive, day-only dogfighters . . . a *pure* firepower/attrition weapon. The Soviets would launch their massive aerial blitz, and we would meet them in the air, downing the jets one at a time. Naturally, simple little dogfighters are preferable for this kind of "strategy." I use the word "strategy" with reluctance, for this concept is more an exercise in accounting and exchange ratios.

Long-range strike aircraft, on the other hand, could cripple the Soviet air blitz by attacking their Achilles' heel—runways. Fuel-air explosives, the MRASM standoff missile, the hypervelocity missile, and related armaments could raze an airbase in minutes. MiGs on the ground would be destroyed, while those aloft would have no base at which to refuel, rearm, or even land. A fuel shortage at 50,000 feet is truly an "energy crisis."

Our next generation of aircraft should certainly be more single mission-oriented—either specialized designs or optimized models of a single airframe. There may indeed be room for lightweight fighters as part of this new hi/lo mix of single-mission warplanes.

But the development of "simple" radarless dogfighters and attack jets to the exclusion of interdiction/strike combat planes would be a strategic nightmare. "Simple" little airplanes "simply" will not meet the most basic needs of American air strategy.

Stephen Danckert
North Quincy, Mass.

Ex-Spouses and Retirement Pay

Regarding the " 'Former Spouse' Benefits Aired" item on p. 98 of the January '82 "Bulletin Board" section: Why is it so hard for senators, congressmen, and Supreme Court justices to listen to both sides of an issue and then come up with laws that are fair and just?

Community-property states had, in the past, decreed (as routinely as divorce itself) that the ex-spouse of retired military personnel would receive one-half of military retirement pay. Then, the Supreme Court makes a decision that the ex-spouse of retired military personnel is not entitled to one penny of military retirement pay. Now, Rep. Pat Schroeder introduces legislation that would give an *automatic* pro-rata share of both retirement pay and survivors benefits to ex-spouses who had been married at least ten years.

I contend the only fair and just way to approach this problem is on an individual "case-by-case" basis. It can't be handled fairly with an absolute "yes" or an absolute "no" attitude. When two people divorce, a separate and distinct portion of time must be set aside by a judge to hear both sides of the issue, and "proof of entitlement" (or nonproof) must be established by both parties.

"Proof of entitlement" is the real issue here. To say an ex-spouse is automatically entitled to something he or she in fact did not earn is ridiculous. On the other hand, to say absolutely "no" to an ex-spouse for something that he or she rightfully worked hard for during the marriage is equally ridiculous.

A judge, in a community-property state, using common sense, and following written federal guidelines, could, in ninety-nine percent of divorce cases, come to a fair and equitable proportionment of retirement funds and benefits the ex-spouse "earned" while being a contributing factor toward national security as the partner of a service member. . . .

The simple fact is that not all ex-spouses "earned" the right to entitlement of a retired military person's retirement benefits, nor could they prove it if they told the truth to a judge.

"Proof of entitlement" and the individual handling of this problem on a "case-by-case" basis is the only fair and just solution.

A very long time ago, a bill entitled the "Soldiers and Sailors Relief Act" was passed. It would do well for judges and legislators to post a copy of this Act on their office wall and read it from time to time.

TSgt. John E. Jonas,
USAF (Ret.)
Albuquerque, N. M.

As a member of AFA, I want to enlist support to fight DoD, specifically Assistant Secretary for Manpower Lawrence Korb, and also Senators Jepsen and Tower and Rep. Pat Schroeder concerning the subject of bill S.1814, which would allow states to grant former military spouses a share in a member's retired pay after only five years of marriage to a maximum of fifty percent.

I wonder if these people plan to make laws regarding their earned retirement plans? And to carry the process further, why not legislate for IBM, GE, GM, and other private companies with retirement plans?

The Supreme Court decision is being completely circumvented by these people. Do we need another bureaucratic problem to administer? I, for one, am tired of government trying to legislate every issue under God's sun.

The mechanics are in place already. State courts should rule the retired pay as an asset to be considered in alimony and child support. If the wife complains of the loss of CHAMPUS, then let each partner share in the premium cost of a comprehensive Blue Cross/Blue Shield program. Why should the government be expected to take care of the possibility of this retired member having two or three wives in his lifetime with the government responsible for multiple medical patients?

The basic point is this: Retirement pay is a benefit earned by the member, and not community property. But as part of his income, it should be used to incorporate alimony and child support, and medical insurance. To give retirement to the wife is

wrong. The court system is in place at no extra cost to the government. We need no more bureaucrats administering our retirement plan.

I would appreciate hearing other views as I entreat support of mine. Somehow I feel that others are all too willing to legislate every phase of society. If they feel they must act in this manner, then let us ensure that they include themselves in these programs.

Is there some way military members could be united to head off this situation?

Lt. Col. Richard F. Turoski, USAF
McConnell AFB, Kan.

Penalized for Joint Service?

I am writing in response to the item in the April '82 "In Focus . . ." section concerning Gen. David C. Jones's proposed reforms [of the JCS].

General Jones is absolutely right about officers not wishing to jeopardize their careers in a joint service assignment. I served four years in the Defense Contract Administration Service, commanding an organization of 315 people spread over two states. It was the best assignment in my career, but, alas, the Air Force passed me, as well as many other officers, over, since we were considered purple-suiters.

Out of twenty-six USAF officers eligible in the Defense Logistics Agency for O-6, only two Air Force officers were selected. One was a veterinarian, the other selected on his fourth try. Other services, particularly the Navy, consider DLA a dead end. Navy promotions to full commander after service in DLA were just about zero. The Army seems to look on joint service more favorably.

I received more responsibility and had greater authority in DLA than I ever had in the service. My command was invaluable in numerous major defense programs, for all services, from the M-1 tank, to the B-1, to the nuclear carrier *Vinson.*

Despite the breadth of my contribution, the Air Force felt I was out of the Air Force for four of my five years as a lieutenant colonel. Despite general and flag officer endorsement, the Air Force felt that the other services did not understand USAF's rating system.

What a shame! Joint service should be a reward, not a penalty. Yes, it is a retirement haven—most or all the general officers I knew retired after a tour in DLA.

Will we ever learn?

Lt. Col. Raymond T. Cwikowski, USAF (Ret.)
Dayton, Ohio

AIRMAIL

Soviet Aerospace Almanac

I have just finished reading the Soviet Aerospace Almanac in the March issue. I am very interested in what takes place inside the Soviet Union (as I hope we all are), and I always look forward to this issue. The fact that it took me a month to read shows how informative and worthwhile it is. This was one of your better ideas, and it makes a real contribution to our professional knowledge.

But one result of this issue is that it stimulates my interest, and that leads to more questions. For example:

The Soviet Union is a huge country, covering 8,500,000 square miles and eleven time zones. It is three times larger than the US. Logistically, how does the Soviet military support such an area?

There are more than 100 ethnic groups within the Soviet Union, and they speak more than 100 languages. What impact does that have on command and control?

How reliable are the other military forces in the Warsaw Pact, and how much does the Soviet Union rely on them?

I fully realize how difficult it is to get accurate information out of such a closed society, and that you have limited space. But it would be interesting to learn about more of the day-to-day details of the Soviet military.

Capt. Robert G. Welbaum, USAF
Dayton, Ohio

• *For an assessment of the reliability of the Warsaw Pact's forces, see "Warsaw Pact: Juggernaut or Paper Tiger?" by Capt. Steve F. Kime, USN, on p. 67 of this issue.*—THE EDITORS

I would be easier in my mind concerning congressional action on the defense budget if I thought that all members of Congress had read your 1982 Soviet Aerospace Almanac.

Accordingly, I would be happy to underwrite the cost of a few copies toward this end. If others did the same, we could assure ourselves that our senators and representatives have at least had the opportunity to educate themselves.

Eugene S. Browning
Glendale, Mo.

• *Many thanks to Mr. Browning for his kind offer, but members of Congress already have the opportunity to "educate themselves." AFA provides complimentary copies of each issue of* AIR FORCE *Magazine to all members of Congress and other selected high government officials.*—THE EDITORS

Media Antics

I have waited a long time for someone of some stature to question the actions of the news media in covering world events. Gen. T. R. Milton has done an excellent job of that in his article, "Develop Strategy, Then Act," on p. 87 of the April '82 issue.

I appreciated his observation that "it was good luck for everyone, even the French, that Waterloo's glory was not tarnished by modern reporting," and another comment that "the ever-present electronic eye caught our young soldiers in the act of carrying M-16 rifles in El Salvador, to the immense glee of self-righteous critics of militarism in any form. . . . [O]ur fellows . . . felt safer with M-16s in their hands. The television crew was safer as well, a point I have not heard made."

In my opinion, the Administration in general and the State Department in particular have been derelict in their responsibilities in not openly criticizing the news media for their reporting practices, which have been harmful to our national objectives. Self-discipline within the media is nonexistent, as their loud cry of "freedom of the press" obliterates any vestige of common sense in the way they do business.

I hope that General Milton's comments catch fire in other publications that are not cowed by the media's assertion that anyone who questions their antics is against freedom of the press.

I am concerned that freedom of the press, as conceived by the media, might well cause us to self-destruct.

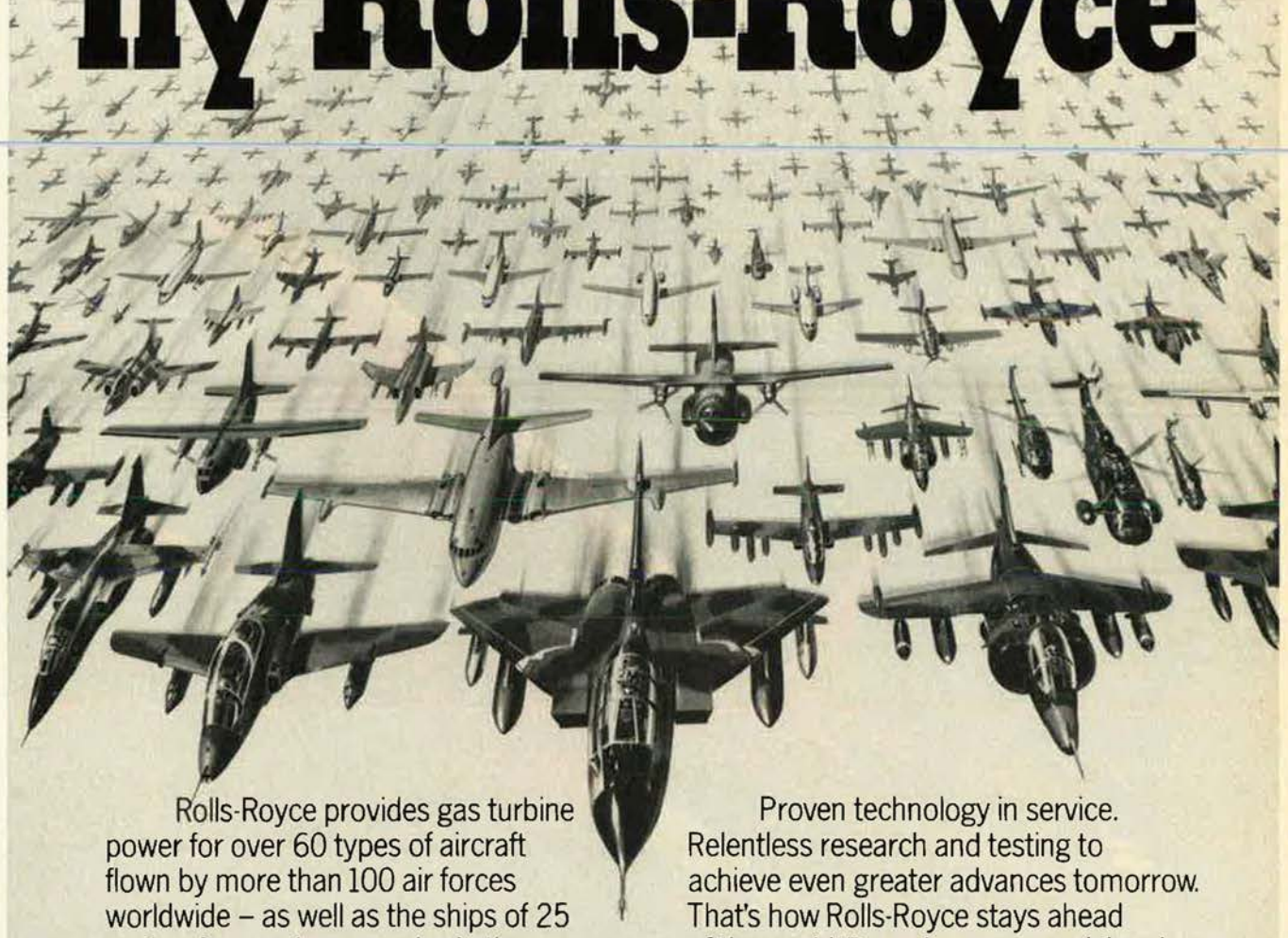
Col. Willard W. Stukey, USAF (Ret.)
Ellenton, Fla.

Bring Back the Draft

I found "The Case for the All-Volunteer Force" by Ed Gates on p. 101 of the January '82 issue to be very myopic. Stating that the improvement in the quantity and quality of recruits during FY '81 was the result of recruiting and benefit programs is questionable. In all probability, the current recession and high civilian unemployment rate are the most likely causes for the improvement in recruitment and retention.

The AVF in previous years has mainly attracted persons from the disad-

Why 100 air forces fly Rolls-Royce



Rolls-Royce provides gas turbine power for over 60 types of aircraft flown by more than 100 air forces worldwide – as well as the ships of 25 navies. A record no one else in the world can equal.

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But now there is a new state-of-the-art—the MQM-107B. Like its predecessor, it can be surface launched from a zero-length launcher with rocket booster assistance. It can be operated from remote ground control just like the MQM-107A, and recovered on command with a two-stage parachute system. In fact, the MQM-107B can do everything its predecessor did, but with greatly improved performance characteristics.

The MQM-107B utilizes an increased thrust propulsion system together with more precise digital flight control and improved 3-axis maneuvering autopilot to raise performance characteristics to a new level. Speeds in excess of 535 knots TAS are possible, from sea level to over 40,000 feet. Maneuvers requiring constant g loads up to 6 g's are no problem.

These improvements permit more precise target control and increased mission profile flexibility. For example, low altitude terrain following missions and simultaneous three vehicle flight missions can be flown. And the MQM-107B digital control system has additional computer capacity already built in to accommodate the even more stringent target requirements of the future.

In addition to improved performance, the MQM-107B has an improved payload capability with an internal volume capacity of 4.8 cubic feet. Easy access to augmentation and scoring payload and core electronics are also included in the design. And the new MQM-107B is mobile. Launch, tracking and control units are all self-contained. Relocation of a target operation is a matter of just picking up and moving.

The MQM-107B and all the various elements of its improved design have been thoroughly tested. It more than meets the military's demands for large payload volume and weight, target size, speed, altitude, endurance and precise controllability. All within a down to earth, cost-efficient system. That's technology.

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vantaged and lower-income groups. Conversely, the Soviets ensure that their military is filled with their skilled and intellectuals. Under the AVF system, our military will never be a representative cross-section of American society.

We should not forget that, to make the recruitment quotas in past years, the standards for acceptance were lowered. The majority of military supervisors will readily admit that the quality of personnel today is not equal to [that of the] recruits admitted during the years of the draft.

Mr. Gates's last paragraph, in which he contends that the most compelling reason for continuing the AVF and forgetting the draft is because of the attitudes of draft-age youth, is absolutely ridiculous! Are we to appease those few who violate the law by establishing a system that will provide for our defense with lower-quality personnel than our adversaries?

It is time we promote patriotism, prosecute law violators, and ensure our military receives quality recruits in sufficient quantity to provide for the best possible defense.

Maj. L. H. Hoffer, USAFR
Oswego, Ill.

Operation Linebacker

I am writing a book on Operation Linebacker. I wonder if any readers who participated in that highly successful operation—whether Linebacker I or Linebacker II—could contact me?

I would be interested to hear personal experiences and anecdotes about the operations in general, and any account of the unsuccessful and later successful bombings of the Paul Doumer and Thanh Hua bridges.

I would be extremely grateful, also, if anyone who has pictures would be prepared to part with them for a little while—they would be returned in due course.

Capt. D. G. R. Rosser-Owen, RAF
Studies Department
Royal United Services Institute
for Defence Studies
Whitehall
London SW1A 2ET
England

Bomber Command Museum

We are engaged in raising the daunting sum of £2.5 million to build the Bomber Command Museum at Hendon to mark the campaigns of the Royal Air Force Bomber Command and those of the US Eighth and Ninth Air Forces.

These campaigns were the longest and most sustained in military history, lasting from September 1939 to May 1945. They cost the lives of 112,000 aircrew—57,000 Britons, Canadians, Australians, New Zealanders, and South Africans, killed mainly in the night attacks; and 65,000 Americans lost in the massive daylight raids on Germany. Nowhere else was the casualty rate so high, perhaps because nowhere else was battle joined with the enemy on such a continuous and relentless scale.

The Museum will stand as a memorial to the magnificent cooperation that has existed between our two countries now for such a long time. We are working jointly with US authorities in this country, not only in the actual building of the Museum, but in the essential fund raising.

We feel that it is to individuals that we must look to raise a large proportion of the necessary funds. We invite any readers who feel that they could make a donation to contact us at the address below.

Bomber Command Museum
Appeal
Royal Air Force Museum
Aerodrome Rd., Hendon
London NW9 5LL
England

Looking for . . .

My maternal uncle, Reginald George Standerwick, did his apprenticeship with General Electric at Rugby, then had a spell with Lord Kelvin in Glasgow. He left for GE and the United States in 1910 or 1911, and was already, or became, a turbine expert.

During the war we understood that my uncle developed the superchargers for B-17 Flying Fortresses. When he came on a visit in 1947, we learned that Sir Frank Whittle's jet engine had been flown secretly to GE, and that Whittle had lived under an assumed name for weeks or months with my uncle and aunt at Marblehead, Mass.

As I am collecting material for a family history, I would be grateful for any information concerning my late uncle's career.

J. O. Roach
77 Barton Rd.
Cambridge CB3 9LL
England

Since February 1979 I have been engaged in research to reconstruct the story of the successful evasion of five Allied airmen from Occupied Europe to Spain. To say that this evasion was extraordinary would be an understatement, for it took one of the evaders no less than six months to reach Spain.

There were three American airmen and two British. I have now traced four of them; one has proven as yet untraceable. However, I do know his last known address, have his missing aircrew report, his escape and evasion report, and a photograph.

The fifth officer was Jack Donald Cornett, who was hit and bailed out over Etampes Mondesir airfield in France after his P-47 had caught fire.

Jack Cornett's last known address was 821 Mitchell St., Klamath Falls, Ore. Despite the help of the town's mayor, I could not find him.

I would like to get in touch with anyone who knows or knew Jack Cornett. He is an essential part of an important story of the war—evasion.

Hans Onderwater
4, Gentiaan
2992VD Barendrecht
The Netherlands

I am attempting to contact Ronald Dean Coleman, who was a lieutenant with the Fifteenth Air Force in North Africa and Europe and later served on B-29 #688, which was probably assigned to the 97th Bomb Wing in the Pacific.

If anyone has any information that might assist in locating this man, it would be appreciated if you contacted me at the address below.

Opal Coleman
709 E. Mesquite St.
Nocona, Tex. 76255

I need help in finding a young lieutenant I once worked with. He is Lt. Prentice Beatty, and he served with the 3d Bomb Squadron and lived in New Orleans in November 1944. He flew in South America, and his home was in either New Jersey or New York.

I look forward to hearing from anyone with information about this man.

TSgt. R. L. Shaffner, USAF (Ret.)
Rte. 1, Box 439
Conestoga, Pa. 17516

I have been trying to locate Norman and Edward Sells (Sellz?), twin brothers who flew as radar operators on B-29s from Saipan. They were members of the 498th Bomb Group, 873d and 875th Bomb Squadrons.

Norman was shot down in April 1945 over Japan, and was a surviving prisoner of war. I was sent home before I was able to find out how he was. We three were together in Great Bend,

AIRMAIL

Kan.—the boys came from Nebraska.

If anyone can put me in touch with them, I would appreciate it very much.

Murray Juvelier
152-12 Jewel Ave.
Flushing, N. Y. 11367

I am looking for my grandfather, Robert Pennington Evans. I believe he served thirty-two years in the Air Force. I last saw him in 1971 when he was living in San Pedro, Calif. He retired that year while stationed at Edwards AFB. His last known address was in Wilmington, Calif.

Any information about my grandfather would be greatly appreciated.

Elizabeth Graves
P. O. Box 93
Raphine, Va. 24472
Phone: (804) 377-2645

I am looking for Pfc. William E. Lauber II. His last known address was on 4223 Baltimore Ave. in West Philadelphia. He served with the 5th Airdrome Squadron in the European theater in 1944.

His father may have been a policeman, and he served as a communications teletype operator during the war. I'd like to contact him for a squadron reunion. (He must be living in the Philadelphia area.)

Please contact me at the address below.

Felton O. Freeman
308 E. 19th St.
Rome, Ga. 30161

My wife recently returned from a trip to England. While there, she was given a book with the following information written inside the cover:

"This book is mine—after the war return it to me, please. Capt. James L. Mehaffey, 107 Citizen St., Bay St. Louis, Miss., USA. June 1944—aboard ship to France."

The donor found it in a library aboard a German ship he purchased after the war.

Anyone who knows the whereabouts of Captain Mehaffey or his kin, please contact me at the address below. Although a bit late, I'd like to return his book.

SMSgt. Joseph G. Plante,
MassANG
126 Pine St.
Westfield, Mass. 01085

Collectors' Corner

Our unit maintains a collection of patches that we feel is among the best in PACAF, and possibly in the whole Air Force. We display the collection on the walls of the base weather station and on the walls of the hallway outside—attracting considerable interest from aircrews and visitors to base operations. At present, we have more than 1,400 patches in the collection.

We would like to continue to add to our collection, and we invite readers to contribute flying unit patches to our collection. We especially need patches from tactical fighter squadrons and special operations units.

Contributions can be mailed to the address below.

Det. 4, 1WW/CC
Patch Collection
Hickam AFB, Hawaii 96853

I am in the process of constructing super-detailed models of the following SAC aircraft: B-36, B-47, B-50, and B-52.

I would appreciate assistance from anyone who could provide me with the pilot's manual for any of these aircraft.

Also, I would like to obtain a unit patch for the 42d Bomb Wing at Loring AFB, Me.

Capt. Kenneth Nielsen,
CalifANG
P. O. Box 908
Santa Margarita, Calif. 93453

I am looking for a C-141 StarLifter model made by Mr. Igami of Tachikawa, Japan, to finish my collection of USAF aircraft I have flown.

At one time, I had one on order with Mr. Igami, but I left the Far East before it was complete and have since lost his address.

I will pay a fair price and/or a finder's fee to anyone who can lead me to one. I would also be interested in any Igami model aircraft that needs a good home!

John Apelt
1475 Cadwell Ct.
Riverside, Calif. 92506
Phone: (714) 784-2518

Does anyone have information on a source for purchasing a big belt buckle displaying a B-17?

I can find big belt buckles featuring motorcycles, eighteen-wheelers, other planes, etc., but none with an "Old Fort" on it.

Any readers with information are invited to contact the address below.

J. F. Bolger
Star Rte. 2, Box 406
Eustis, Fla. 32726

I am a former member of the 6147th Tac Control Group, K-47, Korea 1952. I am in need of a "Mosquito" patch, depicting a mosquito carrying a microphone.

If you can help me out, please contact me at the address below.

W. R. Forrester, Jr.
304 Lynch St.
Edgefield, S. C. 29824

I am a junior at Embry-Riddle Aeronautical University in Daytona Beach, Fla., and am an AFROTC cadet at Det. 157. I am majoring in Aeronautical Science and am planning on a USAF flying career.

I am very interested in collecting US Army Air Corps and US Air Force patches, but I'm having a hard time getting started. If any readers have any patches they don't want, I would greatly appreciate it if they would send them to me. (I am more than willing to reimburse mailing costs, and would cherish all contributions.)

C/1st Lt. Dean B. Marvin,
AFROTC
Embry-Riddle Aeronautical
University
Regional Airport
Daytona Beach, Fla. 32014

I'm trying to complete my collection of SAC, AAC, ESC, MAC, and PACAF patches. I am primarily looking for wing, group, and squadron patches.

If any readers have any patches they no longer want, I would appreciate having them. I will reimburse postage for anyone who requests it.

Steve Grochowski
32 Travis Dr.
Offutt AFB, Neb. 68113

I am a collector of patches and other insignia of Air Force, ANG, and AFRES units of all periods. I also collect old flight gear and clothing, along with unit histories. I have a number of Minnesota ANG patches for trade, and other units including some older fighter-interceptor squadrons.

I would be interested in hearing from anyone who would like to trade.

Joseph Dudley, Jr.
W1260 First National Bank Bldg.
St. Paul, Minn. 55101

Collector desires donations of all Air Corps/Air Force patches for upcoming book. Is your collection available for photographing? Can you send good quality photos with identification? Will purchase at a low price.

Stephen L. Robertson
1200 Kienast Dr.
Fayetteville, N. C. 28304

DEFENSE MYTHS— AND FACTS

A growing body of mythology gets in the way of rational decision-making on important defense matters. Gen. Robert C. Mathis, USAF's Vice Chief of Staff until May 31, presents facts to dispel some of the more pernicious myths floating around Washington.

BY GEN. ROBERT C. MATHIS, USAF (Ret.)

I'M NOT much on mythology, but there certainly are a lot of myths floating around Washington these days concerning defense issues. Myths have a purpose, but they don't help much when you're making serious decisions that will determine the future of the country.

The growth in Soviet military power and a vital concern over the state of our military forces have precipitated ongoing debate over our national defense today and the course the United States should follow in the future. This debate is important, and I believe that all of us in the military truly welcome the variety of opinions and creative thought that is being brought out. One of the fundamental strengths of this nation is that we freely express our opinions on any and all issues.

While I firmly believe that everyone has a right to his opinion, I don't subscribe to the idea that everyone has a right to his own facts. In the course of the ongoing debate, a set of opinions has been established and repeated to the point where these opinions have almost become accepted as fact. I would like to address some of those "myth-facts," which, through repetition, have become accepted as enlightened wisdom and truth.

Myth: We Overestimate the Threat

The requirement for national defense is established because of a threat to the nation. One "myth-fact" alleges that we can get by in today's world with a greatly reduced commitment to national defense.

It would be nice to believe that we could lay down our arms and meet our enemies at the bargaining table and make all well in the world. However, history, common sense, and a realistic appraisal of the world today don't support that contention.

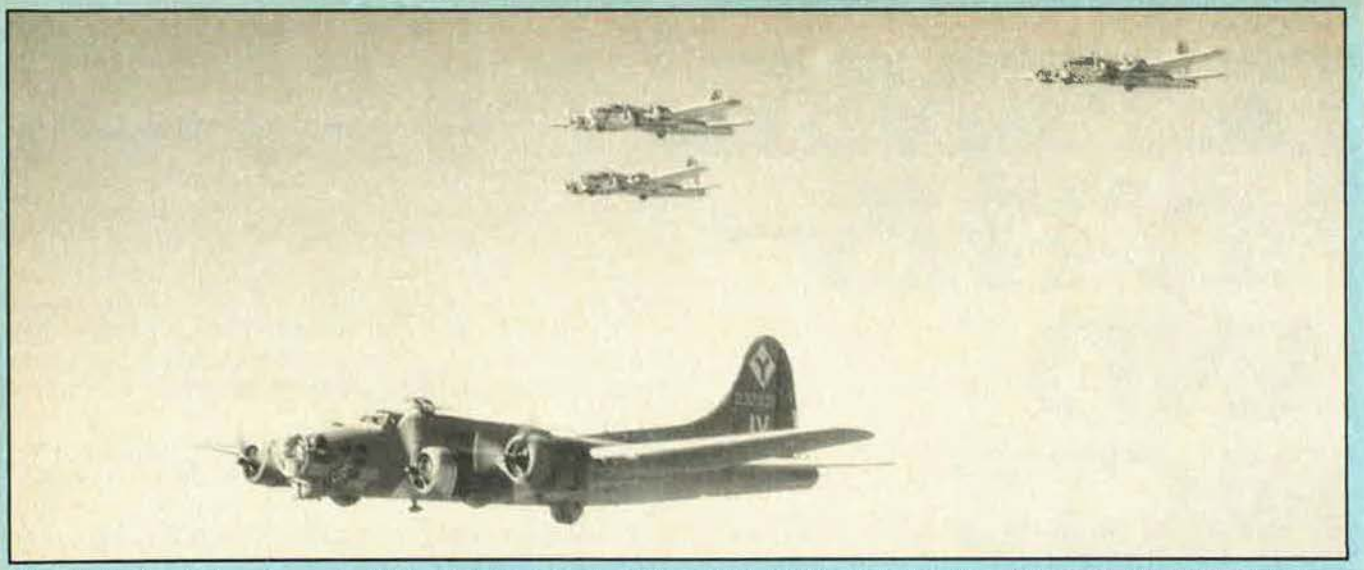
The threat we face today from the Soviet Union is very real. The persistent Soviet military buildup, particularly over the last decade, and their adventuresome activities in recent years reflect the Kremlin's drive for advantage over the West. Like it or not, we, along with our allies, are engaged in a tough, long-term competition with a capable, determined adversary.

The Soviets have outspent the United States in defense by more than $400 billion over the last decade. The American defense establishment spends almost half of its allocated budget on manpower, while the Soviets, with their source of cheap labor, spend less than a quarter of their defense budget on manpower. As a result, the Soviets are able to devote more than twice what the United States does to the procurement of military equipment.

The results of the Soviets' persistent acquisition of military power are disturbingly visible. They have modernized their tactical aviation since the early '70s from a fair-weather, short-range air force oriented to defensive operations, to a sophisticated force that operates at long range and in increasingly demanding weather conditions.

At the same time that they modernized, they maintained a fighter production rate that exceeds ours by a factor of three. In other elements of conventional combat power the trend has been the same: tanks, four to one; surface ships, three to one; and submarines, three to one. The challenge is unambiguous. While we hope for a peaceful world, we cannot slacken the pace as long as the Soviets continue on their current course.

Gen. Bob Mathis brings three and one-half decades of operational and developmental experience to dispelling defense myths.



When B-17s bombed on the second Schweinfurt mission in October 1943, 3,000 people flew the mission and 600 were lost. In a hypothetical calculation, the same ordnance on target could be delivered today with eight F-16s.

Myth: Technology Is Trouble

A second "myth-fact" hypothesizes that modern technology causes us trouble in both cost and maintainability. The "myth-makers" equate technology with complexity and high cost and draw the erroneous conclusion that we would be better off by returning to the combat-proven weapons of the past. They assert that men in simple machines did more—and did it better—than the current generation of men and machines can do today.

This thesis is simply fallacious. For example, the generation of fighter aircraft that we are fielding today—the F-15s, F-16s, and A-10s—represents the most significant increase in operational capability since the introduction of the jet aircraft itself. These aircraft are not only effective, but they are more maintainable, reliable, and easier to operate and employ than the aircraft they replaced.

Somewhere lost in the discussions of those who advocate simple solutions for complicated problems is a comparison of how much capability has changed over time. For instance, the F-16 requires less than two-thirds of the maintenance time of an F-4, while the F-15 requires only about three-fourths of the F-4 maintenance time. So while we have vastly improved the capability, we have at the same time reversed the trend toward increased maintenance.

Even the radios that we use in our aircraft have been made much more reliable and easier to maintain. The ARC-164 ultra-high-frequency radio, common throughout our Air Force today, is roughly forty times more reliable than the radio it replaced.

Mr. Keith Jackson recently illustrated the progress we have made over the years in an article published in the SAE Technical Paper Series—"Quality-Quantity and Technology—A Perspective on Fighter Development." He used the second Schweinfurt raid as a basis for comparison between the B-17, the backbone of the Eighth Air Force in World War II, and the F-16, the smallest combat-coded fighter in the USAF inventory today.

Two hundred ninety-one B-17s, plus their fighter escort, participated in the second Schweinfurt mission on October 14, 1943. Sixty B-17s were lost on that mission, each with a crew of ten. Of the 228 B-17s that made it to the target, only a small percentage was able to get their bombs within the target complex because of the smoke and haze. Actually, only thirteen percent of the bombs that were dropped impacted within that complex. Thus, in order to get that small number of bombs on the target, the Eighth Air Force had to put more than 3,000 people into the air and lost more than 600 of them.

To show you what technology has really done for us, consider how that mission could have been carried out using the tiny F-16. The F-16 can carry about twice the bomb load of the Flying Fortress, could complete the mission in one-third the time, and could serve as its own escort. Using conservative weaponeering estimates, at least seventy-five percent of the bombs dropped by the F-16s would hit the target. Mr. Jackson runs the calculations out and shows that the entire Schweinfurt raid could have been well performed with about eight F-16s and only eight people at risk.

Today, as part of our peacetime training, we routinely deploy fighter squadrons across the ocean and operate them at wartime beddown locations at very high sortie rates for extended periods. With conformal fuel tanks, the F-15 can even cross the Atlantic to Europe without tanker support, if necessary.

As a vivid example of our force projection capability, B-52 bombers recently flew nonstop from North Dakota to Egypt in Exercise Bright Star '82 and dropped their bomb loads on target within one second of their preplanned time. In that same joint exercise, we also flew paratroopers from Fort Bragg, N. C., to Egypt and dropped them in their designated landing zone within twenty seconds of their planned time. These were the longest distance bombing and paradrop missions in history. These are feats that were simply unachievable without our modern capabilities.

Myth: We Can't Sustain Combat

Another "myth-fact" asserts that, while performance has increased, we have lost the capability to fly our

aircraft at high sortie rates in combat. We keep hearing that we can't fly these airplanes like that fine P-51 in Europe in World War II or that super F-80 in Korea. In fact, I seem to remember flying a number of sorties every day in that F-80 in Korea, but what does the historical record show us?

The overall average sortie rate of Ninth Air Force during World War II was 0.26—or one flight every four days. In January 1944, the Ninth Air Force fighter sortie rate was only 0.13, a total of four sorties for the month. In December 1944, the month of the Battle of the Bulge, Ninth Air Force was only able to average a sortie per aircraft every other day. Rates varied with the intensity of combat, but rarely exceeded one sortie per day.

Even during the Battle of Britain, the most intense air campaign in history, the highest daily sortie rate achieved by the RAF was only 1.5 on August 30, 1940. A giant technological leap was taken between World War II and Korea, with the incorporation of the jet aircraft; however, the impact on average combat sortie rates was only a slight increase to 0.32 sorties per day. Again, only rarely did monthly sortie rates even approach one sortie per day in the Korean War.

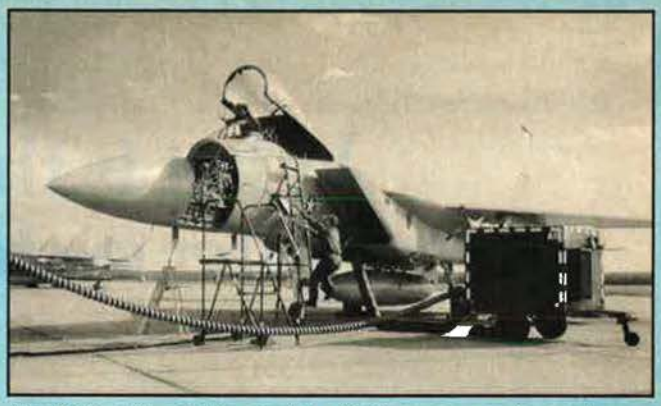
The history of that war shows that I was dead wrong in my memory of how often we flew the F-80. The Air Force was never able to achieve a flight per day for a full month during the entire Korean War in any of its airplanes.

The Vietnamese conflict produced the first large jump in sustained combat sortie generation rates. The overall rate in Southeast Asia was 0.82, and for the first time we exceeded the 1.0 sortie rate for an entire year—in 1972 with the F-4. The historic record shows that the sortie rates in the "good old days" were quite low and didn't show any improvement until the relatively recent past.

Today, the F-15s, F-16s, and A-10s are all simpler to operate and maintain than the aircraft they replaced in the inventory. They have consistently higher mission capable rates. To test our wartime surge potential, sortie surge exercises have become a way of life for the operational Air Force. Although the stress of combat introduces uncertainties, we are confident our newest generation of fighters can meet the demands of required wartime plans, and operate far more effectively, more often, than anything we have seen in the past.

The Air Force safety record is a strong indicator of the operability of the effective new fighters in the force. Last year, the tactical air force had the lowest accident rate in USAF history. The F-15 is the safest fighter in our history with a destroyed rate that is one-twentieth that of the P-51 Mustang and one-sixth that of the F-86.

We have come far since the days when I entered the Air Force. I clearly remember the days following the Korean War—and our safety records prove it—when, for a three-year period (1954–56), we lost nearly one F-86 each training day to peacetime flying accidents. Now with a far less experienced crew force we are setting safety records—a credit to the professionalism of our pilots and maintenance people, together with the operability of the machines.



The F-15, with greater combat effectiveness, requires only three-fourths the maintenance time of the F-4, as seen here at Cold Lake, Canada, during an exercise.

I wouldn't trade our Air Force for any other. We are capable and effective, not "gold-plated" and unnecessarily complex. We operate well with equipment and people who can meet our threat. In the future, we need to capitalize on our technology to increase our effectiveness, not turn our back on our primary advantage.

Myth: We Can't Afford Defense

Another popular "myth-fact" is that an adequate defense is unaffordable. Again we must compare defense spending today with the past. From 1953 to 1962, defense spending was nine to eleven percent of the gross national product (GNP) while inflation was about one to two percent. Today, even with the proposed increases in defense spending, it will only reach about six percent of the GNP.

As another point of comparison, in constant year dollars, in 1962 each individual in this nation invested $930 in defense and $430 in government cash payments and services to the individual. Today, in the FY '82 budget, the per capita defense investment has decreased slightly to $870, while our individual share of government cash and services to the individual has more than tripled to $1,540.

America spends more on alcoholic consumption each year than on the Air Force and more on entertainment than on defense altogether. Is an adequate defense affordable? I believe so. It is a matter of priorities. I am confident that a well-informed American public will support an essential disciplined defense budget.

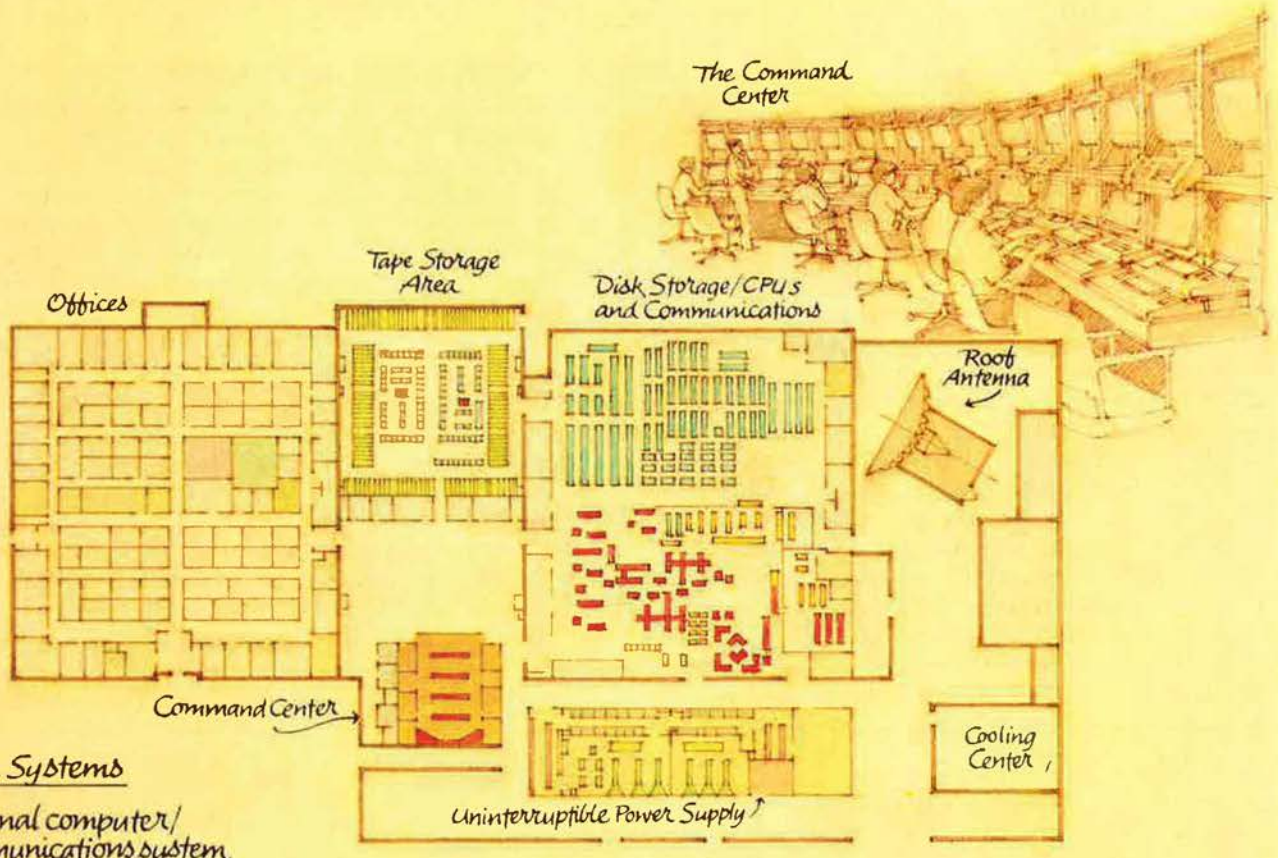
Debates over defense will go on—as they should. I hope that people, well-informed on the real problems that face us, will lend their strong support to actions we are embarked on.

The Air Force of today is strong and made up of outstanding dedicated professionals. The challenges that the Air Force and the nation face in the years ahead are staggering. It is a time when we must dedicate ourselves to the tough task at hand. I am confident we can do it. ■

Gen. Robert C. Mathis is the nineteenth general officer to serve as the Air Force's Vice Chief of Staff. A 1948 graduate of the US Military Academy, he served as a fighter pilot and forward air controller during the Korean War and as a senior military advisor in Vietnam, where he flew more than 200 combat missions. Stateside, General Mathis has seen duty in a number of key aircraft development programs and as Vice Commander of AFSC and TAC. He became Vice Chief in March 1980 and retired on June 1, 1982.

What is the first step in computer systems architecture?

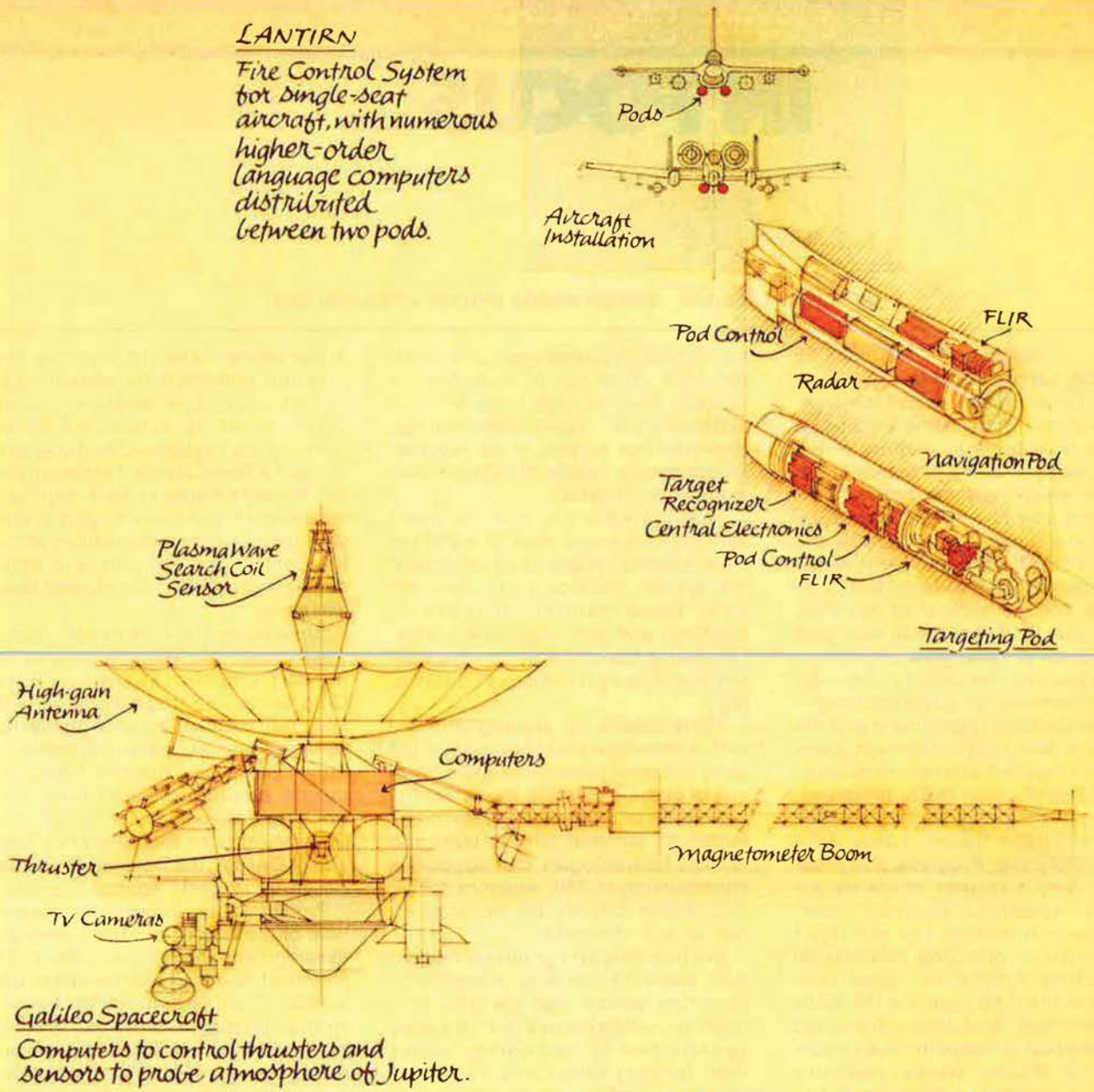
Know the languages.



Data Systems

National computer/communications system, processing 2 billion bytes of data daily.

Data Center



Computers and computer-related architectures are at the heart of today's systems for space and defense.

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The challenges are many and varied: the exploration of our solar system and beyond; the development of defense systems that operate in real time under all conditions; or the efficient management of scientific and business communication networks using multibillion-byte data bases.

The solutions are equally varied. They call for the design of systems to acquire and process data from a wide range of sensors and other input devices, plus answers—or output—in the time and format required.

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IN FOCUS...

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Washington, D.C., Apr. 29

The Big Laser Debate

The Government Accounting Office—which, as its name implies, is staffed by experts in matters of the purse rather than by pioneers of advanced weapons technology—nevertheless saw fit to cast itself in the role of judge and jury over DoD's and the Air Force's directed-energy weapons program. True to form, GAO's report is snidely critical of the Pentagon, but, in a rare break with past caviling about Pentagon "overspending," reaches the conclusion—despite a paucity of substantiation—that the Defense Department and the Air Force aren't paying enough attention to directed energy, especially Space-Based Laser (SBL) programs.

The result of the report, entitled "DoD's Space-Based Laser Program—Potential, Progress, and Problems," was a torrent of media accounts—notably on television "news" shows—concerning the military's dereliction in pursuing this crucial technology. Among the gems contained in the GAO report is the facile assertion that "one widely discussed laser weapon concept involves a constellation of laser weapon platforms in space which has the potential to provide a credible air and ballistic missile defense system for the United States." The report then adds parenthetically and petulantly, "No such defense currently exists." The report, the reader of its unclassified digest is told, was undertaken because of recent interest in Congress, DoD, and the media in space-based laser weapons.

Under the headline of "Feasibility of SBL Weapons Uncertain"—a thought few Pentagon and industry experts would question—comes the somewhat contradictory assertion that "while effective missile defense systems could not be deployed until well into the future, emerging technology has progressed to the point at which its military use is relatively clear."

After being told that SBL's military use is "relatively clear," the hapless reader—who at this point is conjuring up visions of cosmic-ray guns ionizing each other out of existence—is brought back to *terra firma* with the statement that "significant technical uncertainties remain to be resolved before even a limited first-generation weapon is possible."

That statement is then followed with the reasonable assertion that the uncertainties "relate to all aspects of the system, including the laser device; beam control; acquisition, tracking, and pointing; surveillance; command control and communications; and launch and on-orbit servicing."

There also is no arguing with the GAO's assertion that "because of the early nature of the technology, a diversity of opinion exists in the scientific, industrial, and defense communities regarding whether current laser and related technologies can support a constellation of SBL weapons for air and missile defense that would be effective and affordable."

But from this firm ground of realism GAO leaps off into *terra incognita* by asserting boldly that the SBL program should be carried out "at a pace constrained by technology rather than funding limitations as is now the case." DoD's experts—seemingly deemed incapable by GAO's visionaries of assessing SBL's military potential—are then furnished this startling advice: "One option includes an early commitment to an on-orbit demonstration to obtain knowledge relating to system integration."

Inexplicably, GAO skips over an umbrella program known as the "space laser triad," which seeks to develop and prove out the three key technologies required for space defense by means of laser weapons. The three technologies are acquisition, precision pointing, and tracking (Project Talon Gold); high-efficiency infrared chemical laser devices (Project Alpha); and mirror and beam control optics (Project LODE).

Significant improvements in fire control and precision beam direction are required before laser weapons can become useful for space defense. Hence Project Talon Gold, which uses a low-power laser to improve the pointing and tracking capability of high-energy laser weapons. Talon Gold, which is scheduled to be launched by the Space Shuttle as part of the Air Force Space Test program, will be tested against both high-altitude aircraft and space targets to provide fundamental information about fire-control requirements and other design features of space-based laser weapons.

Building on the experience gained from a laser radar tracking program at the MIT Lincoln Laboratory, Talon Gold combines these findings with improved inertial reference platforms, sensors, and alignment systems to provide laser weapons with highly accurate acquisition, pointing, and tracking capabilities. AFSC's Space Division initiated the program on behalf of DARPA, the Defense Advanced Research Projects Agency.

Project Alpha, the second component of the space laser triad, involves development and demonstration of a chemical laser suitable for space operation. Confined initially to demonstration on the ground, this project is focused on technologies that permit the design of laser devices generating extremely-high-power beams and evaluation of a scalable laser. DARPA will transfer Project Alpha to USAF once the feasibility of such a system has been demonstrated. Congress has been skeptical about chemical lasers and seeks redirection of this project toward so-called shortwavelength lasers, including X-ray systems.

The third element of the space laser weapon program is LODE, the large optics demonstration experiment. LODE is concerned with large aperture beam control for high-performance space systems and, according to DARPA, "will integrate significant advances in large mirrors, high-bandwidth fine tracking and beam stabilization, and advanced structures into an ultrahigh-performance electro-optical system."

A prime program goal is development and testing of a complex mirror that, although far smaller than even-

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EF-111A has demonstrated its ability to counter radars. As new and more sophisticated electronics are developed the EF-111A's built-in growth potential lets it adapt to meet the threat. Thus, a full complement of EF-111A's would multiply the effectiveness of defending forces many times over and give the USAF an increased deterrent to aggression.

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tually required, could meet the stringent weight and optical performance criteria of space laser weapons. Space-based high-energy lasers require very large yet low-weight glass mirrors that can be taken aloft, presumably in segments, by the Space Shuttle to focus the laser energy on targets thousands of miles away. Broad advances in a host of subordinate technologies are required before space-based laser weapons can become operational. They include large optics technologies, adaptive optics (meaning adjustable or "rubber" mirrors), lightweight space structures, high-bandwidth control systems, and precise vibration isolation systems.

While the overall task is of herculean dimension, recent significant progress in such fields as large optics technology justifies the assumption that space-based laser weapons could be tested in prototype form by the 1990s. Following LODE's hardware demonstration by DARPA—a task that will last several years—the mirror beam technology derived from the project will be transferred to the Air Force for ground-based systems integration and ultimate space demonstrations.

Dr. James P. Wade, Principal Deputy Under Secretary of Defense for Research and Engineering, testified before the Senate Armed Services Committee that a fundamental prerequisite for space-based laser weapons would be an advanced space-based surveillance system. The separate surveillance systems required for aircraft or missile targets, he said, "would be major systems developments in their own right. While the technology for such surveillance is under development, there are no current plans to deploy such systems. Also, an advanced launch system, such as the proposed Shuttle Derivation Launch Vehicle [the SDLV is envisioned to have a payload three times that of the present Shuttle] or Heavy Lift Launch Vehicle (HLV), would be required to place space-based laser systems in orbit in a single launch. Otherwise, multiple Shuttle launches and in-space assembly would be necessary."

At the same time, Dr. Wade testified, in consonance with several other ranking civilian and military laser experts, it will take until 1987 to complete DARPA's technology demonstration program. Information from this program, in turn, is needed to decide on the scope and direction of the next phase of development, which is estimated to "take about twelve more years."

While it is possible, according to DoD assessments, to fly a space-based laser weapon prototype as early as 1990, this represents a high-risk approach. Further, DoD told Congress, such a prototype would have only a limited capability for an antisatellite mission and "almost no capability against aircraft and essentially no capability against ICBM attack. We consider this option to have no growth potential, and it is not an option which we would recommend that the country pursue."

Probably the most difficult problem facing SBLs is survivability. DoD experts told the Senate Armed Services Committee that there is "little doubt" that space-based laser weapons can be destroyed by concerted enemy attack, with threats ranging from impact weapons to nuclear effects at long range.

It follows that laser battle stations need to incorporate standard defensive features, such as the ability to avoid, engage, and destroy attackers, and exhibit force structure and design characteristics that ensure reasonable survival rates.

In this context, Pentagon experts told Congress that systems patterned on this country's Miniature Homing Vehicle antisatellite (ASAT) weapon would represent a major threat to laser battle stations. Such an ASAT, when launched by aircraft or small boosters, would be extremely difficult to detect because it could approach from many aspects—including directions where the sensors of the target are blind—and during any portion of the battle station's orbit. Further, such attacks could be launched in salvos. While a space-based laser could theoretically destroy a Miniature Homing Vehicle, detecting and acquiring such a wily target in time appears to be beyond the ken of even the best available technologies.

Defense Department scientists testified that a laser battle station would also be vulnerable to a "space mine" or "fellow traveler," either a conventionally or nuclear-armed weapon that could be detonated either by ground command or preprogramming. Assuming that such mining tactics can be spotted in time, the US would have to enforce a sterile "keep out" zone around space-based laser weapons. Since nuclear effects in space retain significant destructive capability over distances of hundreds of miles, this might prove impossible.

The gravest threat to future space-based laser weapons is posed by direct ascent, one-on-one nuclear antisatellites, especially if they are heavily protected with an ablating heat shield to counter the battle station's self-defense capability. Lastly, DoD experts don't rule out the possibility of laser weapons battling each other, involving attacks on laser battle stations by laser ASATs or even ground-based laser weapons. While scenarios of this sort take on a "Star Wars" tincture, competent scientists point out that if space-based laser weapons indeed prove feasible and practical, the "attacking" laser would have the advantage over the defender.

At odds with assessments by DoD and Congress, GAO asserted that "with such long-range military potential, it is important that the SBL program be a well-structured, funded, and managed effort from the outset. GAO questions whether such a program currently exists." The present program, according to GAO, "is a funding limited approach to developing the technology for SBLs. This approach risks keeping the potentially revolutionary technology in component development for the foreseeable future."

Under the heading "Limitations of the Existing SBL Program," GAO complains without further explanation that "the SBL program is becoming a joint Air Force and DARPA effort. The Air Force is responsible for SBL weapons development while DARPA is responsible for demonstrating the feasibility of the Space Triad technologies." This arrangement seemingly does not suit GAO, for there is the cryptic recommendation to the Secretary of Defense "to establish a management structure to accomplish program objectives efficiently."

The media sensation germinated by the GAO report probably will do little toward maintaining a measured, prudently paced research and development program in the field of laser weapons technology. Micromanagement of crucial defense programs by the General Accounting Office's auditors, to judge by this effort, is not likely to strengthen America's defense posture.

The NATO Crisis

A topical new study entitled "NATO Today: The Alliance in Evolution" by the Senate Foreign Relations Committee staff concludes that now is a "particularly bad time for Congress to consider any proposal to remove US troops from Europe" because the Al-

liance faces unprecedented "multiple strains which tend to reinforce one another." As a result, the Senate Committee argued, "NATO's basic cohesion can now be threatened if policymakers mismanage certain critical issues including sanctions against the Soviet Union, US troop reductions under a revised Mansfield amendment, and implementation of NATO's dual-track decisions on intermediate-range nuclear weapons."

Proposals under consideration by both liberal and conservative members of Congress to withdraw all US troops from Europe over a short period of time "would represent such a drastic shift in US policy that its overall consequences would be catastrophic," according to the Committee report. The idea of partial or phased withdrawals, on the other hand, "does have appeal to some. But in the current political climate, any significant withdrawals would be seen as punitive and would clearly provoke an angry, confused, and divisive European reaction that would severely harm NATO cohesion."

Another US proposal—recently advanced by the Reagan Administration—also is not being looked at with favor by the Senate Foreign Relations Committee. The thrust of this proposal, that is deemed as running counter to NATO's doctrine of flexible response and forward defense, is to "place a far greater premium on the global flexibility of US forces and hold open the option of responding to aggression in one region—such as the Central Front in Europe—by retaliating in other regions.

"The key to this strategy, known as 'horizontal escalation,' rests in the assertion of US maritime superiority. Although the Administration staunchly denies that its new, more global, and offensive-oriented strategy reflects a moving away from NATO, many critics are not so sure. The critics charge that there is simply not enough money in the defense budget to build a 600-ship Navy and maintain our current force presence in Europe," according to the Committee report.

The Pentagon rejects claims of US disengagement from NATO, stressing instead that the increased flexibility derived from the horizontal escalation policy would strengthen rather than detract from current NATO capabilities. A case in point is that new carrier task forces could fight in the Mediterranean or Norwegian Seas and would not necessarily be committed to the Pacific or Indian Oceans. Similarly, programmed expansion of strategic mobility forces, in the main the acquisition of fifty

IN FOCUS...

C-5Bs, forty-four KC-10s, and high-speed transport vessels, not only boosts the effectiveness of the Rapid Deployment Joint Task Force but enhances this country's ability to reinforce NATO more rapidly.

Although the study dutifully records the Pentagon's rejoinder to critical claims concerning the horizontal escalation policy, there are suggestions of overextension and a mismatch of strategy and force levels: "Many military leaders believe that there is approximately a $750 billion shortfall between the strategy they are charged with carrying out and the resources projected to be made available in the Administration's Five-Year Defense Plan (FYDP). In Senate Armed Services Committee hearings earlier this year, Under Secretary of Defense [for Policy] Fred Iklé, as well as the chiefs of all four services, testified that the FYDP would not provide forces that would have a 'reasonable assurance' of carrying out all assigned tasks," the report says.

Delving into the nature and extent of antinuclear movements and anti-Americanism in Western Europe, the committee report claims that "many Americans tend to overemphasize the extent to which the nuclear disarmament movement in Europe is controlled by the Soviet Union. The Soviets clearly attempt to support and influence the movement in many ways, but they did not create it nor do they direct it." But, operating through national Communist parties, the Soviets have scored successes in promoting antinuclear campaigns, the report discloses.

Also, the Soviets "dominate groups such as the World Peace Council and the World Federation of Trade Unions that in turn are active in public demonstrations." Antinuclear sentiments in Europe, the Senate Foreign Relations Committee study claims, "do not necessarily correspond with anti-Americanism. . . . Favorable general opinion of the United States was the majority sentiment in seven countries surveyed in October 1981. Italy and West Germany were the most pro-American, with two-thirds of those asked expressing a good opinion of the United States. Only two of the seven countries, however, had a majority express 'confidence' in the United States."

The study found "grave concern" about the adequacy of the Alliance's nuclear deterrent, especially with regard to NATO's short-range or battlefield nuclear systems that some Europeans see "as more of a danger to the Alliance than to the enemy. In particular, critics have questioned whether the Alliance actually requires 6,000 to 7,000 tactical nuclear weapons, whether the political release procedures could be implemented in a timely fashion, and whether the devastation caused by their use on allied soil would be worth whatever military gains might be achieved."

Underscoring the widening concern over massive deployment of SS-20 Soviet intermediate-range ballistic missiles, the study found that European defense analysts fear that these weapons enable Moscow to launch massive strikes against European targets "from relatively secure launch sites on Soviet territory. These observers have also been alarmed by the continued augmentation of Soviet air defense and the declining prospect that allied interdiction/strike aircraft could penetrate to targets behind the Soviet border."

On balance, the findings by the Committee's staff experts are sanguine concerning the political viability of the Alliance, asserting that intramural squabbles are typical of the "controversies which enliven democratic societies but do not undermine their legitimacy."

Washington Observations

★ Interest is building within the Administration to transfer the Ballistic Missile Defense (BMD) program from the Army to the Air Force. The Defense Department will probably be requested to report by December 1, 1982, on whether such a transfer should, or should not, be arranged.

★ Latest assessment of the Soviet ASAT space interceptor is that it can reach altitudes of up to about 1,000 kilometers, or adequate to reach many of this country's crucial intelligence satellites at their nadir. The Soviet ASATs that demonstrated significant intercept capability are radar guided. There is evidence that the Soviets are also working on an electro-optically guided ASAT, but to date they apparently have not been able to make this technique work. US concern about the Soviet ASAT stems in part from the fact that it might be able to mount surprise attacks on US spacecraft and that, in the case of clandestine US satellites, this country might not even want to acknowledge that an attack has taken place.

★ Tentative findings from the second flight of the Space Shuttle indicate that significant improvements in the detection of deeply submerged submarines appear possible through the use of technologies now under development.

★ Senior Pentagon officials acknowledge that the latest versions of Soviet ICBM reentry vehicles (warheads) are more accurate than their US counterparts.

★ Evidence is mounting that the Soviets are developing a mobile ICBM, possibly derived from the SS-20 IRBM.

★ The Administration is well along in planning US negotiating policies for strategic arms reduction talks with the Soviet Union—now referred to as START rather than SALT. Indications are that the principal measuring standard of strategic nuclear capability sought by the US will be a combination of warhead numbers and throw-weight. SALT II, by contrast, counted only launchers, a criterion deemed unacceptable by the Reagan Administration.

The Administration also plans to count Soviet Backfire bombers as strategic systems. SALT II exempted these high-performance bombers with intercontinental range from consideration as a central delivery system. START, in the view of senior Administration officials, is to be resumed either sometime this summer or fall.

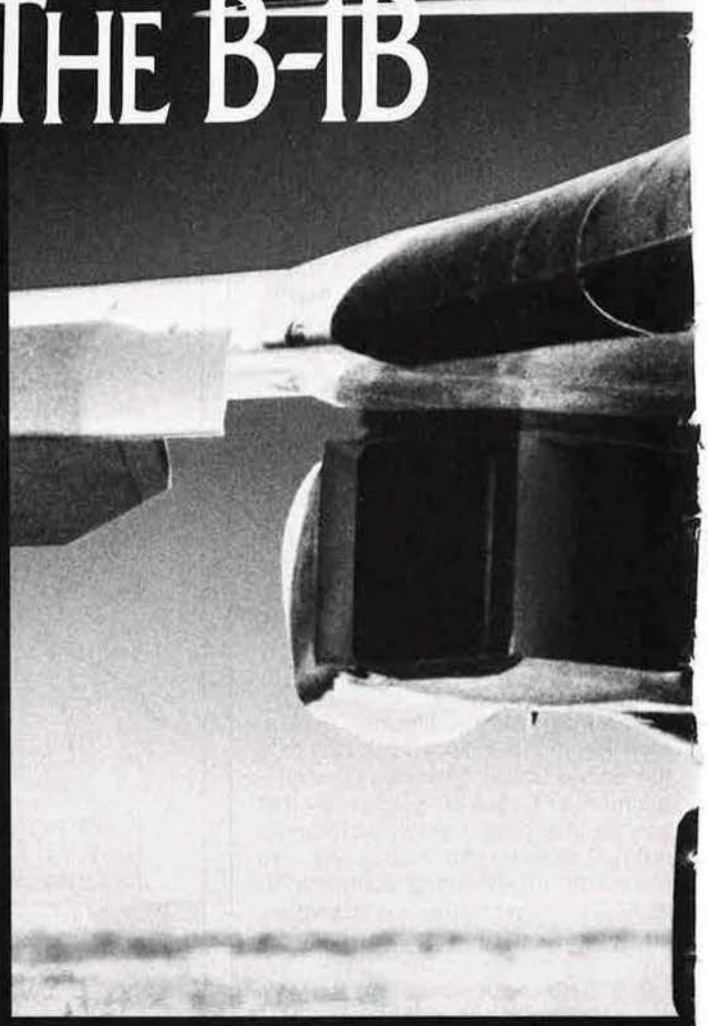
★ Secretary of Defense Caspar W. Weinberger told the Council on Foreign Relations in New York City that the Soviet Union designed its strategic nuclear forces in "such a way that can be interpreted only as offensive, not just as deterrent, forces. We also see disturbing evidence, such as their development of a refiring capability and major expenditures for civil defense shelters, that they think they can win a nuclear war—and that is a very dangerous development."

The only viable US response is "to make sure that no aggressor will ever think he could profit from initiating a nuclear attack; in short, to make sure nuclear war could not be won," Secretary Weinberger explained. This country, he added, would prefer "significantly lower nuclear force levels and we are developing a program to press for genuine and verifiable arms reduction. Contrary to popular impressions, we have not, over the years, increased the number of our nuclear weapons. In fact, we have fewer nuclear warheads today than we had in 1967—not a handful fewer but thousands fewer."

Secretary Weinberger said that the fulcrum of the Administration's defense policy was the ability to deter aggression against the United States and against its allies by maintaining the capability to respond effectively at the "lowest possible level of violence."

If conflict occurs, he said, "our defensive actions will seek to end the conflict as quickly as possible, at the point of aggression. But if a conventional war should be forced upon us, the United States and allied forces may also have to launch counteroffensives elsewhere to restore the peace and protect our freedom. The United States may take military actions that threaten Soviet vulnerabilities critical to their prosecution of the war should that prove necessary to restore peace," the Secretary of Defense pointed out. ■

A Proud Heritage In Military Aircraft Helps Assure On-Time Delivery Of The B-1B



Rockwell International's North American Aircraft Operations is fast gearing up to produce on schedule the Air Force B-1B multi-role aircraft—one of the nation's top priority strategic systems dedicated to help keep world peace.

Over the past four decades the company has produced more military aircraft than any other U.S. company including the record-setting X-15, the durable F-86 Sabre Jet and the legendary P-51 Mustang and B-25 Mitchell of World War II.

Today, the experience and skill born of that heritage are being applied to the B-1B, a versatile aircraft designed to become an essential element of the nation's deterrent force.

The ability of the B-1B to fly intercontinental distances without refueling and then streak low at ground-hugging altitudes with a wide range of payloads insures its operational use for a variety of military missions well into the next century. And, engineers are applying the latest technologies

and techniques to deceive radar as well as other detection systems.

Already more than 50 major purchase orders which will total approximately $750 million have been placed with companies throughout the United States for the B-1B, and more than two-thirds of the structural engineering drawings needed to build it have been released.

Since production go-ahead from the Air Force in January, 1982 substantial progress has been made toward the on-schedule delivery of the first airplane to the Air Force by 1985.

At Rockwell, we're proud of our aircraft heritage and we're proud to be building, on schedule, the Free World's most capable strategic aircraft: the B-1B.

Rockwell International

...where science gets down to business

AEROSPACE WORLD
News, Views & Comments

By William P. Schlitz, SENIOR EDITOR

An old war-horse about to be put out to pasture was instead saddled up for a battle charge—its first ever. The RAF Vulcan bomber, similar to the above, had recently been converted to carry conventional bombs. With in-flight refueling, it flew from Ascension Island to attack Stanley Airfield in the Falklands, part of Britain's plan to isolate the Argentinean forces and eventually bring about a cessation of hostilities. The world's first delta-wing bomber, the four-engine subsonic Vulcan initially flew in 1952, entered operational service in 1957, and, like the B-52, was designed for a nuclear-deterrent role. With the British transferring that mission to ICBM-firing submarines, the Vulcan aircraft were to be retired this year.

Washington, D. C., May 4

★ With the approach of the fourth orbital test flight, NASA already is planning major Space Shuttle modifications.

Two involve the Shuttle's solid rocket boosters and the Orbiter's thermal protection system.

With funding approval, the space agency intends to replace eight of the eleven metal segments of the current booster motor case with four segments made from filament material. Other motor components, including the metal forward and aft domes and the external tank attach segment, would remain unchanged, officials said.

The new filament-wound case will be required for high-performance launches primarily into near-polar orbit from Vandenberg AFB, Calif. The lightweight motor case will help compensate somewhat for reduced lift capabilities from the West Coast. Launches from Vandenberg would not have the added velocity provided by the earth's rotation. A lighter case would also make possible heavier payloads orbited from the Kennedy Space Center in Florida.

First use of the motor would be in late 1985. If the new case is approved, a series of test firings would be conducted by Thiokol Corp.'s Wasatch Division, Brigham City, Utah, under direction of NASA's Marshall Space Flight Center, Huntsville, Ala.

The second innovation involves replacement of the Shuttle's tiles and other refractory materials. Loss of tiles has been the source of concern, with temperatures reaching nearly 1,648°C (3,000°F) at some points during Orbiter's reentry.

Although the original materials performed well beyond expectations, NASA research continues to produce more sophisticated materials, according to Howard Goldstein, head of the Thermal Protection Materials Section at NASA's Ames Research Center, Mountain View, Calif.

As is not commonly known, the original thermal protection system was comprised of four types of heat-resistant materials effective in temperatures ranging from a relatively cool 371°C (700°F) to reinforced carbon-carbon materials effective up to 1,649°C (3,000°F).

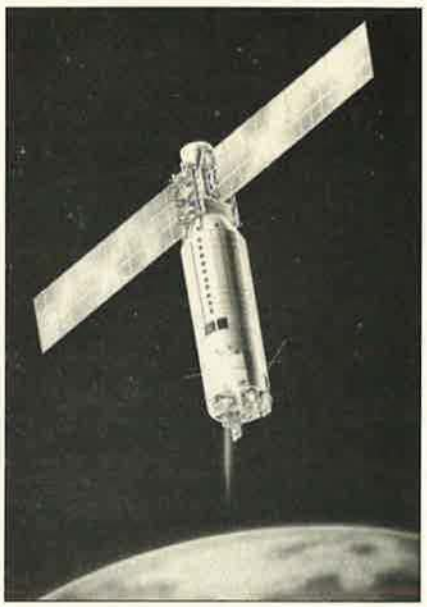
The high-temperature insulation covers about forty-three percent of the Orbiter's surface.

Another substance Ames is working on: the material that insulates the gaps between the reusable tiles.

★ The Europeans are borrowing a page from the Space Shuttle recoverable rocket booster book.

The aerospace company of Fokker in the Netherlands has developed an interstage parachute system that will make possible the recovery of the first stage of the Ariane launch vehicle.

According to officials, "Current launching procedure provides for detonation of the stage—which is more than eighteen meters [fifty-nine feet] long and weighs 16,000 kg [35,274 pounds]—following burnout and separation. Recovery of the stage promises savings of several millions of dollars per launch, since the engines and propellant tanks in particular could be reused."



Artist's concept of experimental ion-electric SERT II satellite shows thruster operating and solar panels to power internal systems. See opposite page.

The Fokker parachute system is to undergo an operational test next October during the seventh Ariane mission that will orbit a scientific satellite known as Exosat.

As is Ariane itself, development of the parachute recovery system was multinational. Overseer CNES—the space agency of France—selected Fokker as prime contractor to design, develop, and integrate the system. Irvin of Great Britain provided the main parachutes, while Autoflug of Germany supplied the control box and smaller parachutes.

The parachute system is housed in the interstage connecting the first and second stages. Fokker is responsible for series production of Ariane's two interstages and the engine frame of the third stage.

Following deployment of the parachute system and splashdown in the Atlantic, the stage would be recovered by specially designed ship, *à la* the Space Shuttle solid boosters.

★ NASA's Lewis Research Center, Cleveland, Ohio, reports that an eleven-year trial has proved the efficiency and reliability of a new type of space propulsion based on an ion-electric rocket engine.

Named SERT II for Space Electric Rocket Test II, the engine holds the promise of reduced costs and extended life for many future space payloads, officials said.

One use of the ion-electric engine would be to provide propulsion for spacecraft and satellites launched by conventional chemical rockets. Also, for instance, communications satellites orbited by Space Shuttle could be boosted into 22,300-mile-high geostationary orbits via the ion-electric engine. Other uses visualized include "steering" deep space probes and, closer to home, helping satellites in station-keeping—minute positional changes to retain precise orbits.

While the ion-electric engine is less powerful than its conventional counterpart, its relative longevity is much greater. And a cluster of such engines on a spacecraft or satellite free of the earth's gravitational forces could provide years of propulsion, officials said.

Citing statistics, Center officials said that during SERT II's eleven-year odyssey it circled the earth 56,143 times, traveled 1,600,000,000 miles during 100,000 hours in space, executed 6,000 commands beamed to it from the Lewis ground station, and transmitted 5,000,000,000 bits of information during some 40,000 hours of operation.

Backseater Lands F-4C After Bird Collision

With the pilot unconscious and wind howling through the shattered canopy, an Idaho Air National Guard F-4C was brought down safely on April 8 with navigator Lt. Fred Wilson at the controls. He had never landed a Phantom jet before.

Wilson, thirty-two, in civilian life is a gas pump repairman and serves with ANG's 190th Tactical Reconnaissance Squadron in Boise, Idaho, as a navigator and weapon systems officer.

The harrowing experience began at sunset about 100 miles west of Boise over the desert in eastern Oregon with Capt. Gregory Engelbreit, thirty-five, flying the high-performance photoreconnaissance aircraft on a routine low-altitude training mission. Captain Engelbreit's civilian job is with Hewlett-Packard electronics in Boise.

What was believed to be a Canadian snow goose then hit the aircraft. The impact smashed Captain Engelbreit's shoulder and dislodged his oxygen mask—incapacitating him and breaking off communications. Wilson immediately took the controls and climbed to a higher altitude to avoid mountains.

Maj. Bill Miller in another Idaho ANG Phantom heard Wilson's "mayday" and with the help of the FAA radar at Salt Lake City intercepted the crippled aircraft. He then flew on its wing to Mountain Home AFB, about 135 miles from the collision.

The two aircraft flew formation right onto the runway, and despite his injuries Captain Engelbreit managed to lower the landing gear, a crucial maneuver since it can't be done from the backseat. He was then medevaced by helicopter to a Boise hospital.

Lieutenant Wilson holds a private pilot's license and from time to time takes control of the F-4 during training missions. His first landing experience, though, came in the emergency. "There's not a pilot in the unit who doesn't want the only other guy on board the plane to be able to fly. I guess it makes good sense," said Lieutenant Wilson in an understatement.

In the US, bird strikes occur the year around, increasing dramatically during the spring and fall bird migrations. Annually, aircraft encounters with birds average about 1,300 at the cost in damage of about $20 million. The estimated worldwide cost yearly is about $1 billion.

About seventy-five percent of aircraft bird strikes take place in the vicinity of airports, with jet engine ingestion being a present and growing hazard. Low- and fast-flying helicopters are viewed as being particularly vulnerable.

The Air Force, in conjunction with FAA, is establishing a radar ornithology program to track migrating flocks of birds and alert aircrews to their presence. Its tactical aircraft often operate in low-altitude ranges where birds are most likely to be encountered, and USAF has generally led the way in developing bird-hazard prevention techniques.

While both military and civilian pilots tend to downplay the danger of bird strikes, here is one sobering prospect: A two-pound bird will hit an aircraft flying at 500 mph with an impact force of 50,000 pounds.

—BY DAVID R. FRAZIER

Idaho ANG Lt. Fred Wilson inspects the shattered windscreen of the F-4C he landed from the backseat following a bird strike. A navigator, he had never before landed a Phantom. (Photo by David R. Frazier)

During the last year of SERT II's flight, all power processing components were fully functional and all onboard systems were operable, including temperature and attitude controls, horizon scanners, the backup

cold gas system, and command system.

SERT II weighed 3,300 pounds (1,497 kg). Its main body was twenty feet long and five feet in diameter. At one end were two ion-electric engines and at the other two deployed solar cell arrays to convert sunlight into electricity to operate the experimental engines and other equipment.

The next space test of an ion rocket engine is to take place in 1983, with more powerful versions under study and being considered as main propulsion clusters for future spacecraft.

The electric rocket engine is called an ion thruster because thrust is produced through the rapid controlled discharge of ions created by the ionization of atoms of the fuel supply—in this case liquid mercury.

The engine was invented and demonstrated at the Lewis Center by Dr. Harold R. Kaufman in 1958. SERT II was launched into polar orbit—never out of sunlight—in February 1970.

★ In another propulsion matter, an improved space motor developed under the supervision of USAF's Rocket Propulsion Laboratory, Edwards AFB, Calif., is being hailed as a "new-generation" space motor.

Officials said it could increase the weight of future payloads being launched from Space Shuttles and other spacecraft by as much as forty percent.

The mushroom-like solid fuel motor, known as the Improved Performance Space Motor-II (IPSM-II), was developed by Thiokol Corp.'s Wasatch Division, Brigham City, Utah, and successfully tested recently at Arnold Engineering Development Center, Arnold AFS, Tenn.

The new motor was specifically developed as a powerful booster to place satellites and other payloads deeper into space or at higher earth orbits after being carried aloft by the Shuttle or other launch vehicles.

According to AFRPL program manager Rafael Felix, IPSM-II incorporates a high-energy solid-propellant fuel contained in a unique composite materials casing to give the motor a higher impulse rate and significantly more thrust than similar size motors.

IPSM-II weighs about 7,800 pounds (3,538 kg) and is sixty-three inches in diameter at the casing's maximum width. It is 116 inches long including the fully extended exit cone.

An advanced nozzle and trapped-ball thrust vector control system were also tested during the recent firing. The nozzle is made of advanced carbon-carbon materials.

The motor is being evaluated with a fixed nozzle for possible use with spin-stabilized payloads.

★ The Deputy for Range Instrumentation, Eglin AFB, Fla., recently received the first test model of what will be the largest production program in the organization's history.

The Modular Threat Emitter (MTE) is designed as a low-cost threat radar emitter simulator. The first unit is to undergo extensive testing during a ten-month program. In addition, said officials, environmental testing of the unit has begun to determine functional

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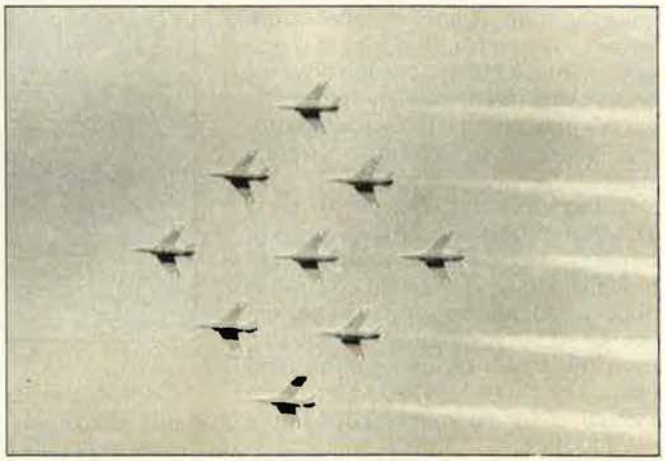


Three finalists in a photo contest—"Spirit of Flight"—that will be part of an exhibit touring the US. Left, "Self-Portrait in a T-33A," by Capt. Walter P. Shiel, Elmendorf AFB, Alaska; below, "British Red Arrows," by Tony Linck; and, below left, "Canadian Air Force's Snowbirds Demonstration Team," by Monte Maxwell. The contest was conducted by the Aviation Hall of Fame of New Jersey at Teterboro Airport and sponsored by Minolta Corp.'s Photographic Division.

capability under extreme weather conditions.

As a training device, the MTE will be deployed worldwide to introduce Tactical Air Force combat crews to a realistic electronic warfare environment. According to MTE program manager 1st Lt. Frank Hicks, "The MTE is capable of simulating selected aspects of three missile threats on a 'one-at-a-time' basis.

"The MTE is a modular system, allowing each missile to be simulated by changing a set of the total system. This will allow the system to be expanded with new threat modules, provide lower life-cycle costs, and keep production costs down."

A computer controls many operational and diagnostic functions of the emitter. The entire system is designed for transport aboard a C-130.

Production of the MTE is expected to begin during FY '83 and continue through 1988, "significantly enhancing USAF's capability to provide realistic electronic warfare training."

★ With added emphasis on tactical missions at night, the Air Force is developing pilot vision aids for both in and outside the cockpit.

Aeronautical Systems Division, Wright-Patterson AFB, Ohio, is looking closely at electroluminescent (EL) lighting systems for runways, cockpits, and aircraft external lights, for example.

EL light uses a zinc-sulphite phosphor base that, when excited by an alternating current, releases photons—or light. One of EL's advantages is that it produces little or no infrared and thus is more compatible with pilots' night-vision goggles. The goggles amplify infrared, resulting in vision distortion in the cockpit.

EL lighting has been installed on an HH-53 and UH-1 aircraft, both used in low-level night rescue missions, and on an AC-130 and MC-130. The unique lighting is scheduled to be installed on a C-130 adverse weather aerial delivery aircraft at Pope AFB, N. C., and on six A-10s of the 57th Fighter Weapons Wing, Nellis AFB, Nev. While A-10 pilots do not use

Despite Obstacles Korean Air-to-Ground Range Goes Operational

In a remote, mountainous area of South Korea, the country's first air-to-ground range is now in operation. Activation of the Korean Tactical Range, or KOTAR, is the culmination of an arduous effort by people of the Air Force Communications Command.

Prior to KOTAR, all tactical air-to-ground range training in the Pacific took place at the Crow Valley range in the Philippines. Operational obligations and costs thus kept visits to Crow Valley by South Korea-based aircrews at a minimum.

It became recognized that realistic air-to-ground training was essential to tactical readiness in Korea. After negotiations and delays, in July 1980 an agreement was reached whereby Korea would provide the buildings, real estate, and targets. For its part, USAF would be responsible for the communications/electronics systems and equipment.

Although final program approval came in March 1981, funding delays pushed back actual equipment installation until three months before the scheduled January 1982 activation date. Also an obstacle was the remote location of the site. Korea's weather wasn't a help.

But when PACAF elevated the project to the top of its priorities list, the communicators were able at last to get to work. Program Manager TSgt. Mel Dymond of the 1843d Engineering Installation Group, Wheeler AFB, Hawaii, pressed his search for equipment. In developing a master plan, surveying sites, defining manning, and ordering equipment, great credit should be given to the 2146th Communications Group, Osan AB; the 1843d at Wheeler; and the Pacific Communications Division headquarters at Hickam AFB, Hawaii.

Members of AFCC's Engineering and Installation Center, Oklahoma City AFS, Okla.; AFSC's Armament Division, Eglin AFB, Fla.; and the 1827th Electronics Installation Squadron, Kelly AFB, Tex., engineered and installed two systems for scoring pilot bombing accuracy despite uncompleted buildings, harsh living conditions, and limited water. They even did their own cooking.

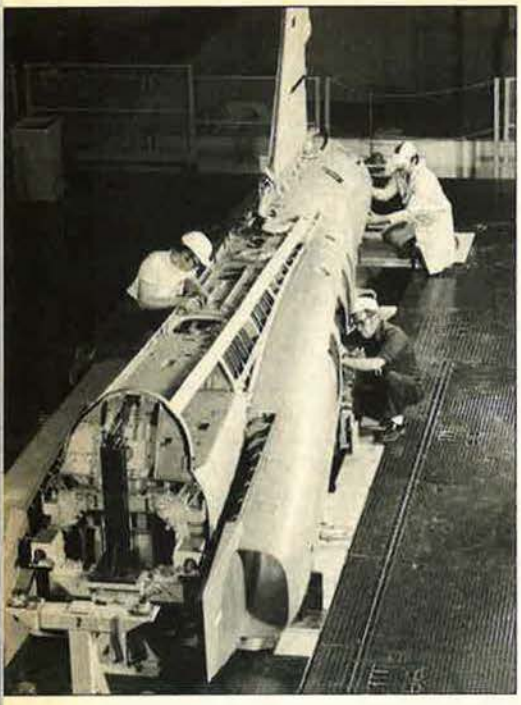
In October, the high-frequency radio installation was completed; UHF/VHF radios, weather teletype, and phones were installed and intrabase radios were deployed. Spearheading these and other efforts were Capt. Larry Taylor of the 2146th Communications Group, and CMSgt. Delmar Lee, 1837th Electronics Installation Squadron, Yokota AB, Japan.

A twenty-two-person unit headed by Maj. James Davis and Andy Rack engineered and installed the integral microwave system. These members of the 2146th's Operating Location-D activated microwave links at a dozen sites throughout Korea during extreme weather and by improvising equipment.

The communicators begged, borrowed, and built. They worked on mountaintops in ice and snow and gave up their holiday leave.

In January 1982, people from Operating Location-B of the 2146th and Detachment 2 of PACAF's 51st Composite Wing, Osan, moved in and began operations. The communicators had made it happen. —BY CAPT. ANIDA WISHNIETSKY, USAF

Sgt. Robert Foley installing a high frequency antenna during construction of the Korean Tactical Range, KOTAR. (USAF photo by TSgt. Bertram W. I. Mau)



At Northrop's facility in Hawthorne, Calif., workers mate the center and aft fuselage sections of the first F-5G Tigershark, latest in the series of tactical air defense fighters set for first flight this fall.

night-vision goggles, project manager Maj. Chet Pieroway commented, "producing more uniform low-level light, the EL systems reduce glare and reflections."

Exterior use of EL is being considered for A-10s because incandescent systems blend in with the stars, increasing the difficulty of locating other aircraft such as wingmen. EL lighting, on the other hand, presents a distinct contrast and does not flicker like incandescent lights. Crew station lighting designs are also to be verified.

"The Navy, Marine Corps, and NASA also are interested," said Major Pieroway. "We're looking at applying EL lighting to parachutes, paratroopers' clothing, ships and carrier decks, combat field lighting, and the Space Shuttle. The applications seem endless."

★ In April TAC initiated a new security police exercise program dubbed "Silver Flag Alpha." It's an ambitious undertaking bent on training security police to defend air bases.

It kicked off at a site thirty-three miles north of Nellis AFB, Nev. Participating in the initial two-week training period was a ground defense flight of forty-four people from the 325th Security Police Squadron, Tyndall AFB, Fla.

AEROSPACE WORLD

Silver Flag Alpha involved tactical training with M-60 machine guns and M-16 rifles provided with Multiple Integrated Laser Equipment Systems (MILES). Tactics included land navigation, desert survival, desert camouflage, forward operating location occupation, and offensive and defensive techniques. An AC-130 gunship deployed from the 1st Special Operations Wing at Hurlburt Field, Fla., and flew missions in support of the ground defense force as it practiced defensive operations.

By next fall, officials hope to see Silver Flag Alpha fully operational and capable of exercising some 200 TAC security police each month.

★ Now that Congress has reversed the regulation disallowing multiyear contracting, AFSC's Electronic Systems Division plans to save the taxpayers about $16 million.

Under a $193 million multiyear contract, the first ever awarded by Electronic Systems Division, Raytheon Co. of Sudbury, Mass., is to supply USAF with 110 transportable, digital, troposcatter radio terminals to improve battlefield communications.

The long-term commitment allows the contractor to purchase raw materials in larger amounts and produce units in economical quantities, commented Lt. Col. Vollie C. Fields, Jr., of the Electronic Systems Division.

The new AN/TRC-170 terminals are smaller, lighter, and have about twice as many voice, data, and teletype channels than units currently in use. They also operate over greater distances and have a coding feature to prevent enemy interception of military messages.

Two versions are being produced. For distances of 150 miles, the radio equipment is packaged in a box-like shelter and uses two fifteen-foot-diameter, dish-type antennas mounted on tripods. It can be transported by truck, rail, helicopter, or cargo aircraft and be set up within four hours.

A second, smaller model has 100-mile range and resembles a pickup truck camper. It is equipped with two six-foot antenna dishes mounted on a trailer.

Delivery of the first radio is expected by December 1984.

INDEX TO ADVERTISERS

★ This year marks the fiftieth anniversary of two of a famed aviatrix's most spectacular feats: on May 20, 1932, Amelia Earhart became the first woman to solo the Atlantic nonstop, only five years to the day after Lindbergh's transatlantic flight. Then, in August, Miss Earhart flew solo from coast to coast, the first woman to do so.

With these and other accomplishments, Amelia Earhart proved that women could become proficient professional pilots and also focused attention on aviation as an up-and-coming mode of transportation.

The bright red Lockheed Vega in which Miss Earhart made those flights is on display in the Pioneers of Flight gallery at the Smithsonian's National Air and Space Museum in Washington, D. C. Her life and career will be the subject of a Museum symposium on June 18 featuring lecturers including both personal friends and aviation researchers who have studied her mysterious disappearance over the Pacific in 1937 while attempting the first round-the-world flight by a woman.

More modern aerospace pioneers will be Sally K. Ride, thirty, and Guion S. Bluford, Jr., thirty-nine, respectively the first American woman and first black American to travel in space.

An expert on the mechanical arm that will be used to deploy satellites from the Space Shuttle, Ride has a doctorate in astrophysics from Stanford University and has been in astronaut training since 1978. She'll be a crew member aboard the seventh Shuttle flight next April.

USAF Lt. Col. "Guy" Bluford is a pilot and a veteran of more than sixty combat missions in Southeast Asia. A graduate of Penn State's engineering school, Bluford has been named to the four-person crew of the Shuttle's eighth orbital mission scheduled for next July.

Amelia Earhart vanished somewhere in the Pacific while flying this Lockheed Vega in the first attempt by a woman to make an around-the-world flight. This year marks the fiftieth anniversary of several of the aviation pioneer's feats. See item.

Spain's CASA aircraft manufacturer has delivered this first of three STOL-capable C-212 series 200 military transports to Panama. Other Central American nations interested in the light transport are Costa Rica and Nicaragua. Although designed primarily to deliver military cargo, troops, and parachutists, the aircraft can be quickly reconfigured for civil flights. Some 220 have been built thus far to fill orders by twenty-seven countries worldwide.

★ **NEWS NOTES—The USSR orbited a new unmanned space station in mid-April** in preparation for what Western observers think will be a mission involving a French astronaut this summer. The launching of Salyut-7 is seen as the next step in the Soviet goal of **establishing a permanent station in space** to be occupied by rotating crews of up to twelve cosmonauts.

The Aviation/Space Writers Association presented **a national award to Edgar E. Ulsamer,** Senior Editor (Policy & Technology), and AIR FORCE Magazine for Ulsamer's article, "The Long Leap Toward Space Laser Weapons," which appeared in the August 1981 issue. The award was presented on May 5 during the national Aviation/Space Writers meeting at Fort Lauderdale, Fla.

Died: Lt. Col. William C. Lambert, USAF (Ret.), highest-ranking surviving World War I ace following the death of Eddie Rickenbacker who was credited with twenty-two victories with the Royal Flying Corps; served in World War II; and the Reserves thereafter, of undisclosed causes in Ironton, Ohio, in March. He was eighty-seven. ■

Double Coverage:

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CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., Apr. 23

House Panel on MX

The House Armed Services Committee said expeditious deployment of MX is vital, and it emphasized again that "deceptive basing, accompanied by the *threat* of a ballistic missile defense, is the best choice for national security and is technically feasible."

The House panel, however, made reductions in ballistic missile defense (BMD) development by halving the Army request and cutting USAF BMD-related efforts from $109 million to $33 million. "The committee believes that funding for . . . [BMD] efforts should be reduced below that requested until the various issues surrounding the implications for the Antiballistic Missile Treaty are thoroughly investigated and until the committee is aware of the basing system for which the Ballistic Missile Defense is being designed."

The authorizing panel deleted funds for studying an air-launched basing scheme for MX and cut procurement funds for missile basing by fifty percent. The committee position will probably be subject to further cuts on the House floor, including amendments to follow the Senate, and defer production of the first nine missiles, eliminate interim basing, and require a decision on permanent basing by December 1.

Authorization Changes

The $180 billion DoD authorization bill, $3 billion less than requested, passed by the House and Senate Armed Services Committees could be somewhat undone once a budget is adopted. Congressional sources predict the budget agreement between the White House and Capitol Hill will include a $30 billion defense outlay cut for the period FY '83–'85. This is expected to provide a seven percent real growth rate, instead of the 10.5 percent planned.

It will probably be up to the Appropriations Committees to make the cuts to fit with the budget resolution. Some Defense and congressional sources think part of the savings may come from "juggling" accounts, specifically adjustments in the fuel and inflation figures.

B-1B Costs Questioned

Rep. Joseph Addabbo (D-N. Y.), chairman of the House Appropriations defense subcommittee and a vocal B-1B critic, refused to accept USAF testimony on the program because, he said, DoD had not provided his panel access to B-1B cost analyses prepared by the Air Force and the Office of the Secretary of Defense. The congressman alleged this indicates the projected program cost of $20.5 billion has already been exceeded.

USAF special assistant for the B-1B, Col. Jim Evatt, denied the allegation, saying the B-1B is "on schedule with all four associate contractors . . . is in excellent condition in cost and schedule, and the projected cost is certainly achievable." These facts must be impressive, he said, "even to those [in Congress] who say B-1B isn't the way to go."

Having come through the authorizing committees unscathed this year, little problem was expected with the program in Congress. But with a recent effort in the House Appropriations Committee to rescind all FY '82 B-1B money for transfer to the student loan program having been defeated by only five votes, getting the cost data to the committee is vital. Air Force spokesmen insist DoD will provide Representative Addabbo with the requested information to assure FY '83 funding—$4 billion in procurement and $750 million in R&D.

C-5B vs. 747

A hearing on airlift needs provided Sens. Sam Nunn (D-Ga.) and Henry Jackson (D-Wash.) with a forum to elicit from senior Army, USMC, and USAF officers the pros and cons of the Lockheed C-5B and the Boeing 747. Because of severe shortages in outsize cargo capability, the Air Force chose to augment its airlift forces with fifty C-5Bs and forty-four KC-10s. The decision was a result of the Congressionally Mandated Mobility Study, which found that an additional 25,000,000 ton-miles of airlift per day, 10,000,000 for outsize cargo, was needed.

Senator Jackson, representing the home state of Boeing, contends the current fleet of seventy-seven C-5As can meet outsize cargo needs. Thus, he believes the near-term shortfall shifts "to additional airlift capability to haul oversized and bulk materials which constitute seventy-three percent to eighty-five percent of the airlift requirements. . . ." He feels that purchase of new and used commercial wide-body 747s with greater range, payload capability, and speed would be the cost-effective solution.

Pentagon witnesses, on the other hand, stressed that the need for outsize airlift capability is acute and growing, and only the C-5B has the unique military capabilities to carry the wide range of Army and Marine Corps firepower without being disassembled. Despite the higher cost for the C-5B—$1 billion more over a twenty-year life cycle and $7 billion more in acquisition—the pronounced need for outsize cargo carriage warrants the added funds.

The House and Senate Armed Services Committees have thus far authorized the first two C-5Bs; whether the funds will be appropriated for the program is questionable.

Titan II Revival

Foes of the Administration's plan to retire early the fifty-two Titan IIs, led by Sens. James Exon (D-Neb.) and Carl Levin (D-Mich.), succeeded in getting the Senate Armed Services Committee to authorize $74 million for their retention through FY '83. The phaseout of the ICBMs, which was to have begun next October at the rate of one per month, was planned as a budgetary move to save $500 million over five years. Opponents argue that it would have meant a unilateral drawdown of forces, especially in total megatonnage, before a replacement system (MX) was operational. The House took no similar action, but there is reason to believe that the House will eventually side with the Senate and add on the $74 million. ■

The uses of space are by now ubiquitous and commonplace, yet to many "space" still has a science-fiction aura. To understand US use of space now, and to look ahead, AIR FORCE Magazine interviewed the Commander of Space Division. He begins by pointing out that . . .

Space Is a Place

AN INTERVIEW WITH LT. GEN. RICHARD C. HENRY, USAF
COMMANDER, SPACE DIVISION

BY F. CLIFTON BERRY, JR., EDITOR IN CHIEF

AIR FORCE Magazine: General Henry, could you start by defining "space"?

General Henry: Well, to define "space," first I would say that space is a place. It's a place where the laws of aerodynamics do not apply, and things in space move in ballistic trajectories or according to the Keplerian laws of motion about planets. And everything we do in space is a function of the kinds of orbits that we have around the earth. We first started to use this place called space as an avenue of destruction in 1945 with the German V-2 rocket. And we used it again in the mid-fifties when we moved into the era of intercontinental and intermediate-range ballistic missiles. It continued to be a potential avenue to the future Armageddon that we all dread. But as we have been putting things into space that stay there, one can argue that perhaps we now have the opportunity of turning this place called space from an avenue of destruction into an opportunity for peace.

AFM: Is that the concept of the deterrence of truth you've mentioned before?

General Henry: Well, perhaps, and it's in this context that many, many times over the years we have looked at the use of space for the military forces—the Department of Defense—to find out what the military mission really is. The only practicable military mission that we have come up with yet is still the collection, movement, and dissemination of military information. That is, of course, a very important adjunct to our operating commanders. It's been recognized by the current Administration, which has given the expression "C^3I"—command control communications and intelligence—a priority equivalent to that of the B-1 and the MX and the Trident as part of our strategic modernization. Certainly, if we had the C^3I that space gives one the potential to have, we would have strategic options that we do not have today.

AFM: Can you give us some examples of those options?

General Henry: The most important example is confidence in what one knows. Today we use the concept of dual phenomenology to be assured that indications are validated. But if one had total confidence that one could communicate, if one had total confidence in the knowledge that one receives through communications, then one's knowledge and capacity to respond would be increased manyfold.

AFM: Resulting in improved decision-making?

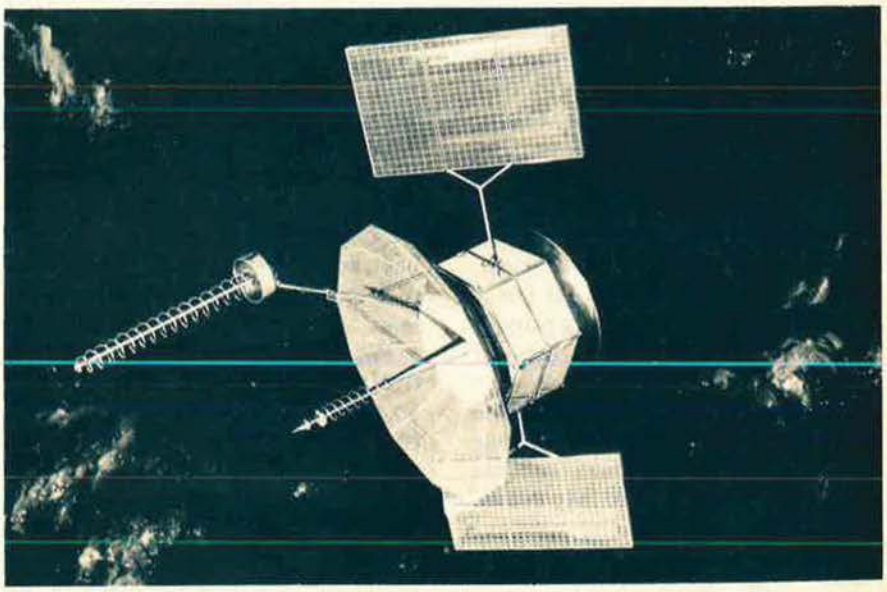
General Henry: Improving decision-making. War has always been known as a state of confusion. Writers have written about the fog of war—the confusion of battle. There are those who have said that the winner is usually the one who is least confused. Students of military history generally find that forces have been mispositioned, forces have become lost, or forces have lost communications, or did not have sufficient knowledge of the enemy, and these circumstances, many times, have made the difference between victory and defeat. Space and use of space in this way provide the opportunity to use our

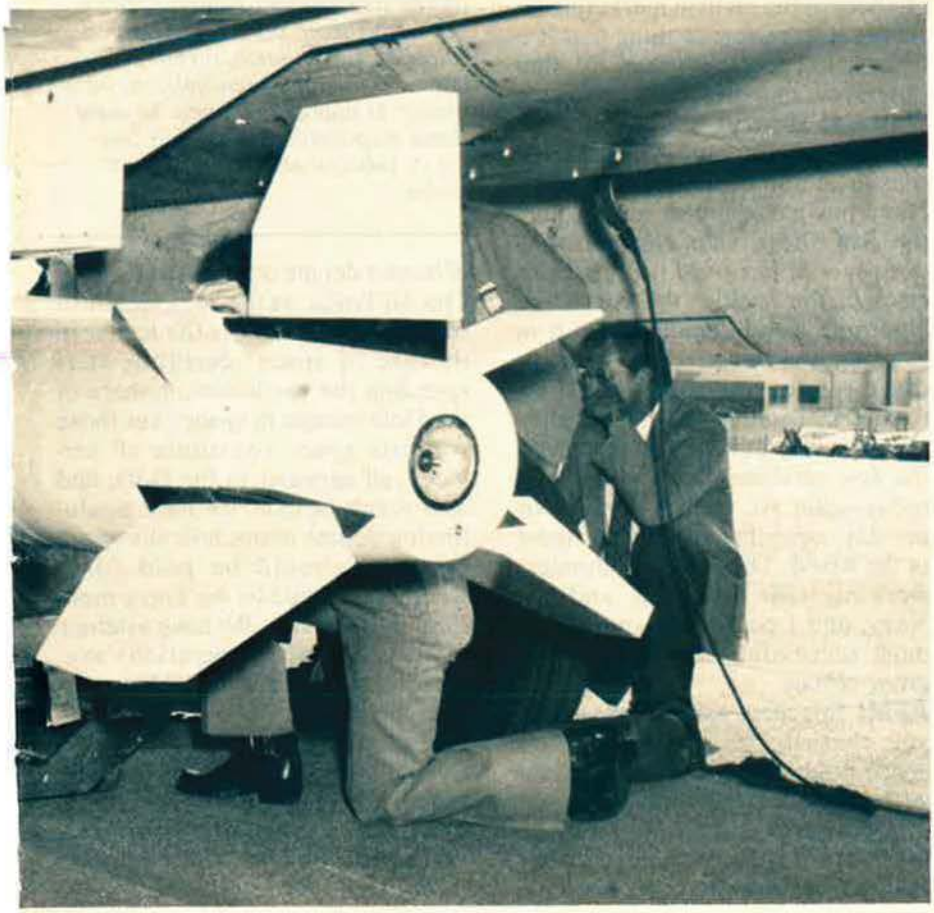
forces more efficiently. By using them more efficiently, we can have a greater probability of success.

The other aspect is that we have, through the use of space today, a literal explosion of information. You see it on the news at 7:00 o'clock at night; you see it in the weather pictures. As we know, this may or may not make a difference, but it's becoming more and more evident that the capture of the hearts and minds of people is an important thing to a nation. Space gives us the opportunity, through the providing of information, to assure that truth is known and understood.

AFM: Does using space for communication make a large stream of information available to more people than could have had it before?

General Henry: That is the tremendous potential that space offers. Today we talk about television sets that have 150 channels. We see, in real time, events happening on the other side of the world. We see the time soon when we will be receiving into our homes information beamed directly from satellites. It will be a massive education of the people throughout the world.





Below, left, USAF Space Division and Boeing engineers complete a fit check between the prototype SRAM/ALTAIR antisatellite missile and its F-15 carrier. Above, left, artist's concept of a satellite of the Navstar Global Positioning System, that provides unprecedented location fixes in three dimensions. Above, the FLTSATCOM system is used by Navy, Air Force, and National Command Authorities.

AFM: Would you characterize Space Division as a provider of information to its customers? Is that one way to look at Space Division?

General Henry: I would say the better characterization is the provider of the instruments that permit the flow of information to our customers. We provide the instruments that allow the collection, distribution, and dissemination of military

information. The deliverable product we provide to our customers is military information, in the form of an electronic bit-stream. Sometimes we generate it and sometimes we repeat it, but our mission in life is to assure that this bit-stream goes to the operating commanders, wherever they may be in the world.

AFM: How are you bringing the uses of space or the products of your effort to the people in the field, wherever they may be?

General Henry: I have said sometimes in the past that our objective was to bring the use of space down to ships, squadrons, and battalions. That brings up two key points: The first is that every space system we put up is either national in character or serves more than one service. We talk about the Air Force in space, and, to the extent that the Air Force is in space, the Air Force is providing service to more than the Air Force.

Every communications satellite that I have services more than one customer. The navigation satellite program serves the Army, Navy, Air Force, Marines; the weather satellite program services the Air Force, Army, Marine Corps, Navy, and so on. A spacecraft on orbit knows no geographic boundaries by definition because it goes around the world and is worldly in nature and knows no corresponding service boundaries.

What we are trying to do is provide the spacecraft with sufficient power and sufficient signal strength so we can move away from the forty-foot, sixty-foot antennas and the very expensive terminals that we have in some of our aircraft, to affordable terminals that are small enough to be used by battalion commanders or squadron commanders or in small airplanes or in small ships.

The Navy is making great strides in this regard today with its fleet broadcast system that operates in the UHF frequency regime. It uses four satellites that we have stationed over the East Pacific, West Pacific, Indian Ocean, and Atlantic Ocean to connect its fleets together. The Air Force uses those same satellites to interconnect its strategic bombers with command posts back home.

AFM: Is the Global Positioning System an example of something with the small terminal?

General Henry: The Global Positioning System (GPS) is the classic example. It is a navigation system that has been characterized by some as the most profound development of this decade, because it improves our positional navigation by yet another order of magnitude. That is the third order of magnitude improvement in navigation since I was a second lieutenant. When I first came into the Air Force, our primary mode of navigation over water was celestial, which gave an accuracy of ten to fifteen miles. Then we moved into the inertial systems, which today give us an accuracy of a mile or two. Now if we can field the Global Positioning System, we will have positional accuracies of a tenth of a mile, which is a remarkable feat.

We achieve this accuracy with affordable equipment equivalent in size to the TACAN sets that we use today—equipment that can be carried in airplanes with small antennae. I simply do not understand the lack of support for the fielding of such a system, which has such national implications in terms of its offshoot to the civilian marketplace.

AFM: It's the sort of thing that is a natural for, say, purchase by ship operators, commercial . . .

General Henry: Every customer we have encountered has been enthusiastic about the potential. The Navy has navigated in fog through the San Diego ship channel on a destroyer, it has used it in its exercises in the Pacific; the Air Force has used it and demonstrated it in Europe, and has accomplished aircraft rendezvous, and has performed instrument approaches. It is not generally understood that, with the few satellites that we have up today—that we have a three-hour per day capability throughout most of the world. The testing continues, working with the Army and the Navy, and I consider it one of our most successful joint service program offices.

AFM: Specifics aside, how would you characterize the Air Force's space program now—is it still in research and development, is it in operations, or is it a bit of both?

General Henry: Well, I would say that the Air Force today is in a state of honest debate on the use of space. The Air Force, as the most technical service, feels that it is the leader in the use of space; certainly it is spending the predominant share of the DoD budget in space. Yet those who use space constitute all services, all agencies in the DoD, and as a result of that, we have a continuing debate about how the space program should be paid for—whether it should be Air Force money or OSD money. We have a debate as to what space operations are, whether we're still in R&D or operations.

I liken it to the historical perspective of how long we've been in space. We've been in space a little over twenty years. How long have we used the air? We've used the air, essentially, since 1905. If we add

Lt. Gen. Richard C. Henry, a 1949 West Point graduate, has served multiple tours in SAC and TAC, and as an F-4 fighter pilot in Southeast Asia. He served as a detailee with NASA in Washington and Houston in the early '60s. Air Force Systems Command's Space Division, which he commands, is located in El Segundo, Calif. It has global responsibilities that include, in addition to developing and acquiring spacecraft, the launch of military space systems and their orbital support. Space Division's deliverable product is not hardware, but a bit-stream from space, which provides surveillance, communications, weather, and navigational information to operational units. To meet these responsibilities, Space Division's subordinate units span the globe.

twenty years to 1905, it would be 1925. You will recall in those days that the Air Force was a part of the Army.

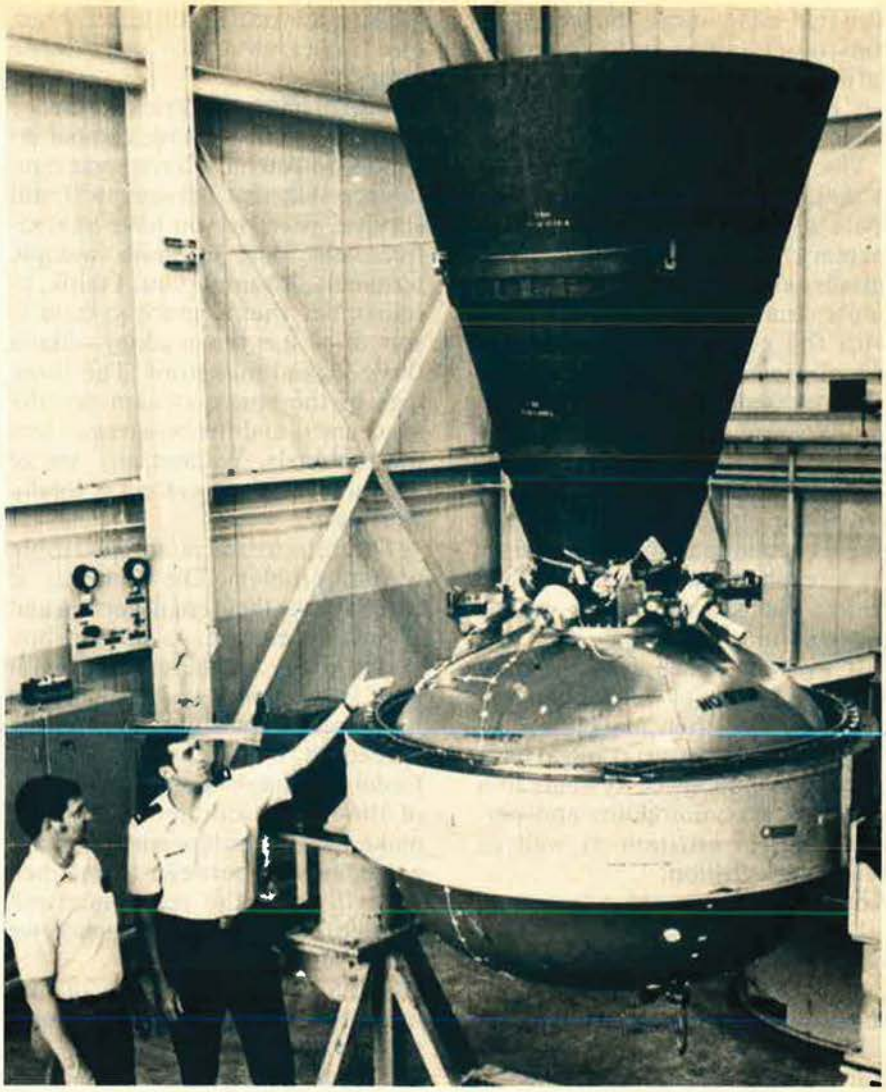
Debate goes on today as to whether or not Space should be a separate service. There are those who have proposed that. There are those who have said that we continue to do too much R&D and do not bring spacecraft into a true operational mode. The question is how to do that. In today's world, when you consider the terrible expense of the way we do business, we do not put many spacecraft on orbit. Each spacecraft is many tens of millions of dollars with a low launch rate, a very high cost per pound, and a very high cost to put on orbit—one needs to build each spacecraft individually in a handcrafted sort of way, and one needs to put them up in a way that one has to be sure to do everything possible to do it right the first time.

There's one thing that I'm sure of: There is no margin for error, and for that reason I have great difficulty distinguishing between research and development and production. Yet we are buying spacecraft in the same way that we buy airplanes, with the same management oversight system, with the same funding system, and I have to say that it is awkward. We have tried, in some instances, to do too much with too little.

For example, we are using boosters today, in the interests of cost-effectiveness, that were built in the early sixties. They are twenty years old and have been in storage since then. We have found that it's very, very difficult to get the high reliability that you want from a system that was built at its outset twenty years ago with an expected reliability of just 0.9. That means that one in ten could fail. Yet, in the interests of saving money, we are doing that.

We did this on the Atlas program. We have nineteen Atlases left. We found, during the last year or two, that we had not spent enough money refurbishing those Atlases to use them as space boosters. As a result, we have put some spacecraft into the ocean—the last one as recently as last December. Now we are going back and spending the money that we should have spent five years ago.

We are now examining the Titan II fleet with the idea of converting them to space boosters. While I appreciate the economy of using the Titan II as a space booster and I fully appreciate that there are spacecraft that can be properly put in orbit using the Titan II, I would hope that those who are in charge of our budget would not force us once again to stand short on the money that it takes to refurbish those ICBMs into the kind of reliability that we need for a space booster. We should have, in a space booster, a reliability in excess of 0.95, a reliability that approaches that of the Space Shuttle.



Inertial Upper Stage (IUS) motor. USAF is developing and producing the IUS, which provides the capability to deliver spacecraft from the Shuttle parking orbit to higher orbits, such as geosynchronous.

AFM: These seem examples of false economies that, in the end, reduce reliability and raise costs in more than just money. There must be a better way, isn't there?

General Henry: There is a better way. One approach being talked about today is to establish a space appropriation within OSD, which would have the same characteristics as NASA and other organizations that buy spacecraft—basically incremental funding and multiyear funding that doesn't constrain you to the extent of the full-funding concept we have today.

AFM: Would that be independent of each of the services and be fenced off in DoD somewhere?

General Henry: Well, if we had a space appropriation, it is essentially a defense appropriation. There are those who argue against that because it denies a flexibility in the budgetary process, but, on the other hand, one can always move the fence. If we did such a thing, it would allow our space programs to compete with each other, and to as-

sure that as we meet the necessary constraints (since budgets are by definition limited), we can adjust our priorities in relation to each other.

The problem that we have today is that, in the budgetary process, space programs compete in a fragmentary sense with airplanes and missiles and so forth. That forces us into a situation where we lose touch with the correlation of the individual programs to each other. We have reached a point in the maturation of space activity where a relationship between space systems is now important, because we are now in a phase where the use of space in war is becoming an important thing. As a result of that, we have got to ensure that space systems will be available in time of war.

If we want space systems to be available in time of war for communications, weather, navigation, or whatever, then we are going to have to start to buy space systems in a way that accommodates and permits combat attrition as well as peacetime attrition.

AFM: Does that suggest "spares in orbit," continuously?

General Henry: Precisely. It suggests that we need to, in a strategic sense, define a force structure on orbit which includes orbital sparing. But we also need to, in addition to that, correlate individual systems with each other so that there is sufficient interdependence, that you have resilience in your force structure. We are now at a stage where we can talk seriously about developing an orbital cross-link—where satellites are connected electronically to each other. If you do that, then you can build on orbit a structure that gives you the kind of resilience you have in your communications systems on earth today.

For example, if I'm in Los Angeles and I'm talking to you in Washington, I may be going through a satellite, I may be going through St. Louis or Houston or Chicago, but it's of supreme indifference to me because I know you're going to answer the telephone. That's the kind of communications structure we can have on orbit that allows me, if I'm in Washington, to talk to the Indian Ocean, and it is of supreme indifference to me whether I go east or west or north or south to get there.

AFM: And you can still talk if someone, either nature or some other force? . . .

General Henry: Yes. Nature or whatever. You will have combat attrition, so you must have some confidence that that network will still survive, because you have alternative paths. And you have multiple terminals. It's important, I think, to remember that a space system is sort of—I use this analogy—like a three-legged milkstool. The three legs of the space system are the spacecraft, and the bit-stream, and the terminals. Without any one of the three, a space system is totally worthless.

The bit-stream is an electronic warfare problem. The terminals, if we can make them small enough and affordable enough so we can buy many, many of them, then we'll have survivability and resilience in the terminal structure. Then in the spacecraft, if we can make them affordable enough, and make enough of them, interconnect them and make them interdependent or have a relationship between them, then we will have the resilience and depth to collect that information we talked about.

AFM: So that's another way of coping with actual or potential threats to operations.

General Henry: Yes. And again, we should not go to space unless it's the only way we can do a job, or can do it better, or it's cheaper. The global movement of information seems to be the one thing we can use space for that we have not learned how to do on earth.

AFM: What do you see as the military threat from an enemy in the near and far term in space?

General Henry: Well, first of all, there is some speculation and discussion by those who talk about a warfighting capability in space. I'm not sure I know how to do that. I'm not sure anyone knows how to do that. The warfighting capability we have today in space is the ICBMs moving through space to get from Point A to Point B. Perhaps someday we will have the technology for an antiballistic missile system. In *theory,* and I emphasize the word "theory," the easiest way to destroy a ballistic missile is as it comes out of the atmosphere on the way up. That could be done from space, using beam weaponry, in theory. The problem is we don't know how to build the beam weaponry.

We probably could short-circuit the national treasury two or three times trying to do that, and so that concept is probably in the far term. Certainly, the Soviets have demonstrated an antisatellite capability at low altitudes. So one can enter into debates and arguments about the extension of sovereignty upward. Today's sovereignty extends, say,—to 100,000 feet or whatever—but no one has quarreled with sovereignty extending up to 100 miles. I would hope that no one would ever call for sovereignty to extend above 100 miles. If you take the sixteen-inch globe in your office, and measure 100 miles above that globe at the same scale, it's about half an inch—obviously we could have a sovereignty issue at 100 miles.

That is a near-term threat. A far-term threat, of course, is the destruction of satellites wherever they may be. Despite the fact that there's almost nothing between here and a satellite that's 22,000 miles over the equator, that 22,000 miles is still 22,000 miles. And if you take that same sixteen-inch globe, that 22,000 miles is, in scale, about four feet from the globe. So getting there isn't that easy. Getting to the right place is not that easy. Certainly, it's within technical feasibility.

But again, if one talks to threat and the practical threat, are the terminals or the bit-streams the easier target? And again, if you have resiliency on orbit, how much capital national resource must a nation expend to go after those satellites? Is it worth it to go after those satellites with that kind of resource?

AFM: So it seems we've been preoccupied with the craft and haven't really devoted much attention to the bit-stream or the terminals, in the debate at least.

General Henry: Perhaps so. And I think that when one talks to survivability, one must talk to the total system and how it's going to operate. In fact, I have asked that the program management direction I receive include guidance on systems survivability because some survivability requirements are stronger than others. I've asked for guidance and money, depending upon the requirements, in each segment of sur-

Coping with a crosswind and using the alternate landing site of Northrup Strip at White Sands, N. M., the Space Shuttle Columbia *touches down after its third mission. (Photo by Mark Usciak)*

vivability—spacecraft, the ground terminals, and the bit-stream.

AFM: Do we have an industrial base that allows for resiliency in providing the components of this triad? Is there enough industrial capability to handle increased numbers of spacecraft and terminals?

General Henry: In my opinion, yes. We buy, certainly today, at an inefficient rate. The tendency today is to buy spacecraft just at sufficient rates to maintain minimum requirements on orbit. We buy in fits and starts, which makes our spacecraft so much more expensive. We develop a subcontractor base and then, while deciding whether or not to buy another spacecraft, we lose that subcontractor base. So we have to pay to get it restarted again—and with that lack of stability, just as we have had with many of our aircraft programs in the past—we are paying far more for spacecraft than we should.

I do not have a single program where I have spacecraft in the barn to launch in an emergency. I don't even have launch vehicles that are untagged, if you will. Happiness, for Space Division, would be having spacecraft at a continuing production. And that is not a high rate of production, but a production that is a recognition of the expected mean mission duration and allows for a little depth on orbit.

The classic example of how not to do it is reflected in our weather satellite program, where we had asked for seven spacecraft over a five-year period, predicated on a very limited expected mean mission rate on orbit, and ended up with three. That is an example of a budget process based on the assumption of a 100 percent success rate and, in fact, the assumption of better than predicted success.

AFM: But that belies reality and experience, doesn't it?

General Henry: Yes, it does. We have generally done better than expected on orbit. We have spacecraft on orbit that were expected to last thirty months and they're almost five years old and still going strong. We have spacecraft on orbit that were expected to last eighteen months and gave us thirty months, and once we start counting on that, then we start to get in trouble.

AFM: There's a debate or suggestion that the Air Force take over the Shuttle mission, and also that the Air Force establish a Space Command. Could you comment on both of these, please?

General Henry: Well, I would say that I recognize the debate on the Air Force taking over the Shuttle mission. Certainly the Shuttle is terribly important to the Air Force, because it is the first space booster that can be used by the military, as well as civilians, that has designed into it the reliability that a space booster should have. Historically, we have never had the kind of redundancy required to give us reliability. I think that the most important thing to remember about the Space Shuttle is that it is very properly titled "The National Space Transportation System" and, as such, it is a national investment. Any decision about whether or not the United States Air Force, or any military organization, should take over the National Space Transportation System, has to be, by its very nature, a political decision, and it would be inappropriate for me to comment on the viability of a political decision.

I would only note that access to space is not cheap, reliability in access to space is not yet easy, and it is not yet simple. The very fact that we are doing what we are doing with the Space Transportation System is a reflection of the national character of the system. It is far from the routine that one associates with buying a 747 or B-52 or anything else that the Air Force does in an operational sense. So a military management of that space transportation system is first, by definition, a political decision and, second, that decision must take into consideration the inordinate complexity and the manpower intensiveness of this system. This system is a remarkable system, yet my children will someday look at that system in a museum and marvel at the primitive nature of it, just as today I look at the Mercury capsule and marvel at how we were able to do what we did with that capsule—we must remember that.

With regard to the debate about a Space Command, I would only say that space is different. Certain functions have to be kept together, specifically the development and building of a spacecraft, the integration of that spacecraft onto its launch vehicle, whether the launch vehicle is an Orbiter, or a Titan, or an upper stage of some kind—its launch or orbit, and its on-orbit support. We have a network around the world today called the Satellite Control Facility that provides field maintenance for all of our DoD spacecraft, and it is just that. We have, as a result, the teamwork within Space Division, between those who man the tracking stations and are program officers and those who man the launch pads and are program officers, that is a teamwork that works—that gets the job done.

I would be sad to see us forced into, for organizational reasons, the customer-developer relationship that we have today on the airplanes.

The operator is dealing with the bit-stream and what is terribly important to the operator is the quality of the bit-stream and the nature of that bit-stream so that he can have affordable terminals. And then the next most important thing for the operator is that he has confidence that the bit-stream will either go up or come down as he wants it, in the way that he wants it, whenever he wants it. The way to generate that confidence is to participate and develop the strategy—what I call the orbital strategy—and then in turn the launch strategy and the procurement strategy that make it all come true. And then the deployment and the establishment of requirements in the terminals so he can do what he has to do.

AFM: Presently, that's a teamwork effort, isn't it?

General Henry: Yes. And it's becoming more and more a multiservice effort. I think one of the fundamental parts of the debate is the joint nature of whatever organization evolves. And, of course, another factor in the debate is whatever organization evolves—should it or should it not remain within Air Force Systems Command, a command that is organized for development and acquisition in the classic role of airplanes. I emphasize again that space is different. One of the most awkward relationships that Space Division has with its management responsibilities is the fact that it is awkward, trying to buy space systems under a system originally designed for the procurement of quantity units for our operating forces.

AFM: You mentioned management. Are you getting enough qualified Air Force engineers to manage your programs?

General Henry: No. My toughest problem today is the experience of my management. I am getting lieutenants, forty-one percent of my work force are lieutenants; my shortfall is in middle management. In my contracts arena seventy percent of my buyers, contracting officers, and procurement clerks have less than three years' experience, and forty percent have less than one year of experience. So I am working with an experience shortfall that is putting Space Division through one of the most difficult times in its history. The experience shortfall is occasioned by the exodus from the armed forces that we all know happened. It's also occasioned by the national shortfall of engineers, a national shortage, and it's compounded by the difficult circumstances of living in the Los Angeles area.

AFM: Those conditions, or circumstances, are really fierce for young people, aren't they?

General Henry: Well, they are tolerable for young bachelors coming out of college, whether they be male or female. But for the thirty-year-old who has small children, or the forty-year-old who has children in high school, it is intolerable. My ability to recruit is limited by that. The people are excited about the mission, but they say they are unwilling to put their family through the trauma and the culture shock of moving to Los Angeles where housing is so nearly unavailable and unaffordable.

AFM: What sort of commuting time do your people have?

General Henry: Many of our people spend three hours a day commuting. That's so they can live in affordable housing.

AFM: Is it conceivable that Space Division would move to another area?

General Henry: It's entirely conceivable. It's a matter of whether or not we can afford it. We live and work in some very high-priced real estate near two Los Angeles airports. There are many advantages to our being there because many of our contractors are there, but on the other hand, it is expensive.

AFM: Aren't many of your contractors having the same problems?

General Henry: Many contractors are having the same problems. There's no quick and easy answer. The best thing that has been brought forth so far is the variable housing allowance. But unfortunately, the variable housing allowance is calculated on what our people could afford last year, rather than calculated on the marketplace. As a result, the variable housing allowance that we receive is insufficient. It always lags behind. It's not enough.

AFM: If there were one thing you were remembered for in your tenure, your stewardship at Space Division, what would you like it to be?

General Henry: Well, I guess the one thing that I would like for it to be is that we did reach the threshold of taking advantage of space to make the lot of our soldier, sailor, and airman an easier one. I am convinced that we can use space to do that. I'm convinced that if the soldier, sailor, or airman knows where he is, and if he knows where the enemy is, and if he can communicate with his friends, then his opportunities for living and winning are greatly increased. I hope, in due course, the nation will recognize that and give space the budgetary importance it deserves.

The first indication is showing up in the new Milstar program, a very high-priority communications program for all of the armed services. But as we do that, we need to define in a better way our relationship with NASA on the Space Transportation System. Because whatever direction the political administration may take for the eventual management structure of the Space Transportation System, it is important that we do things today to preserve options for the administration.

What I sense happening today, which has been difficult to achieve in the past, is a sense of partnership with NASA—a joint venture, if you will—which will give options toward the future and allow both the civil and military use of the Space Transportation System. We need to take that in the proper perspective and use the Space Transportation System wherever it can be used best and use expendable boosters, if you will, where they can be used best for the proper mix of economy and utility.

AFM: Do you see the Air Force and NASA moving more toward the joint venture concept you're talking about?

General Henry: Yes, I do.

AFM: So that lays the foundation or the groundwork for whatever direction the political decision takes, doesn't it?

General Henry: That's correct. It leaves the options open for whichever direction. If the political choice is that we have some kind of a government-owned contractor operation—*à la* Sandia Corporation—or continued NASA management, or transition to military management, those options all remain open. ■

SCIENCE/SCOPE

Testing of the first portion of North America's new air defense system has begun at Tyndall Air Force Base in Florida. The system, called the Joint Surveillance System (JSS), spans the continent from Alaska and Canada to the southern borders of the U.S. It will operate from seven regional control centers, each keeping command over an area of about 2000 nautical miles square. In the event of an air attack, each center will use data from civilian and military radars to provide surveillance, identification, and interceptor control functions. JSS also can relay data to E-3A AWACS (Airborne Warning and Control System) aircraft. The Hughes-developed JSS is due to be fully operational in 1983.

Costs of complex hybrids in military electronics have been cut up to 30 percent by an innovative laboratory serving as a "halfway house" between engineering and manufacturing. The Hughes Producibility Lab makes producibility verification models using manufacturing equipment and processes. In this way it thwarts production problems by ensuring that hybrids are designed to meet assembly-line capabilities. Reliability also improves. The lab has demonstrated its worth by ensuring the production rate of the F/A-18 strike fighter radar.

State-of-the-art electronics for improving NATO's air defense posture have been demonstrated at Hughes. During fly-bys of an AWACS (Airborne Warning and Control System) aircraft, sophisticated digital communication links were made with NATO AEGIS processing and display consoles. AEGIS stands for Airborne Early/Warning Ground Environment Integrated Segment. It is designed to enhance the NATO Air Defense Ground Environment (NADGE) used for air defense in Europe. AEGIS allows operators on the ground to view radar data received and seen by operators in the AWACS aircraft. This AWACS information, merged with the extensive track data base of the NADGE network, permits ground control of interceptor aircraft. An important component of the system is the Hughes-built JTIDS (Joint Tactical Information Distribution System) Class 1 terminal, which provides encrypted, jam-resistant, high-capacity digital and voice communications.

The Target Recognition and Attack Multisensor on the U.S. Navy's A-6E Intruder aircraft has been judged 1981's most valuable weapon system by the Order of Daedalians, a fraternity of military pilots. TRAM was cited for giving carrier-based Intruders the ability to fly strike missions in any weather day or night. TRAM includes a forward-looking infrared sensor, laser designator and range-finder, multimode radar, and high-speed computer. Hughes builds the TRAM's Detecting and Ranging Set, the laser and infrared device.

With the equivalent strength of almost one-half million pounds per square inch, the wire used to carry guidance signals to the TOW (Tube-launched, Optically tracked, Wire-guided) anti-tank missile boasts one of the highest tensile strengths of any steel wire in the world. The wire measures less than six thousandths of an inch in diameter, yet can support a 10-pound weight. It is made by U.S. Steel Corp., one of few companies in the world with the equipment and skills to manufacture such thin wire with extreme purity. Hughes produces TOW missiles for the U.S. Army, U.S. Marine Corps, and 32 nations.

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USAF IN SPACE

Two stories are apparent: One, to be featured in a subsequent issue, will examine the Air Force's investment in the national Space Transportation System. For the present, the nation is celebrating the third Space Shuttle flight and looking forward to the fourth, largely unaware of USAF's globe-girdling effort in . . .

Supporting the Space Shuttle: The Blue-Suit Contribution

BY WILLIAM P. SCHLITZ, SENIOR EDITOR

IN THE predawn darkness of March 22, everyone on the eastern coast of central Florida seemed to be on the move. Autos, vans, campers, vehicles of every description converged on the Kennedy Space Center north of the resort town of Cocoa Beach, slowing traffic on the highways to a crawl.

This was no movement of refugees fleeing a disaster, but a pilgrimage of Americans intent on witnessing a historic national event: the third launch of the US's Space Shuttle. As many as one million people turned out for the now-familiar but still spectacular sight—the earth-shaking fireball of ignition followed by a plume of white smoke trailing the Shuttle as it hurtled skyward.

For the launch, many Air Force people were at their posts at the Kennedy Space Center, at adjacent Cape Canaveral AFS, and at nearby Patrick AFB. Not merely observers, they were to be participants in a full spectrum of roles in support of the Space Shuttle's third orbital test mission. Hundreds of other Air Force people—blue-suiters and civilian employees alike—manned facilities elsewhere in the US and around the world.

With liftoff, the Shuttle curved upward to disappear after a few seconds into cloud cover. Unknown to most spectators was that those few moments began a somewhat longer time sequence—the solid rocket booster burn—that had Air Force range safety officers at the Range Control Center glued to their consoles.

These blue-suiters and civilian technicians working with them soon received data from multiple tracking sources that the Shuttle was indeed on its prescribed course. This was comforting to Capt. Bill Barnett, the Primary Range Safety Officer. His hand hovered over red switches built into his monitoring console. It would have been his duty to send "arm and destruct" signals to explosive devices in the Shuttle's external tank and boosters had the flight gone awry. But, as advertised, the solid rocket boosters burned out and were jettisoned some 120 seconds after launch and more than 100 miles downrange.

"Under NASA and Air Force rules," explained Captain Barnett, "we're charged with protecting lives and property. The Shuttle on launch has millions of pounds of fuels aboard. If it turned toward land and threatened to impact on a populated area, we'd have no choice but to destroy it."

"The likelihood of being instrumental in the loss of multimillion dollar hardware and perhaps the astronaut crew is a great responsibility for a young officer," said Captain Barnett's senior, Lt. Col. Nicholas Byrnside. "But he's a member of a team and would receive assistance from other experienced people before having to make such an extreme decision on his own. He's also well rehearsed through the wide range of contingencies during training sessions we conduct here and also in conjunction with the astronauts practicing simulated Shuttle launches at the Johnson Space Center in Houston."

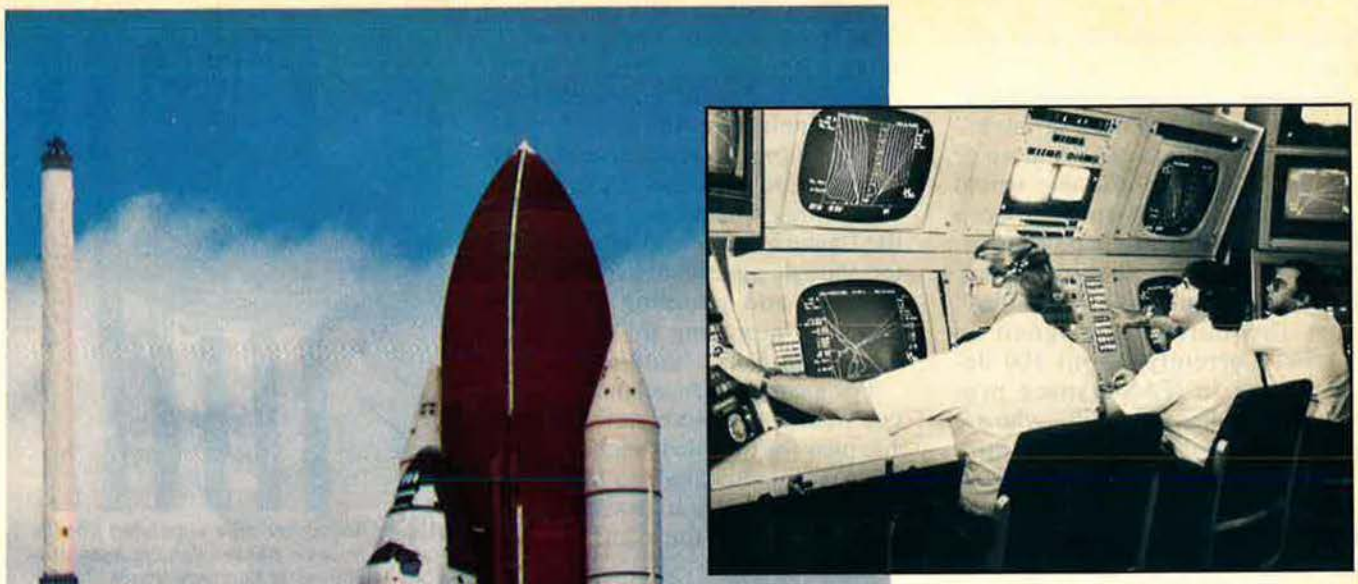
Because of the possibility of a safety destruct of the Shuttle tanks on launch, there are secure communication procedures between the Range Control Center at the Cape and Mission Control in Houston. These preclude any ill-intended interference from the outside. The signal to the spacecraft over which a destruct command would be transmitted is constant—and also intrusion-proof.

In the event of a Range Safety decision to terminate the flight, the destruct system is designed to register a warning on the Orbiter's instrument panel to give the crew time to eject or separate the Orbiter from the boosters and tank. Without going into detail, this warning system has been designed to be fail-safe and absolutely reliable.

Communication between Houston and the Range Control Center is a two-way street, which allows Mission Control to alert the Center quickly to any emergencies the Orbiter crew might be experiencing.

In the normal course of events, the Range Control Center's responsibility for safety ends some nine minutes into launch when the Orbiter's main engine is shut down and the expendable fuel tank is jettisoned.

As these elaborate precautions underline, safety is a critical factor in launch activities. At the Cape (generally meaning the Kennedy Space Center, Cape Canaveral AFS, and Patrick AFB), "safety" is a word that is heard often, as is the phrase "contingency planning." Both are constant themes in this study of blue-suit support for NASA's Space Shuttle.



The critical first two minutes of the Shuttle launch sequence are monitored at Range Control Center by, from left, Capt. William H. Barnett, Jr., Jerry D. Watson, and Maj. Gary D. May. (Photo by TSgt. Dennis Nieuswma) Left, the drama of ignition and liftoff. (Photo by Steve Nolte, and Mark and Tom Usciak)

The Origins of Shuttle Support

In 1958, an Act of Congress created NASA and gave it its marching orders. That piece of legislation also assigned the Air Force as the Department of Defense's executive agent in providing support for the fledgling space agency. The 1958 Act also charged the Air Force with assuming responsibility for overseeing military space programs. The Air Force was the logical choice, given its decades of experience in managing the development of major aeronautical systems, including the production, test, and launch of a wide assortment of missiles. (It is no accident that NASA's Kennedy Space Center was built on land adjacent to USAF's Cape Canaveral AFS, launch point for the Eastern Test Range.)

In the years since 1958, NASA, as a management organization, has "borrowed" heavily many and varied kinds of expertise from the Air Force and the other military services. The Air Force, though, has provided the majority share.

Then came Air Force involvement in NASA's Mercury, Gemini, and Apollo manned space programs, the joint Apollo/Soyuz mission, Skylab, and, recently, the Space Shuttle (which is the vehicle being developed for the national

Space Transportation System program).

In terms of people support, one category consists of the "detailees" assigned by DoD to NASA more or less full-time. One example would be the military pilots who have been dedicated to the astronaut program. At the height of the Apollo program, there were some 300 "detailees" from the military assigned to NASA. Currently, about 100 detailees are in NASA space programs, including about fifty who are astronauts or astronauts-in-training.

While through the years all ranks have been represented, one of the top Air Force detailees is Maj. Gen. James A. Abrahamson, probably best known throughout the Air Force for his stewardship of the F-16 development program. He's currently serving with NASA headquarters in Washington, D. C., as Associate Administrator for Space Transportation Systems. "The partnership forged by the Air Force and NASA since the beginning of the Space Age is continuing with the development of the national Space Transportation System—and, in fact, is being strengthened," said General Abrahamson.

"That partnership will prevail in the operation of the national STS for the foreseeable future. While the Air Force will continue to represent DoD in the military use of the Shuttle, the civilian side—NASA's current role—is under reevaluation and a decision on what the STS management setup will be will come somewhere down the road. For the present, though, we'll be concentrating on joint economies in operations. In any event, with the fifth launch of the Shuttle—the first operational flight—a new era in the Space Age will have commenced," said General Abrahamson.

Another category consists of people whose primary mission is other than NASA-related, like the bluesuiters at the Cape Canaveral AFS Range Control Center who support missile test launches from Cape pads down the Eastern Test Range and are thus perfectly suited to support Shuttle launches.

A third category falls somewhere between the other two. An example would be the Military Airlift Command's Detachment 15 of the 39th Aerospace Rescue and Recovery Wing stationed at Patrick AFB. Aerospace Rescue and Recovery Service units have the primary mission of combat rescue, and they train toward that end. Detachment 15's primary mission is support of the Eastern Space and Missile Center, though significant aspects of its training and planning activities focus on preparing for contingencies during Space Shuttle launches.

For example, Detachment 15 rescue helicopters were stationed at a site near the Shuttle launch complex with "rotors turning" on March 22, trained and ready to assist the *Columbia's* crew in the event of a mishap on launch.

The unit is equipped with three CH-3E amphibious Jolly Green Giant rescue helicopters, but is beefed up for Shuttle launches with an additional three in-flight refuelable and rescue-equipped HH-3E helicopters and crews—including pararescuemen—from Detachment 11 of the 39th ARRW at Myrtle Beach AFB, S. C., and the 301st ARRS (AFRES) at Homestead AFB, Fla.

In a training demonstration two days before the March 22 Shuttle launch, two of these helicopters came in "low and slow" over a body of water known as the "Barge Turnaround Basin" near the huge Vehicle Assembly Building at the Kennedy Space Center.

Anchored out in the basin was a mockup of a Space Shuttle fuselage (also used in rescue simulations on land). In it was a two-man simulated "crew"—mannequins dressed in spacesuits. The helicopters disgorged into the water five-man teams fitted out in specially designed protective garments and equipped with self-contained breathing apparatus.

The teams quickly inflated yellow rafts and paddled to the mockup to demonstrate procedures for extracting both "astronauts" through the top hatch. The astronauts were then lowered into the rafts and strapped into slings for helicopter hoist and simulated flight to a hospital.

"Working with NASA, Detachment 15 personnel have devised equipment and procedures to conduct both land and water rescues of the Orbiter crew," said Maj. (Lt. Col. selectee) Ray M. Boudreaux,

Above, helicopter on a simulated Shuttle rescue mission passes Vehicle Assembly Building at Kennedy Space Center. Right, demonstrating crew extraction techniques on an Orbiter fuselage mockup with gantry and Shuttle in the background. (UPI photos)

Detachment 15 Commander. "Navy underwater demolition team divers from UDT-21 in Norfolk, Va., are teamed with rescue PJs to form the five-man rescue teams. Detachment 15's slice of the Shuttle support pie, though small, could be very significant in the event of an abort or return to launch site.

"To indicate the extent of our planning, six helicopters are required—two rescue, two support, and two backup. The rescue helicopters have a five-man rescue team specifically equipped to operate in a hazardous environment at a downed Orbiter and either a NASA or military doctor aboard, plus an additional PJ especially trained in medical procedures. One of the support helicopter pilots is designated 'Air Boss' and is in charge of the mission," Major Boudreaux continued. The second support helicopter contains NASA photo personnel to document any contingency in an effort to prevent a similar mishap.

"Aboard the 'Air Boss' helicopter, hovering in a safe area upwind from any toxic gases emitted by the downed spacecraft, would be an astronaut known as the AIRCOD—short for Airborne Contingency Operations Director. Highly knowledgeable about the Orbiter's configuration," said Contingency Coordinator Lt. Col. James Bogart, "the AIRCOD would be mainly on the lookout for the presence of ex-

tremely toxic Shuttle fuel. Just breathing its fumes could be fatal. That's why the PJs' suits and breathing gear have been specifically designed to resist its lethality and corrosive nature."

"Once inside the cockpit," said MSgt. Joseph S. Stanaland, pararescueman NCOIC of Detachment 15, "the PJ must ensure that the possibly incapacitated astronauts continue to breathe through bottled oxygen that would be attached to their hoses. The PJ has been trained to power down the Orbiter and otherwise throw a number of essential switches.

"Provision has been made for the quick decontamination of the Orbiter crew and the PJs, should that be necessary. Of course, we're talking about off-runway, remote, and water crashes. Conventional fire fighters also trained in Shuttle rescue procedures and decontamination would be called upon to contend with on-runway crashes."

Using their aerial refueling capability, the rescue helicopters might be required to conduct long-range rescue missions should the Orbiter abort and come down far out at sea. Short of the miraculous, blue-suiters considering Shuttle contingencies have addressed as many of the "what ifs" as could be addressed.

"In planning rescues," said Sergeant Stanaland, "we're looking ahead to future Shuttle missions that have aboard additional crew members such as mission specialists. Also in Detachment 15 we're planning for the contingencies that might arise when Orbiter landings begin at the Kennedy Space Center."

Helicopter rescue crews and fire fighters at the primary landing site at Edwards AFB in California and at the Orbiter's alternate landing sites around the world are kept up to date on equipment and procedures that are constantly evolving.

Alternate landing sites have been designated at NS Rota, Spain; Kadena AB, Okinawa, Japan; Honolulu IAP with DoD support from Hickam AFB, Hawaii; and, as everyone now knows, Northrup Strip at the Army's White Sands Missile Range in New Mexico. When weather first caused a day's delay in the Orbiter reentry and ultimately dictated a landing at Northrup Strip, there was little consternation among the rescue people, Detachment 6, 40th ARRW, there. While thankfully not needed, they had rehearsed for a range of contingencies and were ready.

Involved in on- and off-runway contingency training at Northrup Strip was "Buff," or "Columbia II" as it is also known, a salvaged B-52 forward section rigged out as an Orbiter fuselage similar to the mockup used by Detachment 15 and the fire fighters at the Cape. Buff is the brainchild of the 833d Civil Engineering Fire Protection Branch, an element of the Space Shuttle Contingency Response Force at nearby Holloman AFB, the air base that supports contingency planning at Northrup Strip.

Once NASA had ascertained that in all probability Northrup Strip would be the Orbiter landing site, all concerned at the Strip and those from Holloman turned in a superlative effort. In a scathing sandstorm, the 4449th Mobility Squadron from Holloman erected from its portable resources a tent city—eight general-purpose shelters and a small hangar. These were in place for the Orbiter turnaround activities and the storage of NASA ground-support equipment.

The sandstorm piled up drifts on the Northrup Strip runways, requiring White Sands Army engineers to labor around the clock to grade them.

The Army people at White Sands, in coordination with Fort Bliss near

El Paso, Tex., deployed a platoon of Military Police to provide security and crowd control for the expected thousands of visitors. A battalion aid station was also erected at the site's public viewing area. Fort Bliss provided some thirty Huey helicopters for augmented security support, medevac, and distinguished visitor transport.

Supervising these activities was Lt. Col. Dave Phillips, TDY from the Space Shuttle Support Office at Patrick AFB, Fla.

"Worldwide, the communications available in the event of a contingency is incredible," commented Col. Sam Anzalone of contingency planning. "Detachment 15 alone has access to multiple frequencies on four separate types of radio." The ARRS units standing alert during Shuttle launches perform and train for conventional rescue operations during normal times. Detachment 15, as is the case with other ARRS units, has had its share of credited lives saved from year to year.

Once again emphasizing the safety theme in Shuttle-related activities, several hours before launch Detachment 15 helicopters—in league with longer-range C-130s and Coast Guard patrol boats—ensure that a hazardous-area "box" of sea surface, and the air above it, extending from the Cape to about 180 miles downrange, is free of vessels and aircraft.

Aided by radar surveillance, a Coast Guard officer with access to all maritime radio frequencies at the Range Control Center monitors this activity. He'll vector aircraft or patrol craft to any intruders.

The special vessels equipped to salvage the Shuttle's jettisoned external boosters are also cautioned out of harm's way. An aircraft is specifically assigned to keep track of the tanks once jettisoned.

In all, there are about nineteen aircraft involved in and airborne in the vicinity of the Cape during a Shuttle launch, including one to deal with the contingency of hostile intruders should any appear. Just prior to launch—and again on reentry—an astronaut (it was John Young for the second and third Shuttle missions) goes aloft in a Gulfstream II for a final weather check.

Serving as the NASA Orbit Flight Control Team Landing Support Officer during a Space Shuttle flight is Capt. Al Chapman, shown here manning a console at the Mission Control Center in Houston. Air Force blue-suiters and civilian technicians provide worldwide support during Space Shuttle missions in activities ranging from contingency planning to weather forecasting and Orbiter tracking. Many are assigned to NASA full-time as "detailees" in the STS program.

The Weather Consideration

As the rains at Edwards and the lack of visibility at Northrup Strip proved, weather can be crucial in Space Shuttle operations.

"The MAC weather people assigned to Cape Canaveral AFS wear a number of hats," commented meteorologist Capt. (Maj. selectee) Donald J. Greene. "We have a dedicated staff of observers and eleven forecasters for day-to-day operations around the clock here, where missile launches are conducted routinely. For the Shuttle launch sequence, an additional team of advanced weather officers helps provide assessments that the NASA team at KSC and Mission Control in Houston can use to determine a launch commit. We also provide meteorological information to Range Safety to aid their recommendation to Col. Marvin L. Jones, Commander of the Eastern Space and Missile Center, who is ultimately responsible for range safety.

"There is a wide spectrum we're interested in. For example, the contingency people have to know what the weather is like at the alternate landing sites. The people retrieving the jettisoned boosters want to know what kind of seas to expect. Clouds, winds, and precipitation are all important in the launch and landing decisions.

"We also arrange special support, as in tracking unique conditions such as solar activity that may contribute to lapses in our communications. We have the capability, unique among Air Force weather watchers, to track electromagnetic storms and plot lightning strikes. Although the Shuttle on its pad is protected by a huge lightning insulator, we like to warn those working there of approaching jeopardy. Also of high interest is the weather along the route the 747 will fly bringing the Orbiter back."

Wind speed, direction, and the amount of vertical mixing would be important in the case of a toxic spill, Captain Greene cautioned.

"We begin launching weather balloons fifty-five hours before launch and expend twenty of them in that period. Since the Orbiter will go up right through the atmosphere into space we need detailed wind profiles. We follow most balloons up to eleven miles altitude, but some provide data from nineteen miles. Rocketsondes—including some from Point Mugu, Calif., and Barking Sands, Hawaii, provide mainly post-analysis data from fifty-five

miles. Gathering weather data is an interservice—including Coast Guard—cooperative venture. We are, of course, also dependent on the MAC-sponsored Air Force Global Weather Central and the World Meteorological Organization."

Detachment 11, 2d Weather Squadron, is MAC's unit providing weather support for operations at the Cape. Besides the aforementioned weather services and aids, Detachment 11 meteorologists also receive data from fourteen instrumented towers—up to 500 feet high—that provide weather profiles for the entire Cape area. Weather satellite data is received every thirty minutes around the clock.

DDMS Planning

In March 1977, the Secretary of Defense designated the Commander of AFSC's Space Division as "DoD Manager for Space Shuttle Support Operations." *(Also see adjacent box and interview with Lt. Gen. Richard C. Henry, p. 36)*

The support function refers to DoD elements associated with development of the national Space Transportation System *beyond* the scope of Air Force R&D responsibilities.

The primary on-scene staff in carrying out the support task is the DoD Manager's Space Shuttle Support Office (DDMS for short) at Patrick AFB. In effect, DDMS manages DoD people and assets in support of developing the Space Shuttle and is instrumental in planning for contingencies during Shuttle missions—two tall orders.

Director of DDMS is Col. John Sniegowski, a veteran in this field whose experience dates back to the Gemini program. Several civilian specialists on his staff are similarly experienced: Jack Nordbusch with thirty-one years in harness and Fred Schwartz with twenty-five years.

"In the early days, besides aborts on launch, we were concerned with reentry and splashdown, during which the Navy carrier on station was the most visible support element. Now, on- and off-runway mishaps receive major contingency attention," said Colonel Sniegowski.

"We are prepared to respond worldwide to aircraft-type aborts that include launch-pad mishaps, Orbiter impacts on land, water, or swamps, and crew ejection over land or water," said Colonel Sniegowski. "At any time just before or during a Shuttle mission, some twenty-seven aircraft, forty-five crash and rescue vehicles, and about 220 people are on alert around the world" in the contingency aspects of the mission, said Colonel Sniegowski.

"On launch, NASA has developed what is called the 'abort-once-around' option, meaning that the Orbiter did not achieve orbit and would circle the globe to land at Edwards AFB in California or at Northrup Strip.

"Once in orbit, the spacecraft would be circling the globe once every ninety minutes. It should be able to reach one of the alternate landing sites if a problem arose—providing it wasn't too severe," the Colonel said.

"Should the Orbiter come down in a foreign country, we have a mechanism through contacts at the State Department to inquire as to what assistance that country could provide. At DDMS, of course, we have access to US military forces throughout the world and know where the closest rescue capability would be," he said.

"Our biggest challenge is to antic-

The Air Force's Shuttle Command Structure

The Air Force has evolved a rather complex command structure to undertake its myriad of space activities that range from the test launches of military missiles to the orbiting of civilian weather and communications satellites.

In the case of USAF support of the development and launch of the Space Shuttle, the chain of command is fairly straightforward. At the top is the Air Force Systems Command's Space Division at Los Angeles AFS, Calif., itself involved in all manner of space programs from developing payloads to identifying future military technological needs. Space Division is commanded by Lt. Gen. Richard C. Henry. *(For an interview with General Henry, see p. 36.)*

Day to day, Space Division elements manage Space Shuttle processing support, including activities at Cape Canaveral and at the Johnson Space Center. Other Space Division components oversee the development of the Shuttle launch capability at Vandenberg AFB. Still others are involved in developing the Inertial Upper Stage and engineering the spacecraft that will fly in the Shuttle cargo bay. For missions themselves, General Henry adds a second national Space Transportation System hat as the DoD Manager for Space Shuttle Support Operations.

Immediately subordinate to General Henry—and his deputy when tasked with DoD Space Shuttle support responsibilities—is Brig. Gen. William T. Twinting, Commander of the Space and Missile Test Organization at Vandenberg AFB, Calif. The importance of Vandenberg has been underscored because of facility construction already under way to conduct future Shuttle launch and recovery under Air Force control.

Reporting to General Twinting, and heavily involved in Shuttle activities, is the Eastern Space and Missile Center (ESMC) at Patrick AFB, Fla. Commanded by Col. Marvin L. Jones, the Center includes Patrick AFB, Cape Canaveral AFS, and the downrange stations of the Eastern Test Range, and hosts the DoD Manager's Space Shuttle Support Office (DDMS), General Henry's primary staff for contingency support of Shuttle launches. In this, DDMS has an overview of the Eastern Test Range and access to a worldwide communications net.

DDMS is no newcomer to the idea of manned spaceflight emergencies and has been in operation since the capsule splashdowns of yesteryear. Director of DDMS is Col. John Sniegowski, who has been associated with manned spaceflight since 1965. During Shuttle launches he commands the Contingency Support Center at Cape Canaveral AFS and occupies a position at Johnson Space Center.

Directly within ESMC's area of responsibility is the 6555th Aerospace Test Group, which is involved in launching DoD spacecraft missions aboard the Shuttle from the Cape and also supports the development of Shuttle launch and landing capabilities at Vandenberg AFB through its experience with the Shuttle at Kennedy Space Center. Last but far from least, the Test Group is responsible for launch base testing and operations for the Inertial Upper Stage, to be used as an orbital booster for the Shuttle and the Titan 34D. *(See story.)*

Thus, the blue-suiters at the Cape (meaning Kennedy Space Center, Cape Canaveral AFS, and Patrick AFB) normally fall into two space-related groups, both ultimately responsible to General Henry. One group routinely supports a variety of launches (they could be Army or Navy weaponry, or military or civilian space payloads) from Cape Canaveral AFS down the Eastern Test Range. The other group concentrates on Shuttle development, processing, and test launches from the Kennedy Space Center. When a launch approaches, however, the efforts of both groups are blended to provide comprehensive Air Force support of the nation's first Space Transportation System.

ipate and plan for any possible contingency. That's eased somewhat now that we have had several successful missions under our belts," Colonel Sniegowski said.

With a transatlantic abort landing a possibility, in late April Colonel Sniegowski led a party of DDMS and NASA staffers to Africa to survey commercial airports at Dakar, Senegal, and Monrovia, Liberia, as potential candidates for yet another Orbiter alternate landing site.

During Shuttle launches, DDMS staffers man the Contingency Support Center in operation at Cape Canaveral AFS. There, four dedicated AUTOVON lines are ready for exclusive worldwide use in a contingency. Colonel Sniegowski is also authorized the use of MAC airlift resources—including C-5s—if necessary. (That was an option in moving support equipment when the landing site for the third orbital mission was changed from Edwards AFB to the Northrup Strip. Instead, though, the gear was transported by train.)

During Shuttle missions, the Center is manned twenty-four hours a day. Besides rescue-operation experts, others include a DoD medical representative and an Air Force Public Affairs officer. In the latter post, on duty during the third Shuttle launch, was Maj. Ron Hinkle, whose primary assignment is with the Public Affairs Office at the Eastern Space and Missile Center at Patrick AFB. Major Hinkle was at the Contingency Center not as an observer but as a player. In a contingency he would not perform his usual role of answering media queries but would coordinate public affairs matters between the Public Affairs Office at Mission Control and the contingency site.

Air Force public affairs people, though helpful to the media, are usually unobtrusive and behind-the-scenes. Welcome exception to this rule was the team headed by Maj. (Lt. Col. selectee) James Moore of the ESMC Public Affairs Office. They manned the media desk at the Kennedy Space Center prior to and during the third Shuttle launch. The reams of news releases they wrote were comprehensive in detailing the extent of the Air Force's contribution in support of Space Shuttle development and operations.

The Eastern Test Range

The Eastern Test Range (ETR) has been the nation's primary test facility for missile and space systems since 1950. Headquartered at Patrick AFB, it includes Cape Canaveral AFS and extends more than 10,000 miles across downrange stations in the Atlantic and into the Indian Ocean (into which the debris from the Shuttle's expendable fuel tank falls). There, it meets the outer limits of the Western Test Range to form a global range.

As the Lead Range during Shuttle launches, the ETR has operational control of a comprehensive network of DoD and NASA tracking stations. These include facilities of the Western Test Range, Vandenberg AFB, Calif.; Air Force Flight Test Center, Edwards AFB, Calif.; Pacific Missile Test Center, Point Mugu, Calif.; Kwajalein Missile Range, Kwajalein Atoll; US Army Electronic Proving Ground, Fort Huachuca, Ariz.; and the Army's White Sands Missile Range in New Mexico. Also coming into play are NASA's stations at Wallops Island, Va., Dryden Flight Research Center, Calif., and Bermuda. Staffing this network is a small army of civilian technicians and military people from the various services.

To indicate the massive coverage, precision tracking pulse radars are located at Ascension Island in the South Atlantic, up the Caribbean chain to Florida, westward across the continental US to Hawaii, and beyond to the Kwajalein Atoll in the South Pacific.

The various tracking stations come into play through the Shuttle launch, orbit, and landing. In addition, the USNS *Vandenberg,* on station in the Atlantic, collects data on the solid rocket boosters' reentry and parachute splashdown.

During launch and landing, radar data from tracking stations is all channeled through the Center Computer Complex at Cape Canaveral AFS for processing before distribution to NASA users at Mission Control in Houston and Goddard Space Flight Center in Maryland (all space-related communications pass through Goddard). On-orbit tracking data is forwarded to NASA through either the Eastern or Western Test Range, depending on tracker location.

"Prior to launch, a series of major simulations have taken place to ensure the network's readiness," said Col. Richard A. Gardner, Deputy Commander for the Eastern Test Range.

Management processes at the Eastern Test Range are complex and are broken down into function, such as program management, systems engineering, analysis, and operational command and control.

The program management function is responsible for ensuring that the DoD ranges and test centers are able to support as required by NASA. In this capacity, program management is the interface with NASA and provides programmatic direction to the systems engineering/analysis and the command/control functional areas.

High technology issues fall to the systems engineering and analysis functional area. Responsibilities include evaluating and maintaining the accuracy of DoD's radar tracking network, developing instrumentation and computer software in response to Shuttle-unique requirements, and operating the extensive worldwide communications network needed to tie the DoD tracking network together.

Real-time command and control functions are performed by the ETR's Range Control Officer (RCO) and Lead Range Control Officer (LRCO). The RCO controls all the ETR's support to Kennedy Space Center for the launch phase. The LRCO controls all DoD tracking support for all mission phases and interfaces this support with Goddard Space Flight Center and Johnson Space Center. In their capacities, the RCO and LCRO are the direct representatives of the Commander, Eastern Space and Missile Center.

Test Group Is Key Element

The 6555th Aerospace Test Group at the Cape, commanded by Col. Charles A. Kuhlman, serves as Eastern Launch Site program manager and launch agent for AFSC's Space Division. The 6555th is also responsible for DoD space launch activities involving the Titan III and Space Shuttle.

The Test Group's Launch Vehicle Division directs and controls the government/contractor team that

builds up, checks out, and launches the Titan III, the US's current workhorse military space booster. The Group's Satellite Systems Division similarly directs and controls launch-base activities for DoD satellites orbited by Titan, other expendable space boosters, and the Space Shuttle.

But behind the rather bland designation "6555th Aerospace Test Group" is an Air Force organization that is crucial to future operations of the Space Shuttle. "In addition to overseeing missile launches, our Space Transportation (Space Shuttle) System Division literally works directly with NASA in the development, checkout, and operation of Shuttle hardware," commented Colonel Kuhlman.

"Col. Charles MacGregor is the Group's—and hence Space Division's—representative on the Kennedy Space Center NASA staff." He heads a division of some forty Air Force people involved in all aspects of Kennedy Space Center's Space Shuttle activity. "It's his job to see that the Air Force and NASA work together to support the military requirements for use of the Space Shuttle," noted Colonel Kuhlman.

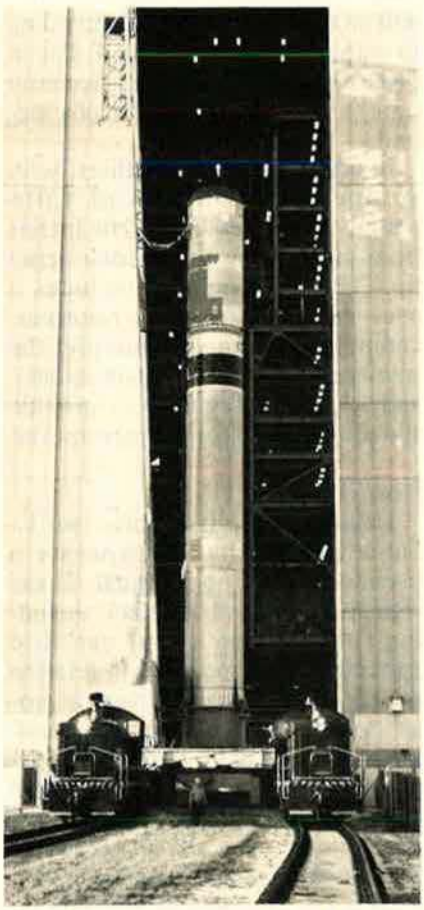
"Originally," continued Colonel Kuhlman, "the concept was to transition by 1985 from the expendable Titan to the Space Shuttle. Titan was to be phased out once the Shuttle demonstrated clearly that it had assured launch capability for whatever orbital mission was required. But reality forced the realization that expendable launch vehicles such as the Titan will continue to play an essential role. Subsequently, the decision was made to keep Titan 'in harness' as backup and supplement to the Shuttle. Therefore," Colonel Kuhlman noted, "in the foreseeable future the composition of the launch force could be a mix of Shuttles and Titans, and thus the missile's production line has been kept open."

But with the recent last launch of the Titan IIIC, a new generation missile is waiting in the wings—the Titan 34D—already under active testing at the Cape by the 6555th Test Group team. The 34D will have more propellant in the core vehicle than the IIIC, additional solid propellants in the strap-on motors, and—the revolutionary difference—it will feature the Inertial Upper Stage (which is also undergoing active final test and checkout supervised by the Test Group).

The design differences give the new Titan increased flexibility and allow more pounds of payload to be boosted into geosynchronous orbits.

The IUS, of course, is also being designed to be carried in the Orbiter's cargo bay. In the weightlessness of space, the IUS will be popped out of the Orbiter by an uncomplicated spring device. Clear of the Orbiter and ignited, it will carry payloads into geosynchronous orbits.

The 6555th plans the first operational launch—no test firings will be conducted—of the Titan 34D/IUS next September, when it will deliver a Defense Satellite Communications System into orbit. First use of the Shuttle IUS is planned for the sixth Space Shuttle mission scheduled currently for January 1983 when it will boost NASA's first Tracking and Data Relay Satellite System (TDRSS) into orbit.



The first of a new generation of Air Force Titan 34D launch vehicles being moved from KSC's Vertical Integration Building to the Solid Motor Assembly Building.

All this is not as easy as it sounds. Eight major contractors ship components of the new Titan 34D to the Cape. They are then assembled and tested as a core vehicle in the Vertical Integration Building. The core vehicle is then to be transported on the Titan railroad system to the Solid Motor Assembly Building, where the two solid rocket motors are attached, and then to the launch pad where final systems tests are made to assure that everything mates up before launch. Colonel Kuhlman noted that, at this time, the group was conducting a Pathfinder operation for 34D with actual flight hardware to make sure that all procedures and systems are thoroughly checked out prior to actually beginning the final processing for launch.

In the matter of routine support of Shuttle launches, "the Test Group operations include all ground processing directly associated with the DoD payload or satellite, integration of the payload into the Orbiter, the launch countdown, and recovery and refurbishment following its return," said Colonel MacGregor.

Last but not least, the Test Group's role has been expanded from launch support to an assessment of Shuttle development, test, and operations at Kennedy Space Center. The lessons to be learned will serve the Air Force well when blue-suiters begin to launch and control Shuttle flights from Vandenberg AFB, Calif., in the mid-1980s. For the present, however, the 6555th provides the only opportunity in the Air Force to work directly with the Space Shuttle at the launch base and it is proving to be an excellent training ground for the future.

AIR FORCE Magazine plans a future report on the Air Force's investment in the national Space Transportation System, including the preparatory activities at Vandenberg and elsewhere. NASA is a research and development organization. With a successful—and final—fourth test flight of the Shuttle, a crossroads of sorts will have been reached. It remains to be seen what kind of civilian management apparatus will be devised to oversee the national STS during Shuttle operations in the years ahead. ■

USAF IN SPACE

Though not as glamorous as the Space Shuttle program, the Air Force satellite program is already beginning to provide better communications, weather forecasting, and global positioning or navigation. Here's a brief review of the Air Force's satellite programs, reporting how they support operational commanders worldwide.

The Air Force Satellite Systems

COMPILED BY CAPT. PHIL LACOMBE, USAF
CONTRIBUTING EDITOR

ALTHOUGH overshadowed in the public's view by the spectacular success of the Space Shuttle's development flights, the Air Force effort in satellite development and employment is no less significant. In fact, because some systems are already operational and the phased development of others provides interim operational capabilities while development toward the final system continues, Air Force satellite systems are already of importance to military commanders.

The importance of satellite systems and their potential in the future are well illustrated in the AIR FORCE Magazine interview with Lt. Gen. Richard C. Henry, Space Division Commander, on p. 36 of this issue. Broadly speaking, the Air Force's space program includes some systems that do more than just relay information—provide navigational or weather information for instance. One such satellite system is the Navstar Global Positioning System.

Navstar Global Positioning System (GPS)

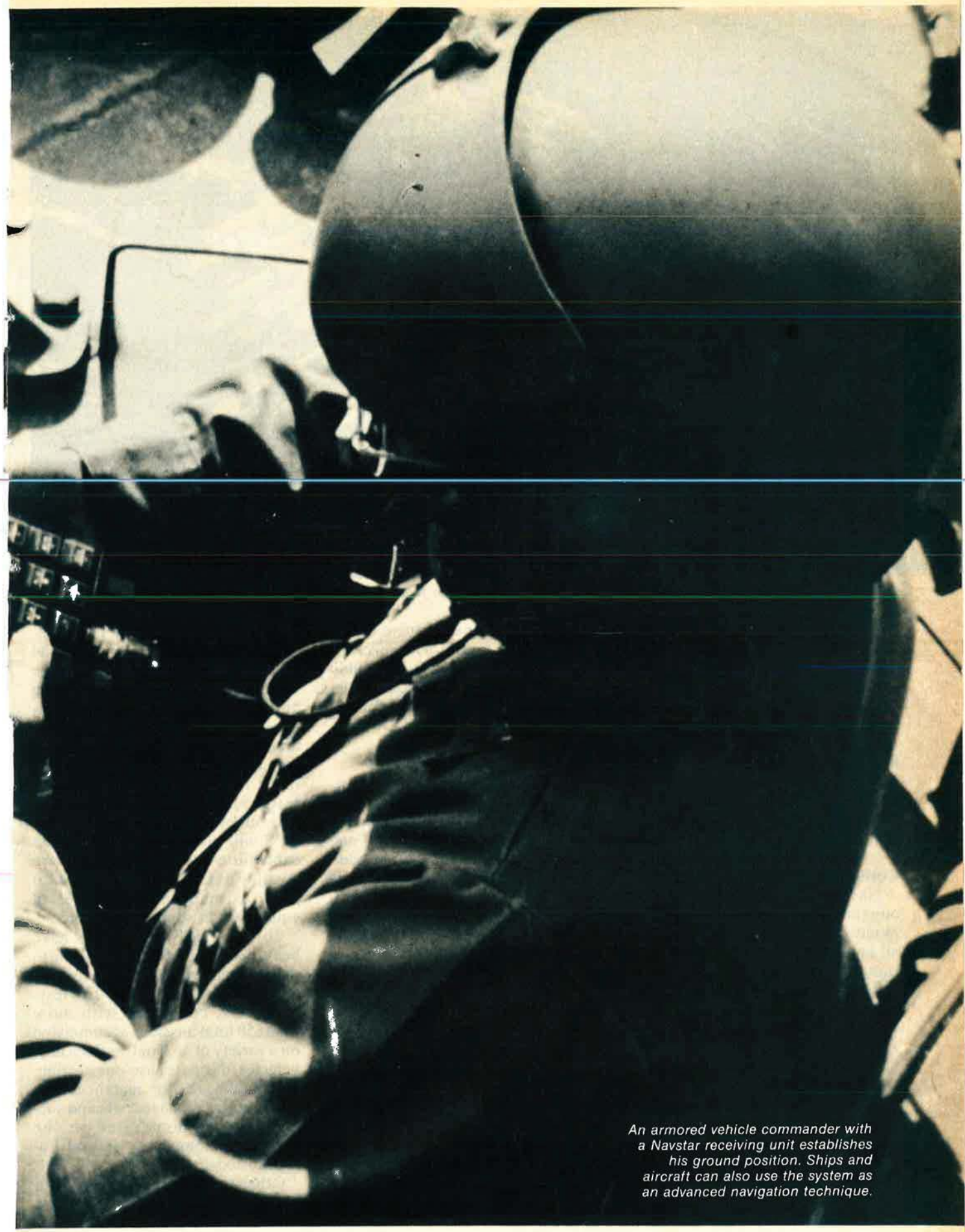
Essentially, the Navstar GPS is a satellite and ground-based system designed to provide the armed forces with an order of magnitude increase in accuracy over current navigational and position identification capabilities. Now being developed for all US and allied military forces by the Air Force Systems Command's Space Division, GPS will eventually employ at least eighteen satellites in subsynchronous earth orbits of 10,900 nautical miles to provide global coverage. The satellites will orbit in several distinct planes, be three-axis stabilized, and will circle the globe every twelve hours.

The GPS will provide tactical and strategic forces with accurate position fixes to within fifty-two feet in three dimensions (longitude, latitude, and altitude). In addition, GPS will provide users with velocity data to within 0.3 feet per second, also in three dimensions, and with accurate time to within one millionth of a second.

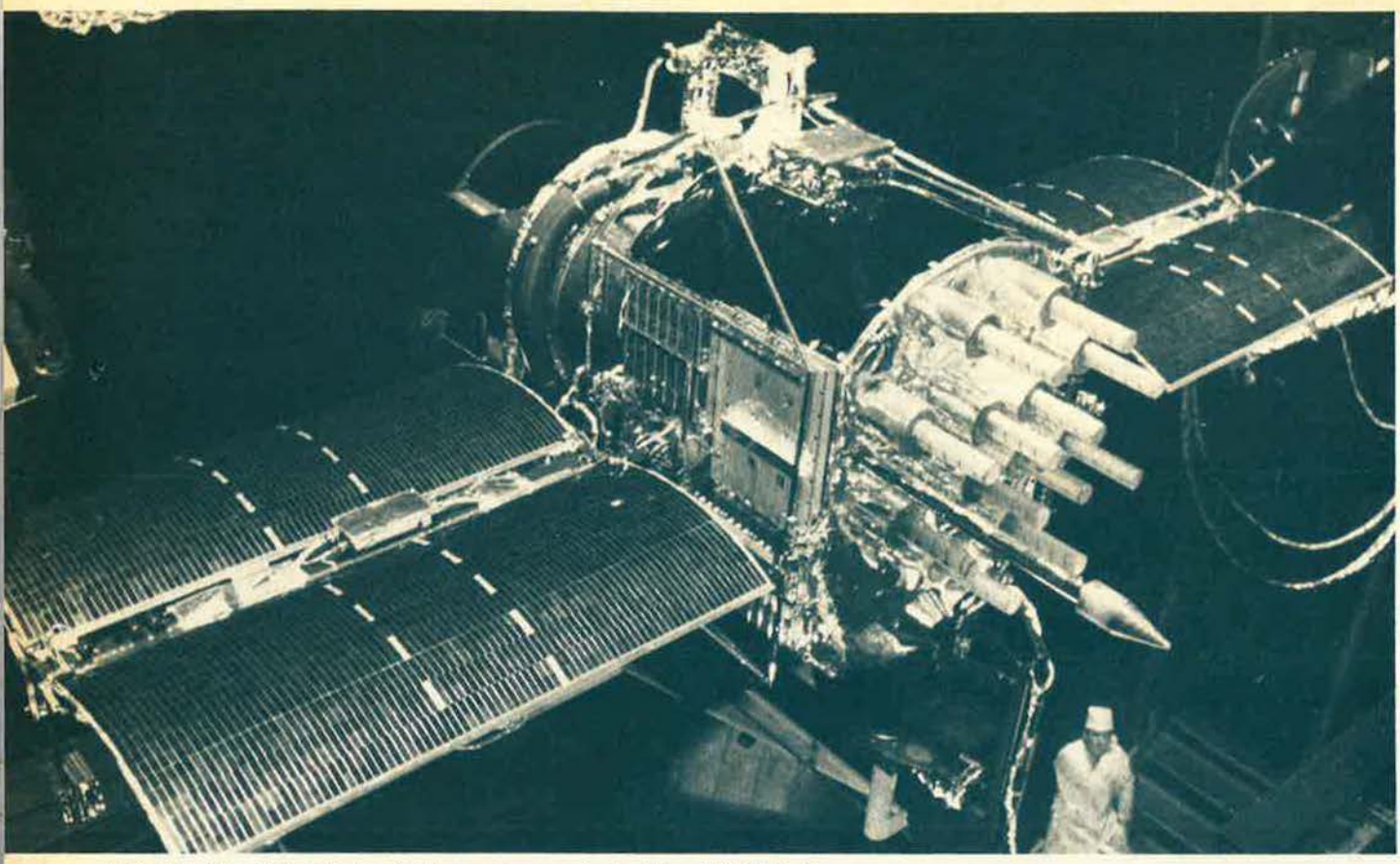
In addition to the satellites, with an operational weight of 1,016 pounds and measuring 210 inches from solar array tip to solar array tip, GPS development includes a user segment (passive receiver/computer elements to interpret the satellite-generated transmissions), and a control segment to provide updating of the information required.

How It Works

Each satellite transmits two L-band signals that incorporate a pseudo-random noise signal. These signals provide varied data, including information about satellite ephemerides or position in relation to other celestial bodies, atmospheric correction data, and satellite clock bias data. In the final system, a user's receiving device will select the signals from the four satellites in the most advantageous orbital positions and process the data from those satellites to compute accurate location estimates. In addition, user devices installed in aircraft, naval vessels, missiles, or ground vehicles will be able to navi-



An armored vehicle commander with a Navstar receiving unit establishes his ground position. Ships and aircraft can also use the system as an advanced navigation technique.



A Navstar Global Positioning System undergoes tests at Arnold AFS in Tennessee.

gate more accurately using the satellite information.

Various protective devices are available against threats aimed at the space, user, and control segments of the system. The pseudo-random noise code incorporated into the L-band transmissions requires a replica code generated by the user's receiving device and affords protection against interception or unauthorized use.

Control and User Segments

Navstar's control segment will consist of five widely separated monitor stations to track passively all satellites in view and accumulate ranging data from the navigation signals. This information will be transmitted to the Navstar Master Control Station at Vandenberg AFB, Calif. The Master Control Station will process the information and use it for orbit determination and systematic error elimination. Using an uplink station, the Master Control Station will update satellite computers with satellite ephemerides, clock drift, and other data required for effective operation.

A variety of contractors are developing the user equipment necessary for integration with aircraft, land vehicles, and ships. In addition, a lightweight backpack is under production and testing for use by ground troops.

Phased Development and Application

Navstar GPS is being developed in three phases. The initial concept validation phase began in 1974 and included the positioning of six satellites in two orbital planes to provide periodic three-dimensional coverage over various test areas, including the Army's Yuma Proving Ground in Arizona. During Phase II, Full-Scale Development and System Testing, the six-satellite constellation was maintained for GPS and the Trident Improved Accuracy Program. The third phase of development is scheduled to begin this year, heading toward an Initial Operating Capability in the latter half of the 1980s.

Potential strategic and tactical applications of Navstar GPS are numerous: en-route land, sea, and air navigation; bare base instrument approaches; all-weather airdrops; field artillery and shore bombardment; coordinate bombing; inertial navigation system updates in a wide variety of vehicles; photo-targeting and photomapping; passive rendezvous of land, sea, and air assets; antisubmarine warfare; minesweeping; mining and sensory delivery; range instrumentation; search and rescue; target acquisition; geodesy and survey; and a variety of others. GPS will provide highly accurate capabilities, and cost savings are possible as GPS user gear could replace as many as five pieces of equipment in some applications.

To date, GPS test results have been promising for application to the strategic and tactical environments. More than seventy-five tests have been conducted with more than 650 total missions accumulated on a variety of air, land, and sea host vehicles during phase-one testing. The backpack, for instance, was tested at the Yuma test site and successfully demonstrated in the NATO environment at several European locations.

Other tests included successful passive rendezvous between F-4 and C-141 aircraft, and a ren-

dezvous within tens of meters of the planned intercept point by a naval vessel and a P-3B aircraft. Testing of GPS-aided landing approaches were also successful with UH-1H, F-4, and C-141 pilots repeatedly bringing their aircraft to the Instrument Landing Approach window at decision height. In addition, helicopter landings with GPS-provided navigation resulted in fifty percent of all landings within a ten-by-six-meter box of the target landing point and ninety percent of all landings within a twenty-five-by-seventy-two-meter box of the target.

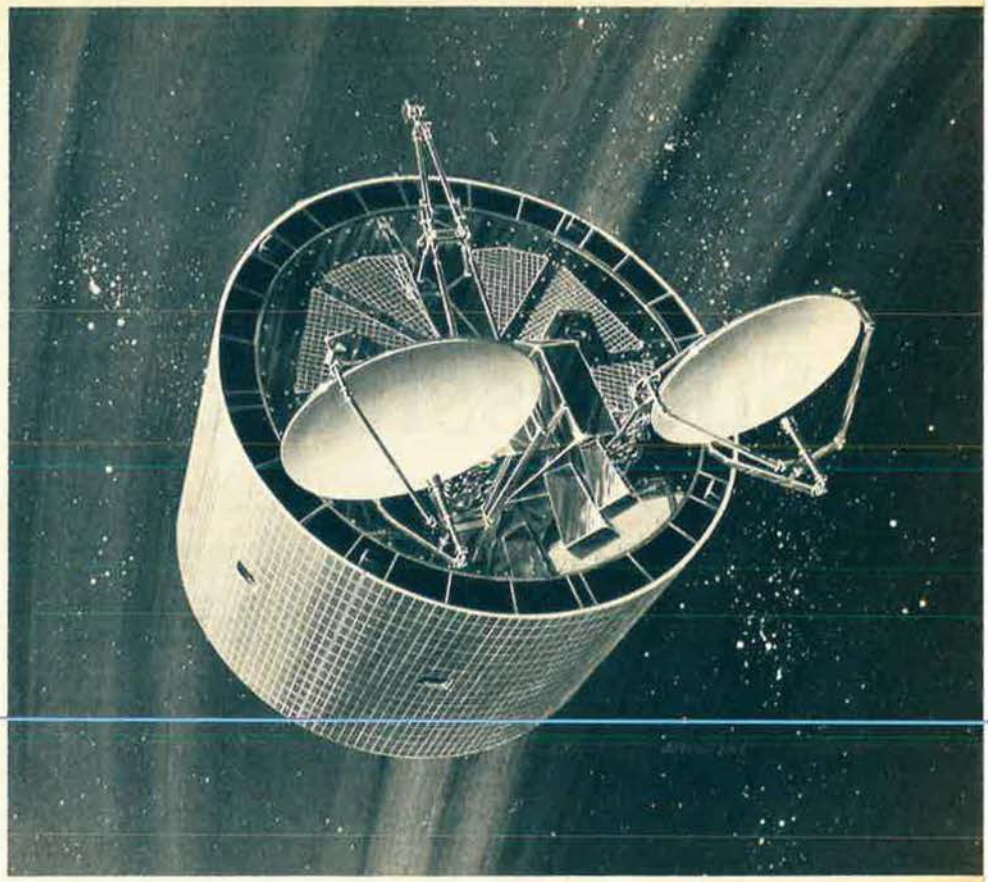
Sea navigation tests demonstrated GPS capabilities with a fast frigate navigating the San Diego harbor channel around Coronado on two separate occasions. The average mean difference between the conventionally plotted navigation solution and the GPS navigation solution was less than thirty meters.

In aerial weapons delivery, the GPS test results have also been dramatic. Tests conducted in August 1981 saw an F-4J toss bombs from between 1,000 and 2,000 feet AGL so accurately that if the target had been the Vincent Thomas Bridge in Long Beach, Calif., all bombs would have been on target—with half of them falling within ten meters of the center point.

GPS application to missiles has also been demonstrated with tests of GPS-aided Minuteman III missiles. In these tests, the GPS-assisted Minuteman guidance system was able to produce more accurate results than the Minuteman guidance system with conventional radar assistance.

Current plans for military buys of Navstar GPS user equipment, based on POM requests, indicate the Air Force wants 7,291 aircraft sets and 1,285 manpacks. The Army, Navy, and Marines are also requesting GPS user equipment for a variety of vehicles, and the Defense Mapping Agency has requested a number of manpacks.

The GPS effort is a significant one. The development of the three segments, under Space Division management, is proceeding on track. Today six satellites are in orbit and the Operational Control System Design and Development Contract (Phase III) has already been awarded.



Artist's concept of a DSCS satellite in orbit. The Defense Satellite Communications System program has been designed in three phases, with the second currently fully operational in providing global communications via four satellites.

Air Force Satellite Communications System (AFSATCOM)

Operational since May 19, 1979, AFSATCOM satisfies high-priority Department of Defense and Air Force communications requirements for command and control of US nuclear forces around the world.

AFSATCOM has no dedicated satellites; rather, AFSATCOM transponders are carried aboard a number of host satellites. Two of these are the Fleet Satellite Communications System, with its equatorial orbiting satellites, and the Satellite Data System, with its polar-orbiting satellites. These systems provide AFSATCOM transponders with worldwide relay capability between airborne and ground teletype terminals.

AFSATCOM's user elements include mobile and fixed terminals, plus various antennas and power supply systems. AFSATCOM message transmissions use a minimum of power and offer secure two-way communications.

Defense Satellite Communications System (DSCS)

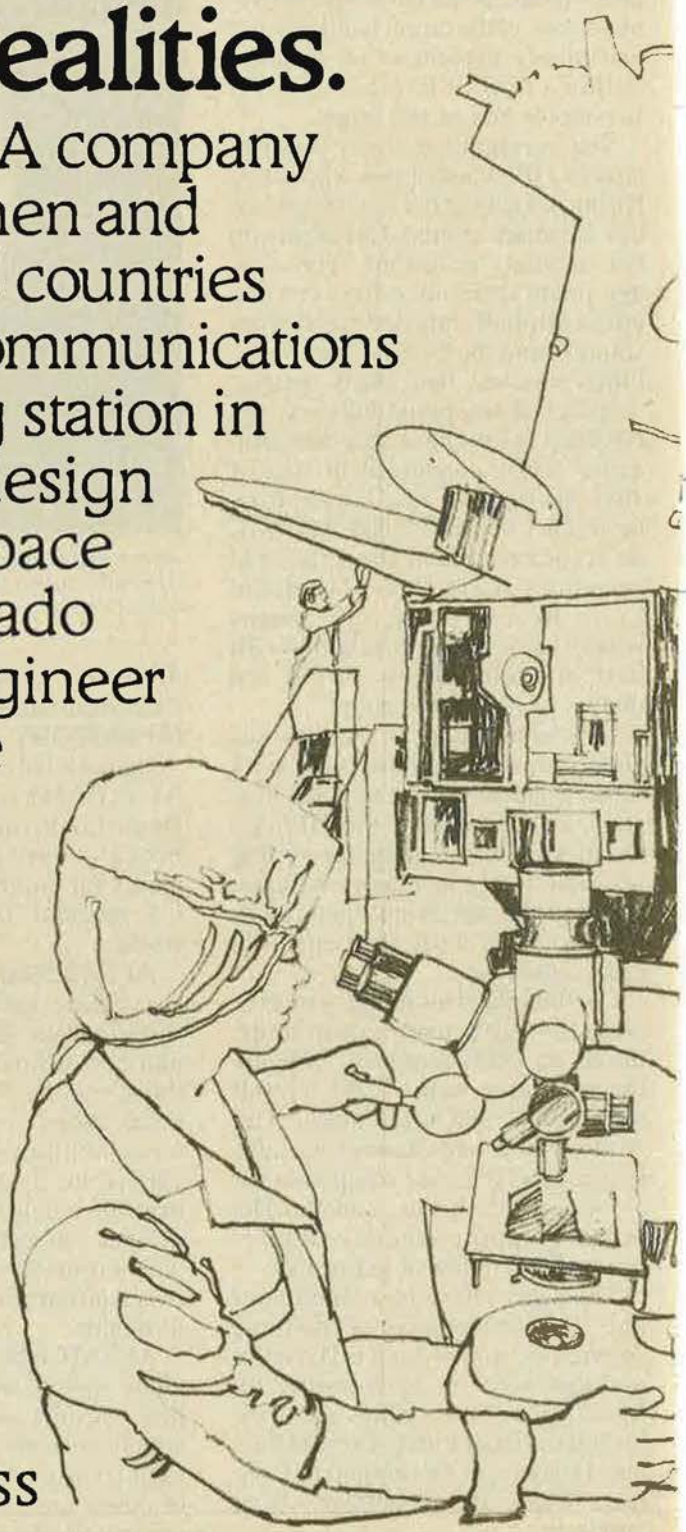
DSCS is a three-phased program to provide worldwide communications links for the Defense Department's requirements. Under the control of the Defense Communications Agency, the DSCS program's satellites are designed, developed, procured, launched, and maintained by the Space Division.

Phase One of the DSCS program saw the launch of twenty-six 100-pound satellites to provide single channel relay of voice, imagery, computerized digital data, and teletype transmissions in the late sixties.

Though designed for a brief eighteen-month life span, one of the original Phase One satellites is still operating. Phase Two of the program is fully operational today, with four active and two spare satellites providing global four-channel communications links for defense use. Phase Two satellites weigh more than ten times as much as their predecessors, incorporate propul-

Our People Make Impossible Dreams Successful Realities.

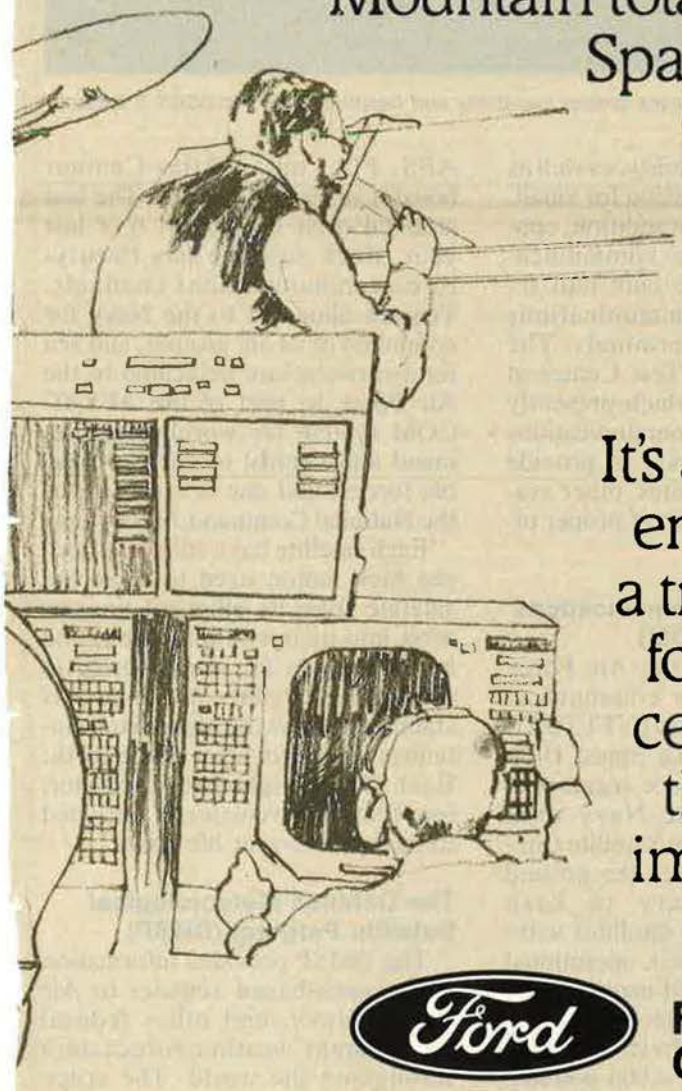
We're Ford Aerospace. A company of more than 11,000 men and women working in 25 countries around the world: A communications technician at a tracking station in Greenland, a satellite design expert in Palo Alto, a space orbital analyst in Colorado Springs, a software engineer in Sunnyvale, a missile guidance electronics assembler in Newport Beach, a Space Shuttle flight controller in Houston–these and all the rest of our people have a very special on-the-job attitude, an extraordinary commitment to success



which has helped to make Ford Aerospace & Communications Corporation one of the largest companies of its kind in the world.

Our accomplishments in satellite communications (INTELSAT V prime contractor), Defense (NORAD Cheyenne Mountain total system support), and Space Mission Support (NASA & DOD Space Shuttle and Satellite engineering and support services) reflect this attitude.

It's an attitude that has enabled us to establish a tradition of success for a quarter of a century; an attitude that does, in fact, make impossible dreams successful realities.



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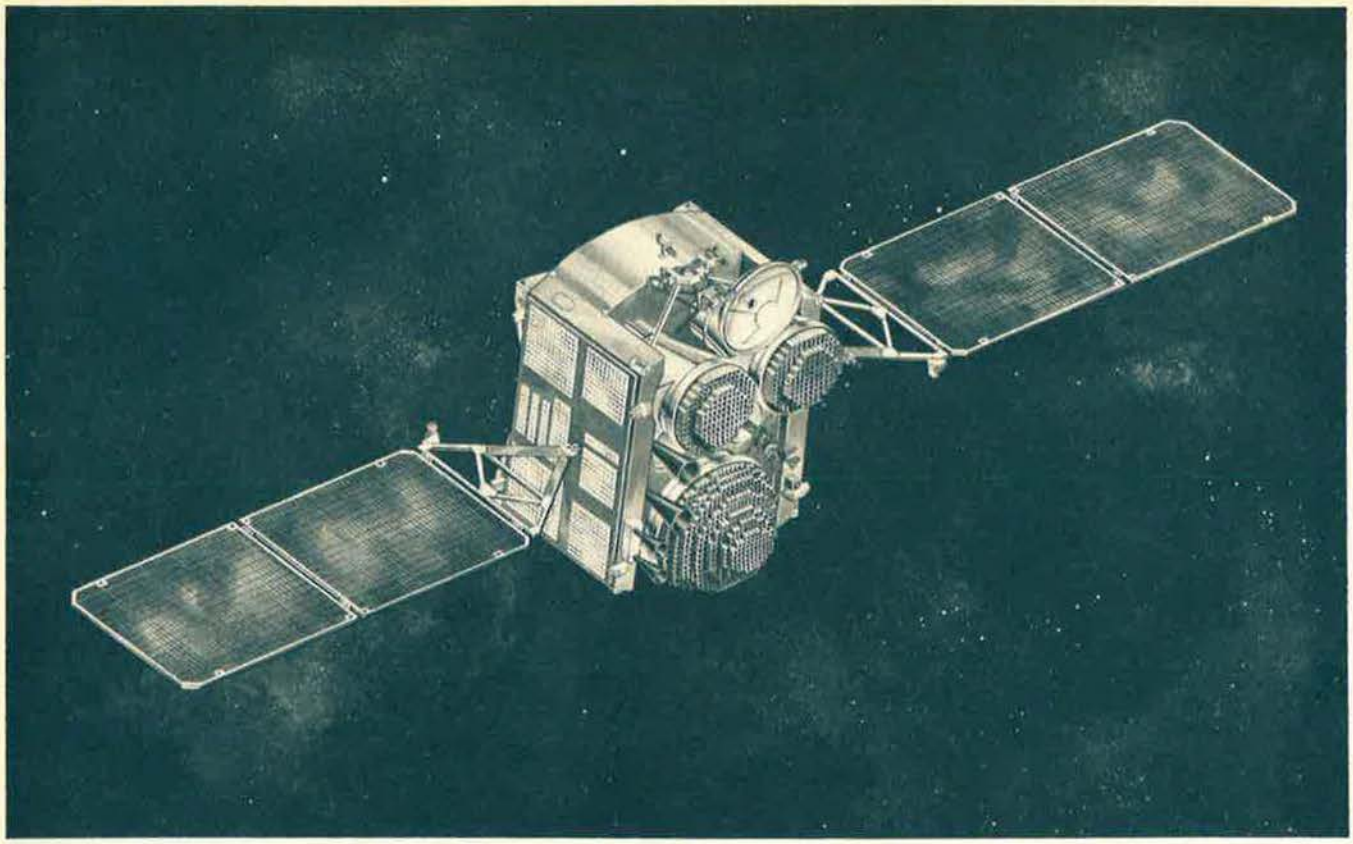


The first DSCS III satellite is scheduled for launch this year and promises greater capability and flexibility over the DSCS II system.

sion systems for orbit repositioning to support contingency communications requirements, and have two dish-shaped antennas that are steerable by ground command to allow concentration of the electronic beam on small areas for portable ground station links.

DSCS II satellites were launched aboard Air Force Titan IIIC boosters. Though sixteen satellites were procured, only six are now operational; four never achieved orbit due to failures in the launch vehicles; three outlived their operational life span of five years; and one is slated for launch, in a modified configuration, later this year.

The first DSCS III satellite is also scheduled for launch this year. DSCS III satellites will assume the same 23,230-nautical-mile synchronous orbit over the equator as the DSCS II satellites. A total of twelve DSCS III satellites will be bought.

DSCS III will offer greater flexibility, longer life span (ten years), and increased capability (six channels). Flexibility is a good description of DSCS III, since its array of antennas, with steerable beams and other improvements, will provide earth-coverage capability, as well as a spot beam transmission for small, portable receivers. In addition, control of the satellites' communications system will be built into selected Defense Communications Agency-managed terminals. The Air Force Satellite Test Center at Sunnyvale, Calif., which presently controls DSCS II communications systems, will continue to provide control for the satellites' other systems and maintenance of proper orbit characteristics.

Fleet Satellite Communications System (FLTSATCOM)

Another part of the Air Force worldwide satellite communications system is the Navy's FLTSATCOM. The Air Force Space Division acquired the space segment of the system for the Navy and, through the Air Force Satellite Control Facility, provides the ground command necessary to keep FLTSATCOM's five satellites within one degree of their operational longitude in a 22,250-nautical-mile geosynchronous equatorial orbit.

FLTSATCOM's first satellite, weighing more than 4,000 pounds, was launched from Cape Canaveral AFS, Fla., on an Atlas-Centaur booster in February 1978. The last attained orbit on August 6 of last year. Each satellite has twenty-three communications channels: Ten are allocated to the Navy for command of its air, ground, and sea forces; twelve are dedicated to the Air Force as part of the AFSATCOM system for worldwide command and control of nuclear-capable forces; and one is reserved for the National Command Authorities.

Each satellite has a solid-fuel apogee kick motor, used to drive the satellite from its elliptical transfer orbit into its operational orbit, and hydrazine jets for maneuvering in space. The satellites are three-axis stabilized, allowing their fixed antennas to always point at the earth. Each of the eight-foot-diameter, four-foot-high vehicles is designed to have a five-year life span.

The Defense Meteorological Satellite Program (DMSP)

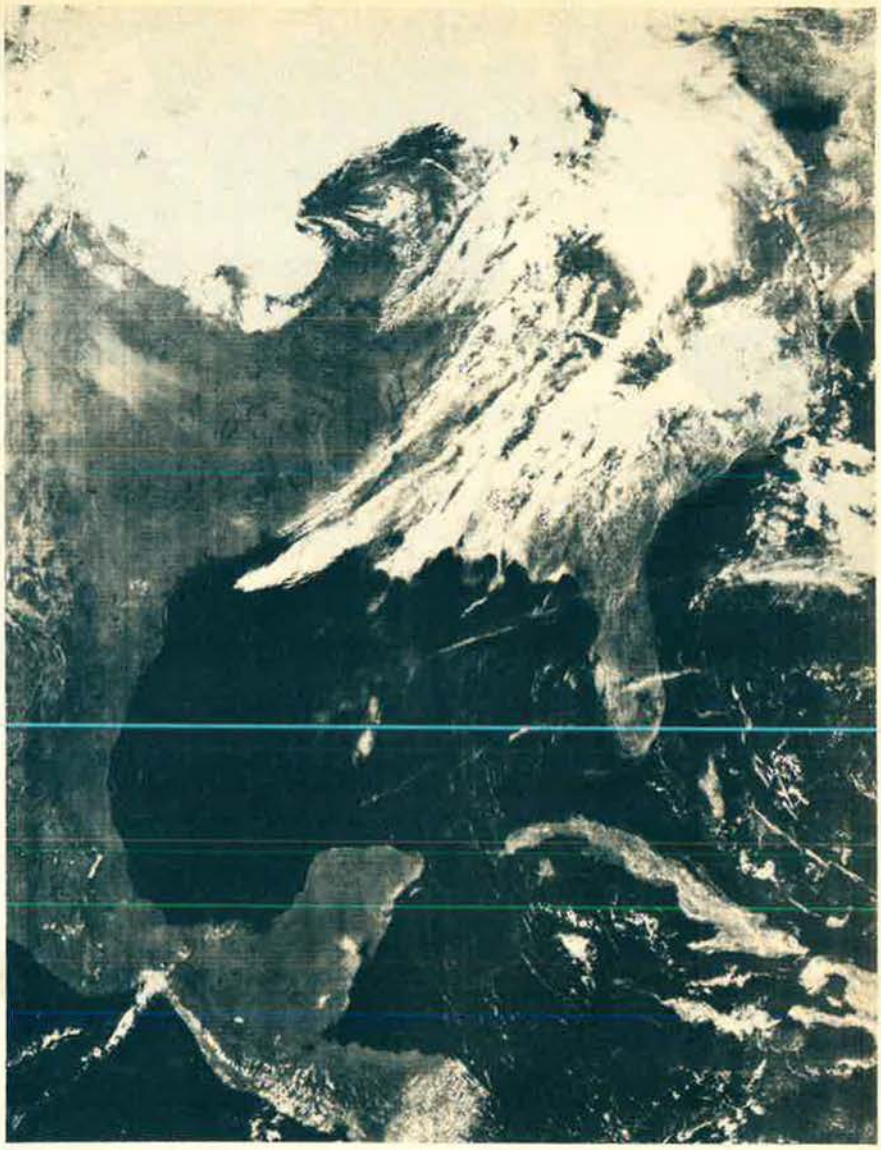
The DMSP provides information from space-based sensors to Air Force, Navy, and other federal government weather forecasters throughout the world. The space segment of the program normally

uses two satellites in sun-synchronous, near-polar orbits of 450 nautical miles. These satellites complete an earth orbit in 101 minutes—allowing each satellite to survey the entire globe in about twelve hours.

The satellites now being used are known as Block 5D-1 satellites. Each scans a 1,600-nautical-mile-wide area. The 1,131-pound satellites have an Operational Linescan System, which uses a radiometer to provide visual and infrared imagery at either 0.3 or 1.5 nautical mile resolution. This data is used by forecasters to analyze cloud formations in a wide range of military requirements. In addition, the satellites take infrared and microwave soundings at various altitudes to provide temperature and moisture measurements at various points within the atmosphere. Also, some satellites are equipped with precipitating electron spectrometers to provide data necessary in forecasting the location and intensity of the aurora in the northern hemisphere—useful for military radar and long-range ground communications.

Essentially, the DMSP satellites provide data to two command readout locations operated by the Strategic Air Command's 4000th Aerospace Applications Group, as well as to Air Weather Service units with fixed or mobile equipment and Navy shipborne terminals. The command readout stations at Fairchild AFB, Wash., and Loring AFB, Me., feed the DMSP-provided data to the Air Force's Global Weather Center at Offutt AFB, Neb., and the Navy Fleet Numerical Oceanography Center.

The DMSP program is scheduled to begin using a new satellite, the Block 5D-2. In fact, Space Division recently received the first Block 5D-2 satellite and is now conducting prelaunch tests and preparations.



Defense Meteorological Satellites are in sun-synchronous, near-polar orbits of 450 nautical miles, in which they circle the globe once every 101 minutes. Completing a survey of the entire planet in about twelve hours, the DMSP satellites transmit photos to military ground stations and ships around the world.

NATO Integrated Communications System (ICS)

The NATO ICS is a three-satellite communications network built and launched under the management of the Space Division. The Phase III system, now in operation, consists of three satellites launched between April 1976 and November 1978. These three satellites were launched aboard NASA Delta space boosters from Cape Canaveral into geosynchronous orbits of 23,300 nautical miles above the Atlantic Ocean. In addition to serving NATO's communications needs, the second NATO ICS satellite supports the US Defense Satellite Communications System.

Each of the NATO ICS satellites is spin-stabilized at ninety rpm, with a hydrazine reaction control system, and incorporates a "despun" antenna platform with three horn antennas: one narrow-beam, one wide-beam, and one common receiver. An electric motor drive keeps the three antennas pointed at the proper earth locations. The NATO ICS offers three communications channels, an X-band beacon for identification and acquisition by ground control stations, and onboard S-band receivers for satellite command and control.

A fourth NATO ICS satellite has been ordered, with an option on a fifth, which should extend system life into the late 1980s.

The Air Force satellite communications program is already operating in support of operational commanders from all services. The development work now going on will go far to improve the system further. And others are planned, like the use of Laser Communications (LASERCOM) with satellites—but that's well into the future and only preliminary testing of LASERCOM for satellite capabilities is expected in the 1980s. ■

USAF IN SPACE

Man has been using space regularly for just a quarter-century; yet, by now, exploitation of space is commonplace. Knowing that, it is useful to reflect on the many people of the US Air Force, past and present, who are . . .

Space Pioneers

BY CAPT. ALBERT V. CHAPMAN III, USAF

PRIDE and accomplishment are the words that best describe the thrust of the US Air Force space program. Characterized by dynamic growth and state-of-the-art technology and development, the program ranges from meteorology and surveillance to command control and communications activity vital to national security. While past efforts focused on unmanned satellite operations, the Air Force today is actively engaged in manned spaceflight operations. Spurred by success and the promise of the Space Shuttle, the Air Force commitment to manned spaceflight is amply evidenced by the service's Manned Spaceflight Support Group (MSFSG) at NASA's Lyndon B. Johnson Space Center in Houston, Tex.

The Space Shuttle, with its enormous potential, bridges the gap between NASA's responsibility for space research and the Defense Department's congressional mandate of responsibility for space activities peculiar to or primarily associated with the development of weapon systems, military operations, or the defense of the United States.

The Space Shuttle captured the interest of the Department of Defense as it offers increased capability in space, including greater mission flexibility, an ability to accomplish military space activity on a routine basis, and lower payload life-cycle costs through recovery and reuse.

As the Department of Defense executive agent for Space Shuttle matters, the Air Force entered an agreement with NASA in February 1970, ensuring that the Space Transportation System (STS) would provide maximum utility to both military and civilian users at lower operating costs than the then-present space launch systems.

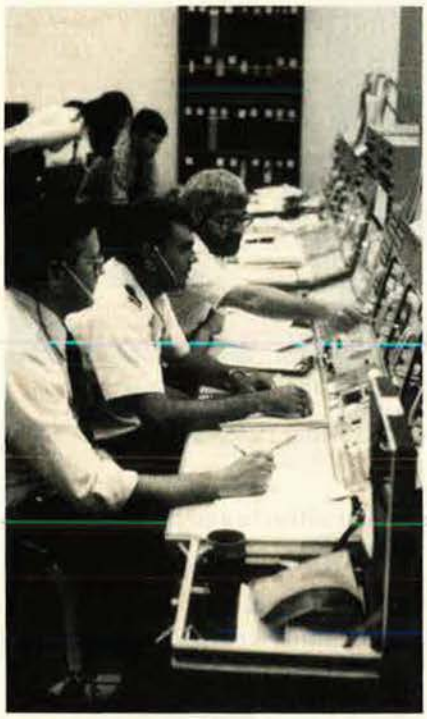
Military Personnel at JSC

The Johnson Space Center (JSC), with more than 100 buildings located twenty-five miles southeast of Houston, is the NASA center responsible for design, development, and testing of all manned spacecraft and associated systems required for manned spaceflight. It is also home of program management responsibility for the Space Shuttle program, and employs more than 3,600 engineers, technicians, managers, and support personnel—in addition to another 6,000 contractor personnel who work at or near the Center. Military people have also been assigned there since the early days of JSC's operation.

Military officers have formed the backbone manpower pool for astronaut crews. In addition, another category of military people has worked at the Johnson Space Center. Under the auspices of the Detailee Program, these Air Force members doff their uniforms and are on loan to NASA to help meet various requirements for engineering and technical support. On completion of their tours with NASA, these individuals are reassigned to military units.

The visibility of Air Force personnel in manned spaceflight operations at JSC increased on June 1, 1979, with the establishment of the Manned Spaceflight Support Group

Left, 2d Lt. Josie A. Ballato, a recent USAF Academy graduate, is a Shuttle flight controller for on-board navigation systems. Her area of technical knowledge will be used extensively in Shuttle rendezvous and docking maneuvers. Below, Maj. Harold L. Hardwick, Jr., is one of the initial cadre of DoD Space Shuttle flight controllers. He is a guidance, navigation, and control system engineer. He is flanked by Greg Hite (left foreground) and James Webb, NASA co-workers. (Photos by Capt. A. V. Chapman, USAF, printed courtesy NASA)



In NASA's training division, Capt. Eugene H. Powell (standing) and Maj. Charles W. Shaw, both former USAF missileers, are being trained as Shuttle mission simulator operators and instructors.

(MSFSG) under AFSC's Space Division Commander, Lt. Gen. Richard Henry.

Emphasis on direct participation by MSFSG members in the Shuttle effort with increased focus on active involvement in operation of manned spaceflight cast the organization, unlike its predecessors, into the limelight of manned space affairs. Now aligned under SD's Deputy Commander for Space Operations, MSFSG is directed to develop the capability to plan and conduct DoD Space Transportation System (STS) missions. USAF personnel train at JSC in order to support the command and control of DoD STS missions directly. Furthermore, MSFSG obtains STS services for STS/payload integration and payload mission support and oversees the implementation of secure DoD missions at JSC. The unit also manages the acquisition phase of the Shuttle Operations and Planning Complex (SOPC) portion of the Consolidated Space Operations Center, including the transition of DoD personnel from JSC to the SOPC.

MSFSG Cadre

Charged with the training of Air Force people to command and control Space Shuttle flights carrying both national defense and civilian cargo, one of the first major efforts of the new MSFSG organization was creating a cadre of officers to form the nucleus of Air Force manned spaceflight expertise.

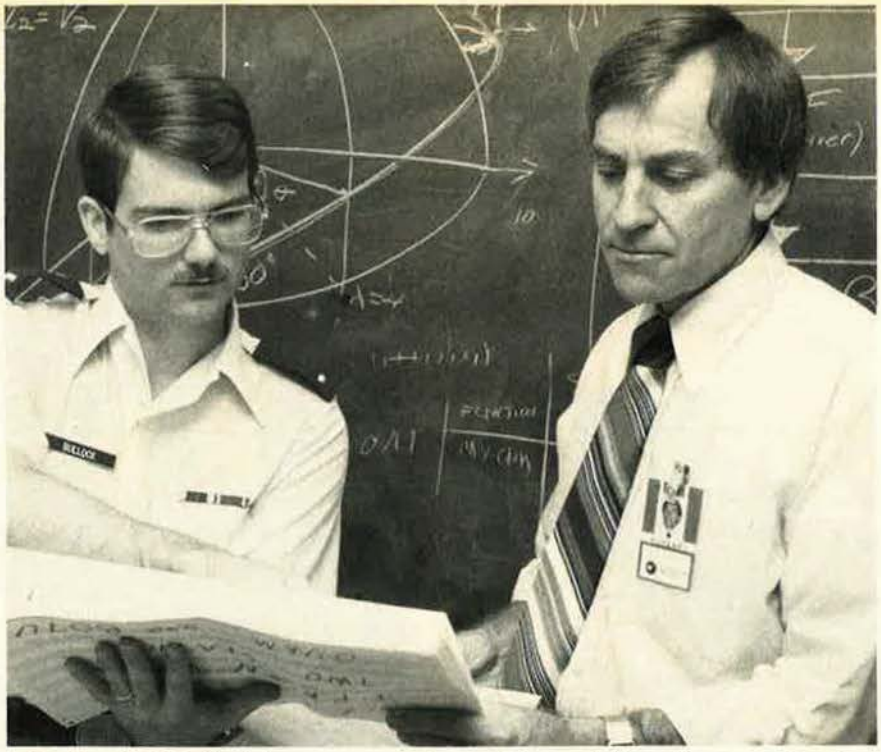
Rigorous screening of numerous military records and résumés by USAF and NASA officials at JSC produced the best possible combination of experience, ability, and potential to form the first uniformed team of manned spaceflight officers. One by one, in close concert with the Manpower and Personnel Center at Randolph AFB, Tex., requests went out to selected individuals across the nation and overseas. People with distinguished records of distinctive accomplishments continued to augment the unit as time rolled on, and each new successive MSFSG member began to accept a critical role in the success of the Air Force's manned spaceflight mission.

As the Department of Defense commitment to space activities became evident by the growing Air Force presence at the Johnson Space Center, it was reaffirmed by such high-ranking military and civilian government officials as Lt. Gen. Jerome F. O'Malley, Deputy Chief of Staff, Plans and Operations: "The Air Force is gearing up for the exploration of space over the next few years. . . . It's time to get the operators more involved with space activities. . . . We are entering a new era of space operations, and must recognize that space is no longer an R&D environment only, but an operational medium as well."

After describing the need for space capabilities and the importance of field commanders having confidence in the capabilities of space systems, General O'Malley told the MSFSG audience: "The Air Force made a conscious effort to staff your organization with select, eager people who possess a variety of skills that will contribute both to the job we have here at the Johnson Space Center and the future job at the Air Force Control Center in Col-

orado Springs. . . . Where we go will largely be determined from the fruit of your labor."

Air Force cadre personnel assigned to MSFSG simultaneously receive specialized training and perform mission-essential duties in four distinct areas; Flight Planning, Flight Readiness, Flight Control, and Control Center Operations and Maintenance. These Air Force people have been carefully assigned to key positions in the NASA work centers where they will acquire the knowledge and skill needed to carry out the standing order: "Prepare for the eventual command and control of DoD Shuttle flights from a Consolidated Space Operations Center."



2d Lt. Harold E. Bullock is a computer science officer and flight planner working in Space Shuttle software development. Here he explains a new space navigation computer capability to NASA branch chief Elrick McHenry. (NASA photo)

Flight Planning

In the Flight Planning area, officers design all aspects of Shuttle flight; planning can begin three to five years before a given Shuttle flight ever leaves earth. Initially, sophisticated computer programs, part of JSC's Mission Planning and Analysis Division, facilitate flight planning to the finest detail, and are refined constantly to achieve maximum performance. Based on requirements levied by various military and civilian program offices, flight planners design the entire launch trajectory, orbital operations, Orbiter reentry, and landing. They determine how much fuel, water, electrical power, and support equipment will be required on a Shuttle mission that could range anywhere from a couple of days to a number of weeks. Air Force mission planners are involved in developing and maintaining the flight design system, selecting a best liftoff time and flight trajectory, determining how to integrate payloads correctly, and designing proper navigation tools. Other Flight Planning duties include analysis of propulsive and nonpropulsive consumables, orbital maneuvering, landing procedures, and real-time support to the Mission Control Center during flight.

Flight Readiness

Air Force members are also assigned to NASA's Training Division—responsible for that part of the Shuttle mission known as Flight Readiness. There, military people are learning the complexities of astronaut and flight controller training for various Space Shuttle missions. This office provides instructors and training for two purposes: mission-specific training for Shuttle crews (astronauts and mission specialists), and specific flight training for the flight controllers who man consoles in the Mission Control Center.

In addition to participating actively in the training of Space Shuttle astronaut crews and mission control flight control teams, Flight Readiness personnel parallel the real-time activity of flight controllers—working closely with experienced engineers and controllers to analyze and solve actual mission flight deviations.

Simulation Control Area (SCA) teams and their respective operators configure the Shuttle Mission Simulator to duplicate conditions experienced in flight in order to evaluate proposed workarounds or fixes for inflight anomalies. This allows them to create or recreate, and solve, during flight, unexpected problems with the Shuttle. Other functions typically performed by Flight Readiness personnel include flight data file management, crew activity and planning and scheduling, and determination of Shuttle Orbiter attitude and pointing procedures.

Flight Control

The third category of MSFSG members is assigned to Flight Control. Here, officers are learning real-time conduct of Space Shuttle missions. After receiving intensive academic training in one of dozens of specialized Orbiter systems and operating procedures, and following many hours of intensive integrated simulations involving the flight controller team and the astronaut crew, they are assigned to specific console positions and certified for flight.

They actively command and control Space Shuttle flights and associated payload activity—constantly monitoring, analyzing, and correcting discrepancies in the scores of Shuttle subsystems. They continuously refine specialized procedures in guidance, navigation, and control; propulsion systems; computer commanding; communications; thermal systems; flight computers; auxiliary power units; flight dynamics activity; landing support operations; and operations and payload integration activities. After all premission planning and training has been accomplished, the actual flight

is controlled from the Mission Control Center consoles of these Flight Control team members.

Control Center Operations and Maintenance

The fourth area where USAF cadre members are assigned is the Ground Data Systems Division (GDSD). These Air Force people are being qualified in Mission Control Center operation and maintenance functions. They are responsible for the proper configuration and readiness of a worldwide network of satellite tracking stations to acquire orbital Shuttle voice and telemetry data and route it to JSC.

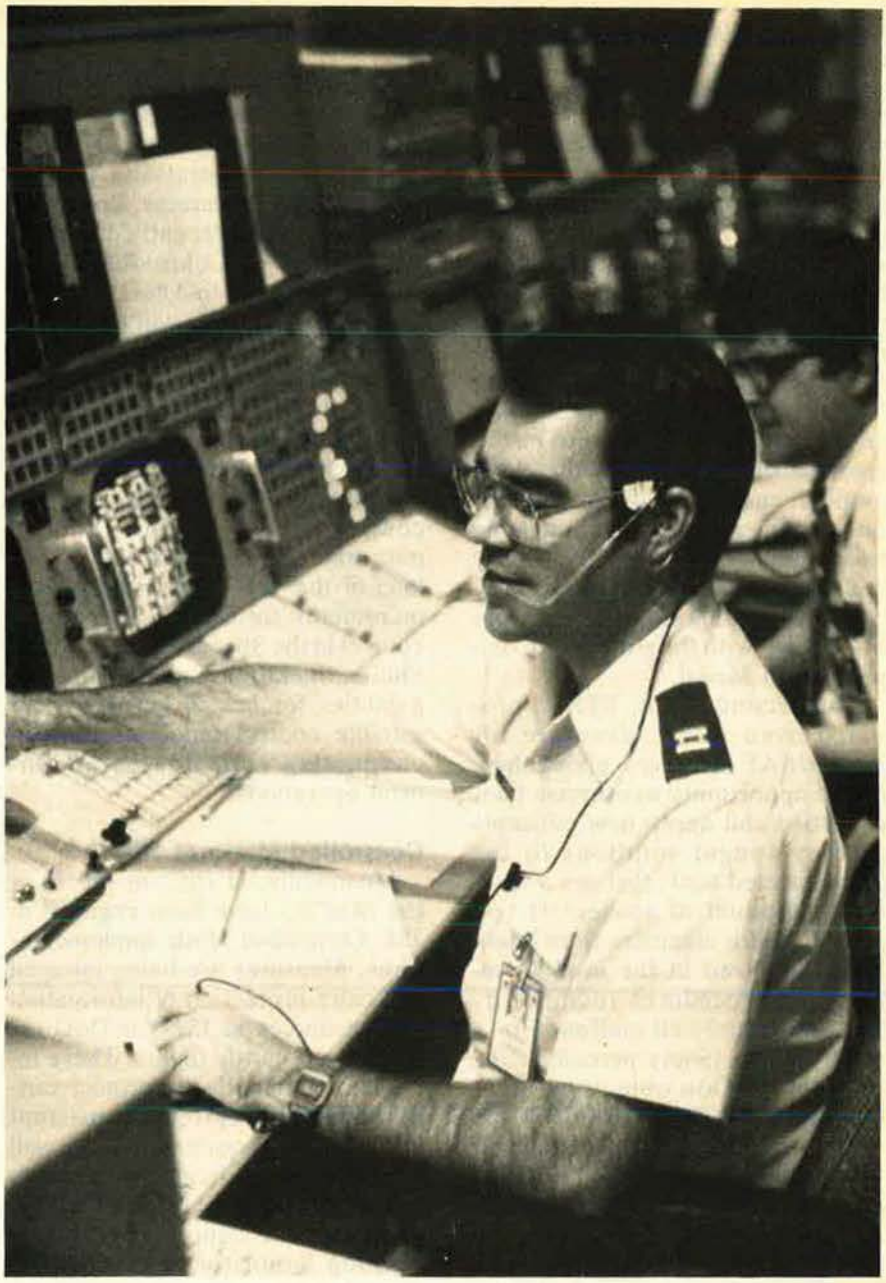
Once telemetry data is delivered to the Mission Control Center in Houston, GDSD personnel break it down and distribute it in a usable format to facilitate interpretation by the Flight Control team and various payload and subsystem users. This is critical for the success of real-time command and control of Shuttle flight activity. In addition, GDSD personnel provide overall management of the myriad equipment, consoles, displays, and analytical devices found throughout the Mission Control Center complex.

Accomplishments

MSFSG members are assigned throughout the NASA organization with mission-essential duties at JSC. As their ranks swelled in 1981, responsibility multiplied as well, with nearly two dozen cadre members advancing through the last of an extensive and comprehensive series of activities culminating in qualification for STS-1 certification as members of the Houston Mission Control Space Shuttle Team.

Cadre members were tenaciously pressing on with critical last-minute accommodations in the NASA Mission Planning and Analysis Division, while MSFSG members in the Training Division were found performing duties as Shuttle Mission Simulator operators, Shuttle Flight Operations Systems Instructors, and Flight Data File Managers. Meanwhile, the first Department of Defense Space Shuttle Flight Controllers and GDSD personnel put checklists through review after review and refined procedures in the final stages of finetuning for flight. Despite their varied disciplines, controllers meshed smoothly with their respective teams.

Twenty MSFSG cadre officers supported the 1981 maiden flight of the Shuttle at Houston's Mission Control Center. One provided de-



Capt. Robert W. Harris is an instrumentation engineer flight controller. During flight, he controls Orbiter communication subsystem functions. One of the initial cadre assigned to MSFSG in 1980, he has a background as an Air Force communications officer that helped him blend rapidly into Shuttle mission control activity.

Captain Chapman is one of the original thirteen officers selected to enter training at the NASA Johnson Space Center in 1980 as DoD's first cadre of Space Shuttle flight controllers. He supported STS-1 and -2 from the Mission Control Center as Orbit Team Landing Support Officer, and was then advanced to duties as Operations Integration Officer. From a career Air Force family, Captain Chapman entered the Air Force in 1971 as an Electronic Intelligence Operations Specialist. After a tour in West Berlin, he received an appointment under the Airman Scholarship and Commissioning Program, and completed his B.S. degree at Brigham Young University, where he was commissioned a distinguished graduate of the Air Force ROTC. He subsequently earned an M.S. degree in Systems Management from the University of Southern California, and was tendered a Regular commission.

tailed spaceflight meteorology status, another worked the timing problem that delayed initial countdown. One coordinated landing site support status while another recommended adjustments to Orbiter cabin temperatures. One arranged real-time Orbiter telephone links with the White House while another commanded the TV cameras aboard the Shuttle. One calculated orbital adjustment burns and another kept the simulators standing by to proof solutions in case of an emergency. STS-1 proved to be the great success our nation has long awaited, and in recognition for their outstanding achievement in helping bring about that success, the twenty cadre members were personally decorated by SD Commander General Henry with the Air Force Commendation Medal.

The second flight, STS-2, provided even more adventure for more USAF members, giving them ample opportunity to exercise their expertise and apply new concepts as they sought solutions to the many-faceted trials that are a natural by-product of spacecraft test flights. Cadre members were intensively involved in the in-flight replanning procedures required by the STS-2 fuel-cell malfunction—ensuring that ninety percent of the original mission objectives were still met.

JSC personnel recognize their Air Force colleagues as valuable assets to the STS program. They have undergone rigorous training and demonstrated their knowledge time and again in complex mission simulations, briefings, and actual spaceflight.

Secure Operations

MSFSG's mission goes beyond the STS flight test program. An early issue that faced planners developing Air Force Space Operations concepts and capabilities was whether DoD should develop an independent capability for conducting Shuttle flights or continue to use NASA's JSC. Following years of study, it has been decided to modify NASA JSC facilities for DoD activity and operate in a controlled or secure mode for support of DoD missions, called Controlled Mode Operations, until a separate DoD-operated Shuttle Operations and Planning Complex (SOPC) is available.

The SOPC is currently planned for collocation with the Satellite Operations Center, within a Consolidated Space Operations Center (CSOC), which Secretary of the Air Force Verne Orr recently disclosed will be built in Colorado Springs during the mid- to late-1980s. Included in the CSOC will be a dedicated centralized DoD Shuttle Mission Command and Control and Payload Operations Specialist Training Facility, as well as the Satellite Operations Center. The CSOC will provide the management and control needed for DoD Shuttle missions and the increased work load of the '80s—meeting DoD requirements for launch and orbital control in the Space Shuttle era with Shuttle operations and planning capabilities for launch activities and satellite control functions used in conducting DoD spacecraft on-orbit operations.

Controlled Mode at JSC

Meanwhile, at JSC, members of the MSFSG have been engaged in JSC Controlled Mode implementations. Measures are being initiated to assure protection of information and resources at JSC for DoD activities on Shuttle flights. These include modifications to protect various computer systems consistent with NASA requirements, as well as facility modifications, such as tourist entrances at the NASA Mission Control Center and Shuttle Mission Simulator to permit continued public viewing of JSC resources.

In addition, Mission Control Center construction modifications for the Flight Control Room and Support Rooms to facilitate DoD operations were begun in 1981. Meanwhile, other systems and hardware for the Controlled Mode are being installed, tested, certified, and made ready for the first DoD Shuttle mission. All subsystems are scheduled for completion by July 1983.

SOPC Activity

MSFSG personnel are also developing concepts for manning and equipping the proposed CSOC. The MSFSG Flight Support and Training Directorate determined that more than 900 military and civilian specialists must be trained to operate the SOPC portion of the CSOC. In-depth studies helped determine the types and numbers of positions to be filled, technical skills to be acquired, and the best procedure for identifying and training manpower resources.

Members of the MSFSG SOPC Project Office have been coordinating closely with NASA to define requirements and system configurations for the SOPC portion of the Consolidated Space Operations Center. After completing initial studies at the functional level, detailed follow-up studies will be initiated to define specific equipment designs needed to bring the SOPC on line.

Payload Integration and Mission Ops

A final group of MSFSG members continues to perform one of the earliest functions assigned the detachment. Payload integration and mission support directorate personnel have influenced the very design of the Shuttle and now work to assure Shuttle compatibility with DoD payloads. These MSFSG payload integration engineers, mission support officers, and system safety people make sure Air Force needs are met at each stage of Shuttle development. They are the Air Force's day-to-day link with NASA during the years it takes to prepare a DoD mission for Shuttle flight. In addition, they support the Space Division Deputy Commander for Space Operations in defining the role and responsibilities of future DoD mission directors.

With new Shuttles continuing down the assembly line, four-member crews and end-of-mission landings at the Kennedy Space Center only months away, and with the official announcement about the Consolidated Space Operations Center in Colorado Springs and the reorganization of the USAF Space Operations career field and forecasts of its doubling in size in the next few years, one thing is clear: Air Force space operations are taking on new importance. The Manned Spaceflight Support Group in Houston will have a direct impact on the course of events yet to follow in this most exciting arena. ■

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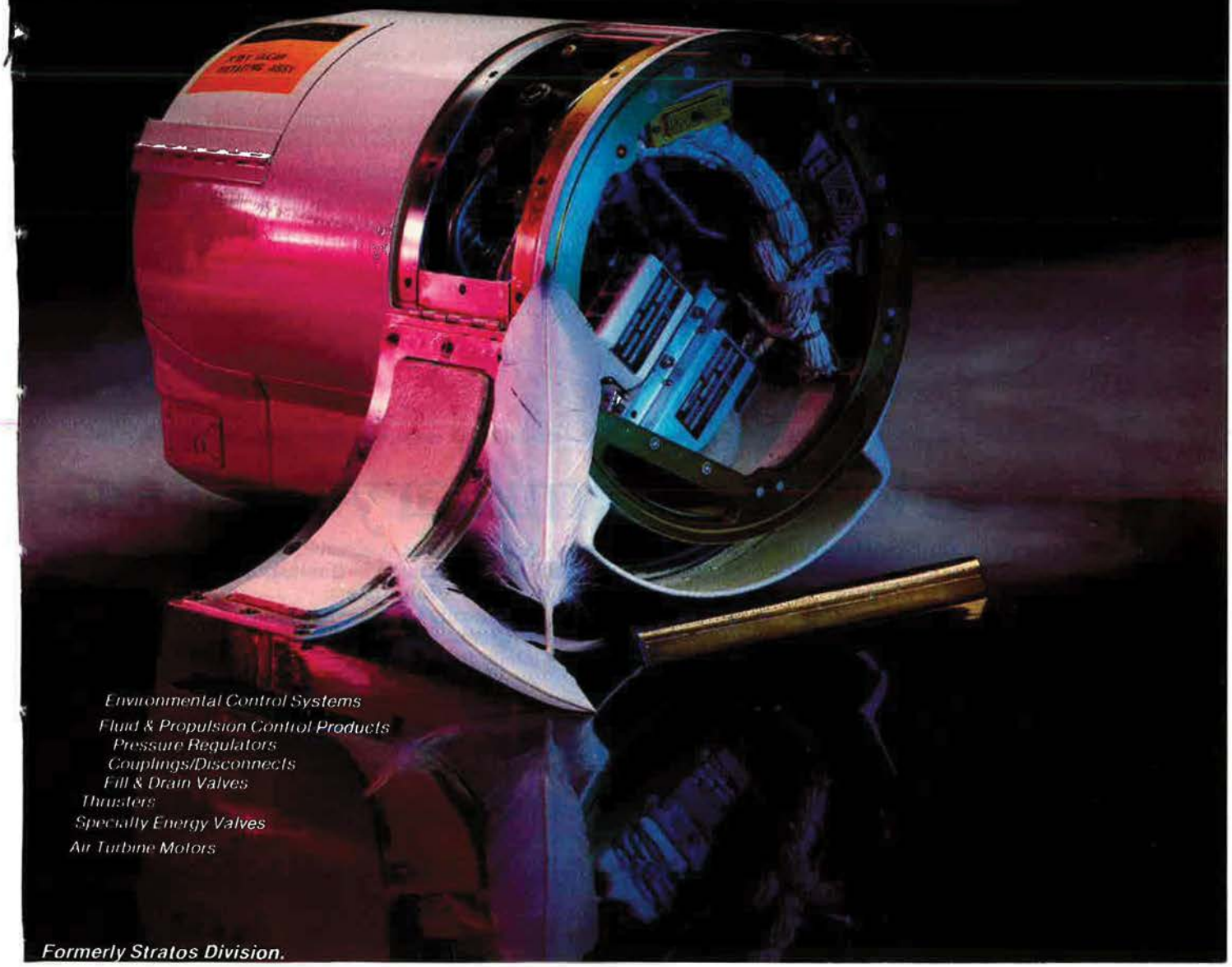

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Although the Warsaw Pact and its forces may appear to be a formidable, monolithic war machine, when faced with a situation other than invading Western Europe, the Pact may be less than the sum of its parts.

WARSAW PACT: JUGGERNAUT OR PAPER TIGER?

BY CAPT. STEVE F. KIME, USN

THE danger to Western Europe is clear to anyone who bothers to count the forces arrayed against it. Because of this, there is a tendency in the West to become preoccupied with NATO cohesiveness. Sometimes it appears as if political and economic differences and cumbersome decision-making processes render NATO impotent in the presence of an enemy coalition that is better organized and strongly united. This is, of course, not entirely true. The truth is that, while NATO has its problems, it remains a formidable alliance. Is the Warsaw Pact, in fact, as strong an alliance as NATO? The answer seems to depend on the nature of the conflict in which the two alliances might engage.

In both NATO and the Warsaw Pact there is an intercontinental nuclear superpower. The US has served as the conventional catalyst and the nuclear bulwark of NATO, while the USSR provides the bulk of conventional military power in Eastern Europe and all of the nuclear striking power. The political and doctrinal roles of the two superpowers in their respective alliances are also quite different; the US is a senior partner, but the USSR thoroughly dominates the Warsaw Pact. This domination undoubtedly yields coherence and strength but, hidden behind the peacetime facade of the Soviet monolith, there may also be fragility and weakness. In the past, the diversity and flabbiness of democracies have been converted into awesome strength in conflict, while the opposite has happened to their totalitarian attackers. In spite of appearances in peacetime, NATO may be better able to conduct coalition warfare than the Warsaw Pact.

Doctrine and Geopolitics

The US contribution to NATO does not always yield support for US policies. We can't dictate the levels of military budgets in NATO or always have our way in matters of readiness and force posture. We are, after all, a long distance from Europe. History, economics, politics, and the global relevance of intercontinental nuclear power all make the US somewhat "European," but geography does not. Soviet power, buttressed by Soviet doctrine, permeates the neighbors of the Soviet Union on the Eurasian land mass. Thus, there is a fundamental geopolitical asymmetry in the relationships between the two superpowers and their respective military alliances. The fact that the US is in important respects an "artificial" European power has long plagued NATO strategy. There are also doctrinal implications of the other superpower's position astride the Eurasian land mass.

The Warsaw Pact serves both peacetime and wartime purposes and answers Soviet security concerns in both offensive and defensive ways. Eastern Europe is a vital economic, political, and territorial buffer zone for a Russia that has historically sought to insulate itself from Western ideas and Western power. It is, at the same time, the launching pad for a crushing offensive against the West if war should break out.

In peacetime, or at least in times short of a major East-West conflict, Soviet military power is the key ingredient in a Soviet formula for dominating East European affairs. The Warsaw Pact's personnel, decision-making machinery, and force dispositions are used by the Soviet leadership to manage East Europe's political, economic, and social intercourse with both East and West.

In a war with the West, Soviet doctrine seeks to win by carrying the battle swiftly and decisively to the enemy. Familiar Soviet doctrinal tenets such as surprise, high mobility, and mass dictate the disposition of force at the periphery of the Soviet empire. There would be no time to cope with reluctant allies: their forces must be so integrated and disposed that their only viable option in a major East-West war would be to move westward and, like the USSR, spare their own homelands as much as possible from the brunt of battle. In both peacetime and war, Soviet leaders have judged that the best Warsaw Pact doctrine and posture are based on the principle that "the best defense is a good offense."

Doctrine and Reliability

The Soviets also do not always get their way. Sometimes Soviet leaders must tolerate a significant degree of deviation, and occasionally they suffer outright insolence, but raw Soviet power is kept close by in case it is necessary to enforce Soviet will over deviant Pact members. It is not just NATO that keeps Soviet divisions at the ready in Eastern Europe.

The Warsaw Pact does not exist merely to oppose NATO. It is a necessary instrument of Soviet control in Eastern Europe. Soviet forces on the territories of Pact states are, in one sense, like MVD troops in the Soviet Union itself. It should be no surprise that a country that

maintains hundreds of thousands of internal troops to control its own population would take care to maintain the capacity to control the peoples of a vital buffer area.

It is not sufficient to ask whether East European populations and armies are "loyal" to the USSR, or even whether they would be reliable in conflict. Anyone familiar with East European politics knows that historical enmities, cultural differences, and the simple urges for freedom of expression militate against loyalty between states and between nationalities. True loyalty to the USSR could not be a realistic hope for the Soviet leadership, except perhaps from the traditionally pro-Russian Bulgarians. However, predictability of behavior, or reliability in a given combat situation, is a different thing than loyalty. Power and circumstances, or the "correlation of forces" at a given time, can critically affect reliability.

We cannot know how reliable the Warsaw Pact would be in war. Of perhaps greater importance is that the Soviet leadership cannot judge the Pact's reliability with any certainty either. They must consider the facts of peacetime relationships and the ability of the USSR to predetermine wartime events and attitudes through military doctrine and posture before arriving at any judgment of Pact cohesion in conflict. The loyalty of Poles, East Germans, Hungarians and Czechs—not to mention Ukrainians, the Baltic peoples, and others—might well depend on circumstances that evolve on the battlefield, and where the battlefield is.

Where Is the Battlefield?

History has shown that Soviet troops will intervene in East European affairs when the security of the Soviet Union or the survival of single-party rule are threatened. So far they have prevailed easily, but so far the assistance of "fraternal" troops has not been absolutely necessary and Soviet troops have not had significant resistance from members of East European armed forces.

This is not just because the Soviets have been lucky. Luck is the residue of design. Having forces in place and being willing to act decisively when negotiations and cajolery fail have helped. But the Soviet leadership has good reasons for fearing that Soviet troops could be faced with massive, possibly unmanageable, resistance in some future intervention.

East European officer corps are thoroughly indoctrinated in Soviet concepts and doctrine and are highly integrated into a political and military command approved and nurtured by the Soviet Union, but they cannot be counted on as reliable partners in Soviet invasions of their homelands. Even if they could be trusted, it would be reckless for a Soviet leadership to expect the conscripted troops of invaded nations to fire upon their brothers and sisters. If the battlefield is in Eastern Europe, Soviet soldiers might have to fight alone. There is no Warsaw Pact "doctrine" for internecine conflict in Eastern Europe. It would not be politically or militarily feasible to have such a doctrine.

If ever the USSR chooses, for example, to invade Poland, it must do so outside the parameters of Warsaw Pact military doctrine, because that doctrine envisions only a coordinated, massive offensive toward a battlefield in Western Europe. Soviet decision-makers know that, if they invade Poland, Warsaw Pact doctrine and capabilities enter a state of suspended animation. Soviet military power could probably prevail on any battlefield inside the "alliance," but the price in terms of Soviet ability to cope with major East-West conflict could be enormous.

A No-Option Environment

Soviet leaders probably could not whip up East European enthusiasm for a premeditated, unprovoked attack on the West. They would surely be unenthusiastic about volunteering their homelands as the transit zone and potential battlefield in the service of Soviet expansionism. Given a choice, East Europeans would most likely choose not to fight, or might choose to fight the Russians. Soviet strategists are aware of these facts of life and understand that their problem is to structure the politico-military environment in such a way that no real choice is left to non-Soviet Warsaw Pact nations.

Soviet military doctrine and force dispositions in East Europe call for a massive, rapid offensive onto West European terrain. This doctrine and posture makes sense in the light of Russian and Soviet history, justifies forces for dominating Eastern Europe in peacetime, and, perhaps most important of all, serves to ensure the reliability of non-Soviet Warsaw Pact forces in a major war with NATO. Poles, East Germans, Hungarians, and Czechs have no real alternative to at least going through the motions of supporting the Soviet-led offensive westward.

Twenty Soviet divisions in East Germany, two in Poland, four in Hungary, and five in Czechoslovakia, backed up by awesome support from Soviet territory and controlled by a highly integrated command and control system in the hands of the Soviet high command, would create a no-option military environment for non-Soviet Warsaw Pact forces. They would be sucked into the "slipstream" of a massive military machine gathering momentum as it moved westward. So long as that machine worked, East Europeans would be put in a position where they would be serving their country ill if they did not go along.

But it is not only Eastern Europeans whose options are limited by Warsaw Pact doctrine and posture. The USSR itself is a prisoner of its policies. Indeed, a highly coordinated, massive offensive westward may be the *only* viable strategy for the Soviet Union to use against the West. There is a "house of cards" aspect to Soviet strategy for war against NATO. What if the massive military machine does not work? What if it works ini-

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Captain Kime is Associate Dean of Faculty at the National War College, and also Director of Soviet Studies and Director of Elective Studies there. He began his Navy career in submarines, then completed master's and Ph.D. degrees at Harvard. He has served as an attaché in the Soviet Union, and on the Defense Intelligence Agency staff. He will return to Russia early next year as the US Naval Attaché. The opinions and conclusions presented in this article are solely Captain Kime's, and do not necessarily represent the views of the National War College or the Department of Defense.

Formidable in the canned situations of maneuvers (with planted charges exploding on cue), will the Warsaw Pact forces' cohesion fracture if the play does not unfold according to script?

tially but bogs down in an unexpectedly long and slow ground campaign or in the chaos of a nuclear battlefield? It may be that, while a Warsaw Pact offensive on the ground into Western Europe has high prospects for success, any failure would be absolutely cataclysmic for the Soviet Union. The margin for error is probably very small.

While it is probably true that East Europeans will have little choice but to join a successful westward drive, there would be much less reason for them to maintain support for a stalled Soviet military machine. Soviet military doctrine and posture are designed to eliminate choice for non-Soviet Warsaw Pact forces, but a stalled offensive would present options for disrupting rather than supporting the offensive. It would be tempting for national patriots in East Europe to seize the opportunity to rid themselves of the Soviet yoke.

These considerations generate disturbing characteristics for Soviet military doctrine. Not only do we find the familiar Soviet preferences for surprise and massive forces, we find plans for an offensive that cannot afford to shift to defense. We are faced with a potential enemy who can escalate to wider conflict but cannot retreat and may even have problems de-escalating. Even in the initial phases of East-West conflict, our opponent may have no viable lower-level options.

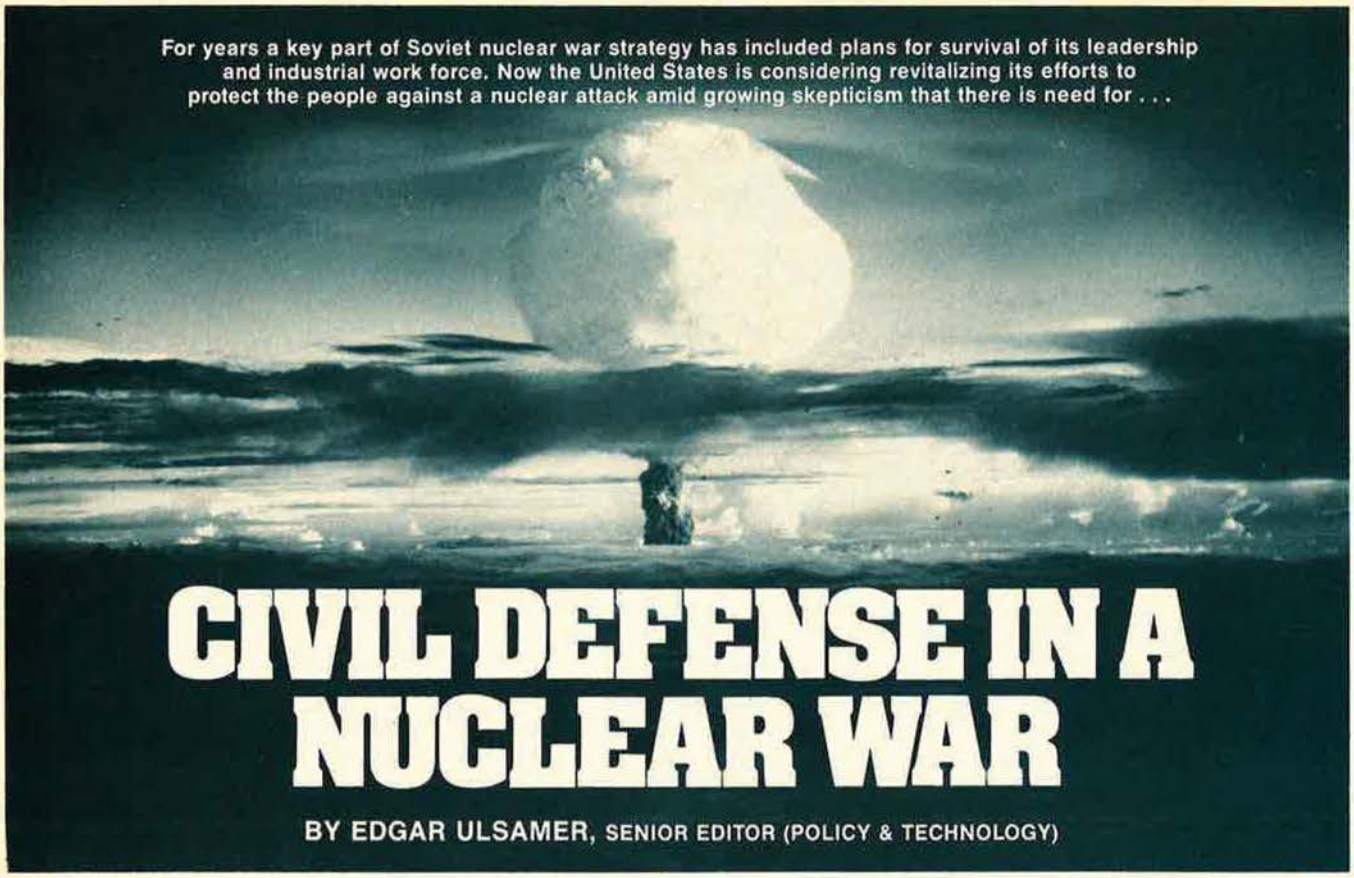
Conclusion

The Warsaw Pact is extremely well-organized and equipped to carry out a massive offensive against NATO. The problem for Warsaw Pact strategists (*i.e.*, the Soviet High Command) is not the prospect of conflict with NATO, awesome as that prospect is. That conflict can be prepared for. In a major East-West confrontation, at least initially and during a successful offensive, Pact allies have little choice but to provide their share of the resources to carry out the provisions of the doctrine, and the Soviets easily dominate the planning and command structures. If it is an all-out war, NATO had better be prepared for the juggernaut.

Soviet leaders and strategists can take little comfort in this positive assessment of the Warsaw Pact, because it applies only in peacetime and during the successful conduct of a major war that the Soviet Union would surely rather avoid. For all its power and apparent unity of purpose in peacetime, the Warsaw Pact is a fragile, brittle alliance. The USSR cannot count on much help from its allies in adversity, and might even find itself fighting erstwhile allies at the worst possible time—if NATO appears to be gaining the upper hand.

In NATO, we always appear to be in some disarray. Our problems tend to be visible. In conflict our peacetime problems will probably not be very relevant, and they may simply go away. In peacetime, the Warsaw Pact presents a facade of unity and integration of forces, doctrine, and policy. But it is a unity rooted in uncontested Soviet power and suppression of national wills.

In a crisis within the Pact, or if the juggernaut is stalled, NATO might discover that the Warsaw Pact is a paper tiger. ■



For years a key part of Soviet nuclear war strategy has included plans for survival of its leadership and industrial work force. Now the United States is considering revitalizing its efforts to protect the people against a nuclear attack amid growing skepticism that there is need for . . .

CIVIL DEFENSE IN A NUCLEAR WAR

BY EDGAR ULSAMER, SENIOR EDITOR (POLICY & TECHNOLOGY)

WESTERN morality and emotions suggest that the cataclysmic consequences of nuclear war make the very act of provoking such a war unthinkable. But in Moscow, nuclear war is seen as unthinkable only if it is unwinnable. It can be argued that US failure to develop the forces, capabilities, and national will needed to convince the Soviet Union of the impossibility of "winning"—however the occupants of the Kremlin may define that term—creates deterrence in only one direction, toward US self-deterrence, while providing the USSR with the incentive to think the unthinkable.

There is, of course, no sound substitute for effective deterrence of strategic nuclear war, whether viewed from a purely moral or purely military perspective, for all-out nuclear war between the superpowers is likely to result in only a relative, technical distinction between winner and loser. That would be the ability of one superpower to recover and reconstitute its residual forces ahead of the antagonist and thereby achieve politico-military victory—albeit by a precariously narrow margin.

There is evidence also—at least in the theoretical world of nuclear war-gaming—that such a conflict could be terminated while still in a limited counterforce (confined to military targets) phase, if one side can demonstrate convincingly after an initial exchange that it is ahead of the other and that continuation would needlessly worsen the loser's fate, without prospect of reversing the outcome. While the chances for "limited" nuclear war between the superpowers may be tenuous at best, the makeup and growth of Soviet strategic forces—and the military doctrines that shape them—leave no room to doubt that the USSR is allowing for such an eventuality, while at the same time building up the means to fight nuclear war flexibly, even on an all-out, protracted basis.

One of the most serious faults of US popular thinking on the adequacy of this country's strategic nuclear forces is the notion that their effectiveness can be gauged by the amount of awe they generate among Western theoreticians and homegrown peace movements. Unfortunately, the calculus of a credible US deterrent is framed in Moscow, not on American pulpits or campuses. As a consequence, the determination of what is not enough, what is enough, and what is overkill turns on sound military judgment amplified by keen psychoanalysis of Soviet decision-makers.

One of the most puzzling elements of the nuclear equation is what role, if any, civil defense should play and, perhaps more fundamentally, if civil defense in a society lacking the docility and totalitarianism of Soviet Russia is even feasible. Since deterrence is at least as much a matter of Soviet perception of US capabilities as it is of the actual effectiveness of these capabilities, a second set of questions might hinge on whether the USSR would take seriously an energetic buildup of the US civil defense apparatus.

Advocates of greater investments in civil defense—including high Administration officials—believe that millions of American lives can be saved in case of nuclear war through stepped-up CD programs. Critics of this approach generally are inclined to treat CD as ineffective in case of a broad nuclear attack on the US, but admit that such measures could reduce casualties signif-

icantly in case of a counterforce attack by protecting the population in areas affected by nuclear fallout.

The Soviet CD Program

The Soviet Civil Defense Program, according to US intelligence, devotes roughly twenty times the resources—in terms of full-time personnel, facilities, and equipment—allocated by the US for this purpose. More than 15,000 blast-resistant shelters (not counting the Soviet subway system, which can double up as a CD facility) are known to exist and are thought to be sufficient to accommodate roughly 15,000,000 people.

If a large-scale nuclear exchange were to occur in the mid-1980s, about ninety percent of the Soviet population compared to about forty percent of the US population would survive, according to a CIA estimate. About one-third of the US survivors would be injured or suffer radiation sickness. Obviously, estimates of this type depend on attack scenarios and are rather hypothetical. US intelligence acknowledges that the peacetime effectiveness of the Soviet civil defense organization suffers at times from the reluctance of industrial officials to spare essential labor and other resources and from friction between CD officials and the civilian population. Under wartime conditions these bureaucratic inefficiencies probably would be overcome by increased centralization of authority, the CIA predicts.

On the whole, US CD officials told Congress, "the Soviets' view of their civil defense organizational structure is probably a favorable one—overall better than it was before the Soviet military assumed control of it in the early 1970s. The Soviet leaders' emphasis on civil defense also offers the potential to foster favorable popular attitudes toward the Soviet system, to demonstrate the leadership's concern for the people, and to lend credibility to calls for vigilance against potential enemies. Nearly every Soviet citizen receives civil defense instruction either in school or through training courses, lectures, and exercises at places of work. Public attitudes about surviving a nuclear war remain skeptical, however, and there is evidence that many people do not take the program seriously."

While the US intelligence community remains uncertain about the effectiveness of Soviet civil defense, there is general agreement that it goes a long way toward improving the ability of the leadership, the essential work force, and the population at large—in that order of priority—to survive a nuclear war. At the same time, Soviet CD helps keep the economy going in wartime and enhances the USSR's chances of recovering from the effects of nuclear war. Soviet spending on civil defense is estimated at about $2 billion annually.

Nuclear Weapons' Characteristics

When a thermonuclear weapon of a given yield explodes on or near the surface of the earth, the ranges of the immediate effects are fairly well defined, according to government studies. Within a certain radius from ground zero, destruction due to blast and shock, initial nuclear radiation, and thermal effects will be so great that survival of inhabitants in conventional structures is improbable. At considerably greater distances from ground zero, the immediate effects will be weaker or nonexistent and the delayed effects, those associated with the radioactivity present in the fallout, will predominate. It is the phenomenon of radioactive fallout that introduces the greatest uncertainty into assessments of the casualties that would be expected to result from nuclear attacks on the United States.

Radioactive contamination of the earth's surface by a nuclear blast occurs in two ways. One results from the generation of neutrons (subatomic particles that are lethal in large doses), which are captured by the soil; the other is caused by fallout of radioactive particles from the cloud formed by the explosion. The amount of contamination and its distribution over the earth's surface are principally dependent on the energy yield of the explosion, the relative contributions of fission and fusion to the yield, the height of burst, the nature of the surface over or on which the detonation occurs, and finally the meteorological conditions at the time of the explosion and shortly thereafter. For a given amount of fallout, the number of casualties that can be expected is determined primarily by the protection afforded the local populace against residual nuclear radiation.

If a large-scale nuclear exchange were to occur in the mid-1980s, about ninety percent of the Soviet population compared to about forty percent of the US population would survive . . .

Thermonuclear weapons have two principal parts: a fission trigger (in fact, an atomic bomb) that initiates the fusion process, or burn, of the second, thermonuclear, part. The relative sizes of the two parts can be adjusted to achieve different results. The fission segment is the principal cause of fallout. The term "clean" nuclear weapons—meant only in a relative sense—indicates that the fission trigger has been made as small as possible in relation to the fusion segment. Conversely, nuclear weapons can be made "dirty" by emphasizing the fission portion and through use of materials with a long radiation half-life in order to prolong the contamination of a given area. The so-called cobalt bomb falls into this category.

Strategic planners assume that nuclear attacks will involve two forms of weapon detonation—in the air above the target, or on the ground, right on top of a hardened target. (A third technique, involving a heavy, shielded warhead penetrating deep into the ground before detonation, is still being explored, but appears to have sizable drawbacks and limited advantages.)

The highest degree of lethality (destructiveness) from an accurately delivered warhead is obtained through airbursts at relatively low altitudes. This so-called optimum height of burst varies, depending on the weapon's

yield and other factors. In an operational sense, the advantages of such a detonation could well be negated by the ultraprecise fuzing required, as well as by errors. Warheads descend on their targets at an angle, thus compounding the problems of fuzing accuracies of a weapon exploded above the ground compared to one detonated on the ground.

Nuclear scenarios are further complicated by the so-called fratricidal effect that can destroy or deviate a warhead that follows too closely behind the detonation of a prior one. Yet, for a high probability of success in an attack against a given target, an aggressor is almost certain to assign two reentry vehicles (RVs) against it. In order to do this while minimizing fratricidal effect, the attacker is most likely to airburst the first RV and groundburst the second.

Assumptions about the numerical ratio between air- and groundbursts are crucial to casualty estimates. A warhead that is detonated on the ground spews up much more debris and, therefore, can cause several times the number of fallout casualties as would a weapon of the same yield that is exploded in the air. Probably the most effective ways for an attacker to minimize civilian casualties are by selecting targets that are not near large population centers, and by what DoD experts call "target offset." This means attacking a military target in a way that deliberately minimizes the casualties in nearby urban areas. While it may seem incongruous that an aggressor would be so concerned about collateral damage, defense strategists count on reasonable efforts to spare the civilian population in case of limited nuclear exchanges.

A related and equally decisive factor affecting casualties is the relative degree of protection against residual nuclear radiation afforded the local population following an attack. According to US government analyses, the radiation dose rate inside a standard brick residence without basement is likely to be no more than twenty percent of the rate encountered on the outside; the dose rate that will prevail in a residential basement would be about four percent of that encountered outside the building. Casualty estimates are affected in a decisive but debatable way by assumptions about the percentage of the US population that might seek shelter.

Basic environmental conditions existing at the time of an attack and within a few days thereafter can significantly affect casualties. Dust, fog, rain, and snow can't be predicted, yet will help determine how far out the burst's thermal energy is propagated and thereby affect the nature and size of the firestorm that accompanies nuclear blasts.

Also, the number of casualties (the combined total of fatalities and nonfatal injuries) resulting from an attack on all major strategic weapons concentrations in the US can change by a factor of three, depending on wind conditions. Prevailing winds in the primary US military target areas can be assumed to be at their strongest in March and November. Typical wind patterns cause the least spread of nuclear contamination in June and July, according to government studies.

Casualties from a massive attack on US industrial and transportation centers probably can be gauged more precisely than in the case of limited counterforce attacks. The unthinkable consequence of such a general nuclear attack on the US would kill more than 100,000,000, or half the population. Assumptions about casualties resulting from comprehensive attacks on all major military targets or from a limited attack on such targets are subject to a host of variables. The span of estimated casualties, therefore, ranges from about 100,000 to more than 16,000,000, depending on the scenario.

The Revitalized US CD Program

Impetus for current Administration plans to resurrect the US civil defense program—that has been largely dormant since the advent of "détente"—comes from an ad hoc interagency working group formed a year ago by the National Security Council.

This group was charged with examining means for improving national security by providing for continuity of government, emergency communications, and civil defense in the event of a nuclear attack. Assistant Secretary of Defense for International Security Affairs Richard N. Perle recently told Congress that the Administration decided as a result of the group's findings "to increase the resources devoted to civil defense, to expand the program on a nationwide basis, and to lay the groundwork for repairing crucial deficiencies in previously proposed programs for protecting our nation against nuclear attack." A National Security Decision Directive outlining the new civil defense policy was issued subsequently and became the basis for a long-term civil defense enhancement program by the Federal Emergency Management Agency (FEMA).

The view that offensive nuclear capabilities are a "better buy" in terms of deterrence than civil defense is widely held.

Concurrently, the Defense Department set up a special Directorate for Emergency Planning that, according to Secretary Perle, is responsible for overseeing the "FEMA civil defense program, for coordinating all Defense Department emergency planning efforts . . . and for ensuring that FEMA's planning for nuclear attack preparedness is appropriately integrated with other strategic nuclear attack planning within the Department of Defense." This tighter integration paid off in FEMA's recent "REX 82 ALPHA Readiness exercise, which was run in conjunction with the Defense Department's nuclear command post exercise IVY LEAGUE," Secretary Perle told Congress. He explained that "during this joint FEMA-DoD endeavor, ways and means of providing military support to civil defense under nuclear attack conditions were carefully examined, and the findings are being assessed."

The IVY LEAGUE nuclear war game, described as a

unique, integrated exercise of the civilian and military command structures and the associated command and control systems, posited a massive Soviet nuclear attack on the US. The Single Integrated Operational Plan (SIOP), as well as defensive emergency measures, including civil defense, were tested against the IVY LEAGUE scenario. The results of the combined exercise were not announced for security reasons.

Seven-Year Civil Defense Plan

As part of the Administration's FY '83 budget request, President Reagan announced a seven-year enhanced civil defense program for the United States to complement "primary US reliance on strategic offensive forces as the preponderant factor in maintaining deterrence." FEMA Director Louis O. Giuffrida told Congress the plan is a "moderate, orderly, responsible, and inexpensive way to implement a complete population protection program by the end of FY '89."

Acknowledging that "the thought of a nuclear attack is repugnant to our citizens, and that it is therefore difficult to sustain prolonged broad support for a civil defense program," he explained that FEMA's "concept does not demand active participation from the American people in the civil defense program until there is a need—that is, until there is warning of an impending attack. We will concentrate on putting into place the programs needed to organize and control the emergency actions by the people when they themselves will feel the need."

The thrust of the $4.1 billion program is to protect the US population by relocating people, over a period of several days, from larger cities and other potential risk areas during an acute crisis and providing them with fallout protection and support. Capabilities to protect people in-place should time or circumstances preclude crisis relocation will also be improved.

In a large-scale attack preceded by strategic warning, a balanced, moderate-cost civil defense program emphasizing crisis relocation is expected to save up to twice as many Americans as the forty percent expected to survive under the present state of civil defense. This new program includes plans for crisis relocation of people from potential risk areas, operational systems and capabilities for execution of relocation plans, and plans for protecting the population from fallout by expedient construction of shelters.

In his budget message, President Reagan set forth four objectives for the new civil defense program:

- "Enhance deterrence and stability in conjunction with our strategic offensive and other strategic defensive forces. Civil defense, as an element of the strategic balance, should assist in maintaining perceptions that this balance is favorable to the US;
- "Reduce the possibility that the US could be coerced in time of crisis;
- "Provide for survival of a substantial portion of the US population in the event of nuclear attack preceded by strategic warning, and for continuity of government, should deterrence and escalation control fail; and
- "Provide an improved ability to deal with natural disasters and other large-scale domestic emergencies."

The President directed that the civil defense program consist of three major elements, and adhere to the following timetable:

In the case of population protection, he asked that the development of plans and deployment of supporting operational systems be completed by the end of 1989. Primary reliance is to be placed upon relocating the population of US metropolitan and other potential high-risk areas to surrounding areas of lower risk during a period of international crisis, taking advantage of extensive US transportation resources, according to his directive.

In the area of industrial protection, "analyses and preparations will be completed, which will allow a funding decision to be made on a program to protect key defense and population relocation support industries."

Lastly, the President ordered that analyses and preparations be completed to "allow a funding decision on blast shelters for key industrial workers in defense and population relocation support industries."

A key component of the Administration's civil defense enhancement is an ancillary telecommunications and warning program consisting of the National Warning System (NAWAS); the Emergency Broadcast System; and the Federal Direction and Control System. The NAWAS system and the Federal Direction and Control System are dependent on commercial telephone lines. Many of the state and local emergency communications and warning systems also depend on commercial telephone lines. The existing communications and warning system is vulnerable to nuclear effects and would not be useful during or after an attack.

Over the next few years FEMA will replace the old telecommunications and warning system with one that can survive a nuclear attack and operate on a sustained basis. A nuclear attack disrupts "soft" communications and thus could degrade or prevent efforts at various government levels to manage response and recovery activities.

FEMA, therefore, plans to create a survivable telecommunications and warning system by using radio as the primary means of communications. High-frequency radios protected against the electromagnetic pulse effect of nuclear weapons and provided with an independent source of electrical power can operate during and after an attack. Such a communications capability is essential in the revitalized civil defense program.

The transition to high-frequency radio is the first step in the modernization program. Later on, FEMA will introduce satellite communications, low-frequency radio, and other advanced technologies to provide the telecommunications and warning system with redundancy. The use of more than one form of radio communications can be expected to improve the reliability of the overall system in emergencies.

Congressional reaction to the Administration's stepped-up civil defense program has been mixed so far. The view that offensive nuclear capabilities are a "better buy" in terms of deterrence than civil defense is widely held. If, for budgetary reasons, the issue is treated as an either-or proposition, civil defense, despite strong White House support, will probably remain in the comatose state that it's been in for the past two decades. ■

VENEZUELA: Caribbean Linchpin

Friendly to the United States, and anchoring the southern rim of the Caribbean, Venezuela is more important to the US than just its oil exports. It wants to be a mature partner in international events, and an F-16 purchase by its Air Force could be a litmus test.

BY GEN. T. R. MILTON, USAF (RET.)

THE RIDE into Caracas from the modern airport by the sea can be a lively one, depending on the traffic and what might be taking place in the tenements on the city's outskirts.

Caracas traffic at its worst is almost indescribable, making Cairo seem tranquil by comparison. As for the tenements, they house an unruly population that often enlivens traffic jams with a little intramural gunplay. It is all part of the turmoil that goes with Caracas's status as a principal oil capital.

An Oil-Rich Nation

Oil has played the major role in Venezuela's economy for a good many years now. In 1929 Venezuela was the world's largest oil exporter, and today it ranks fifth in oil production. What is perhaps more important are the untapped oil tar deposits in the Orinoco delta. The potential of these is measured in trillions of barrels, of which ten percent or so are probably recoverable by modern technology. Since ten percent of several trillions is nothing your pocket calculator will handle without outside help, we can settle by agreeing it is a great deal of oil.

Venezuela, then, is an important country in a world utterly dependent on petroleum. And while Venezuela is a member of OPEC, indeed a founder of that cartel, it is in our hemisphere, the supply route is a short one, and, most important of all, Venezuela is one of our better friends on this side of the Atlantic.

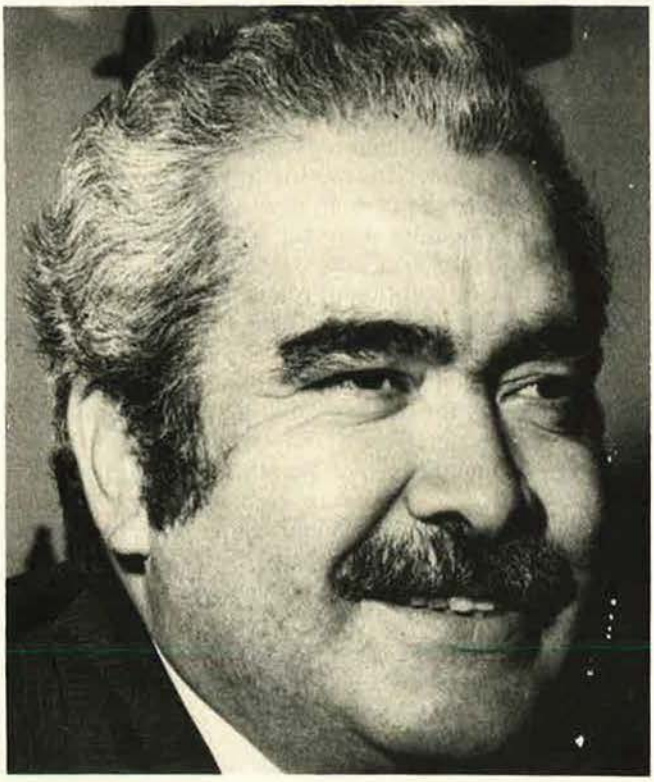
As other nations have discovered, to be oil rich is not to be without problems. The petroleum industry is not labor intensive, and the presence of oil seems to discourage agriculture. Venezuela is no exception, with about seventy-five percent of its population of nearly 15,000,000 living in cities, too many of them in poverty and squalor. Neighboring Colombia is making a contribution to Venezuela's problems as natives of that impoverished land drift into Maracaibo and Caracas looking for nonexistent jobs.

Downtown Caracas boasts, in its airport, a real eye-opener—evidence of the riches and hustle that the presence of oil brings with its discovery. The airport is a most improbable affair, with a single east-west runway lying in a narrow valley between steep and forbidding mountains. The city, of course, is on all sides of this airpatch, which is home base to 800 private airplanes, the presidential flight, and a miscellaneous assortment of military transports. Overseeing this disaster waiting to happen is a Venezuelan Air Force base commander whose duties include placating and occasionally confronting the owners of the private air fleet. As is usually the case with dangerous airports, this one has an excellent safety record.

Caracas is a booming and crowded metropolis with much of the world beating a path to its door or, more accurately, pounding on hotel desks in exasperation over the lack of a room. Everything seems packed to overflowing: the streets, the hotels, even the 747 that leaves on Friday for Miami, a city that has become the big BX for affluent Venezuelans who evidently find the airfare a small price to pay for a weekend in Miami's stores.

The Military Mission

Unlike some of its neighbors, Venezuela is a democracy, another way of saying it does not have a military junta in charge of things. Like all Latin American coun-



Venezuelan President Luis Herrera Campins epitomizes his country's traditional support of the United States, while steadfastly asserting its unique identity and policies.

tries, this was not always so. A succession of military strongmen ruled Venezuela until a revolt in 1958 led to a new constitution and a popularly elected government. Probably because the armed forces themselves played a leading part in overthrowing the last military dictator, Col. Marcos Pérez Jiménez, the military occupies an important place in today's Venezuelan scheme of things. As is generally the case, the Army, with 27,000 troops, is the largest force. Since Venezuela is reasonably tranquil these days, the Army's main concerns appear to be keeping an eye on internal security and a watch on the borders, particularly the eastern one with Guyana.

To this end, there are some frontier posts under construction in the hot and inhospitable area facing Guyana. The Venezuelans seem to feel there is a real danger of encroachment into Venezuelan territory by that former British colony. Guyana, which provided the last redoubt for Reverend Jim Jones and his poisonous brand of salvation, is backward, English-speaking, and leftist, any one of which is reason enough to arouse Venezuelan suspicion. Since there have been certain recent indications of Cuban activity in Guyana, the Venezuelan concerns appear to be justified. Besides, the great Orinoco River is the essential transportation link for iron ore as well as other minerals, and soon, for oil from the delta's tar sands. An armed Guyana would be an uncomfortably close threat to the Orinoco and its commerce.

The Armed Forces

The Army has a small air element consisting of a few Israeli Arava transports—curious egg-shaped machines with a range that would seem to be inadequate for Venezuela's distances—two or three other Beech, Swearingen, and Pilatus utility transports, and some assorted Aerospatiale and Bell helicopters.

Venezuela's Navy is next in size with a strength of 9,000. It has a sizable coastline to patrol, along with responsibility for the security of the Orinoco. A glance at the map will show this latter task presents certain difficulties. The Orinoco empties into the Atlantic, an ocean that is separated from the rest of Venezuela's Caribbean coast by Trinidad, the Lesser Antilles and, as we have noted, by the next-door presence of Guyana. The Navy also has a small number of aircraft, ASW Grumman S-2Es, Agusta and Bell helicopters, search-and-rescue HU-16As, and a light transport or two.

The smallest of the armed forces is the Venezuelan Air Force, with fewer than 5,000 active-duty people aboard. It is, nonetheless, the one getting all the attention these days, both in Caracas and abroad. Like a lot of other small countries around the world, Venezuela wants a new fighter, and, unlike most of those other countries, Venezuela can pay for what it wants.

What it wants, of course, is the F-16, the first-line F-16 with the F100 engine. The decision on this airplane was not arrived at by thumbing through brochures. An Air Force team, headed by Brig. Gen. Carlos Pinaud, an active fighter pilot who can put on quite a show in a Mirage, looked at and flew the contenders.

Israel, freed from previous US export restrictions on J79 engines, made a pitch for the Kfir, and General Pinaud was favorably impressed with the improved performance of the Kfir over the Mirage III from which it sprang. But the F-16 was the choice, as it was over all the other contenders, to the immense and particular disappointment of France's Dassault. Even so, the French remain much in evidence on the chance, presumably, that our Congress will overturn the F-16 deal. Admittedly, France has made a tempting offer, one that would upgrade Venezuela's existing Mirage squadron—a mixture of Mirage IIIs and 5Vs—to the latest Mirage V configuration. This would include a new engine, head-up display, new avionics, and nosewheel steering, a modern convenience denied Mirage pilots until now. Besides upgrading the existing squadron, the French have offered additional Mirage Vs at a most attractive price. Even the training and manuals would be in English. All in all, it is an offer that would seem hard to turn down except for the fact that Dassault's follow-on support has proven expensive and unsatisfactory to Venezuela. Unless something goes wrong at our end, the

Aerial view of downtown Caracas, featuring the Palacio de los Academics, reflects the contrast between colonial and modern.

The oil fields of Lake Maracaibo made Venezuela the largest oil exporter in 1929. Today, it ranks fifth in oil production and possesses enormous untapped reserves.

Venezuelan Air Force will be getting F-16s in 1983—twenty-four to begin with, and twenty-four later on.

It will be a black day in Venezuela if things do go wrong, for these people have their hearts set on getting F-16s, and they do nothing to conceal it. The preparations that have been made at Maracay, the designated base for the F-16 squadron, are impressive and indicative of high technical competence.

Air Force Facilities

The simulator building just off Maracay's flight line is a first-class facility, far better than those at most of our air bases. It presently houses a C-130 simulator which is the absolute last word in terms of complexity and sophistication, an advanced Mirage III simulator, and various instrument trainers. The place of honor is reserved, naturally, for the F-16 simulator yet to come.

Maracay has a new 4,000-square-foot electronic maintenance building designed by Westinghouse, again with the F-16 in mind. Completely air-conditioned, it also has the largest clean room in South America. The Venezuelan maintenance chiefs reckon they can support sixty percent of the F-16 electronic program now, and substantially more as time goes on. As for other maintenance, they plan to do first and second echelon at Maracay, some depot work in Caracas, and ship the rest to a contractor in Florida.

In wandering around the Maracay facilities, we came across a group preparing a briefing for President Luis Herrera Campins and his cabinet. It seems there is some lingering opposition here and there in Venezuela's bureaucracy toward this expensive outlay for the Air Force, and the President wants his officials to be both convinced and informed. The briefers had put on a blackboard the questions they were preparing to answer.

- What is the F-16?
- Why do we need it?
- What is its compatibility with what we already have?
- What must we do to be able to support it?

The second question is the one that has been asked in Washington, sometimes with the answer supplied that Venezuela does not need F-16s. There has been a long-standing antipathy in our government, particularly during the time of Secretary McNamara and, more recently, of President Carter, toward selling advanced fighters to Latin American countries. The result of this policy has been a dismal one for our aircraft industry. Latin Ameri-

Venezuela's Legendary Squadron

The Venezuelan Air Force has a hobby, the collection of flyable old airplanes. These are assembled in a Legendary Squadron and represent every airplane the Venezuelan Air Force has had in its inventory. There is, for instance, an ancient French machine of pre-World War I vintage, and an assortment of other relics from that time on, all flyable. For some years, however, two notable airplanes were missing from the Legendary Squadron—a Stearman primary trainer and, most importantly, an AT-6. Old Venezuelan pilots, like old pilots in our Air Force, have fond memories of these two birds, and the Legendary Squadron was under great pressure to find them.

In the fall of 1980 a Stearman and an AT-6 were located in Florida and purchased. Now began the next problem: How to get them to Venezuela. The answer to that came from two modern Don Quixotes, a middle-aged Venezuelan airline pilot and a young USAF lieutenant colonel. The airline pilot, Capt. Jesus Romero, had flown the Stearman long ago. Lt. Col. Franklin Wilson had never been close to an AT-6, but no matter. These two flew up to Miami, found their airplanes, and reflected on what they had agreed to do. Colonel Wilson located someone to give him a casual cockpit check, including a tip on torque and its unsettling effect on pilots raised in tricycle landing-gear jets. He then bought a map of the Caribbean, and the two romantics set out for Caracas, Wilson at 120 mph, Romero at seventy. Neither, of course, had a radio, lights, or nav aids.

One way or another, these old crates made their way down through the Antilles, buying gasoline from filling stations and landing where they could. There was an ugly moment on one island when some nasty looking fellows, obviously in the drug trade, ordered Wilson to be on his way. Out of gas, with night coming on, he found shelter in the cottage of a retired Detroit policeman and gasoline, the next day, at a village filling station.

Grenada was his last stop before Caracas, and the Cubans building the air base there, completely confused by this young American flying an ancient airplane decked out in Venezuelan markings, were not hospitable. According to Wilson, the atmosphere on Grenada was thoroughly revolutionary, with Marxist slogans and pictures of Ché Guevara dominating the scene.

Well, Colonel Wilson got to Caracas and so, somewhat later, did Captain Romero. The point of the story is the impression Frank Wilson, who happens to be bilingual, made in Venezuela. His delivery of the AT-6 to the Legendary Squadron was worth, in good will, any number of diplomatic visits.

Sometimes, it seems, the old American touch comes back.

AT-6 Texan, ferried from Florida to Venezuela down the Antilles chain, undergoes restoration for future service with Venezuela's Legendary Squadron.

can countries have simply bought their advanced fighters somewhere else, mainly from France or the USSR.

The basis for our past reluctance to sell fighters to Latin America has been a conviction that these countries do not need this sort of advanced weaponry, and, besides, they will only cause mischief if they get it. It is an argument that would be persuasive if we were the sole makers of fighter airplanes.

But apart from the fact that Venezuela can go elsewhere if we turn them down, there is a good case to be made for a new fighter in that country.

Rationale for the F-16

First of all, as we have noted, Guyana is a potentially troublesome neighbor, one that, in conjunction with Cuba, could cause difficulties in the future. A better reason can be found on Grenada, an impoverished little island ninety miles north of Venezuela, the smallest independent nation in the western hemisphere. Left to its own resources, Grenada is not a credible threat to anything, but it has not been left alone. The air base Cuba is building on the island includes a 10,000-foot runway and other provisions, like hardstands and storage facilities, not required for an improbable tourist trade. Unless all the signs are mistaken, Grenada is meant to be Cuba's southern military anchor in the Antilles chain, and MiG-23s will be frequent visitors, if not residents.

Nicaragua is farther away, at a distance of 800 miles or so, but it is also preparing for a modern air force of MiGs. Whatever the Cuban long-range scheme may be, it is clear that attention is being paid to the matter of Caribbean air superiority. Venezuela's case for F-16s would seem to be a persuasive one.

There is more to this capable Air Force than a fighter squadron, even if that is the one getting most of the attention at present. Like all South American countries, Venezuela has to worry about leftist guerrilla movements that are never entirely quiescent. The counterinsurgency (COIN) squadron of fifteen OV-10Es is in response to this threat, as are the helicopter gunships, a mission the Venezuelan Air Force performs for the Army. East of Caracas on the Caribbean coast, the Barcelona air base has twenty-three Canberras for the bomber and recce role.

Professional Training and Ties

Across town from the air base, Maracay is also the location for the Venezuelan Air Force Academy. In something of an equal rights breakthrough for macho South America, there are now women cadets in the student body of 200.

Flight training is part of the four-year curriculum, one that appears to be typically strong on engineering subjects, with a good measure of military training and discipline thrown in. Attrition is on the high side of forty percent, a figure not too far out of line with that found in other service academies, our own included. Once again, as is the case in Argentina, there are visible signs of earlier German influence, not the least being the ceremonial goose-step maneuver cadets use when addressing or taking leave of a superior.

Goose step notwithstanding, the dominant relationship in Venezuela these days is its one with the United States. English is the second language, American schools are favored for the children of those who can afford a foreign education, and Venezuelan military officers wear with obvious pride pilot wings earned in the United States. When a visitor noticed a small American flag on a junior officer's desk, the Venezuelan smiled and said, in explanation, "our friends."

All of which makes one wonder why we make it so difficult for a nation like Venezuela to send its officers to our schools. Under our usurious approach to tuition fees, one which seems to include a pro rata share of everything that goes on at Maxwell AFB, Venezuela must ration its students at the Air University. It is a pity, because it has long been established that training in our schools makes for lasting and useful friendships. Our current policies appear designed to discourage this sort of thing.

Venezuelan-US Relations

Nonetheless, Venezuela is a friend in the Caribbean. If and when the F-16 deal goes through, the ties should grow stronger, especially if we use a little imagination in strengthening those ties. Joint Caribbean air-defense exercises would not be a bad idea, perhaps in conjunction with the Tactical Training Wing at Homestead AFB in southern Florida. Perhaps tankers could be spared occasionally for Venezuelan refueling training in their F-16s. While there is no indication anyone is thinking in terms of a formal military alliance, it is no secret the United States and Venezuela share a common worry about growing Cuban ambitions in the Caribbean basin. The arrival of the F-16s in Venezuela will create a natural basis for military cooperation.

The atmosphere in Caracas is an amicable one toward Americans nowadays. Venezuelan oil exports to the United States continued during the 1973 oil embargo, despite its OPEC membership. In fact, speaking of OPEC and its Arab connotations, Venezuela maintains cordial relations with Israel and has, as we have noted, spent a substantial amount of money with Israeli Aircraft Industries.

At the moment we have no major differences with Venezuela, and scarcely any minor ones. The country is democratic, subversion is at a low ebb, and there are no human-rights problems standing in the way of a closer friendship. Only if the F-16 purchase should be rejected, for whatever misguided reasons, would we see our relationship cool.

As a young Venezuelan fighter squadron commander said, "If the F-16 doesn't come, we don't want any more gringos around here." He laughed and poked his American friend, but I had the impression it was not all a joke. ■

Gen. T. R. Milton's by-line is one familiar to AIR FORCE *Magazine readers from his monthly columns on airpower issues. A 1940 graduate of the US Military Academy, General Milton went on to command air units in Europe during World War II. Later assignments included service as Chief of Staff of Tactical Air Command and as Comptroller of the Air Force. Just prior to his retirement in 1974, he served as the US Representative to the NATO Military Committee. His report on Brazil appeared in the March '82 issue; his report on Argentina appeared in April.*

AIRMAN'S BOOKSHELF

Flawed History

The Pacific War, by John Costello. Rawson, Wade Publishers, New York, N. Y., 1981. 742 pages, with notes, illustrations, and index. $24.

The fortieth anniversary of Pearl Harbor has brought with it a number of books about that dramatic attack and the great conflict it initiated. This thick volume is really a far-reaching account of the Allied war against Japan, as it was fought in the Pacific and on the Asiatic mainland. But its most outspoken and critical portions deal with the events leading up to Pearl Harbor and with a number of controversial issues surrounding them.

The author is not a historian, but rather a British television writer-producer whose research into the Pacific conflict has produced a well-written yet careless recounting of generally known events. He relies primarily on published sources, adding an occasional fillip from recently opened intelligence records.

The result is a vivid description of the strategy and operations of the war, full of lively battle scenes and suggestive analyses. Air, sea, and ground operations are neatly balanced, with proper appreciation of the role of each. And the contributions of British arms receive more attention than is usually the case in works by American authors.

But what might have been an outstanding account is badly served by a multitude of careless mistakes and oversimplifications. These range from a tenfold error in the number of American fatalities sustained in crushing the Philippine insurrection, in the early pages, to an even grosser overstatement of the kilotonnage of the Hiroshima bomb, near the end of the book—with sufficient slips in names, places, dates, gun calibers, and so forth in between to raise serious questions abut the reliability of the entire volume.

There is also a tendency to overstate and then claim as new certain long-accepted facts—such as the impact of the B-17 on prewar Pacific strategy—which further weakens the author's credibility.

It is thus not too surprising that Costello's main charges about coverup or conspiracy surrounding the Pearl Harbor attack are also lacking in care and credibility.

He is convinced, for example, that shortly before Pearl Harbor, Prime Minister Winston Churchill sent President Roosevelt details of Japan's plans for war, a "positive" and unmistakable warning of imminent conflict. This warning, says Costello, was in the form of a translation of Copy 145 of the Japanese Combined Fleet Operation Order No. 1, which his own research had just uncovered in the newly opened intelligence files and which, presumably, had been artfully concealed all these years.

Unfortunately for this theory, Copy 145 of the Combined Fleet Order was not captured until the spring of 1945, when American divers recovered it from a sunken Japanese warship—a fact well established since its publication in the record of the postwar Pearl Harbor investigation in 1946. That a translation of the order ended up in closed intelligence files is not surprising. But that Costello failed to see it in the published record is a little difficult to understand.

Suffice it to say that Washington and London had a pretty good idea of Japanese intentions (other than toward Pearl Harbor) in December 1941. But they certainly lacked the specific details that a copy of the basic Japanese naval order would have given them.

Costello is also intrigued by the old "winds messages" controversy, the argument over whether or not Washington heard certain Japanese weather broadcasts signaling a rupture in diplomatic relations and ordering the destruction of codes and documents. He has a few new bits of information, but nothing to upset the accepted interpretation that the messages were probably never actually broadcast (since there was no need for them) and that, even if they had been, they would have told us nothing we hadn't already learned from other sources.

In the final analysis, Costello has spoiled what might have been a very good book by haste, misstatement, and a search for devils. The serious reader should approach it with care.

—Reviewed by Dr. Stanley L. Falk, Deputy Chief Historian for Southeast Asia, US Army Center of Military History, and author of several books on World War II in the Pacific.

City of Twilight

Paris in the Third Reich: A History of the German Occupation, 1940–1944, by David Prycee Jones. Holt, Rinehart & Winston, New York, N. Y., 1981. 294 pages, with photographs and bibliography. $25.

Paris had been spared the devastation visited on other cities in the new kind of war. There had been no aerial bombardment. No horrendous street-to-street fighting. The people of Paris simply awoke one day in June 1940 to find the German occupiers among them, sitting in the cafés, snapping photographs of the famous structures.

Indeed, the world of the Parisian had been transformed almost overnight. The declaration of war on Germany following the invasion of Poland in September 1939 had meant little change. With 3,000,000 men under arms—reputedly the finest army in the world—guarding France's frontier with Germany, the citizens of Paris had nothing to fear. Then the *drôle de guerre*—phony war—became *blitzkrieg,* and the Germans were in Paris.

With Europe conquered and Britain under aerial siege, the war would soon be over anyway. And the Germans had been benevolent, allowing a large part of France to remain self-governing with Marshal Pétain as head of state in Vichy. Perhaps an accommodation with Germany on semi-equal footing could be worked out. Or so many thought.

For not a few cosmopolitan Pari-

sians this was a typical dilemma: What if a German friend from prewar days calls and asks to visit? Should he be allowed to come in uniform? Or should the meeting be relegated to a café? How individuals responded to many kinds of such quandaries "was a matter of temperament and hazard, though later their lives were sometimes to turn on such imponderables," notes the author of this fascinating book. Throughout the book, the behavior of people is treated objectively and without comment.

Thus, the stage was set for the great City of Light to enter an era of twilight.

Initially, there was no mass enlistment in the resistance movement. There was no resistance movement. But the underground began to grow spontaneously in the grass roots, though haphazardly, to be sure.

One of the most significant factors with the coming of the occupation was France's splintered political structure. Those of the far right—fascists and others—applauded Hitler's leadership of the German people and his stunning conquest of the Continent. Once in power in Vichy, they employed the infamous Milice—a counterpart of the Gestapo—to persecute the regime's enemies: resistance "traitors," Communists, and Jews. In fact, anyone who opposed them.

The book, then, is not confined to an account of life in Paris during the occupation, but also examines the role of collaborationist Vichy and its policies.

As for the Communists, it was a particular piece of bad timing that, under the party line dictated by the Hitler/Stalin nonaggression pact of 1939, they were ordered to welcome the Germans. The leadership, in effect, became visible and was duly marked for extinction.

For the most part, Parisians of Jewish extraction were to share the fate meted out to other Jews throughout Europe. The national taint is that so many at all levels in France cooperated unprotestingly in the deportation program. Many knew—and a number approved—the end result. Unfortunately, many of Europe's Jews, political refugees, and other "undesirables" had fled to France for sanctuary from the Nazis. Now they became once again all too vulnerable.

Throughout occupied France, including Paris, the invaders left the governmental machinery essentially intact, while bending it to their will. (In Paris, children returned to school within days of the takeover.)

With the coming of the Germans, Parisians of all stations of life began walking a moral tightrope that was to continue throughout the occupation. Many who strayed off it were made to answer at the liberation—for example, high-level officials who went beyond a certain point in collaborating with their German supervisors. Ordinary people, too, were to face retribution. For the young Parisiennes, Paris was still Paris and the Germans were masters of Europe. Many young women fell under the spell of the tanned gods in Wehrmacht uniform.

As the war continued, food was rationed strictly in Paris, but it nonetheless became increasingly scarce. In the flourishing black market, people with money and no scruples could acquire anything they wanted. Ethically, how far could one go? many Parisians asked themselves.

With a favorable exchange rate, Germans in Paris could purchase many items no longer available at home. Said one young woman with the German Foreign Ministry: "Fantastic deals were being transacted all around on the sly, for wines, food, shoes, what have you. We could buy what we wanted, much more than the French. It was the most wonderful and unforgettable time of my youth."

The end of that time was fast approaching.

For the astute, the crisis point had passed. Britain remained unvanquished and the United States was on the march. The underground, while uncoordinated, rife with ideological infighting, and frequently devastated by betrayals, was stiffening. The Germans were losing in the East.

Besides the actions and attitudes of the period's political figures, the author also touches upon those of the city's social, religious, and cultural leaders.

The second section of the book contains interviews with surviving participants of the most astounding occupation in history.

—Reviewed by William P. Schlitz, Senior Editor.

New Books in Brief

Air Raid: Pearl Harbor!, edited by Paul Stillwell. The United States in 1941 was a nation divided over whether to become involved in the then-raging world war when the Japanese launched their attack on Pearl Harbor and galvanized the country to action and unity of purpose. But more than that, Pearl Harbor was a watershed in American life that touched each person individually. Here Editor Stillwell has collected forty-seven first-person narratives from participants and witnesses to the raid, ranging from an account by the leader of the Japanese forces attacking Hawaii to the US Secretary of Labor's memories of President Roosevelt's response to the surprise attack. With preface, photos, and index. Naval Institute Press, Annapolis, Md. 21402, 1981. 299 pages. $19.95.

Death March: The Survivors of Bataan, by Donald Knox. With the recent fortieth anniversary of the American surrender on the Bataan Peninsula, this oral history compiled from the memories of sixty-eight survivors of the infamous "Death March" that followed the surrender is a timely reminder of the incredible sufferings and deprivations experienced by American servicemen during World War II. Of the 10,000 Americans who surrendered on Bataan in 1942, only 4,000 survived the war to tell of the horrors of the ninety-mile "Death March," the deplorable conditions in the prisoner of war camp in the Philippines, and their harrowing transfer to Japan to work in forced labor camps there. With preface, maps, and photos. Harcourt Brace Jovanovich, Inc., New York, N. Y., 1981. 482 pages. $19.95.

Fokker: Aircraft Builders to the World, by Thijs Postma. A well-illustrated overview of the Fokker Co., this book does not attempt to disguise its partisanship. However, within this limitation, it provides a clear outline of the development of the company from Anthony Fokker's first *Spins* ("Spider") to the F.27 Friendships and F.28 Fellowships of today. With index. Jane's Publishing Inc., New York, N. Y., 1980. 160 pages. $19.95.

Mighty Eighth War Diary, by Roger A. Freeman. A daily operational history of the largest air strike force ever to see battle, this large book is sure to interest veteran, historian, and buff alike. Covering more than 1,000 Eighth Air Force operations from June 1942 to May 1945, the *Diary* provides numbers and units of aircraft on a mission, bomb tonnages carried, claims and losses, and many other details. Also included are short narratives of incidents, appreciations of distinguished combatants, and hundreds of wartime photos. Though the *Diary* can stand on its own as a historical work, it is a natural companion to author Freeman's classic history, *The Mighty Eighth.* With introduction, notes, and index. Jane's Publishing Inc., New York, N. Y., 1981. 508 pages. $29.50.

—Reviewed by Hugh Winkler, Ass't Managing Editor.

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JANE'S

ALL THE WORLD'S AIRCRAFT SUPPLEMENT

JUNE 1982

Jian-6 (MiG-19SF) single-seat day fighter of Egyptian Air Force; late production version with relocated brake-chute *(Denis Hughes)*

SHENYANG

CHINESE STATE AIRCRAFT FACTORY: Shenyang, Liaoning Province, People's Republic of China

SHENYANG (MIKOYAN) J-6

It is now possible to identify by their Chinese names four versions of the J-6 (Mikoyan MiG-19) built in China. These are produced at Shenyang, and also at Tianjin, in Hebei Province.

Jian-6 (Jianjiji-6, or J-6). Chinese equivalent of single-seat MiG-19SF/PF (NATO reporting name 'Farmer-C/D'), as described in 1981–82 edition of *Jane's All the World's Aircraft*. Current production aircraft have relocated brake-chute, as described for Jianjiao-6.

Jian-6Xin (Jianjiji-6Xin). The Chinese word Xin, meaning new, is used to designate this version of the Jian-6/MiG-19PF, in which the Soviet-designed Izumrud (Emerald) intake-mounted radar is replaced by a Chinese-developed airborne interception radar in a slimmer and sharply-pointed radome mounted centrally on the intake splitter plate.

Jianjiao-6 (Jianjiji Jiaolianji-6). Tandem two-seat fighter-trainer version, developed in China. Described separately.

Jianzhen-6 (Jianjiji Zhenchaji-6). Single-seat fighter-reconnaissance version, generally similar to Soviet MiG-19R, with cameras mounted in lower forward fuselage instead of the third NR-30 cannon which occupies this position in the fighter-bomber versions.

SHENYANG JIANJIAO-6

Chinese name: Type 6 Jianjiji Jiaolianji (Fighter Trainer)

A tandem two-seat training version of the MiG-19, with the designation MiG-19UTI, was developed by the Mikoyan bureau in the USSR, but was produced in limited numbers only. The Jianjiao-6, although of similar concept, was developed entirely in China, and differs from the MiG-19UTI in a number of important respects. Like the fighter-bomber and reconnaissance versions, it is produced at both Shenyang and Tianjin.

Unlike the MiG-19UTI, in which the additional cockpit was accommodated within the existing fuselage, the Jianjiao-6 has been lengthened by 0.84 m (2 ft 9 in) forward of the wing for this purpose. To offset the effect of this increase in length on the aircraft's directional stability, two ventral strakes are added underneath the rear fuselage, one on each side of the existing curved strake on the centreline. In another external change, the pneumatically deployed tail-braking parachute is now housed in a streamline 'bullet' fairing on top of the rear fuselage at the base of the rudder, faired into the top of the 'pen-nib' fairing above the jetpipes. This modification, which is standard on all two-seat and recent-production single-seat versions of the J-6, eliminates the nose-down pitching moment induced by the former underfuselage location of the brake-chute, and so permits it to be deployed earlier in the landing sequence.

The tandem cockpits are covered by individual canopies, both opening sideways to starboard, and there is a separate internal windscreen between the front and rear cockpits. The rear seat is slightly elevated; Shenyang semi-automatic ejection seats

Close-up of front of the Chinese-developed tandem two-seat trainer version of the MiG-19 *(Denis Hughes)*

Close-up of nose of Jian-6Xin, with Chinese-developed radar

are installed, and each instrument panel is equipped with basic avionics.

Power plant (two 25.50/31.88 kN; 5,732/7,167 lb st Wopen-6 turbojets. Chinese-built version of the Tumansky R-9BF-811) is the same as in the single-seat J-6. Early attempts to maintain a comparable fuel capacity resulted in the completion of a prototype fitted with small wingtip tanks, but these proved incompatible with such a sharply-swept wing. Instead, production Jianjiao-6s have the two wing-root 30 mm NR-30 cannon deleted, the bays for these being occupied by additional internal fuel tanks. As a result, the trainer has a total internal fuel capacity of approx 2,000 litres (440 Imp gallons; 528 US gallons), only slightly less than the 2,170 litres (477 Imp gallons; 573 US gallons) of the single-seater. The undernose NR-30 is retained for use in armament training.

Combined Shenyang/Tianjin production of J-6 versions was reported in 1981 to be at an approximate rate of 60 per month, although at least part of this output may consist of older aircraft now being refurbished or remanufactured for export. Deliveries of the two-seat version have been made to the air forces of Pakistan (where they entered service in September 1980 and now fly with Nos. 14, 25, and 26 Squadrons) and Egypt.

DIMENSIONS, EXTERNAL: As for Jian-6/MiG-19SF/PF except:

Length overall (excl nose-probe):

Jian-6	12.60 m (41 ft 4 in)
Jianjiao-6	13.44 m (44 ft 1 in)

WEIGHT:

Max T-O weight:

Jian-6, Jianjiao-6, with external stores
approx 10,000 kg (22,000 lb)

PERFORMANCE (Jianjiao-6): Generally similar to single-seater except:

Never-exceed speed at 10,670 m (35,000 ft)
917 knots (1,700 km/h; 1,056 mph)

Max level speed at S/L
Mach 1.09 (723 knots; 1,340 km/h; 832 mph)

Max speed with flaps extended to 15°
431 knots (800 km/h; 497 mph)

Max speed with landing gear extended
269 knots (500 km/h; 310 mph)

Rotation speed
108 knots (200 km/h; 124 mph)

Approach speed
189 knots (350 km/h; 217 mph)

Touchdown speed
145 knots (270 km/h; 168 mph)

Stalling speed, flaps and landing gear up
126 knots (234 km/h; 145 mph)

Max rate of climb at S/L, with afterburning
more than 9,145 m (30,000 ft)/min

T-O run, with afterburning
approx 670 m (2,200 ft)

Average sortie time	45 min
g limit ('clean')	+ 8.0

ATR

AVIONS DE TRANSPORT RÉGIONAL: Address: BP 31107, 31026 Toulouse Cédex, France

Launching of the ATR 42 programme was announced at the beginning of November 1981, following a simultaneous decision on October 29, by the boards of directors of Aérospatiale (France) and Aeritalia (Italy) to go ahead with this new twin-turboprop transport aircraft. The decision was confirmed on November 4, 1981, by the signature of a new co-operative agreement for equal sharing of ATR 42 programme work and costs, and for the setting up of a Groupement d'Intérêt Economique (pooling of common economic interest) to manage the programme. This GIE was formally established on February 5, 1982, and has its headquarters in Toulouse.

ATR corresponds to the initial letters of the French and Italian words for 'regional transport aircraft', and 42 to the seating capacity of the basic aircraft at 81 cm (32 in) pitch. A combined Aérospatiale/Aeritalia design group is working at Toulouse to complete the definition of the aircraft; computer-aided design and manufacturing techniques are being used throughout.

ATR 42

The ATR 42 is a high-wing twin-turboprop transport aircraft embodying a number of advanced-technology features in the fields of aerodynamics, structures, and equipment. Design is to FAR Pt 25 and to European Joint Airworthiness Requirement JAR 25 for the certification of transport aircraft. Choice of the Pratt & Whitney Aircraft of Canada PW100/2 turboprop as the aircraft's power plant was announced on June 8, 1981.

Basic design targets are good economy, a high level of field performance, and a wide-body standard of comfort. The fully-pressurised cabin will provide four-abreast seating for up to 46 or 49 passengers at 76 cm (30 in) pitch, with a galley, toilet, and two baggage/cargo compartments. Development possibilities include an initial 'stretch' (ATR XX) to carry 54–58 passengers, a quick-change passenger/cargo version (ATR 42QC), an all-freight version (ATR 42F), and commercial or military transport versions with rear-loading capability.

An intensive worldwide marketing campaign had been started at the end of 1980, and a full-size cabin mockup was displayed at the Paris Air Show in June 1981. By the time of the October 1981 launch date 14 airlines (five in the USA, two in France, and others in Australasia, Europe, Central America, and Southeast Asia) had signed option contracts and made initial payments on a total of 56 ATR 42s.

Two prototypes of the ATR 42 will be built. First flight is planned for August 1984, with the second

Artist's impression of the ATR 42 regional transport under joint development by Aérospatiale of France and Aeritalia of Italy

prototype scheduled to fly two months later. US and European certification is anticipated in the third quarter of 1985, to enable deliveries to begin in the fourth quarter of that year. Aeritalia will be responsible for the entire fuselage, including the tail unit and landing gear; and for the hydraulic, air-conditioning, and pressurisation systems. Aérospatiale will undertake design and construction of the wings; layout of the flight deck and cabin; and will also be responsible for power plant, electrical system, flight controls, and de-icing system installation, and for final assembly and flight testing of the civil versions. Aeritalia will assemble and flight test any cargo/military variants with a rear ramp. Initial production plans are for an output of five aircraft in 1985, 33 in 1986, and 52 in 1987.

Main characteristics of the basic passenger version are as follows:

TYPE: Twin-turboprop regional transport aircraft.

WINGS: Cantilever high-wing monoplane. Aérospatiale RA XXX 43 wing section, derived from NACA 43 series, with thickness/chord ratio of 18% at root and 13% at tip. Two-spar fail-safe metal wings, constructed of conventional metal alloys, with leading-edges of Nida Nomex glass-fibre sandwich. Constant-chord centre-section and tapered outer panels. Dihedral 2° 30' on outer panels. No sweepback. Two-segment double-slotted single-rotation flaps, each segment with its own hydraulic actuator, on each trailing-edge. Ailerons actuated mechanically by cables and push/pull rods; no servos. Electrically actuated trim tab in each aileron. Pneumatic de-icing of leading-edges outboard of engine nacelles.

FUSELAGE: Conventional semi-monocoque fail-safe structure of light alloy unit construction, employing main and secondary frames and longitudinally disposed skin panels. Basically circular cross-section throughout most of length. Crew, passenger, and baggage/cargo compartments pressurised.

TAIL UNIT: Cantilever structure, with sweptback vertical surfaces (attached to rearmost fuselage frame) and non-swept horizontal surfaces. Tailplane mounted near tip of fin. Construction mainly of conventional alloys, with fin and tailplane leading-edges of Nida Nomex glassfibre sandwich. Mechanically actuated mass-balanced rudder and elevators. Electrically actuated trim tab in rudder and each elevator. Pneumatic de-icing of tailplane leading-edges.

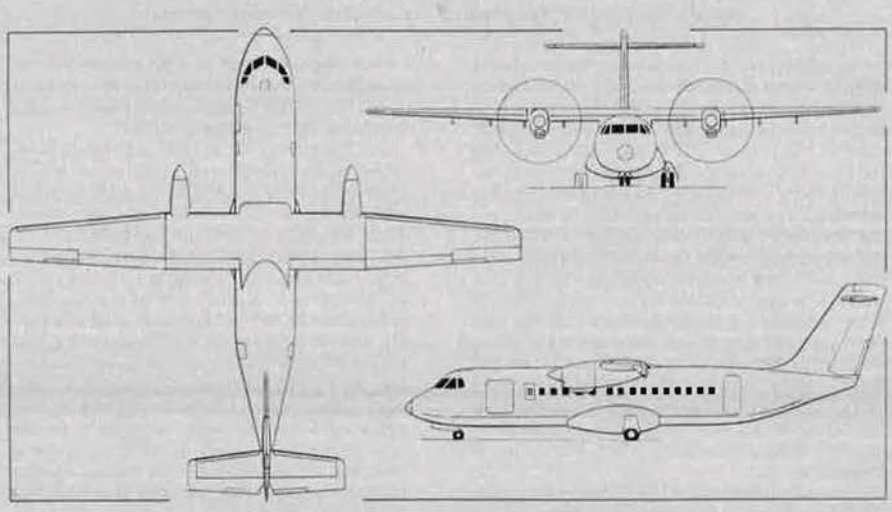
LANDING GEAR: Hydraulically retractable tricycle type, of Messier-Hispano-Bugatti/Magnaghi/Nardi design, with twin wheels on each unit. Nose unit retracts forward, main units inward into fuselage and large underfuselage fairing. Disc brakes and anti-skid units on main gear. Main-wheel tyre pressure 7.0 bars (101.5 lb/sq in). Low-pressure tyres optional, requiring modification to underfuselage fairing.

POWER PLANT: Two Pratt & Whitney Aircraft of Canada PW100/2 turboprop engines, each flat rated to 1,342 kW (1,800 shp) and driving a large-diameter propeller with composite material blades. Fuel in two integral tanks formed by wing spar box, total capacity 5,700 litres (1,254 Imp gallons). Single pressure refuelling point in starboard wing leading-edge. Gravity refuelling points in wing upper surface.

ACCOMMODATION: Crew of two on flight deck, with optional third seat for observer. Seating for 42 passengers at 81 cm (32 in) pitch, or 46 or 49 passengers at 76 cm (30 in) pitch, in four-abreast layout with central aisle. Passenger door, with integral steps, at rear of cabin on port side. Main baggage/cargo compartment between flight deck and passenger cabin, with separate loading door on port side. Rear baggage/cargo compartment, toilet, galley, wardrobe, and seat for cabin attendant, aft of passenger cabin, with service door on starboard side. Additional baggage space provided by overhead bins and underseat stowage. Entire accommodation, including baggage/cargo compartments, pressurised and air-conditioned. Quick-change passenger/cargo version (42 passengers or five LD3 containers) fitted with ball transfer plates aft, roller tracks, and anti-crash net at front of cabin. Emergency escape hatch for crew in roof of flight deck. Emergency exit for passengers on each side at front of cabin.

SYSTEMS: Independent air-conditioning and pressurisation systems, utilising engine bleed air. Pressurisation system (max differential 0.41 bars; 6.0 lb/sq in) provides cabin altitude of 2,000 m (6,560 ft) at flight altitudes of up to 7,620 m (25,000 ft), and a sea level cabin environment at flight levels up to 4,085 m (13,400 ft). Hydraulic system comprises two independent groups, each including an electrically-driven pump, and actuates wing flaps, landing gear, wheel brakes, and nosewheel steering. Pneumatic system for de-icing of outer wing leading-edges, tailplane leading-edges, and engine air intakes. Main electrical system is 28V DC, supplied by two 9kW engine-driven starter/generators and two nickel-cadmium batteries, with two solid-state static inverters for 115/26V single-phase AC supply, and a third (standby) inverter for 115V only. A 115/200V three-phase supply from two 20kVA engine-driven variable-frequency alternators is used for anti-icing of windscreen, flight deck side windows, stall warning and airspeed indicator pitots, and for de-icing of propeller blades and spinners. APU optional.

AVIONICS: Standard avionics package includes two VHF, two VOR/ILS/marker beacon receivers, radio compass, DME, ATC transponder, cockpit voice recorder, intercom, and PA system. Optional avionics include HF receiver, autopilot, Category 1 and 2 flight directors, radio altimeter, GPWS, microwave landing system, area navigation, and weather radar.



The 42/49-passenger ATR 42 transport aircraft (two Pratt & Whitney Aircraft of Canada PW100/2 turboprop engines) *(Pilot Press)*

DIMENSIONS, EXTERNAL:

Wing span	24.572 m (80 ft 7½ in)
Wing chord:	
at root	2.57 m (8 ft 5¼ in)
at tip	1.41 m (4 ft 7½ in)
Wing aspect ratio	11.08
Length overall	22.70 m (74 ft 5¾ in)
Length of fuselage	22.11 m (72 ft 6½ in)
Fuselage: Max width	2.86 m (9 ft 4½ in)
Height overall	7.59 m (24 ft 10¾ in)
Tailplane span	7.31 m (23 ft 11¾ in)
Wheel track	4.10 m (13 ft 5½ in)
Wheelbase	8.78 m (28 ft 9¾ in)
Propeller diameter	3.96 m (13 ft 0 in)
Distance between propeller centres	8.10 m (26 ft 7 in)
Propeller/fuselage clearance	0.80 m (2 ft 7½ in)
Passenger door (rear, port):	
Height	1.75 m (5 ft 9 in)
Width	0.75 m (2 ft 5½ in)
Height to sill	1.265 m (4 ft 1¾ in)
Cargo/baggage door (fwd, port):	
Height	1.53 m (5 ft 0¼ in)
Width	1.275 m (4 ft 2¼ in)
Height to sill	1.265 m (4 ft 1¾ in)

DIMENSIONS, INTERNAL:

Cabin:	
Length (excl flight deck, incl baggage compartments)	13.849 m (45 ft 5¼ in)
Max width	2.57 m (8 ft 5¼ in)
Max width at floor	2.26 m (7 ft 5 in)
Max height	1.91 m (6 ft 3¼ in)
Volume	44.8 m³ (1,582 cu ft)
Baggage/cargo compartment volume:	
front	5.8 m³ (204.8 cu ft)
rear	2.7 m³ (95.3 cu ft)
overhead bins	1.6 m³ (56.5 cu ft)

AREAS:

Wings, gross	54.5 m² (586.6 sq ft)
Vertical tail surfaces (total)	12.5 m² (134.5 sq ft)
Horizontal tail surfaces (total)	10.3 m² (110.9 sq ft)

WEIGHTS AND LOADINGS:

Manufacturer's weight empty	8,319 kg (18,340 lb)
Operating weight empty	9,296 kg (20,494 lb)
Max fuel load	4,500 kg (9,920 lb)
Max payload	4,809 kg (10,602 lb)
Max T-O weight	14,715 kg (32,440 lb)
Max ramp weight	14,765 kg (32,550 lb)
Max zero-fuel weight	14,105 kg (31,095 lb)
Max landing weight	14,420 kg (31,790 lb)
Max wing loading	270 kg/m² (55.3 lb/sq ft)
Max power loading	5.48 kg/kW (9.01 lb/shp)

PERFORMANCE (estimated, to FAR Pt 25, incl Amendment 42, PW100/2 engines, ISA, except where indicated):

Max cruising speed at 6,100 m (20,000 ft)	277 knots (513 km/h; 319 mph)
Normal max operating speed	Mach 0.55 (250 knots; 463 km/h; 288 mph CAS)
Stalling speed:	
flaps up	91 knots (167 km/h; 104 mph)
60° flap	70 knots (128 km/h; 80 mph)
Max rate of climb at S/L	567 m (1,860 ft)/min
Rate of climb at S/L, one engine out	198 m (650 ft)/min
Max operating altitude	7,620 m (25,000 ft)
Service ceiling, one engine out, at 97% of max T-O weight, ISA + 10°C	4,085 m (13,400 ft)
T-O balanced field length at max T-O weight:	
at S/L	950 m (3,117 ft)
at 915 m (3,000 ft) (ISA + 10°C)	1,150 m (3,773 ft)
Landing field length at S/L, at max landing weight	895 m (2,937 ft)
Max range with 42 passengers, reserves for 87 nm (161 km; 100 mile) diversion and 45 min hold	728 nm (1,350 km; 838 miles)
Block time for 200 nm (370 km; 230 mile) stage length at max cruising speed at 6,100 m (20,000 ft), IFR reserves	54 min

GRUMMAN

GRUMMAN AEROSPACE CORPORATION: Head Office: South Oyster Bay Road, Bethpage, New York 11714, USA

GRUMMAN (GENERAL DYNAMICS) EF-111A

The programme to convert General Dynamics F-111As into EF-111A electronic warfare aircraft, and to evaluate their ability to provide ECM jamming coverage for air attack forces, was initiated in 1972–73. Operational deployment of the F-111A in Southeast Asia, from March 1968, had revealed shortcomings, despite special preparation under the Harvest Reaper programme to provide these aircraft with advanced ECM equipment that would facilitate penetration of enemy airspace. Subsequent enquiry revealed that many factors contributed to the limited success of the F-111A in Southeast Asia: lack of adequate and effective ECM jamming was responsible for many of its problems, as well as those of all other types of combat aircraft in that theatre of operations.

Because of the growing potential of Soviet-built air defence systems, which stretch across Eastern Europe, NATO anti-invasion forces must have the capability of suppressing literally thousands of radar 'eyes', able to locate precisely the route and speed of counter-attacking air strikes. In addition, updated SAM systems and new interceptors with sophisticated ECM equipment are being introduced regularly by the Soviet Union, providing its armed forces with a now-acknowledged lead in electronic warfare, both ground and airborne.

Senior US Air Force officials believe that utilisation of the EF-111A as a tactical jamming system, in combination with the E-3A Sentry AWACS aircraft, is vital to help offset this Soviet lead. Because of its vast masking power, the EF-111A is considered essential to provide cover for air-to-ground operations along the forward lines, and for support of penetrating allied strike forces. If some future circumstances should make it necessary to launch a counter-strike against Soviet penetration of NATO territory, EF-111As operating on the friendly side of the FEBA (forward edge of the battle area) could blind the other side's electronic 'eyes', making it possible for NATO strike forces to attack the armoured spearhead, as well as resupply areas, reserves, and SAM installations 17–35 nm (32–64 km; 20–40 miles) behind the opposing lines, with something less than half the losses that might be expected without use of the EF-111A's jamming systems.

Three basic modes of deployment are foreseen for the EF-111A: standoff, penetration, and close air support. In the standoff role, jamming aircraft would operate within their own airspace, at the FEBA. Out of range of the enemy's ground-based weapons, orbiting EF-111As would use their jamming systems to screen the routes of friendly strike aircraft. In the penetration role, the EF-111As would accompany strike aircraft to high-priority targets, their Mach 2 capability making them ideal escort aircraft for such a task. The close air support requirement calls for EF-111A escorts to neutralise anti-air radars while the strike force delivers its attack on enemy armour.

Design study contracts were awarded to General Dynamics and Grumman by the US Air Force in 1974, and in January 1975 it was announced that Grumman had been awarded a contract to convert two existing F-111As to EF-111A prototype configuration. Primary electronic warfare equipment of these prototypes comprises the AN/ALQ-99E tactical jamming system, an improved version of the AN/ALQ-99 system carried by the US Navy's Grumman EA-6B Prowler.

The ALQ-99E's jamming transmitters are mounted in the weapons bay, with their antennae covered by a narrow, 4.9 m (16 ft) long canoe-shape radome. The fin-tip pod, similar in shape to that of the EA-6B, houses the receiver system and antennae. Total weight of the new equipment is about 2,720 kg (3 US tons).

Claimed to be the world's most powerful airborne ECM system, the ALQ-99E's frequency coverage, reliability, and effective use of available jamming power enable the EF-111A to penetrate the world's densest known electronic defences. Its electronic systems can be converted quickly to counter new threats as they develop, and, even if multiple hostile radars switch to a variety of frequencies, the EF-111A's broad range of jamming capabilities can handle them immediately. The aircraft's tactical jamming functions are managed by an electronic warfare officer (EWO), who controls both active and passive equipment through the onboard computer. Computer management enables the EWO to handle a tactical workload previously requiring (as in the EA-6B) several operators; for example, preflight programming of the computer with known radars frees the operator to concentrate on new and more urgent threat radars. The automated ALQ-99E has exceptional versatility and speed for identifying and locating threat radars, and assigning jammers to neutralise them over a wide range of frequencies.

Second prototype (66-049) of the Grumman (General Dynamics) EF-111A electronic warfare aircraft was used for flight testing the complete jamming system

A partially modified F-111A, fitted by Grumman with the weapons bay radome, was flown for the first time on December 15, 1975. The first flight of a fully-aerodynamic prototype (66-041), with fin-tip pod and underbelly radome, was made from Grumman's Calverton, N. Y., facility on March 10, 1977; the complete system was flown for the first time on May 17, 1977, on the second prototype (66-049). Subsequent Grumman flight testing of the jamming system involved 84 flights totalling 215 flight hours, completed by the system aircraft during a period of 3½ months. US Air Force flight testing involved 78 flights totalling 258 flight hours during a six-month test programme. The USAF tests verified various mission operational concepts, flight formations, and the jammer's electromagnetic compatibility with other strike aircraft. (These latter tests dispelled an earlier concern that the friendly strike force, as well as enemy threats, might be jammed by the powerful signals emanating from the EF-111A.) Structural flight tests under all operating conditions demonstrated an 'infinite' life for all modified areas of the aircraft's structure, and flying qualities were considered virtually identical to those of the F-111A strike version.

Including the two prototypes, US Air Force plans currently envisage the conversion of 42 F-111As (of 86 still operational at the beginning of 1982) to EF-111A standard, to equip two squadrons. The contract for the first six 'production' aircraft was signed in April 1979, and these, like the prototypes, were delivered to Grumman from the 366th Tactical Fighter Wing at Mountain Home AFB, Idaho. The 366th TFW is also the first EF-111A unit, and the two prototypes were returned there in late 1981 after being brought up to full production standard. The first flight in this form was made, by the former systems prototype, on June 26, 1981; the first EF-111A delivered back to TAC was 66-041, the original prototype. Initial operational capability with the EF-111A is scheduled for November 1983.

TYPE: ECM tactical jamming aircraft.

WINGS: Cantilever shoulder-wing monoplane. Wing section NACA 64A210.68 (modified) at pivot point, NACA 64A209.80, with modified leading-edge, at tip. Sweepback of outer portions variable in flight or on the ground from 16° to 72° 30'. Wing sweep actuated by Jarry Hydraulics jacks. Dihedral, at 16° sweep, is 1°. Incidence, at 16° sweep, is 1° at root, −3° at tip. Five-spar structure, with stressed and sculptured skin panels, each made in one piece between leading- and trailing-edge sections, from root to tip. Leading- and trailing-edge sections of honeycomb sandwich. Three-segment airbrakes/lift dumpers in upper surface of each wing, operated by Bendix servo-actuators, function as spoilers for lateral control at low speeds. Full-span variable-camber leading-edge slats and full-span double-slotted trailing-edge flaps.

FUSELAGE: Semi-monocoque structure, mainly of aluminium alloy, with honeycomb sandwich skin. Some steel and titanium. Main structural member is a T-section keel, under the arms of which the engines are hung.

TAIL UNIT: Conventional cantilever sweptback surfaces, utilising honeycomb sandwich skin panels, except for tailplane tips and central area of fin on each side. Central portion of fin (built under subcontract by Canadair) is reinforced to support fin-tip pod. All-moving horizontal surfaces ('tailerons') operate both differentially and symmetrically to provide aileron and elevator functions. Bendix servo-actuators for tailerons and rudder. Two long, narrow ventral stabilising fins.

LANDING GEAR: Hydraulically retractable tricycle type, with single wheel on each main leg. Twin-wheel nose unit retracts forward. Main gear is a triangulated structure with hinged legs which are almost horizontal when the gear is extended. During retraction, the legs pivot downward, the wheels tilt to lie almost flat against them, and the whole gear rotates forward so that the wheels are stowed side by side in the fuselage between the engine air intake ducts. Low-pressure tyres on main wheels, size 48-17 in. Disc brakes, with anti-skid system. Main landing gear door, in bottom of fuselage, hinges down to act as speed brake in flight.

POWER PLANT: Two Pratt & Whitney TF30-P-3 turbofan engines, each rated at 82.3 kN (18,500 lb st) with afterburning, close-mounted under wing root on each side of fuselage. Hamilton Standard hydro-mechanical air intake system, with movable shock-cone. Fuel tanks in wings and fuselage, total capacity 18,919 litres (4,162 Imp

gallons; 4,998 US gallons). Pressure fuelling point in port side of fuselage, forward of engine air intake. Gravity fuel filler/in-flight refuelling receptacle in top of fuselage aft of cockpit. Oil capacity 30.3 litres (6.7 Imp gallons; 8 US gallons).

ACCOMMODATION: Crew of two (pilot and electronic warfare officer) side by side in air-conditioned and pressurised cockpit. Portion of canopy over each seat is hinged on aircraft centreline and opens upward. Zero-speed, zero-altitude (including underwater) emergency escape module, developed by McDonnell Douglas Corporation and utilising a Rocket Power Inc rocket motor. Emergency procedure calls for both crew members to remain in capsule cockpit section, which is propelled away from aircraft by rocket motor and lowered to ground by parachute. Airbags cushion impact and form flotation gear in water. Entire capsule forms survival shelter.

SYSTEMS: Hamilton Standard pressurisation and Garrett air-conditioning systems. Hydraulic system for actuation of wing sweep, landing gear, and flying controls. Westinghouse AC electrical system, with Sundstrand 90kVA integrated drive generators (instead of 60kVA in F-111A). General Electric flight control system. Improved air-cycle system for avionics; liquid cooling system, with ram-air heat exchanger, added. Sundstrand emergency power unit.

AVIONICS AND EQUIPMENT: AN/ARC-112 HF com transceiver; Magnavox AN/ARC-164 UHF com transceiver; AN/AIC-25 intercom; AN/AJQ-20A INS; Collins AN/ARN-118 Tacan; Honeywell AN/APN-167 radar altimeter; Collins AN/ARA-50 UHF/DF; AN/ARN-58 ILS; IBM (Federal Systems Division) 4 Pi digital computer; Texas Instruments AN/APQ-110 terrain-following radar; AN/APQ-160 attack radar; AN/APX-64 IFF/SIF; Eaton Corporation (AIL Div.) AN/ALQ-99E tactical jamming system; Sanders AN/ALQ-137(V)4 self-protection system (SPS); AN/ALR-62(V)4 terminal threat warning system (TTWS); AN/ALR-23 radar countermeasures receiver system (CMRS); AN/ALE-28 electronic countermeasures dispenser system (CMDS). All tactical jamming functions are managed by the EWO who can, through computer management, handle a tactical electronic warfare workload which previously required several operators and more equipment. In addition, the automated system of the EF-111A has exceptional capability for locating, identifying, and assigning jammers to enemy emitters over a wide range of frequencies. The AN/ALQ-99E jamming system comprises ten transmitters (Raytheon high-band, AEL low-band), five Raytheon exciters, numerous receivers, computers, display systems, and one Raytheon RF calibrator, per aircraft. To provide surveillance radar and complementary support jamming, USAF is investigating a modular addition to the Westinghouse AN/ALQ-131 jammer pod that would enable it to be carried under the wings of the EF-111A.

ARMAMENT: None.

DIMENSIONS, EXTERNAL:

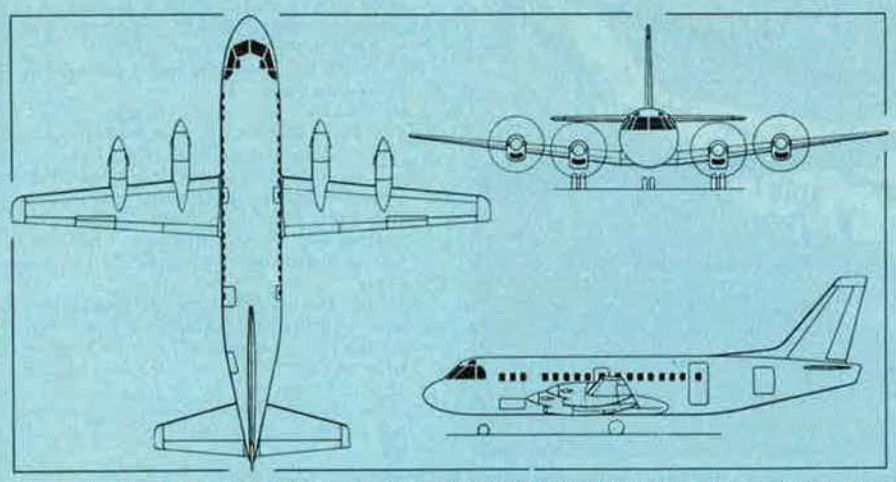
Wing span: spread	19.20 m (63 ft 0 in)
fully swept	9.74 m (31 ft 11.4 in)
Wing mean aerodynamic chord	2.76 m (9 ft 0 in)
Wing area, gross (16° sweep)	48.77 m² (525 sq ft)
Wing aspect ratio (16° sweep)	7.56
Length overall	23.16 m (76 ft 0 in)
Height overall	6.10 m (20 ft 0 in)
Wheel track	3.19 m (10 ft 0.4 in)
Wheelbase	7.44 m (24 ft 4.8 in)

WEIGHTS:

Weight empty	25,072 kg (55,275 lb)
Max internal fuel	14,741 kg (32,500 lb)
Design T-O weight	33,000 kg (72,750 lb)
Combat T-O weight	31,751 kg (70,000 lb)
Max T-O weight	40,346 kg (88,948 lb)
Max landing weight	37,421 kg (82,500 lb)

PERFORMANCE (estimated for typical mission, at max T-O weight except where indicated. A: basic standoff; B: penetration; C: close air support):

Max combat speed at combat weight:	
A, B, C	1,196 knots (2,216 km/h; 1,377 mph)
Average speed, outbound:	
A, C	446 knots (826 km/h; 514 mph)
B	512 knots (949 km/h; 590 mph)
Average speed over combat area:	
A	321 knots (595 km/h; 370 mph)
B	507 knots (940 km/h; 584 mph)
C	462 knots (856 km/h; 532 mph)
Average speed, inbound:	
A, C	432 knots (800 km/h; 497 mph)
B	502 knots (930 km/h; 578 mph)
Stalling speed, power off:	
A, B, C	142.2 knots (263.5 km/h; 164 mph)
Rate of climb at S/L, intermediate power:	
A, B, C	1,006 m (3,300 ft)/min
Rate of climb at S/L, one engine out, with afterburning:	
A, B, C	1,021 m (3,350 ft)/min
Service ceiling with afterburning, at combat weight:	
A, B, C	13,715 m (45,000 ft)
T-O run: A, B, C	1,349 m (4,425 ft)
T-O to 15 m (50 ft):	
A, B, C	1,775 m (5,825 ft)
Landing from 15 m (50 ft) at 26,968 kg (59,455 lb) gross weight:	
A, B, C	945 m (3,100 ft)
Landing run at 26,968 kg (59,455 lb) gross weight:	
A, B, C	602 m (1,975 ft)
Combat radius, with reserves:	
A	200 nm (370 km; 230 miles)
B	807 nm (1,495 km; 929 miles)
C	623 nm (1,155 km; 717 miles)
Ferry range	2,022 nm (3,747 km; 2,328 miles)
Endurance without refuelling	more than 4 h



Commuter Aircraft Corporation's new 50/60-seat CAC-100 airliner in its latest, much-revised form
(Pilot Press)

CAC

COMMUTER AIRCRAFT CORPORATION; Head Office: PO Box 83309, San Diego, California 92138, USA

COMMUTER AIRCRAFT CORPORATION CAC-100

Commuter Aircraft Corporation was formed to develop and manufacture a new 50/60-seat commuter airliner under the designation CAC-100. The project had its origins in the GAC-100 programme of the former General Aircraft Corporation of which details can be found in the 1970–71 *Jane's*. The CAC-100 is, however, a slightly larger aircraft, embodying improved power plant and construction. Considerable redesign was being undertaken in early 1982, to incorporate the latest technology. By comparison with the details given in the 1981–82 *Jane's*, a new wing of increased span has been introduced, and is also simplified by the elimination of leading-edge slats. More powerful engines are to be installed, and each will drive a Hartzell five-blade propeller of advanced design. In early 1982 it had not been decided whether to change from forward-retracting to rearward-retracting main landing gear units, or whether to dispense with the variable-incidence tailplane in favour of a fixed unit. Production of the CAC-100 is supported by substantial loan guarantees from the US Department of Commerce and the Ohio state administration. Production will be centered in a new factory that was still under construction in early 1982 at Youngstown Municipal Airport, Ohio.

Rollout of the CAC-100 prototype is planned for 1983, and it is hoped to begin deliveries of production aircraft in early 1984, following certification to FAR Pt 25 standards.

TYPE: Four-turboprop commuter/cargo transport.

WINGS: Cantilever low-wing monoplane. NASA aerofoil. Incidence 3°. Dihedral 7° at 40% chord. Sweepback at quarter-chord 3° 34' 12". All-metal two-spar fail-safe structure of 2024-T4 light alloy. Hydraulically-actuated single-slotted trailing-edge flaps of light alloy construction, extending from inboard of aileron to wing root of each wing. Plain ailerons of similar construction, each operating in conjunction with a differential spoiler on the upper surface of the wing, positioned directly inboard of the aileron and forward of the flaps. Ailerons hydraulically-powered with manual cable backup. Trim tab in each aileron. Pneumatic de-icing boots on wing leading-edges.

FUSELAGE: All-metal semi-monocoque fail-safe structure of circular cross-section, with stringers and skins of 2024-T4 light alloy. Flight deck, cabin, and rear baggage compartment pressurised.

TAIL UNIT: Cantilever all-metal structure of 2024-T4 light alloy, with small dorsal fin and swept vertical surfaces. Variable-incidence tailplane (see introductory notes). Trim tabs and servo tabs in rudder and elevators. Rudder and elevators hydraulically-powered with manual cable backup. Pneumatic de-icing boots for fin and tailplane leading-edges.

LANDING GEAR: Hydraulically-retractable tricycle type, with oleo-pneumatic shock-absorbers and twin wheels on each unit. All units retract forward, the main units into the inboard engine nacelles (see introductory notes). Main-wheel tubeless tyres size 9.50-16 Type III (10-ply rating); steerable nosewheels fitted with tubeless tyres size 6.50-10 Type III (10-ply rating). Multiple disc brakes. Modulated anti-skid units. Pressure for emergency brake and parking brake provided by electrically-driven hydraulic pump.

POWER PLANT: Four 1,050 kW (1,409 ehp) Pratt & Whitney Aircraft of Canada PT6A-65R turboprop engines, each driving a Hartzell advanced five-blade constant-speed reversible-pitch metal propeller with spinner. Fuel in four integral wing tanks with combined capacity of 5,224 litres (1,380 US gallons). Overwing gravity refuelling points, and single-point fuel/de-fuel manifold in starboard inner engine nacelle. Electrical de-icing boots for propellers; air intakes de-iced by engine bleed air.

ACCOMMODATION: Crew of two on flight deck, with

dual controls: provision for an observer. Main cabin accommodates 50 passengers as standard at 81 cm (32 in) seat pitch, with seat for stewardess, coat compartment, toilet, and galley at rear of cabin. Max accommodation for 60 passengers at 74 cm (29 in) seat pitch, with seat for stewardess, and toilet at rear of cabin. Main door at rear of cabin, with stairway that extends from beneath cabin floor. Two overwing emergency exits, one each side. Service door at rear of cabin on starboard side. Pressurised baggage compartment aft of cabin, with door on port side of fuselage. Forward underfloor cargo compartment, with door on port side of fuselage. Avionics bay in nose, to rear of weather radar antenna. Windscreens electrically anti-iced. The cabin is designed to provide for future mixed passenger/cargo or all-cargo operation, the basic floor being suitably stressed and incorporating cargo container attachments. In an all-cargo configuration five LD3 containers could be accommodated. For such use, an optional cargo door, size 1.78 × 2.16 m (5 ft 10 in × 7 ft 1 in), will be available.

SYSTEMS: Air-cycle pressurisation system, max differential 0.45 bars (6.5 lb/sq in), to provide a sea level cabin altitude to 4,570 m (15,000 ft). Dual hydraulic systems at pressure of 207 bars (3,000 lb/sq in), powered by four engine-driven pumps and one electrically-driven standby pump. Pneumatic system, using engine bleed air, for flight instruments and de-icing boots. Electrical system includes four 250A 24-28V DC starter/generators, two 10kVA 120/208V 400Hz alternators driven by hydraulic motors, standby solid-state inverters, and two 24V 22Ah nickel-cadmium batteries. Oxygen system of 1.81 m³ (64 cu ft) capacity standard. APU optional.

AVIONICS AND EQUIPMENT: Basic standard avionics will include dual nav/com and ILS. Optional items will include DME, marker beacon receiver, transponder with provisions for altitude encoding, interphone and passenger address systems, cockpit voice and flight recorders. There are space provisions for the installation of dual ADF, a second DME, HF com, radio altimeter, autopilot/flight director system, and Selcal.

DIMENSIONS, EXTERNAL:

Wing span	22.69 m (74 ft 5½ in)
Wing mean aerodynamic chord	2.20 m (7 ft 2½ in)
Wing aspect ratio	11.09
Length overall	21.63 m (70 ft 11½ in)
Fuselage diameter	2.82 m (9 ft 3 in)
Height overall	7.60 m (24 ft 11¼ in)
Tailplane span	9.14 m (30 ft 0 in)
Wheel track	6.71 m (22 ft 0 in)
Wheelbase	6.39 m (20 ft 11¼ in)
Propeller diameter	2.64 m (8 ft 8 in)
Propeller ground clearance (inner)	0.46 m (1 ft 6 in)

Passenger door (port, rear):

Height	1.98 m (6 ft 6 in)
Width	0.91 m (3 ft 0 in)
Height to sill	1.79 m (5 ft 10½ in)

Service door (stbd, rear):

Height	1.27 m (4 ft 2 in)
Width	0.61 m (2 ft 0 in)
Height to sill	1.79 m (5 ft 10½ in)

Baggage door (port, fwd):

Height	0.48 m (1 ft 7 in)
Width	1.22 m (4 ft 0 in)
Height to sill	1.19 m (3 ft 11 in)

Emergency exits (two, overwing):

Height	0.91 m (3 ft 0 in)
Width	0.74 m (2 ft 5 in)

Baggage door (port, rear):

Height	1.27 m (4 ft 2 in)
Width	1.02 m (3 ft 4 in)
Height to sill	1.97 m (6 ft 5½ in)

DIMENSIONS, INTERNAL:

Cabin: Max height	1.94 m (6 ft 4½ in)
Max width	2.62 m (8 ft 7 in)
Floor area	28.45 m² (306.2 sq ft)
Volume	53.09 m³ (1,875.0 cu ft)
Rear baggage compartment: Volume	5.66 m³ (200.0 cu ft)
Fwd baggage/cargo compartment: Volume	1.90 m³ (67.2 cu ft)

AREAS:

Wings, gross	46.45 m² (500.0 sq ft)
Horizontal tail surfaces (total)	16.72 m² (180.0 sq ft)
Vertical tail surfaces (total)	10.70 m² (115.2 sq ft)

WEIGHTS (estimated):

Weight empty, typical operating	10,349 kg (22,815 lb)
Max payload	5,443 kg (12,000 lb)
Max T-O and landing weight	17,010 kg (37,500 lb)

PERFORMANCE (estimated at max T-O weight, ISA):

Cruising speed at 6,100 m (20,000 ft)	307 knots (569 km/h; 354 mph)
Service ceiling, one engine out	7,620 m (25,000 ft)
T-O runway, FAR 25 at S/L	1,225 m (4,020 ft)
Landing runway, FAR 25/135 at S/L	1,286 m (4,220 ft)
Range with 50 passengers, 91 kg (200 lb) baggage and IFR reserves	640 nm (1,186 km; 737 miles)

The Sikorsky CH/MH-53E, a production CH-53E Super Stallion which has been modified to flight test features of the mine-sweeping MH-53E

SIKORSKY

SIKORSKY AIRCRAFT, DIVISION OF UNITED TECHNOLOGIES CORPORATION: Head Office and Works: Stratford, Connecticut 06602, USA

SIKORSKY CH/MH-53E AMCM

In May 1973, following award by the US Navy of a $1.7 million cost-plus-fixed-fee contract, Sikorsky began the construction of two YCH-53E prototypes. (The production CH-53E is a three-engined development of the Sikorsky S-65, and changes include the installation of a new seven-blade main rotor of increased diameter, with blades of titanium/glassfibre construction, and an uprated transmission of 9,798 kW; 13,140 shp capacity to cater for future growth.) The first YCH-53E prototype flew initially on March 1, 1974, but was lost subsequently in a ground accident. The development programme continued with the second prototype, followed by two pre-production prototypes, and the first of an initial batch of six production aircraft was accepted by the US Navy on December 17, 1980.

To meet a US Navy requirement for an Airborne Mine Countermeasures (AMCM) helicopter, it was decided to convert the first production CH-53E for evaluation in this configuration by installation of the equipment needed to fulfil the role. Designated temporarily as the CH/MH-53E, this AMCM prototype flew for the first time on December 23, 1981. At the present time it is an AMCM equipment-carrying CH-53E, but if the MH-53E is ordered into production it will have enlarged sponsons to provide greater fuel capacity, allowing longer mine-sweeping missions to be flown, and will be able to deploy all existing or planned aerial mine-sweeping equipment. Although the MH-53E would be small enough to be air transportable by MAC's C-5A Galaxy aircraft, its basic in-flight refuelling capability would permit self-deployment over long ranges. It would be shipboard-compatible with amphibious ships serving as AMCM platforms, and could serve also in a vertical on-board replenishment role.

Following the first flight of the CH/MH-53E prototype, it was displayed at the Pentagon, and at Virginia military bases, before the completion of company testing at Stratford. It was planned that after company tests had been completed it would be flown to the US Navy's Coastal Systems Center, Panama City, Fla., for dynamic tow testing with mine countermeasures equipment.

The description which follows applies specifically to the CH-53E, but would apply also to the MH-53E as revised by the foregoing notes:

TYPE: Triple-turbine heavy-lift multi-purpose helicopter.

ROTOR SYSTEM AND TRANSMISSION: Seven-blade main rotor with blades of titanium/glassfibre construction. Titanium and steel main rotor head. Main rotor blades fold. Four-blade tail rotor mounted on pylon canted 20° to port. Rotor transmission is rated at 9,798 kW (13,140 shp) for 10 min, 8,628 kW (11,570 shp) for 30 min. Tail rotor pylon folds on starboard side of fuselage.

FUSELAGE: Conventional semi-monocoque structure of light alloy, steel, and titanium.

TAIL SURFACE: Lightweight braced gull-wing surface on starboard side.

LANDING GEAR: Retractable tricycle type, with twin wheels on each unit. Main units retract into rear of sponson on each side of fuselage.

POWER PLANT: Three General Electric T64-GE-416 turboshaft engines, each with a max rating of 3,266 kW (4,380 shp) for 10 min, an intermediate rating of 3,091 kW (4,145 shp) for 30 min, and a max continuous power rating of 2,756 kW (3,696 shp).

ACCOMMODATION: Flight crew of three. The main cabin of the CH-53E, which is able to carry a maximum of 55 troops, will provide ample accommodation for the specialised AMCM equipment and crew.

SYSTEM: Hamilton Standard automatic flight control system, using two digital onboard computers.

DIMENSIONS, EXTERNAL:

Main rotor diameter	24.08 m (79 ft 0 in)
Tail rotor diameter	6.10 m (20 ft 0 in)

Artist's impression of the fully-developed MH-53E mine-sweeping helicopter, with increased fuel in oversize sponsons

Length overall, rotors turning	30.19 m (99 ft 0½ in)
Length, rotor and tail pylon folded	18.44 m (60 ft 6 in)
Length of fuselage	22.35 m (73 ft 4 in)
Width of fuselage	2.69 m (8 ft 10 in)
Width, rotor and tail pylon folded	8.41 m (27 ft 7 in)
Height overall, tail rotor turning	8.66 m (28 ft 5 in)
Height, rotor and tail pylon folded	5.66 m (18 ft 7 in)
Wheel track (c/l of shock-struts)	3.96 m (13 ft 0 in)
Wheelbase	8.31 m (27 ft 3 in)
DIMENSIONS, INTERNAL:	
Cabin: Length	9.14 m (30 ft 0 in)
Max width	2.29 m (7 ft 6 in)
Max height	1.98 m (6 ft 6 in)
WEIGHTS:	
Weight empty	15,071 kg (33,226 lb)
Internal payload (100 nm; 185 km; 115 miles radius)	13,607 kg (30,000 lb)
External payload (50 nm; 92.5 km; 57.5 miles radius)	14,515 kg (32,000 lb)
Max T-O weight:	
internal payload	31,638 kg (69,750 lb)
external payload	33,339 kg (73,500 lb)
PERFORMANCE (ISA, at T-O weight of 25,400 kg; 56,000 lb):	
Max level speed at S/L	170 knots (315 km/h; 196 mph)
Cruising speed at S/L	150 knots (278 km/h; 173 mph)
Max rate of climb at S/L	838 m (2,750 ft)/min
Service ceiling, at max continuous power	5,640 m (18,500 ft)
Hovering ceiling IGE, at max power	3,520 m (11,550 ft)
Hovering ceiling OGE, at max power	2,895 m (9,500 ft)
Range at optimum cruise condition for best range	1,120 nm (2,075 km; 1,290 miles)

LEAR FAN

LEAR FAN CORPORATION: Head Office: PO Box 60000, Stead Airport, Reno, Nevada 89506, USA

LEAR FAN MODEL 2100

The last aeroplane designed by Mr William P. Lear Sr, before his death on May 14, 1978, was a small twin-turbine business aircraft of advanced design, known originally as the Futura. Since that time it has undergone considerable modification and is known now as the Lear Fan Model 2100.

Of extremely clean appearance, the Model 2100 is built largely of graphite/epoxy composite materials, with other components made of boron, glass-fibre, Kevlar, and various resins. Design of this aircraft began in June 1977, and construction of the first prototype (N626BL) started in November 1978. This flew for the first time on January 1, 1981. One additional prototype and two static and fatigue test examples are being built at Reno; the first 42 production aircraft are also to be built in the USA, after which manufacture will be continued by Lear Fan Ltd, which has been established by Lear Fan Corporation in conjunction with the UK government at Newtownabbey, Co Antrim, Northern Ireland.

TYPE: Twin-turbine business aircraft.

WINGS: Cantilever low-wing monoplane. Thickness/chord ratio 13.5%. Dihedral 4°. Incidence 1° 30'. No sweepback. Three-spar bonded stressed-skin fail-safe structure of advanced graphite/epoxy composite materials. Each spar is made up of two channels, back to back, separated by a layer of honeycomb. Skins and spars each made in one piece, tip to tip. Hydraulically-actuated plain trailing-edge flaps, and manually-operated ailerons, of graphite/epoxy composites. Negative flap setting of −5° for improved high-speed cruise performance. Trim tab in each aileron. Pneumatic de-icing boots on leading-edges.

FUSELAGE: Semi-monocoque fail-safe pressurised structure of graphite/epoxy composites, comprising frames and longerons bonded to the outer skin. Front, centre, and rear fuselage sections each made of two shells, split on horizontal centreline, basically of four plies, increased to six to ten plies at cutouts for windows, etc.

TAIL UNIT: Cantilever Y-shaped structure of graphite/epoxy composites, comprising single-spar V tail and two-spar underfin, the latter stressed to withstand ground impact. Manually-operated elevators, each with trim tab, in V tail; and rudder with trim tab on underfin. Pneumatic de-icing boots on V tail and fin leading-edges.

LANDING GEAR: Hydraulically-retractable tricycle type with single wheel on each unit; main units retract inward, nosewheel forward. Emergency extension by free fall, with pneumatic bottle backup. Nosewheel steering from rudder pedals. Oleo-pneumatic shock-absorbers. Main wheels have Goodrich tubeless tyres size 7.00-8, 8-ply rating. Nosewheel has Goodrich tyre size 6.00-6, 4-ply rating. Goodrich hydraulically actuated brakes, with pneumatic system backup. Optional anti-skid system.

POWER PLANT: Two 634 kW (850 shp) Pratt & Whitney Aircraft of Canada PT6B-35F turboshaft engines, each flat rated to 485 kW (650 shp), mounted in rear of fuselage. These drive, via two independent driveshafts and a combining/reduction transmission (ratio 3.2:1) with separate clutches, a Hartzell four-blade constant-speed and reversible-pitch slow-turning pusher propeller constructed of Kevlar composite, with stainless steel leading-edges. The blades of this propeller are of so-called 'scimitar' shape, offering reduced noise and high efficiency. The two independent driveshafts serve to cushion torsional load changes, and the transmission has sprag clutches which disengage automatically the relative driveshaft in the event of an engine failure. Fuel in integral wing tanks with a usable capacity of 908 litres (240 US gallons). Refuelling points on wing upper surface. No propeller de-icing system required, as efflux from the two turboshaft engines prevents ice formation on the blades.

ACCOMMODATION: Standard accommodation for a crew of two and six passengers, or crew of two with seven passengers, both layouts with refreshment cabinet and toilet. Alternative two crew/eight passenger high-density arrangement, which retains a toilet facility, or all-cargo version with a crew of two. Seat tracks on each side of cabin simplify changes of interior layout, or removal of seats for use in cargo role. Special optional ambulance version can accommodate two stretcher cases, each with attendant, and has biomedical facilities, therapeutic oxygen, and toilet. Clamshell type door, with integral airstairs in lower half, on port side of cabin, forward of wing. Emergency exit on starboard side. Baggage space at rear of cabin, accessible in flight. Entire accommodation pressurised and air-conditioned. Windscreen defrosting and anti-icing by engine bleed air.

SYSTEMS: Cabin pressurisation by engine bleed air, with max pressure differential of 0.59 bars (8.6 lb/sq in), can maintain a 2,440 m (8,000 ft) cabin altitude to max certificated altitude. Freon

The prototype Lear Fan Model 2100, photographed during its first flight, with landing gear extended

vapour-cycle cooling system. Electrical system powered by two 28V 200A starter/generators, with two 125VA 115V 400Hz solid-state inverters, and 24V nickel-cadmium battery. Hydraulic system of 103.5 bars (1,500 lb/sq in) pressure, provided by two engine-driven hydraulic pumps, either of which is capable of maintaining full system functions for operation of trailing-edge flaps and landing gear. Oxygen system of 0.62 m³ (22 cu ft) capacity for emergency use by crew and passengers. Anti-icing system includes pneumatic de-icing of wing and tail unit leading-edges, and electrical or bleed air anti-icing of engine inlets, pitot tubes, static ports, and windscreen. Engine fire detecting and extinguishing system incorporating two Halon extinguishers.

AVIONICS AND EQUIPMENT: Standard avionics by Collins include dual VIR-351 VHF nav receivers, dual VHF-251 VHF com transceivers, dual GLS-350 glideslope receivers,* TDR-950 ATC transponder,* ANS-352 area nav, ADF-650 ADF, AMR-350 marker beacon receiver/audio panel, WXR-250 weather radar, IND-351C VOR/ILS indicator and DME-451 DME; plus Sperry C-14D compass system, VG-14D attitude gyro, SPZ-650L AFCS with flight director,* radar altimeter and digital air data computer;* TBD angle of attack system and emergency locator transmitter. Items marked with an asterisk will be optional after first 50 aircraft. Other optional avionics include Collins HF-200 HF com and WXR-300 colour weather radar; Global Nav GNS-500A VLF/Omega; Sperry air data command display, co-pilot flight director system, and SAT/TAS indicator; TBD RMI/converter, and co-pilot slaved compass system and HSI. Standard equipment includes angle of attack indicator, encoding altimeter, Mach/airspeed indicators, vertical speed indicators, blind-flying instrumentation for co-pilot, cabin pressure indicator, crew seats with lapstraps and shoulder harness, chart/map holders, lap belts for all cabin seats, baggage net or straps, carpeted floor, 'Fasten seat belt-no smoking' sign, cabin fluorescent lighting, passenger reading lights, map and instrument panel lights, navigation lights, landing lights, strobe lights, engine fire detection and fire extinguishing system.

DIMENSIONS, EXTERNAL:

Wing span	11.90 m (39 ft 4 in)
Wing aspect ratio	9.5
Length overall	12.37 m (40 ft 7 in)
Height overall	3.71 m (12 ft 2 in)
Wheel track	3.56 m (11 ft 8 in)
Wheelbase	4.90 m (16 ft 1 in)
Propeller diameter	2.29 m (7 ft 6 in)
Passenger door (port, fwd):	
Height	1.26 m (4 ft 1½ in)
Width	0.76 m (2 ft 6 in)
Height to sill	0.38 m (1 ft 3 in)
Emergency exit (stbd, fwd):	
Height	0.66 m (2 ft 2 in)
Width	0.48 m (1 ft 7 in)

DIMENSIONS, INTERNAL:

Cabin: Length, fwd to aft pressure bulkhead	5.84 m (19 ft 2 in)
Max width	1.45 m (4 ft 9 in)
Max height	1.42 m (4 ft 8 in)
Volume	7.08 m³ (250 cu ft)
Baggage compartment volume	1.25 m³ (44 cu ft)

AREA:

Wings, gross	15.13 m² (162.9 sq ft)

WEIGHTS AND LOADINGS (preliminary):

Weight empty	1,860 kg (4,100 lb)
Max fuel weight	729 kg (1,608 lb)
Max T-O weight	3,334 kg (7,350 lb)
Max ramp weight	3,357 kg (7,400 lb)
Max zero-fuel weight	2,744 kg (6,050 lb)
Max landing weight	3,157 kg (7,000 lb)
Max wing loading	220.36 kg/m² (45.12 lb/sq ft)
Max power loading	3.65 kg/kW (6 lb/shp)

PERFORMANCE (preliminary, at max T-O weight unless indicated):

Max level speed at 6,100 m (20,000 ft)	369 knots (684 km/h; 425 mph)
Max cruising speed at 6,100 m (20,000 ft)	363 knots (673 km/h; 418 mph)

Recent picture of the Lear Fan prototype emphasizes the clean lines of this graphite/epoxy tail-pusher, despite the nose probe carrying flight test equipment

Econ cruising speed at 12,190 m (40,000 ft)	280 knots (518 km/h; 322 mph)
Stalling speed, flaps down, power off	76 knots (141 km/h; 88 mph)
Max rate of climb at S/L	1,052 m (3,450 ft)/min
Rate of climb at S/L, one engine out	396 m (1,300 ft)/min
Service ceiling	12,500 m (41,000 ft)
Service ceiling, one engine out	10,060 m (33,000 ft)
T-O to 15 m (50 ft) at S/L, ISA	762 m (2,500 ft)
Landing from 15m (50 ft) at S/L, ISA, at max landing weight	1,036 m (3,400 ft)
Range, pilot plus four passengers at T-O weight of 2,994 kg (6,600 lb) at optimum speed, with reserves	1,470 nm (2,724 km; 1,693 miles)
Range, pilot plus eight passengers with 64 kg (142 lb) baggage at max T-O weight at optimum speed, with reserves	1,548 nm (2,869 km; 1,783 miles)

PIPER

PIPER AIRCRAFT CORPORATION: Head Office and Works: Lock Haven, Pennsylvania 17745, USA

PIPER ENFORCER

The April 1982 *Jane's* Supplement included an item on the updated Enforcer turboprop-powered close-support aircraft, of which two prototypes are being produced by Piper for USAF evaluation. As stated, the company's continued development of the design is leading to extensive changes. Almost every external dimension, and all surface areas quoted in the specification data, have changed. As a result, the production Enforcer, if built, will be very different from the original P-51 Mustang or even the original Enforcers flight tested during 1970–71.

Major changes announced already by Piper include wing strengthening for operation at a higher gross weight; a fuselage 'stretch' of 0.48 m (1 ft 7 in); enlarged horizontal and vertical tail surfaces; introduction of an aileron boost system to improve roll rate; incorporation of a fast-acting electro-mechanical longitudinal trim system, and of a stability augmentation system on the directional axis; new wheels, tyres, and brakes of increased capacity; improved cockpit air-conditioning; armour protection for the pilot and major systems; installation of advanced nav/com avionics; and provisions for modern weapons. Some of these items were covered in the structural description published in April. The latest known changes are as follows:

WINGS: Hydraulic aileron boost system. Non-jettisonable wingtip fuel tanks.

TAIL UNIT: Trim tabs in elevators and rudder.

POWER PLANT: Aeroproducts propeller.

ARMAMENT: Six underwing pylons have a maximum permissible loaded capacity of 2,576 kg (5,680 lb), with up to 907 kg (2,000 lb) on each inboard pylon and up to 395 kg (870 lb) on each of the two outer pylons on each wing. Weapons can include General Electric GPU-5A 30 mm gun pods, CBU-58A cluster bomb units, Mk 82 Snakeye GP bombs, Mk 20 Rockeye bombs, and CRU-7 2.75 in rockets. Other weapons listed in the April Supplement are not currently specified.

DIMENSIONS, EXTERNAL:

Wing span (over tip-tanks)	12.60 m (41 ft 4 in)
Wing chord at root	2.64 m (8 ft 8 in)
Wing chord at tip-tank centreline	1.19 m (3 ft 11 in)
Mean aerodynamic chord	2.01 m (6 ft 7 in)
Length overall	10.41 m (34 ft 2 in)
Height overall	2.67 m (8 ft 9 in)
Tailplane span	5.38 m (17 ft 8 in)
Wheel track	3.61 m (11 ft 10 in)
Propeller diameter	3.51 m (11 ft 6 in)
Propeller ground clearance	0.13 m (5.1 in)

AREAS:

Wings, gross (tip-tank centreline)	22.76 m² (245 sq ft)
Ailerons (total, incl tabs)	1.13 m² (12.16 sq ft)
Trailing-edge flaps (total)	3.34 m² (35.94 sq ft)
Fin (to fuselage reference line)	1.91 m² (20.58 sq ft)
Rudder (incl tab)	0.89 m² (9.55 sq ft)
Tailplane	5.29 m² (56.98 sq ft)
Elevators (total, incl tabs)	1.46 m² (15.70 sq ft)

WEIGHTS (estimated):

Weight empty	3,266 kg (7,200 lb)
Operating weight (incl pilot and armour plate)	3,577 kg (7,885 lb)
Max T-O weight at 6g load factor	6,350 kg (14,000 lb)
Normal landing weight	3,629 kg (8,000 lb)

PERFORMANCE (estimated at max T-O weight, except where noted):

Never-exceed speed	350 knots (648 km/h; 402 mph)
Max level speed at 4,570 m (15,000 ft)	300 knots (555 km/h; 345 mph)
Cruising speed at 4,570 m (15,000 ft)	220 knots (407 km/h; 253 mph)
Stalling speed at normal landing weight	99 knots (183 km/h; 114 mph)
Max rate of climb at S/L	762 m (2,500 ft)/min
Service ceiling	6,100 m (20,000 ft)
T-O run	527 m (1,730 ft)
T-O to 15 m (50 ft)	655 m (2,150 ft)
Landing from 15 m (50 ft) at normal landing weight	713 m (2,340 ft)
Landing run at normal landing weight	482 m (1,580 ft)
Combat radius with two 30 mm gun pods	400 nm (740 km; 460 miles)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When precise bombing was needed to neutralize a potential naval threat to the invasion of Southern France, the medium bomb wing with the best accuracy record was called upon. The result: a battleship, cruiser, and submarine taken out of the picture.

Precision Bombing Pays Off

BY DINO A. BRUGIONI

WHEN one thinks about how battleships were sunk during World War II, tremendous endeavors and heroic feats come to mind: the maximum effort put forth by the British in tracking and destroying the *Bismarck*, the audacious attack by the Japanese on Battleship Row at Pearl Harbor, the death of *Yamato* under merciless aerial attack by US Navy aircraft off Okinawa in April 1945.

Yet, virtually unnoticed in history, equal skill, valor, and daring of a B-25 bomber group resulted in the loss to the Axis of a battleship, a cruiser, and a submarine in Toulon harbor in the south of France on August 18, 1944.

I was assigned to the 321st Bombardment Group, 57th Bombardment Wing, Twelfth Air Force, stationed at Solenzara, Corsica, at the time, and took part in the raid.

It was no accident that the 321st was called on to perform that mission. The group had the best record for bombing accuracy in the Mediterranean theater, placing more than ninety percent of all the bombs it dropped within the designated target area. Bombing precision in those days was computed on the basis of an imaginary circle that covered an area 600 feet in radius from the center of the objective.

The group had flown more than 500 missions and was also highly regarded for its excellent formation flying. The 321st was frequently chosen to demonstrate these skills for visiting dignitaries. But it was the accuracy of our pinpoint bombing—the bridge-busting, the command-post hits, the runways cratered, the railroad yards leveled, and the close support of ground troops in Italy—that won the praise of those who inspected the aerial photos of our raids.

Preparations for the invasion of Southern France were well under way following the invasion of Normandy on June 6, 1944. There was one unknown, however. In the harbor of Toulon, protected by eighty-two heavy antiaircraft guns, were remnants of the French Navy that constituted a considerable threat to the Allied fleet and invasion forces. French seamanship was well regarded by Allied naval commanders. During the invasion of North Africa, the French battleship *Jean Bart*, with just one of her turrets operational, still sought to challenge the Allied landing forces. She fought with great gallantry against overwhelming odds.

On August 17, the third day of the invasion of Southern France, aerial reconnaissance revealed that the French battleship *Strasbourg*, the cruiser *La Gallisonière*, a *Le Hardi*-class destroyer, and a submarine had been repositioned within Toulon harbor. Their firepower constituted a threat to Allied forces operating nearby.

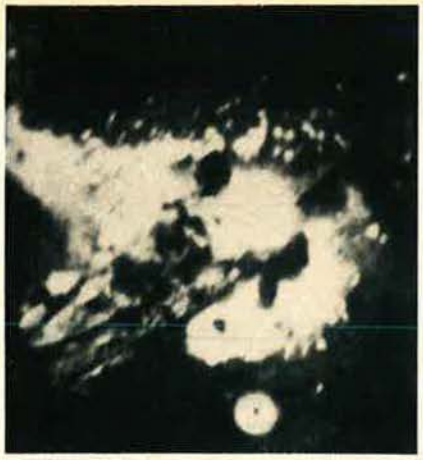
In the evenings, we often gathered along a road leading from the bomb depot to see what type of bombs were being dollied to the airfield. This gave us a good idea as to the mission we would be flying the next day.

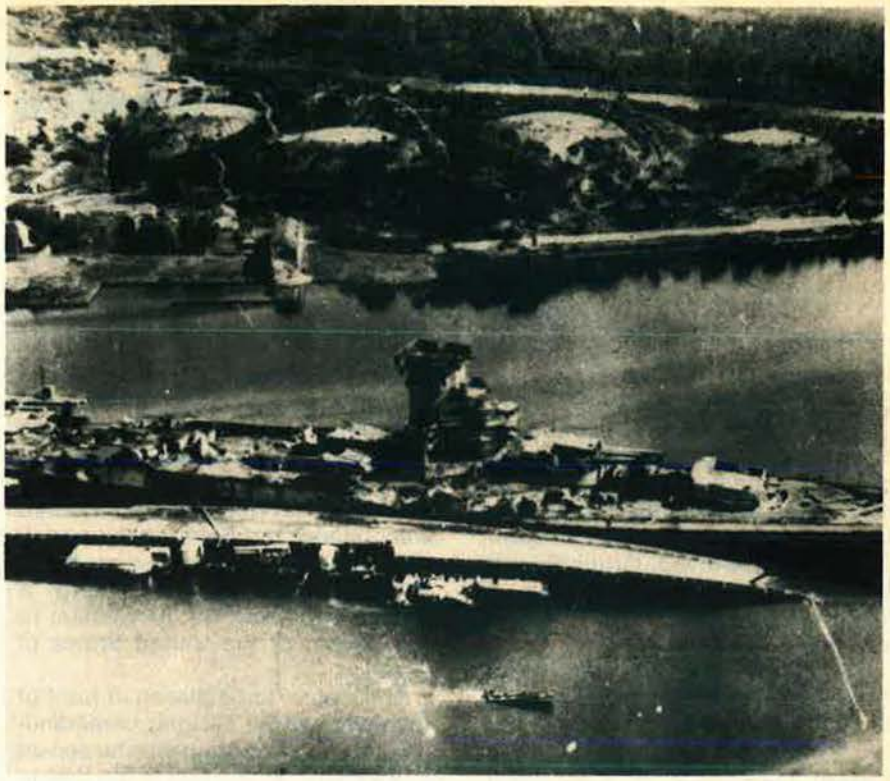
On the evening of August 17, 1944, we saw 1,000-pound armor-piercing and 1,000-pound general-purpose bombs being trundled to the airfield. We knew that the next day's mission would be an interesting one.

The following morning, we were briefed on Mission No. 498, code-named DRYBEEF. The order was to "neutralize the firepower of the heavy naval units at Toulon at all costs." We were briefed on the threat posed by the naval units; about the antiaircraft defenses; and informed that the weather over the target would be CAVU (ceiling and visibility unlimited), but that there was bad weather gathering all around Corsica.

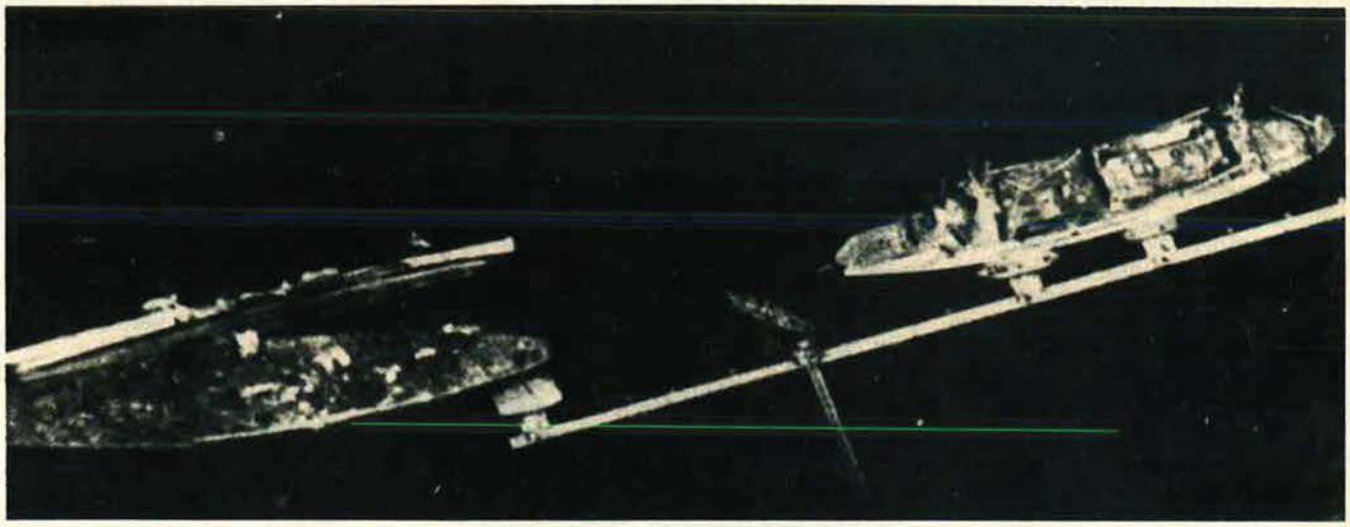
We took off at 1053 hours, assembled at 1126, and began our flight to the target at 13,000 feet. At that altitude, the force of thirty-six B-25s was extremely vulnerable to the heavy AAA guns defending the harbor. Although "window" was used on the bomb run to mislead defensive radar, the flak was extremely intense—both barrage and tracking on the bomb run and on the breakaway. By the time we had cleared the target, eleven men had been wounded and twenty-seven of the B-25s had some damage.

Bombs away came at 1246 hours, and the pattern was an excellent one. There were eight direct hits on the deck of the *Strasbourg*, igniting three fires on its deck. A near miss opened a large hole below the waterline, causing the battleship to list to starboard and settle in. The cruiser was also hit and listed to starboard with its deck





Opposite page—intense flak over Toulon harbor is clear; its alignment and altitude were on the mark in this photo taken by the author. Above, bombs of 321st Bomb Group score direct hits on the battleship Strasbourg *and the cruiser* La Gallissonière. *Right and below, two views of the precision bombing results:* Strasbourg, *with extreme bomb damage, has listed to starboard and settled on the mud bottom;* La Gallissonière *has keeled over on its starboard side. (USAF photos)*



awash, later keeling over on its side. The submarine was sunk; the destroyer had departed prior to the arrival of the B-25s.

Until his recent retirement, Dino A. Brugioni was a senior official and a reconnaissance and photo-interpretation expert for the Central Intelligence Agency. During World War II, he flew sixty-six bombing and a number of reconnaissance missions over North Africa, Italy, France, Germany, and Yugoslavia and was awarded the Purple Heart, the Air Medal with eight oak leaf clusters, and a Presidential Unit Citation. After the war he pursued studies at George Washington University, receiving a B.A. and an M.A. in foreign affairs. He joined the CIA in 1948 and has written extensively on the application of aerial photography to intelligence and other fields. He is an outspoken advocate of the use of aerial photography as a historical source.

On our return from the target, we were required to pass over the Allied invasion fleet. Heavy squalls forced us to descend below 1,000 feet, with the risk of being fired on by mistake, so we fired our Very flare guns and used emergency radio channels to inform the fleet of our predicament.

Because of the wounded airmen, aircraft damage, and weather problems, the group dispersed to land at three separate airfields.

The mission was later rated as one of the most destructive ever carried out by a group of medium bombers. The 321st Group was awarded a Presidential Unit Citation for what was described as the "extraordinary heroism and proficiency that was demonstrated throughout the attack."

The next day, we were back out bridge-busting for the Seventh Army moving inland from the beaches and up the Rhone Valley. ■

THE BULLETIN BOARD

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

Vietnam Veterans Memorial Groundbreaking

After months of impassioned debate and sometimes acrimonious exchanges, a final design for the Vietnam Veterans' Memorial, to be constructed on the Mall in Washington, D. C., was approved. Groundbreaking, with Vietnam veterans from all fifty states on hand, took place as scheduled in late March.

Many feared that the project, which had moved smoothly for its first year or so, had foundered irretrievably shortly after the winning design was chosen. *(See "Bulletin Board" item, June '81 issue.)* The original design, a commanding set of polished black granite walls set at a slight "V" angle, with one wall pointing toward the Washington Monument and the other wall toward the Lincoln Memorial, aroused strong feelings and generated immediate controversy.

Worse, as one observer noted, it was a controversy that "pitted Vietnam veteran against Vietnam veteran," none of whom disagreed that a memorial should be built. With national media attention focused on the discussion, participants argued about the design's subliminal meanings, its architectural approach, the Memorial's color (all summed up by some opponents as "a symbol of defeat which descends into the ground" as opposed to the more usual "soaring white marble monuments" of other wars), and its—as some felt—lack of attention to the living survivors of the conflict. The memorial will contain the names of all 57,414 American service people who died in the Vietnam War, but opponents argued that scant tribute was paid to those who fought and returned.

A tireless champion of the Memorial, Sen. John W. Warner (R-Va.), held lengthy meetings with opponents and supporters, ventilating conflicting views and holding firm for an acceptable compromise that would allow the project to proceed. Warner, a cosponsor of the original authorizing legislation, brought together a cross-section of veterans groups, Vietnam veterans, and interested individuals. The final agreement called for the addition of a flagpole and statuary to the memorial.

The flagpole, to go atop the apex of the two walls, will symbolize the American servicemen and women who "follow and fight for the principles embodied in the American flag." A plaque on the flagpole will read: "A gift from the veterans of Vietnam to the people of the United States of America."

The statue, to be placed in front of the walls, will be "a strong, commanding figure symbolizing all who served in Vietnam." In addition to the design modifications, it was agreed to consider inscriptions for the base of the flagpole and statue and modifications to the inscriptions on the granite walls.

Two inscriptions unanimously approved were:

Secretary of the Air Force Verne Orr looks on as Capt. Bobbie Butler, Chief of Hq. AFMPC's Personal Appearance and Fitness Branch, administers a new physical fitness test to Brig. Gen. Craven C. Rogers, Jr., military assistant to Secretary Orr. The test, now being evaluated (see May '82 "Bulletin Board"), *determines fitness level by cardiovascular response after six minutes of exercise on the exercycle. (USAF photo by O. J. Sanchez)*

"We are honored to have had the opportunity to serve our country under difficult circumstances . . . God Bless America!"; and, "For those who fought for it, freedom has a flavor the protected will never know."

Three approvals are required by law for all memorials in Constitution Gardens—by the National Capital Planning Commission, the Commission on Fine Arts, and US Secretary of the Interior James Watt. Approvals had been obtained for the original design. Proposed statuary designs are now being sought by the Vietnam Veterans Memorial Fund and will be reviewed by veterans groups. Jan Scruggs, VVMF President, emphasized that "Secretary Watt has authorized construction to begin with the clear understanding that the dedication cannot be held until all elements of the memorial—the walls, flagpole, statuary, and enhanced inscriptions—are in place. It is hoped we can stay ahead of the construction schedule through the summer. Our goal remains to dedicate the entire memorial to Vietnam veterans on Veterans Day, 1982."

PROJECT WARRIOR Takes Shape

"Those who ignore the lessons of history are doomed to repeat its mistakes," sayeth the sage. Perhaps with that in mind, as well as with concern for enhancing the esprit of the force, Air Force Chief of Staff Gen. Lew Allen, Jr., has set in motion a new Air Force-wide concept "to create an environment where our people can learn from the warfighting lessons of the past and use that knowledge to better prepare for the future."

Named PROJECT WARRIOR and assigned for implementation to the Deputy Chief of Staff for plans and operations, the project aims at a continuing study of military history and combat leadership, especially the application of airpower. Each Air Force organization is urged to tailor its program to its own needs, but Air Force guidelines stress that the over-all goal should be "to create and maintain an environment for Air Force people to

think and plan in warfighting terms."

Suggested Headquarters ideas for implementation range from instituting an annual Warfighting Conference for Air Force Board members and new general officers; through promotion of an Air Force Heritage Week; to expanding the activities of Air University and the Office of Air Force History in publishing the "finer works" of both Air Force and non-Air Force writers.

Recommendations generated by field units include expansion of physical training to include courses in martial arts; having monthly discussions of war/leadership-oriented books; an increase in realistic war exercises; and the urging of AFA members and other civilian volunteers to participate in seminars on the art of war.

Air Force Aero Clubs Safest Ever

The year 1981 was the safest in Air Force Aero Club history, with four accidents occurring in more than 162,000 hours flown. This is a rate of 2.5 accidents per 100,000 flying hours, dramatically below the 1981 general aviation rate of ten accidents per 100,000 hours. Over the past ten years, Aero Clubs' flying was about 125 percent safer than general aviation's. "General aviation" includes all light aircraft and recreational flying, excluding commercial airline and military operations.

Currently, Aero Clubs are at thirty-eight Stateside and ten overseas bases. The Air Force encourages and will give active assistance to any base group wanting to start a club, pointing out that "Aero Clubs are mission-oriented in that our aircraft are used in natural disaster emergencies, search and rescue missions, and air evacuation. In addition, Aero Club members are authorized to use club aircraft for official TDY travel, which can result in a significant saving to the government."

Besides, as one club member notes, "It's a heckuva lot of fun."

CCAF Celebrates Tenth Anniversary

The Air Force's innovative and popular Community College of the Air Force turned ten years old in April.

What began as an idea in the minds of Air Force training people—an idea heavily supported by the Air Force Association and its affiliate, the Aerospace Education Foundation—has evolved today into a fully accredited community college. Currently, more than twenty-seven percent of the active-duty enlisted force and more than eleven percent of the eligible reserves are enrolled in CCAF degree programs.

The program, which compiles college credit for military and civilian education and training courses into a centralized, recognized, accredited transcript, has consistently earned high marks from all involved, including the most important participants—the enlisted students. AFA wishes it a very happy birthday and sends along a wish for many, many more.

Cadet Cheryl Johnson gives it a whirl in the pilot's seat of an Air Force helicopter during a recent visit to Hill AFB, Utah, by the University of Utah AFROTC. Looking on, Capt. Tom Summers of Det. 4, 40th Aerospace Rescue and Recovery Squadron, explains the controls. Cadet Johnson, who is cadet vice commander of her 120-member unit, is the wife of SSgt. Michael Johnson, now stationed at Kunsan AB, Korea. (USAF photo)

Number of Veterans Drops

For the first time in sixteen years the number of military veterans in civilian life has taken a downward turn.

This and other interesting tidbits are found in a just-released VA pamphlet, "Trend Data 1957–1981." The fifty-two-page booklet covers twenty-five years of data on eleven major VA activities, such as veteran population, expenditures, loans, and insurance.

It notes, for example, that while the number of veterans has dropped to a sixteen-year low of 30,983,000, there has been an almost sixfold rise in outpatient medical care visits, reflecting both the aging of this veteran force, and the trend toward performance of more medical treatment on an outpatient basis.

Concurrently, the number of full-time physicians has increased almost fifty percent, while the average number of VA hospital operating beds has dropped. Meanwhile, the number of vets in VA and VA-supported nursing homes has increased from a low of 324 in 1965 to 22,347.

Copies of the booklet are available, free while the supply lasts, from the Office of Reports and Statistics (70), Veterans Administration, 810 Vermont Ave., N. W., Washington, D. C., 20420.

Paper Master Personnel Records Are No More

For a fleeting moment, recently, Maj. Howard B. Zyskind, the senior Jewish cadet chaplain at the Air Force Academy, held a unique position within the Air Force.

For that moment, and until Maj. Gen. Kenneth L. Peek, Jr., AFMPC Commander, inserted Major Zyskind's paper master personnel records into the paper shredder, his were the last master personnel records in the Air Force still in paper form.

The destruction of this record marked the end of an era and the end of one of the most extensive personnel projects in Air Force history. During a twenty-nine-month period, more than 300,000 enlisted and 71,000 officer paper master personnel records were audited—and selectively re-audited to ensure against any errors—and then destroyed.

This massive effort resulted in the destruction of nearly 14,000 cubic feet of paper.

The records were those of people who had entered the Air Force before 1976 and were still on active duty. Since 1976, master personnel records have been kept on microfiche only.

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However, for those whose service spanned that date, records were kept on both microfiche and paper. AFMPC, in 1979, began destroying the paper, using an elaborate system of checks and double-checks to ensure that all required information was transferred to microfiche. Some special records, such as POW, MIA, retired generals, and the officer/senior NCO selection records, will still be kept on paper.

VA Chief Sets New Computer Policy

VA Administrator Robert P. Nimmo recently told AIR FORCE Magazine that to provide better service to veterans, particularly in the health-care area, he was setting up new policies for the use of computers and automated data-processing technology within VA.

He noted that one of his first major management concerns on taking office was the effective and efficient use of this equipment. Since VA is heavily medical-oriented, this aspect was an area of immediate interest. Accordingly, after a thorough agency-wide review, he is ordering the following steps:

- Each VA medical center will be delegated as much use of its own computer as possible, with time alloted to Headquarters-generated reports, information, etc., held to no more than ten percent.
- Headquarters-required reports will be closely scrutinized to see if the ten percent time allotment can be cut even more. The object, of course, is to allow the medical center director maximum use of ADP technology in-house.
- Patient scheduling, pharmacy records, and laboratory systems are areas that medical centers will be strongly encouraged to address with their increased computer time.

Down-the-road plans call for installation of a new, decentralized computer system in "the seventy-five major hospitals that perform eighty percent of the acute health-care functions in the VA." VA medical centers at Albany, N. Y.; Washington, D. C.; Bay Pines, Fla.; Hines, Ill.; Salt Lake City, Utah; and San Francisco, Calif., will serve as "lead" hospitals in evaluating software, systems design, and training.

Air Force Reserve Medical Program to Grow

During the next five years, the Air Force expects to increase its Reserve medical manning to a point that twenty percent of the total wartime medical personnel resource will come from the Reserve ranks. Presently, Air Force Reserve medical people number about 5,500, a total that is expected to grow to about 10,000 by Fiscal Year 1987.

The first step toward this buildup will be the activation of a 250-bed contingency hospital unit with a staff of 568. Headquartered at Wilford Hall USAF Medical Center in San Antonio, Tex., the unit will have detachments at Kirtland AFB, N. M.; Carswell AFB, Tex.; Barksdale AFB, La.; and Homestead AFB, Fla.

The AFRES Command Surgeon, Col. (Dr.) J. Earle Makant, Jr., points out that the expanded program will result in authorizations for medical specialties that have not previously existed in the Air Force Reserve. The Reserve is gearing up now to recruit to fill the anticipated positions.

Housing Gets Attention

Congressman Parren J. Mitchell (D-Md.) has introduced legislation that would amend the Soldiers and Sailors Relief Act to increase the maximum limit on rent paid by a military member that triggers certain benefits under that Act.

Among the many components of the act, first passed in 1940, eviction protection was afforded the family of a member who occupied a dwelling where rent did not exceed $80 per month. In 1966, this upper limit was raised to $150 a month. The congressman wants to raise this maximum to a "fair market rent level established by HUD," and geared to local standards.

A spokesman for Representative Mitchell told AIR FORCE Magazine that the congressman feels strongly that the current maximum "in no way keeps pace with the rise in prices since 1966, nor the changes in rents across the nation since that year." Further, he said, "this would correct the inequity caused by the incorrect assumption that the same amount of money may be needed to rent appropriate facilities in every region of the country."

Meanwhile, in other Capitol Hill activity, Col. Mario B. Ginnetti, USAF's Family Housing Division Chief, told lawmakers that the Air Force would like to build 946 new housing units at six locations in FY '83. Projects are planned at Fort MacArthur, Calif. (200 units); MacDill AFB, Fla. (twenty-six units); and Powell, Wyo. (fifty units). Overseas, the Air Force is requesting money for units at Incirlik, Turkey (200); RAF Bentwaters, UK (300); and RAF Greenham Common, UK (170). He noted that the Air Force has responded to congressional concerns expressed last year by upping overseas-planned construction.

In the improvements area, some thirty-one bases are slated for modernization and energy conservation investments. Colonel Ginnetti urged approval of these monies, pointing out that, while the Air Force has a stable long-range plan for maintenance of existing units, failure to get funding for such maintenance unduly exacerbates the problem in succeeding years. He noted that well-maintained housing is "essential to compete in the job market as we must in an All-Volunteer Force mode."

Short Bursts

The VA now has **at least one medical center in each state** (except for Hawaii and Alaska, where VA contracts out for hospital bed space), Washington, D. C., and Puerto Rico. Total VA medical centers number 172.

Maj. Gen. Richard Carr, the Air Force Chief of Chaplains, was recently awarded an Honorary Doctor of Divinity degree by Dr. Robert H. Mounce, President of the Whitworth College in Spokane, Wash. "As Chief of Chaplains," Dr. Mounce said, "Chaplain Carr directs a program that . . . requires statesmanship in interdenominational affairs, and a great talent in ecclesiastical management." Chaplain Carr is a graduate of Whitworth College and of the Fuller Theological Seminary, and is an ordained minister of the United Church of Christ. (USAF photo by A1C Lisa M. Tilly)

It maintains 226 outpatient clinics.

The Air Force is gearing up to **convert the Thunderbirds** demonstration group to **F-16s.** A call for enlisted volunteers with a variety of skills is circulating at bases.

In what is believed to be a first, a **military wife** has gone to court to **try to overturn a state employment commission decision** that denied her unemployment benefits because she voluntarily left her job for a PCS move with her husband.

The **Air Reserve Personnel Center** has established a toll-free number, (800) 525-0102, primarily for Guard and Reserve members who don't have access to AUTOVON. Official inquiries are handled from 6:30 a.m. to 6:00 p.m., Mountain Time, except weekends.

The **Air Force Aid Society** produced more than $7 million in grants and interest-free loans to Air Force families in 1981. Bulk of the outlays—$66,000 in grants and $2.3 million in loans—went for basic living costs.

West Virginia has okayed charging **resident tuition rates** to service people and their families who are stationed there and enroll in **West Virginia colleges.** Thirty-three states now extend this well-appreciated recognition to military people.

Congressional sponsors are hopeful that this is the month they gain passage of a bill that would make the week of November 7, 1982, **"National Disabled Veterans Week."**

The latest **Harris Poll** shows the military enjoys **one of the highest "confidence ratings"** by the American public. The survey, asking respondents to judge both public and private institutions, across a range of confidence values, found the US military establishment outscored *all* government institutions in an "overall confidence rating."

VA is offering $4 million in scholarships to about **300 qualified nursing students** to entice them to service in **VA health-care facilities.** Scholarships will provide educational benefits on a pay-back-in-service basis.

The Air Force wound up **second**—behind Army—in this year's **Interservice Boxing Championships.** It's the best blue-suit finish since 1975.

Senior Staff Changes

PROMOTIONS: To be **Major General:** Gerald D. **Larson;** Donald J. **Licker;** Robert A. **Rosenberg.**

To be **Brigadier General:** Donald G. **Aten;** Lee V. **Greer;** William L. **Harper;** Robert L. **Kirtley;** Donald J. **Kutyna;** Clifford H. **Rees,** Jr.

RETIREMENTS: Gen. Lew **Allen,** Jr.; M/G James L. **Brown;** M/G Gerald K. **Hendricks;** Gen. David C. **Jones;** Gen. Robert C. **Mathis;** B/G Joseph D. **Mirth;** B/G Martin M. **Ostrow.**

CHANGES: M/G Harry Falls, Jr., from Cmdr., AFISC, & Dep. IG for Inspection & Safety, Hq. AFISC, Norton AFB, Calif., to Dep. IG, Hq. USAF, Washington, D. C. . . . **Gen. Charles A. Gabriel,** from CINC, Hq. USAFE, Ramstein AB, Germany, to C/S, Hq. USAF, Washington, D. C., replacing retiring Gen. Lew Allen, Jr. . . . **Col. (B/G selectee) Lee V. Greer,** from Dir. of Maintenance, Warner Robins ALC, AFLC, Robins AFB, Ga., to Vice Cmdr., Sacramento ALC, AFLC, McClellan AFB, Calif., replacing B/G Marion F. Tidwell . . . **Col. (B/G selectee) Robert L. Kirtley,** from Cmdr., 7th Bomb Wing, SAC, Carswell AFB, Tex., to Cmdr., 47th AD, SAC, Fairchild AFB, Wash., replacing B/G Regis F. A. Urschler.

Col. (B/G selectee) Donald J. Kutyna, from Dep. for Surveillance & Control Systems, ESD, AFSC, Hanscom AFB, Mass., to Dep. for Space Launch & Control Systems & Space Prgm. Dir., STS, Space Div., AFSC, Los Angeles AFS, Calif., replacing retiring B/G Joseph D. Mirth . . . **B/G (M/G selectee) Gerald D. Larson,** from Cmdr., 45th AD, SAC, Pease AFB, N. H., to Cmdr., AFISC, & Dep. IG for Inspection & Safety, Hq. AFISC, Norton AFB, Calif., replacing M/G Harry Falls, Jr. . . . **M/G Forrest S. McCartney,** from Cmdr., BMO, AFSC, Norton AFB, Calif., to Vice Cmdr., Space Div., AFSC, Los Angeles AFS, Calif., replacing retiring M/G Gerald K. Hendricks.

Col. (B/G selectee) Clifford H. Rees, Jr., from Ass't for Colonel Assignments, Hq. AFMPC, Randolph AFB, Tex., to Vice Cmdr., AFMPC, & Dep. Ass't DCS/M&P for Mil. Personnel, Hq. AFMPC, Randolph AFB, Tex., replacing B/G Winfield S. Harpe . . . **B/G Marion F. Tidwell,** from Vice Cmdr., Sacramento ALC, AFLC, McClellan AFB, Calif., to Dep. Dir., Nat'l Mil. Command Ctr. (#4), J-3, OJCS, Washington, D. C. . . . **B/G Thomas G. Tobin,** from Dep. Dir., Nat'l Mil. Command Ctr. (#1), J-3, OJCS, Washington, D. C., to Cmdr., 45th AD, SAC, Pease AFB, N. H., replacing B/G (M/G selectee) Gerald D. Larson . . . **B/G Regis F. A. Urschler,** from Cmdr., 47th AD, SAC, Fairchild AFB, Wash., to Vice Cmdr., Hq. ESC, Kelly AFB, Tex.

SENIOR ENLISTED ADVISOR CHANGE: CMSgt. Glenn Lewis, to SEA, Hq. AFCOMS, Kelly AFB, Tex., replacing retiring CMSgt. Fred K. Dickinson. ■

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Western Gear Corp.
Western Union Telegraph Co., Government Systems Div.
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INTERCOM

Works by artists who participated in the Art Presentation were displayed at the ceremonies. AFA Executive Director Russ Dougherty (left), AFA National President John G. Brosky (center), and USAF Director of Public Affairs Brig. Gen. Richard Abel pause to admire Los Angeles artist Nathalee Mode's "Bring Me Men . . . and Women."

Annual Air Force Art Presentation Held at Bolling AFB

AFA leaders and staff members attended the recent United States Air Force 1982 Art Presentation at Bolling AFB, D. C., where key Air Force officials commended the 170 artists who participated in the program. The participating artists were honored at the presentation dinner, and their works were on display before and after the ceremonies.

The Air Force Art Collection documents the story of the Air Force through the eye of the artist. The actions and deeds of Air Force people are recorded in these paintings, and tell a story that words alone cannot express. Portions of the collection are in traveling exhibitions that are displayed around the world; other paintings may be viewed at the National Air and Space Museum, the Air Force Academy, the Air Force Museum, and at various Air Force bases. The collection is acquired through the Air Force Art Program under the direction of the Secretary of the Air Force Office of Public Affairs.

At the dinner, Air Force Secretary Verne Orr praised the artists for their participation in the program and for their unique contributions to informing the American public of the role and capabilities of the US Air Force. Secretary Orr spoke in response to artist John Downs of the Artists Guild of Chicago, who represented his peers in presenting this year's paintings to the Air Force collection.

Artist Keith Ferris, a member of the Society of Illustrators (New York) and a long-time member of New Jersey State AFA's Union Morris Chapter, spoke to the dinner audience on the affinity artists feel for the men and women of the Air Force.

AFA National President John G. Brosky, AFA Executive Director Russ Dougherty, and members of the AFA headquarters staff expressed their support for the Air Force Art Collection and AFA's appreciation to the artists for their efforts in portraying the Air Force in all its diversity.

Letter Brings Response from Fellow AFA Member

An example of how AFAers can respond to each other is provided by the letter that follows. It's sent by Lt. Col. Thomas D. Thompson, USAF (Ret.), who is a long-time AFA member and now the Director of Airports in Siskiyou County, Calif. In addition to providing information in response to a letter in the December 1981 "Airmail" section, he asks for information about members of his World War II unit, the 41st Bomb Group.—THE EDITORS

The letter in your December '81 issue *(p. 18)* from Vickie Trucker Jozefiak requesting information on 1st Lt. Donald Neils Trucker, who was lost in the Pacific, gave me quite a jolt. Don and I were four serial numbers apart on graduation from Luke Field, Class 43-A, and we both ended up as first pilots on B-25Ds in the 396th Squadron, 41st Bomb Group (M), Seventh Air Force, during the Gilbert and Marshall Islands campaign in the Pacific during World War II.

Vickie and her father, James R. Trucker (Don's brother), are quite dedicated history buffs of our old squadron. So far, I have contacted them, as has Col. Andrew E. McDavid, USAF (Ret.), who was our CO and also knew Don well.

Trucker had bad luck right from the start of our combat tour from Tarawa. His plane was badly shot up on our squadron's first low-level skip bombing mission to Mille Island on January 19, 1944. He made it back as far as Makin, where he crashlanded on one engine, gear up, but crew unhurt.

Ten days and four missions later, badly shot up again, an engine blew up on approach to Tarawa, and he crashed in the lagoon. All crew injured, but all survived. On this day, after a successful mission against Wotje, the squadron was hit by US Navy fighters and surface ships as we withdrew from the target. Neither the task force (preparing for the

Pacific Air Forces' Outstanding Airmen of 1981 received Air Force Association memberships while being honored at a recent recognition banquet at Hickam AFB, Hawaii. Presenting the memberships, on behalf of Hawaii Chapter President Don Daley, is Col. Marvin L. Braman, right, PACAF Director of Public Affairs. Pictured with Colonel Braman are (from left): Lt. Gen. Arnold Braswell, Commander in Chief, PACAF; SMSgt. Charles R. Brown, Clark AB, the Philippines; SSgt. Cindy L. Blankenship, Yokota AB, Japan; and Sgt. Francis S. Gore, Kadena AB, Okinawa, Japan.

Pictured at a recently held dinner meeting of the Lawrence D. Bell Chapter in New York are (from left): Thomas J. Hanlon, New York State AFA President; Norton C. Willcox, Bell Chapter President; Gen. Bruce K. Holloway, USAF (Ret.), guest speaker at the dinner meeting; and AFA National Director William C. Rapp. General Holloway's address to the Chapter covered the need for a strong defense posture, the necessity for a new manned bomber, and touched on some of his own experiences as a pilot. In addition to AFAers, the dinner audience included local Kiwanis and Rotary Club members.

Kwajalein invasion) nor we had been briefed on each other's positions. A destroyer escort identified us as Japanese Bettys, since we were without fighter escort, on the deck, and near the fleet. Some of the fighters closed to 150 yards, and shot up four of our planes. Lt. Harris C. Taylor's B-25 crashed at sea, and all but one of the crew was picked up by the Navy.

Trucker and the others were sent to Hawaii for hospitalization. When he returned we had moved forward to Makin Island. He left on a noncombat flight in then-Major McDavid's B-25D *Pistol Packin' Mama,* and disappeared en route to Eniwetok. Along with him was Lt. Joseph R. Patton, whose plane had also been shot down on the first Mille raid, but he and four crewmen were picked up by a Navy PBY that time.

We lost about half our squadron in the first eight low-level missions, which included the Maleolap raid on February 10, 1944—both Capt. Charles R. Bullock and Lt. Archibald G. Millard, Jr., and their crews were shot down . . . a very rough war!

A tragic footnote to the first Mille raid: Flight Officer John A. Johnston's plane was hit over the airstrip, but he made a good ditching in Mille lagoon, since I saw them hit the water. After the war, we learned that five crewmen out of six were captured and held about a month before being beheaded under orders from Col. Chisato Oishi, the island commander. He and five other Japanese officers were sentenced to hang after a war crimes trial on Kwajalein in December of 1945.

Vickie, her father, Colonel McDavid, and I are interested in locating any original members of the 41st Bomb Group (47th, 48th, 396th, and 820th Squadrons) for a reunion. I'm in contact with four old squadron mates. Are there any more survivors out there? Please contact: Lt. Col. Thomas D. Thompson, USAF (Ret.), 9312 Azalea Dr., Etna, Calif. 96027.

General Iosue Reports: Insights on the Air Force's People Situation

So that AFA members can gain a first-hand perspective on the Air Force's "people" situation, we've asked Lt. Gen. A. P. Iosue, Deputy Chief of Staff for Manpower & Personnel, to contribute insights from time to time. Following is his first report.—THE EDITORS

Retention Trends Continue Upward

To say that retention of our skilled, experienced people was a severe headache in the late 1970s is an understatement. It was probably one of the toughest if not the toughest problem we ever faced. Now the picture has changed, and the Air Force is enjoying considerable success. The success is built on a delicate foundation, however. Retention rates could skid downward as quickly as they have risen if we do not prepare for the big challenges that may lie ahead.

Probably the best example of our current success is the turnaround in pilot retention. After an alarming twenty-six percent pilot continuation rate in FY '79, (it means we were retaining only twenty-six of every 100 pilots), we had rebounded to a more promising fifty-four percent rate by the end of FY '81. Navigator and nonrated officer retention followed the same upward pattern.

On the enlisted side, reenlistment rates have been just as encouraging. After hitting bottom in FY '80, reenlistments have risen sharply. In FY '81, we posted a forty-three percent reenlistment rate for first-termers—compared to only thirty-eight percent in FY '79.

We would like to take full credit for the improvements, but we cannot. Many factors are responsible. Pay raises, strong internal retention initiatives, better promotion opportunities, and quality-of-life improvements have all helped, but the economic climate has also been a key factor.

When airline pilot hiring peaked in the late 1970s, our pilot retention hit bottom; however, when hiring dropped to just 1,116 in 1981 and more than 4,300 pilots were furloughed, our retention streaked upward. Unemployment and reenlistment rates have also shown surprising similarity. Both rates were low in 1979, and both have been rising since. When unemployment reached almost nine percent at the end of 1981,

our reenlistment rates were at the highest levels in years.

Our retention success, though gratifying, is fragile. Either a lapse in pay comparability or the hoped-for national economic turnaround could drop the trend lines suddenly. To head off such a calamity, we are concentrating on some important initiatives: better reimbursement for moving expenses; stability for the military retirement system, our most important retention incentive; and establishment of a stable, predictable mechanism for annual pay adjustments—to name just a few.

If we avoid complacency and prepare for tomorrow's retention challenges while we are in relatively good health, we may avoid band-aid solutions when recruiting and retention get tougher.

Shortages Continue in Critical Skills

Though retention is high, we are still plagued with shortages in critical skills. For example, we are still feeling the effects of the late 1970s, when pilot training rates were insufficient to replace the big losses. We lost 6,000-plus pilots in FY '78–79 while only training 2,000 new ones. The effect now is a shortage of 1,100 pilots.

Other critical fields have similar shortages. We are short 11,000 skilled NCOs, including 9,300 aircraft maintenance specialists. Our navigator ranks are about 600 short, and we lack some 200 needed physician specialists. The engineer shortage, a national problem, has left us about 1,000 engineers short.

While the statistics may paint a bleak picture, we are optimistic that the shortages can—and will—be overcome. We expect the enlisted critical skills shortage to drop substantially by the end of FY '84, and we expect to be at full manning with pilots, navigators, engineers, and physician specialists by the late 1980s.

An Experience Gap Persists

Because of the shortages, the increasing size of the force (+81,000 between FY '80 and FY '87), and the lingering effects of late 1970s losses, we face a continuing decline in experience levels. During FY '80, we lost 27,000 man-years of pilot experience and skill. Enlisted experience levels are especially low in the chronic critical shortage skills.

The average time in service is dropping for all categories. The average experience of engineers (lieutenant colonels and below) will drop almost two years by the end of FY '87. Average pilot experience will drop by more than a year and navigator experience by more than a year and a half in the same period. About thirty-seven percent of our nonrated line officers are now lieutenants, compared to twenty-three percent just five years ago.

The impact is clear throughout the Air Force. First-term airmen are handling jobs on our flightlines that used to be done by career NCOs, and second lieutenants are taking on leadership and staff jobs recently filled by field graders.

The Challenges Are Being Met

Though shortages and experience problems are expected to persist through most of the 1980s, Air Force people are overcoming the difficulties. This became clear last year when our aircrew members and flightline maintenance crews, although less-experienced than we need, together posted the second best flying safety record in Air Force history. It's a tough climate, but our people are getting the job done through hard work, long hours, dedication, and more effective operating techniques.

Air Force people continue to prove what they have proven throughout the years—that they constitute the best, most motivated fighting force in the world. And their excellence and importance are not being overlooked.

The Secretary of the Air Force, Chief of Staff, and other senior leaders have been speaking out on behalf of Air

Gov. Scott Matheson of Utah proclaimed March 27, 1982, to be "Air Force Academy/AFROTC Day" in the state, on the twentieth anniversary of Air Force Academy/AFROTC Day as organized by Utah State AFA and the Academy's Admissions Liaison Officers in Utah. With Governor Matheson at the signing ceremonies in his office are (from left): Charles Walker, Utah State AFA President; Col. Norm Olson, USAFR, Liaison Officer; Mason Risher, Bingham High School; Becki Baczuk, Brighton High School; Governor Matheson; Pat Dolenc, Bingham High School; Rod Gibbons, Alta High School; and Lt. Col. Ted Weight, USAFR, Liaison Officer.

Kaye Biggar, Texas State AFA Vice President for Aerospace Education, recently presented the Texas AFJROTC State Championship Drill Trophy to the Samuel Clemens High School AFJROTC Drill Team at the conclusion of the Sixth Annual Texas AFJROTC Invitational Drill Meet, held at Lackland AFB, Tex. Accepting the trophy on behalf of the Drill Team is Cadet Commander Lt. Col. Stacey Spence. Cadet Spence was also selected as the "Best Drill Team Commander" at the Meet. AFA's Alamo Chapter sponsors the Championship Trophy for the annual Texas AFJROTC Drill Meet.

INTERCOM

Dallas Chapter President Bernie Bogoslofski is shown presenting a memento AFA mug to Col. Guy Holt, USAF, at a recent Dallas Chapter meeting. Colonel Holt, Director of Operations for Fifteenth Air Force at March AFB, Calif., spoke to the Chapter on the Strategic Air Command of today and of the future.

Mr. and Mrs. Sylvester Sijan, parents of posthumous Medal of Honor recipient Capt. Lance P. Sijan, USAF, pause outside the USAF Academy's Sijan Hall with Col. Robert Delligatti. The Sijans were in Colorado Springs to participate in ceremonies renaming the local AFA Chapter the "Colorado Springs Lance P. Sijan Chapter." The renaming ceremonies took place on the fortieth anniversary of Captain Sijan's birth and one day after SAC CINC Gen. Bennie L. Davis kicked off the local AFA membership drive. (USAF photo by SSgt. Angie Vigil)

Force people and their families. Manpower and personnel priorities have been well articulated in FY '83 budget deliberations and hearings on Capitol Hill: a stable, predictable pay adjustment mechanism for maintaining pay comparability; better reimbursement for moving expenses; stability for military retirement; and protection for such vital institutional supports as commissaries, exchanges, and morale, welfare, and recreation programs. If that top-level backing bears fruit in budgetary and legislative support for people priorities, our success in getting and keeping top-quality people should continue.

Air Force people continue to meet the big challenges of these changing times. Their quality certainly merits the support and the confidence of our friends—as well as the due respect of our potential adversaries.

—By Lt. Gen. A. P. Iosue, USAF

Crusade for Airpower: The Story of AFA's First Thirty-five Years

Former AFA Executive Director James H. Straubel's book, which tells the story of AFA's first thirty-five years, was unveiled on May 19 in Washington, D. C., and is now available to members and chapters nationwide. Titled *Crusade for Airpower,* Jim Straubel's book is continued confirmation that "what is past is prologue," and a reminder that "the heritage of the past is the seed that brings forth the harvest in the future."

With a foreword by AFA's first national president, General Jimmy Doolittle, the book is a delight to read. It details AFA's ups and downs (plenty of both), and contains instructive lessons for future AFAers, as well as fond memories for those "who were there."

The book is published under the aegis of AFA's educational affiliate, the Aerospace Education Foundation. It is available in single or multiple copies from AEF at a price of $14.95 each, plus $1.50 for shipping and handling.

The first 150 copies of the book are collectors' items, with a special flyleaf inserted signed by all living former Secretaries and Chiefs of Staff of the Air Force. This version of the book is selling at a premium price through Michael Nisos at the AEF. Inquiries may be directed to (202) 637-3370.

A gala dinner in Washington on May 19 heralded the book's publication. Persons attending the dinner included present and former Air Force Secretaries and Chiefs of Staff, congressional members, government officials, astronauts, and others involved in the crusade for airpower.

UNIT REUNIONS

Deming Army Airfield
Former Deming Army Airfield officers will hold their third reunion on September 10–12, 1982, in Deming, N. M. **Contact:** Deming Army Airfield, 1982 Reunion, 402 S. Tin, Deming, N. M. 88030.

Guadalcanal Campaign Veterans Ass'n
The Guadalcanal Campaign Veterans fortieth anniversary memorial tribute will be held on August 5–7, 1982, in Winter Haven, Fla. **Contact:** Roy Joe Silva, Producer/Director, 304 8th St., N. E., Winter Haven, Fla. 33880. Phone: (813) 299-8642 (home), or (813) 533-0444 (business). Harry R. Horsman, 1951-57 N. Meridian Rd., Tallahassee, Fla. 32312. Phone: (904) 385-5533.

Night Fighters (WW II)
The Night Fighters of WW II will hold their reunion at the Court of Flags Resort and Convention Hotel, 5715 Major Blvd., Orlando, Fla., on September 3–5, 1982. **Contact:** Leslie L. Craig, 422d Night Fighter

AIRLIFT: The Key to Modern Military Mobility

A NATIONAL SYMPOSIUM OF THE AIR FORCE ASSOCIATION
(conducted in conjunction with the Military Airlift Command)

June 24–25, 1982, at the Marriott Hotel/Airport, St. Louis, Missouri

AFA's Symposium—"Airlift: The Key to Modern Military Mobility"—will probe the equipment and trained manpower required to project US power to remote areas of the world in support of US vital interests. Key government and military leaders will discuss airlift and military mobility in light of a diminished US overseas basing structure, fewer overflight and staging rights, and reduced opportunities for pre-positioning war materials in key areas where American interests could be threatened.

SPEAKERS INCLUDE:

Symposium Keynote Address by:

Dr. Fred C. Iklé
Under Secretary of Defense for Policy (tentative)

Gen. James R. Allen
Commander in Chief, MAC,
heading up a panel of four former MAC Commanders

Lt. Gen. O. E. DeHaven
Director, J-4/Joint Staff

Lt. Gen. Robert Kingston (tentative)
Commander, RDJTF

Gen. E. C. Meyer
Army Chief of Staff

The Honorable Charles H. Percy
Senator from Illinois, Chairman of the Foreign Relations Committee

Mr. John Shea
Retired MAC Senior Technical Advisor

Lt. Gen. Lawrence A. Skantze
Commander, ASD, AFSC

Dinner Speaker:
Gen. David C. Jones
Chairman, Joint Chiefs of Staff

Registration fee for all Symposium events is $150. This fee includes all presentation sessions, coffee breaks, continental breakfast, and a dinner. For information and registration, call Jim McDonnell or Dottie Flanagan at (202) 637-3300, Air Force Association, Suite 400, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006.

AFA's 1982 National Convention and Aerospace Development Briefings and Displays

September 12–16 • Washington, D.C.

Plan now to attend: AFA's 1982 National Convention and Aerospace Development Briefings and Displays, at the new Sheraton Washington Hotel. Additional rooms available at the nearby Connecticut Inn and the Normandy Inn, both served by Metro, at substantially lower rates than the Sheraton Washington.

The new Sheraton Washington Hotel.

Hotel reservation requests: for the Sheraton Washington, send to: Sheraton Washington Hotel, 2660 Woodley Road, N.W., Washington, D. C. 20008; for the Connecticut Inn and Normandy Inn, send to: Connecticut Inn, 4400 Connecticut Avenue, N.W., Washington, D.C. 20008; or Normandy Inn, 2118 Wyoming Avenue, N.W., Washington, D.C. 20008. Make your reservations as soon as possible. All three hotels have a **cutoff date of August 20.** To assure acceptance of your reservation requests, please refer to the AFA National Convention. Arrivals after 6:00 p.m. require a one-night deposit or major credit card number guarantee. Guaranteed reservations must be canceled by 4:00 p.m. on the date of arrival to avoid being charged for that night.

Convention activities include: Opening Ceremonies, Business Sessions, Symposia, luncheons honoring the Secretary of the Air Force and the Air Force Chief of Staff, Aerospace Education Foundation Awards Luncheon, the Annual Reception, and the black-tie 35th Air Force Anniversary Reception and Dinner Dance.

A business session during the Convention.

Secretary Orr visits the Aerospace Development Briefings & Displays.

Sqdn., 3405 Woodvale Dr., Midwest City, Okla. 73110. Phone: (1-405) 737-3677. Dick Ehlert, 286 Briarwood Circle, Fort Walton Beach, Fla. 32548.

Ninety-Nines, Inc.
The Ninety-Nines fifty-second annual international convention will be held on August 10–15, 1982, at the Marriott Pavilion Hotel, downtown St. Louis, Mo. Licensed women pilots worldwide will assemble for business, fun, and to honor women military pilots of WW II, WAFS, and WASP (USAAF); ATA ladies (RAF); and contestants who took part in the thirty annual cross-country AWTAR "Powder Puff Derby." **Contact:** Laura Sellinger. 640 E. Jefferson Ave., St. Louis, Mo. 63122. Phone: (314) 822-4530.

Northwest All Airborne
Airborne personnel who were military-qualified as parachutists, glidermen, air assault troops, special forces, glider pilots, and troop carrier pilots and crews from WW II to the present will rendezvous on September 3–5, 1982, in Portland, Ore., at the Thunderbird Motor Inn. **Contact:** Northwest All Airborne, 364 W. 7th Ave., Eugene, Ore. 97401.

Romania POWs
Prisoners held in Romania during WW II will hold a reunion on August 18–22, 1982, in Tulsa, Okla. **Contact:** Roy Meyer, 4589-G Northside Parkway, Atlanta, Ga. 30339.

Sabre Pilots Ass'n
Members of the Sabre Pilots Association are holding their second annual reunion in Memphis, Tenn., on July 30–31, 1982. **Contact:** Sabre Pilots Association, 3401 Royal Oak, North Little Rock, Ark. 72116.

4th Ferrying Group
The first reunion for the 4th Ferrying Group will be held on June 28–29, 1982, at the Nashville Hilton Airport Inn, Nashville, Tenn. **Contact:** James R. Mansfield, Jr., 310 W. Liberty St., Louisville, Ky. 40202. Phone: (502) 584-3187.

4th Fighter Sqdn.
The 4th Fighter Squadron will hold a reunion on August 8–11, 1982, at the Concord Hotel, Kiamesha Lake, N. Y. Members of the 2d and 5th Fighter Squadrons and 52d Fighter Group are welcomed to attend. **Contact:** Charles Bumgartner, 345 Anderson Ave., Fairview, N. J. 07020. Phone: (201) 445-9291.

27th Fighter-Bomber Group (WW II)
The 27th Fighter-Bomber Group (Africa, Italy, and France) will hold a reunion on July 30–31, 1982, in Nashville, Tenn. **Contact:** Lowell Smith, 4449 Charlotte Ann Dr., Louisville, Ky. 40216. Phone: (502) 447-5118. John Devine, 4440 E. Arapahoe, Phoenix, Ariz. 85044.

34th Air Depot Group
Members of the 34th Air Depot Group of the Twelfth Air Force (WW II) will hold a reunion on August 19–21, 1982, at the Holiday Inn in Riverside, Calif. **Contact:** Joe Myers, 2729 Ostrom Ave., Long Beach, Calif. 90815. Phone: (213) 421-2166.

37th Fighter Sqdn.
The 37th Fighter Squadron of the 14th Fighter Group will hold a reunion on September 24–26, 1982. **Contact:** Walt Goodman, 521 N. Goodman Rd., Lake Charles, La. 70610.

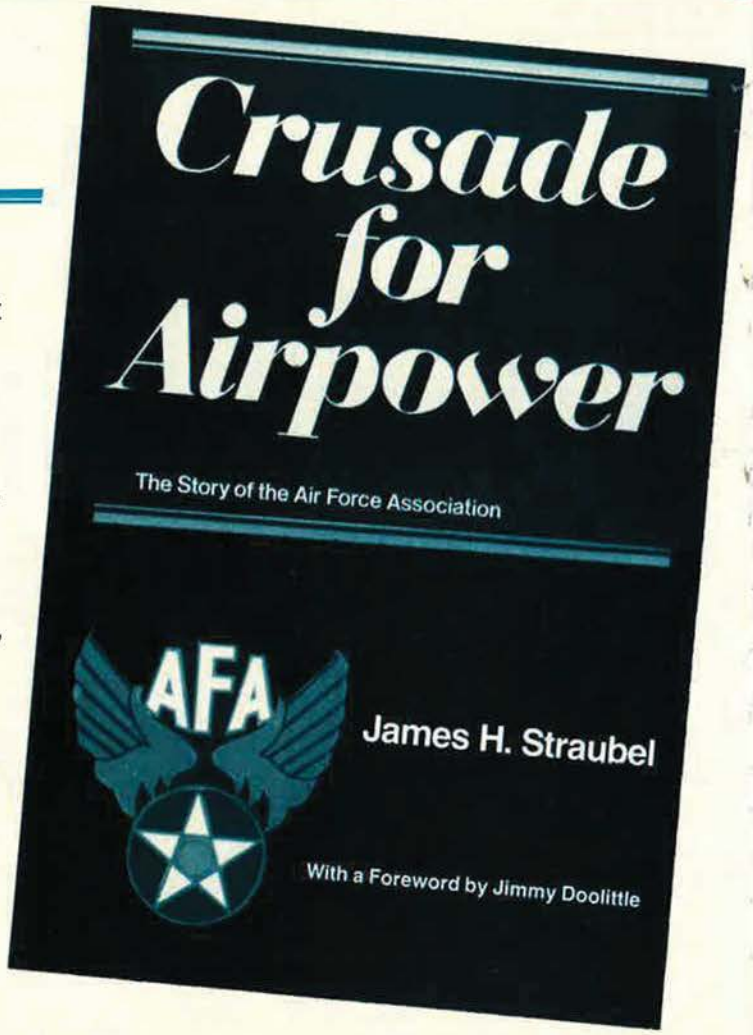
Class 42-H
The Cadet Class of 1942 (Kelly Field Army Air Corps) will hold a reunion in September 1982 in San Antonio, Tex. **Contact:** Lt. Allan F. Beck, USAF (Ret.), 1204 California St., N. E., Albuquerque, N. M. 87110. Phone: (505) 256-3350.

58th Bomb Wing Ass'n (WW II)
Members of the 58th Bomb Wing, Twentieth Air Force (serving in India, China, and Tinian) will hold their reunion on August 11–15, 1982, in Tucson, Ariz. **Contact:** Florence M. Erb, 5808 E. First St., Tucson, Ariz. 85711.

Crusade for Airpower

CRUSADE FOR AIRPOWER is continued confirmation that "what is past is prologue," and a reminder that "the heritage of the past is the seed that brings forth the harvest in the future." The educational value of this book transcends the Air Force Association, showing how concerned and dedicated Americans can educate themselves and others to achieve the basic requirements for national security.

This book is the story of AFA, with its ups and downs detailed in highly readable form, supplemented by a large collection of photos, many published here for the first time.



Crusade for Airpower

Please send me _____ copies of James H. Straubel's new book, *Crusade for Airpower: The Story of the Air Force Association,* at $14.95, plus $1.50 for shipping and handling for a total price of $16.45 per copy.

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Signature _____

INTERCOM

Stuart Craig, left, is being sworn in as an airman in the 433d Civil Engineering Squadron (AFRES) of the Alamo Wing by his father, Col. James C. Craig, USAFR (Ret.). Stuart is the fourth member of his immediate family to serve in the Alamo Wing. His brother Steven serves as a captain in the 74th Mobile Aerial Port Squadron, and brother Scott was commissioned as a lieutenant in the 32d Aeromedical Evacuation Group. Colonel Craig's last assignment before his retirement was as Deputy Wing Commander of the 433d Tactical Airlift Wing.

66th Troop Carrier Sqdn.
The 66th Troop Carrier Squadron (serving in Australia, New Guinea, Biak, Morotai, and the Philippines) will hold its twenty-ninth reunion on July 29–31, 1982, at Bridgeview Motor Inn, Superior, Wis. **Contact:** Arland E. Ekern, Rte. 1, Box 135, Cameron, Wis. 54822. Phone: (715) 859-2877.

94th Fighter Sqdn.
Members of the 94th Fighter Squadron (WW II) will hold their fourth reunion on August 19–21, 1982, at Jackson Lake Lodge near Jackson, Wyo. **Contact:** Harry E. McConnell, 600 Sherry Dr. N., Trotwood, Ohio 45426. Phone: (513) 837-1652.

304th Fighter Sqdn.
The 304th Fighter Squadron Association will hold its reunion on August 5–8, 1982, in Fort Walton Beach, Fla. **Contact:** Tracy P. Little, 3011 Westover St., Shreveport, La. 71108. Phone: (318) 635-2426.

322d FIS/408th FTG
Members of the 322d Fighter-Interceptor Squadron and the 408th Fighter Tactical Group will hold their reunion on August 20–21, 1982, at Klamath Falls, Ore. **Contact:** The Reunion Committee, P. O. Box 6065, Eureka, Calif. 95501.

345th Bomb Group
The 345th Bomb Group, serving in the Southwest Pacific during WW II, will hold a reunion on September 9–11, 1982, at the Antlers Hotel, Colorado Springs, Colo. **Contact:** Jones Burson, Rte. 1, Box 832, Cropwell, Ala. 35054.

369th Fighter Sqdn. Ass'n
The 369th Fighter Squadron Association, along with the 359th Fighter Group and supporting units (448th Air Service Group, 824th Air Engineering Squadron, 648th Air Materiel Squadron, and the 3d Gunnery, Tow-Target Flight) will hold a reunion on August 5–8, 1982, at the Antlers Hotel, Colorado Springs, Colo. **Contact:** Anthony Chardella, 105 Mohawk Trail Dr., Pittsburgh, Pa. 15235.

375th Troop Carrier Group
The 375th Troop Carrier Group will hold a reunion on August 27–29, 1982, in Springfield, Mo. **Contact:** Bill Pepper, Rte. 1., Box 142, Adrian, Mo. 64720.

384th Bomb Group
The eighth reunion of the 384th Bomb Group will be held in Seattle, Wash., on August 5–8, 1982. **Contact:** The 384th Bomb Group, Inc., P. O. Box 1021-A, Rahway, N. J. 07067.

386th Bomb Group (WW II)
Members of the 386th Bomb Group (including the 552d, 553d, 554th, and 555th Bomb Squadrons, and Group Headquar-

AFA STATE CONTACTS

Following each state name, in parentheses, are the names of the localities in which AFA Chapters are located. Information regarding these Chapters, or any place of AFA's activities within the state, may be obtained from the state contact.

ALABAMA (Auburn, Birmingham, Huntsville, Mobile, Montgomery, Selma): **Don Krekelberg,** 904 Delcris Dr., Birmingham, Ala. 35226 (phone 205-942-0784).

ALASKA (Anchorage, Fairbanks): **Frank X. Chapados,** 1426 Well St., Fairbanks, Alaska 99701 (phone 907-452-1286).

ARIZONA (Phoenix, Sun City, Tucson): **John P. Byrne,** 9318 Country Club Dr., Sun City, Ariz. 85373 (phone 602-974-1349).

ARKANSAS (Blytheville, Fayetteville, Fort Smith, Little Rock): **Arthur R. Brannen,** 605 N. Hospital Dr., Jacksonville, Ark. 72076 (phone 501-982-2585).

CALIFORNIA (Apple Valley, Edwards, Fairfield, Fresno, Hermosa Beach, Los Angeles, Merced, Monterey, Novato, Orange County, Palo Alto, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Mateo, Santa Barbara, Santa Monica, Yuba City, Vandenberg AFB): **Richard C. Doom,** P. O. Box 2027, Canyon Country, Calif. 91351 (phone 213-715-2923).

COLORADO (Aurora, Boulder, Colorado Springs, Denver, Fort Collins, Grand Junction, Greeley, Littleton, Pueblo, Waterton): **Karen M. Kyritz,** 17105 East Bethany Circle, Aurora, Colo. 80013 (phone 303-690-2920).

CONNECTICUT (East Hartford, North Haven, Storrs, Stratford, Westport, Windsor Locks): **Frank J. Wallace,** 935 Poquonock Ave., Windsor, Conn. 06095 (phone 203-688-3090).

DELAWARE (Dover, Wilmington): **John E. Strickland,** 8 Holly Cove Lane, Dover, Del. 19901 (phone 302-678-6070).

DISTRICT OF COLUMBIA (Washington, D. C.): **W. Jack Reed,** 1750 Pa. Ave., N. W., Suite 400, Washington, D. C. 20006 (phone 202-637-3346).

FLORIDA (Broward, Cape Coral, Fort Walton Beach, Gainesville, Jacksonville, New Port Richey, Orlando, Panama City, Patrick AFB, Redington Beach, Sarasota, Tallahassee, Tampa, West Palm Beach, Winter Haven): **Lee R. Terrell,** 39 Hemlock Dr., N. W., Fort Walton Beach, Fla. 32548 (phone 904-882-4486).

GEORGIA (Athens, Atlanta, Columbus, Rome, Savannah, St. Simons Island, Valdosta, Warner Robins): **Edward I. Wexler,** 8 E. Back St., Savannah, Ga. 31406 (phone 912-964-1941, Ext. 253).

GUAM (Agana): **Joe Gyulavics,** P. O. Box 21543, Guam 96921 (phone 671-734-2369).

HAWAII (Honolulu): **Don J. Daley,** P. O. Box 3200, Honolulu, Hawaii 96847 (phone 808-525-6296).

IDAHO (Boise, Mountain Home, Twin Falls): **John W. Logan,** 3131 Malad St., Boise, Idaho 83705 (phone 208-385-5475).

ILLINOIS (Belleville, Champaign, Chicago, Decatur, Elmhurst, Peoria): **Richard H. Becker,** 7 Devonshire Dr., Oak Brook, Ill. 60521 (phone 312-654-3938).

INDIANA (Bloomfield, Fort Wayne, Indianapolis, Lafayette, Logansport, Marion, Mentone, South Bend): **Richard Ortman,** 2607 Sunrise Ave., Lafayette, Ind. 47905 (phone 317-743-3896).

IOWA (Des Moines): **Carl B. Zimmerman,** 608 Waterloo Bldg., Waterloo, Iowa 50701 (phone 319-232-2650).

KANSAS (Topeka, Wichita): **Cletus J. Pottebaum,** 6503 E. Murdock, Wichita, Kan. 67206 (phone 316-683-3963).

KENTUCKY (Louisville): **Elmo C. Burgess,** 116 S. 5th St., Louisville, Ky. 40202 (phone 502-585-5169).

LOUISIANA (Alexandria, Baton Rouge, Bossier City, Monroe, New Orleans, Shreveport): **Thomas L. Keal,** 404 Galway Dr., Shreveport, La. 71115 (phone 318-797-9688).

MAINE (Limestone, N. Berwick): **Arley McQueen, Jr.,** 153 Jelliegh Dr., Wells, Me. 04090 (phone 207-646-2718).

MARYLAND (Andrews AFB, Baltimore): **Thomas W. Anthony,** 4111 Carriage Dr., Temple Hills, Md. 20748 (phone 301-894-0067).

MASSACHUSETTS (Bedford, Boston, Falmouth, Florence, Hanscom AFB, Lexington, Taunton, Worcester): **Zaven Kaprielian,** 428 Mt. Auburn St., Watertown, Mass. 02172 (phone 617-924-5010).

MICHIGAN (Battle Creek, Detroit, Kalamazoo, Marquette, Mount Clemens, Oscoda, Petoskey, Southfield): **Jeryl L. Marlatt,** 740 S. Cranbrook Rd., Birmingham, Mich. 48009 (phone 313-494-8232).

MINNESOTA (Duluth): **Edward A. Orman,** 368 Pike Lake, Duluth, Minn. 55811 (phone 218-727-8381).

MISSISSIPPI (Biloxi, Columbus, Jackson): **Don Wylie,** P. O. Box 70, Biloxi, Miss. 39533 (phone 601-374-3611).

MISSOURI (Kansas City, Knob Noster, Springfield, St. Louis): **William A. Dietrich,** P. O. Box 258, Kansas City, Mo. 64141 (phone 816-561-2134).

MONTANA (Great Falls): **Dick Barnes,** P. O. Box 685, Great Falls, Mont. 59403 (phone 406-727-3807).

NEBRASKA (Lincoln, Omaha): **Edward A. Crouchley,** 514 Ridgewood Dr., Bellevue, Neb. 68005 (phone 402-291-4780).

NEVADA (Las Vegas, Reno): **James L. Murphy,** 2370 Skyline Blvd., Reno, Nev. 89509 (phone 702-786-1520).

NEW HAMPSHIRE (Manchester, Pease AFB): **Charles J. Sattan,** 53 Gale Ave., Laconia, N. H. 03246 (phone 603-524-5407).

NEW JERSEY (Andover, Atlantic City, Belleville, Camden, Chatham, Cherry Hill, E. Rutherford, Forked River, Fort Monmouth, Jersey City, McGuire AFB, Middlesex County, Newark, Trenton, Wallington, West Orange): **John P. Kruse,** 1022 Chelten Pkwy., Cherry Hill, N. J. 08034 (phone 609-428-3036).

NEW MEXICO (Alamogordo, Albuquerque, Clovis): **Ken Huey, Jr.,** P. O. Box 1946, Clovis, N. M. 88102 (phone 505-769-1975).

NEW YORK (Albany, Brooklyn, Buffalo, Chautauqua, Garden City, Hempstead, Hudson Valley, New York City, Niagara Falls, Plattsburgh, Queens, Rochester, Rome/Utica, Southern Tier, Staten Island, Suffolk County, Syosset, Syracuse, Westchester): **Thomas J. Hanlon,** P. O. Box 400, Buffalo, N. Y. 14225 (phone 716-632-7500).

NORTH CAROLINA (Asheville, Charlotte, Fayetteville, Goldsboro, Greensboro, Kitty Hawk, Raleigh): **William M. Bowden,** 509 Greenbriar Dr., Goldsboro, N. C. 27530 (phone 919-735-5584).

NORTH DAKOTA (Concrete, Fargo, Grand Forks, Minot): **Maurice M. Rothkopf,** 3210 Cherry St., Grand Forks, N. D. 58201 (phone 701-746-5493).

OHIO (Cincinnati, Cleveland, Columbus, Dayton, Newark, Youngstown): **Francis D. Spalding,** 718 Martha Lane, Columbus, Ohio 43213 (phone 614-866-9381).

OKLAHOMA (Altus, Enid, Oklahoma City, Tulsa): **Aaron C. Burleson,** P. O. Box 757, Altus, Okla. 73521 (phone 405-482-0005).

OREGON (Eugene, Portland): **William Gleaves,** 2353 Oakway Terrace, Eugene, Ore. 97401 (phone 503-687-2269).

PENNSYLVANIA (Allentown, Beaver Falls, Chester, Dormont, Erie, Harrisburg, Homestead, Lewistown, Philadelphia, Pittsburgh, Scranton, State College, Washington, Willow Grove, York): **Tillie Metzger,** 2285 Valera Ave., Pittsburgh, Pa. 15210 (phone 412-884-5257).

RHODE ISLAND (Warwick): **King Odell,** 413 Atlantic Ave., Warwick, R. I. 02888 (phone 401-941-5472).

SOUTH CAROLINA (Charleston, Columbia, Myrtle Beach, Sumter): **William B. Gemmill,** 11 Victoria Ave., Myrtle Beach, S. C. 29577 (phone 803-626-9628).

SOUTH DAKOTA (Rapid City, Sioux Falls): **L. J. Reiners,** 4907 Copper Hill Court, Rapid City, S. D. 57701 (phone 605-343-2538).

TENNESSEE (Chattanooga, Knoxville, Memphis, Nashville, Tri-Cities Area, Tullahoma): **Arthur MacFadden,** 4501 Amnaicola Highway, Chattanooga, Tenn. 37406 (phone 615-622-6262).

TEXAS (Abilene, Amarillo, Austin, Big Spring, College Station, Commerce, Corpus Christi, Dallas, Del Rio, Denton, El Paso, Fort Worth, Harlingen, Houston, Kerrville, Laredo, Lubbock, San Angelo, San Antonio, Waco, Wichita Falls): **John Sparks,** P. O. Box 360 San Antonio, Tex. 78292 (phone 817-723-2741).

UTAH (Brigham City, Cedar City, Clearfield, Ogden, Provo, Salt Lake City): **Charles E. Walker,** 1243 E. 3075 North, Ogden, Utah 84404 (phone 801-782-7826).

VERMONT (Burlington): **John D. Navin,** 350 Spear St., Unit 64, South Burlington, Vt. 05401 (phone 802-863-1510).

VIRGINIA (Arlington, Danville, Harrisonburg, Langley AFB, Lynchburg, Norfolk, Petersburg, Richmond, Roanoke): **Ivan R. Frey,** 73 James Landing Rd., Newport News, Va. 23606 (phone 804-595-5617).

WASHINGTON (Seattle, Spokane, Tacoma): **William C. Burrows,** 6180 93d Ave. S.E., Mercer Island, Wash. 98040 (phone 206-773-5395).

WEST VIRGINIA (Huntington): **James Hazelrigg,** Rte. 3, Box 32, Barboursville, W. Va. 25504 (phone 304-736-9337).

WISCONSIN (Madison, Milwaukee): **Kenneth Kuenn,** 3239 N. 81st St., Milwaukee, Wis. 53222 (phone 414-871-3766).

WYOMING (Cheyenne): **R. S. Rowland,** P. O. Box 811, Cheyenne, Wyo. 82001 (phone 307-638-3335).

INTERCOM

Jim and Lee Wright, members of Florida State AFA's Cape Canaveral Chapter, distribute AFA membership materials to Jay Spenser during the Valiant Air Command's Airshow 82 held at Tico Airport in Titusville, Fla., on March 13–14, 1982.

ters) will hold a reunion on July 3–4, 1982, in San Antonio, Tex. **Contact:** Col. Ed O'Neill, Jr., USAF (Ret.), 1772 Kirts Court, Apt. 212, Troy, Mich. 48084. Phone: (313) 649-1062.

388th Bomb Group
The 388th Bomb Group Association will hold its reunion at the Sheraton Patriot Inn in Williamsburg, Va., in August 1982. **Contact:** Edward J. Huntzinger, 1925 S. E. 37th St., Cape Coral, Fla. 33904.

414th Bomb Sqdn. Ass'n
The 414th Bomb Squadron and the 97th Bomb Group will hold a reunion on August 4–6, 1982, in Chattanooga, Tenn. **Contact:** Charles A. Merlo, 7335 Neckel, Dearborn, Mich. 48126.

451st Bomb Group
The 451st Bomb Group reunion will be held on August 6–8, 1982, in Colorado Springs, Colo. **Contact:** Robert Karstensen, 1032 S. State St., Marengo, Ill. 60152. Phone: (815) 568-7766.

451st Bomb Sqdn.
The 451st Bomb Squadron (along with other units of the 322d Bomb Group, Ninth Air Force,) will hold its fortieth anniversary reunion on October 15–17, 1982, in Tampa, Fla. **Contact:** James J. Crumbliss, 2014 Shady Grove Dr., Bossier City, La. 71112.

452d Bomb Group
Members of the 452d Bomb Group will hold their reunion on September 16–19, 1982, in Houston, Tex. **Contact:** Rom Blaylock, P. O. Box 2536, New Bern, N. C. 28560.

464th Bomb Group
The 464th Bomb Group, comprising the 776th, 777th, 778th, and 779th Bomb Squadrons, will hold a reunion on July 29–August 1, 1982, at the Holiday Inn, East Springfield, Ill. **Contact:** Darrel Holland, Box 205, Newton, Ill. 62448.

485th Bomb Group
The 485th Bomb Group will hold its reunion August 6–8, 1982, in Austin, Tex. **Contact:** E. L. Bundy, 5773 Middlefield Dr., Columbus, Ohio 43220.

505th Bomb Group
The 505th Bomb Group reunion will be held on September 3–6, 1982, in Omaha, Neb. All veterans of the 313th Bomb Wing are invited. **Contact:** William J. Gibson, 5214 Pierce Ave., Ogden, Utah 84403. ■

Coming Events

June 5, **Massachusetts State Convention,** Boston . . . June 11–13, **Alabama State Convention,** Selma . . . June 11–13, **Oklahoma State Convention,** Enid . . . June 12, **Alaska State Convention,** Fairbanks . . . June 12, **Virginia State Convention,** Arlington . . . June 18–19, **Ohio State Convention,** Columbus . . . June 24–25, **AFA Symposium, "Airlift—The Key to Modern Military Mobility,"** St. Louis Marriott Hotel at Lambert International Airport, St. Louis, Mo. . . . June 25–27, **New Jersey State Convention,** Cape May . . . June 25–27, **New York State Convention,** Garden City . . . June 26, **Illinois State Convention,** Chanute AFB . . . July 9, **Michigan State Convention,** Manistique . . . July 9–10, **North Dakota State Convention,** Grand Forks . . . July 9–11, **Texas State Convention,** Kerrville . . . July 16–18, **Georgia State Convention,** Rome . . . July 16–18, **Pennsylvania State Convention,** Coraopolis . . . July 23–25, **Florida State Convention,** Tallahassee . . . July 31, **Louisiana State Convention,** Barksdale AFB . . . August 6–8, **Utah State Convention,** Park City . . . August 12–14, **California State Convention,** Riverside . . . August 13–14, **Wisconsin State Convention,** Milwaukee . . . August 27–28, **Colorado State Convention,** Vail . . . September 12–16, **AFA National Convention,** Washington, D. C. . . . October 21–22, **AFA Symposium,** Hyatt House Airport Hotel, Los Angeles, Calif.

Given that the Warsaw Pact has a sizable advantage in conventional forces, the USSR is continuing to build its atomic arsenal, and that the NATO defense system has serious drawbacks, there doesn't seem to be an alternative at this stage to . . .

Retaining the First-Use Nuclear Option

By Gen. T. R. Milton, USAF (Ret.)

As I write this, the Royal Navy is approaching the Falkland Islands and a confrontation with Argentina. Her Majesty's ships have covered the 8,000 miles from Portsmouth more swiftly than Admiral Nelson would have done, but not by all that much. There is a "High Noon" quality about it all, a throwback to another time: the Brits moving south at a measured twelve knots, the Argentines lying in wait, and the rest of us nervously watching, for this is a dangerous business.

It comes during a very modern dispute of a different nature, one having to do with nuclear weapons and whether or not the safety of the world requires a unilateral freeze. There is not much logic in that proposal, but it does have a powerful appeal. Logic is not easily applied in any discussion of nuclear weapons.

There is, for instance, an article in the spring issue of *Foreign Affairs*. Its authors—Robert McNamara, George Kennan, McGeorge Bundy, and Gerard Smith—are, by reputation, highly intelligent and logical. They have indisputable credentials as experts in national affairs, and few people should know more than they about NATO. Yet, in advocating a no-first-use policy for NATO, they have produced an article that will almost certainly aid the growing movement against the modernization of nuclear weapons in NATO.

In all fairness, this was not their stated intention. They wished, in writing this essay, to point out the folly of nuclear warfare in Central Europe and the consequent need of a greater expenditure for, and reliance on, conventional forces.

To the extent that the authors can make no sense of a nuclear battlefield in Central Europe, or anywhere else, I am in agreement. Nothing is more insane than a concept that contemplates the use of these awful things for tactical advantage. Nevertheless, facts are facts, and the Warsaw Pact, by any yardstick you wish to use, has a sizable advantage in conventional forces.

The equalizer in the early NATO days was American nuclear superiority. Then, as the USSR pulled even, the concept shifted to flexible response, a strategy that calls for the use of nuclear weapons when they are needed to stave off defeat. This strategy was conceived by Robert McNamara and accepted with reluctance by the Alliance, after five years of debate, for there was a suspicion that flexible response meant the United States was beginning to cross its fingers on its European defense commitment.

At any rate, flexible response does leave a certain mystique in NATO's strategy, even a note of irrationality. If the Soviets attack and the situation becomes desperate, says this strategy, NATO may lob a few nukes the Soviets' way. It is not a concept that should be examined too closely. Its persuasiveness lies in the fact that NATO has the weapons, is clearly a defensive alliance without aggressive intent, and might act irrationally—that is to say, with nuclear weapons—if backed into a corner.

As we have noted, the *Foreign Affairs* article puts forward the need for greater concentration on conventional forces This is an unarguable proposition as an abstraction, but there is more to it than that. NATO is still, after all these years, just a loose collection of national forces which may join together under unified command if there is ever a crisis serious enough and if agreement between the nations can be reached. It has never happened thus far, nor has there been any serious attempt to rationalize the roles and missions of these forces, or even standardize their organizations. As basic an issue as war reserve supply levels has never been seriously addressed. A NATO mobilization, thus, would require a period of sorting out.

The reason the Alliance has shuffled along for so many years with its almost unworkable rule of unanimity, its ponderous and politically sensitive alert system, and the tight national holds on military forces is for the same reason there is any alliance at all: a belief that the United States has both the power and the resolve to keep the Soviets on their side of the fence.

This does not seem to be the time to propose that NATO renounce its first-use option in favor of strengthened conventional forces, however appealing that idea may be. There is already more than enough opposition, both in Europe and here at home, to nuclear weapons despite clear evidence the Soviets are increasing their arsenal. The danger of nuclear blackmail and a resultant European capitulation is far greater, in my judgment, than that of a nuclear war, especially if NATO becomes too open and rational in its nuclear strategy.

Meanwhile, the strengthening of NATO's conventional forces should remain a primary, if thus far unattainable, objective. As a first item for study, however, I would suggest to Messrs. McNamara, Bundy, Kennan, and Smith the ponderous agglomeration of NATO itself. Until the present forces committed to the Alliance are more closely tied together, the command apparatus more routinely exercised, and national prerogatives give way more readily to the good of the whole, there is nothing much to be gained by greater conventional strength. Pending that happy day, NATO had better keep a touch of unpredictability in its nuclear behavior. ■

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Record Dividend Payment, too!

In addition to record benefit increases, AFA is also pleased to announce a dividend payment of 30%, the highest ever made. This annual dividend payment, which amounts to 30% of the premium paid for coverage during 1981, is payable to all current policyholders on June 15, 1982. It also reduces the *net* cost of AFA insurance to the lowest amount in the history of this program.

You'll find complete details—and an application on the next two pages. Apply now, for this superb coverage. ——➤

CURRENT POLICYHOLDERS PLEASE NOTE:

An endorsement to your existing Certificate of Insurance reflecting these changes will be sent to you with your 1981 dividend check on June 15, 1982.

All members under age 65 now eligible to apply

NEW, RECORD BENEFIT

CURRENT BENEFIT TABLES

Including Substantial Benefit Increases for Policyholders Under Age 65
(effective May 31, 1982)

Member's Attained Age	STANDARD Premium: $10 per month Basic Benefit*		HIGH OPTION Premium: $15 per month Basic Benefit*		HIGH OPTION PLUS PLAN Premium: $20 per month Basic Benefit*	
	Former Coverage	New Coverage	Former Coverage	New Coverage	Former Coverage	New Coverage
20-24	$85,000	**$100,000**	$127,500	**$150,000**	$170,000	**$200,000**
25-29	85,000	**95,000**	127,500	**142,500**	170,000	**190,000**
30-34	65,000	**70,000**	97,500	**105,000**	130,000	**140,000**
35-39	50,000	**55,000**	75,000	**82,500**	100,000	**110,000**
40-44	35,000	**37,500**	52,500	**56,250**	70,000	**75,000**
45-49	20,000	**22,500**	30,000	**33,750**	40,000	**45,000**
50-54	12,500	**15,000**	18,750	**22,500**	25,000	**30,000**
55-59	10,000	**11,000**	15,000	**16,500**	20,000	**22,000**
60-64	7,500	**8,000**	11,250	**12,000**	15,000	**16,000**
65-69	4,000	**4,000**	6,000	**6,000**	8,000	**8,000**
70-74	2,500	**2,500**	3,750	**3,750**	5,000	**5,000**

AVIATION DEATH BENEFIT* (for pilots and crew members)

Non-war related: Ages 20-34—Payment of ½ the scheduled benefit. (Applies to Standard, High Option and High Option Plus Plans)
Ages 35-74—Payment of the full scheduled benefit. (Applies to Standard, High Option and High Option Plus Plans)

War related:	$15,000	$22,500	$30,000
EXTRA ACCIDENTAL DEATH BENEFIT**	$12,500	$15,000	$17,500

***AVIATION DEATH BENEFIT:** The coverage provided under the Aviation Death Benefit is paid for death which is caused by an aviation accident in which the insured is serving as pilot or crew member of the aircraft involved. Under this condition, the Aviation Death Benefit is paid in lieu of all other benefits of this coverage. Furthermore, the non-war related benefit will be paid in all cases where the death does not result from war or act of war, whether declared or undeclared.

****EXTRA ACCIDENTAL DEATH BENEFIT:** In the event of an accidental death occurring within 13 weeks of the accident, these AFA plans pay an additional lump sum benefit as shown in the tables, except as noted under AVIATION DEATH BENEFIT above.

OTHER IMPORTANT BENEFITS

COVERAGE YOU CAN KEEP. Provided you apply for coverage under age 65 (See "ELIGIBILITY") your insurance may be retained at the same low group rates to age 75.
FULL TIME, WORLD WIDE PROTECTION. The policy contains no war clause, hazardous duty restriction, combat zone waiting period or geographical limitation.
DISABILITY WAIVER OF PREMIUM. If you become totally disabled at any time prior to age 60 for at least a 9-month period, your coverage will be continued in force without further payment of premiums as long as you remain disabled.
FULL CHOICE OF SETTLEMENT OPTIONS. All standard forms of settlement options, as well as special options agreed to by the insured and United of Omaha, are available to insured members.
CONVENIENT PAYMENT PLANS. Premium payments may be made by monthly government allotment (payable to Air Force Association), or direct to AFA in quarterly, annual or semi-annual installments.
DIVIDEND POLICY. AFA's primary policy is to provide maximum coverage at the lowest possible cost. Consistent with this policy, AFA has provided year-end dividends in all but three years (during the Vietnam War) since the program was initiated in 1961, and basic coverage has been increased on seven separate occasions.

ADDITIONAL INFORMATION

Effective Date of Your Coverage. All certificates are dated and take effect on the last day of the month in which your application for coverage is approved, and coverage runs concurrently with AFA membership. AFA Group Life Insurance is written in conformity with the insurance regulations of the State of Minnesota. The insurance will be provided under the group insurance policy issued by United of Omaha to the First National Bank of Minnesota as trustees of the Air Force Association Group Insurance Trust.

EXCEPTIONS: There are a few logical exceptions to this coverage. They are:

Group Life Insurance: Benefits for suicide or death from injuries intentionally self-inflicted while sane or insane will not be effective until your coverage has been in force for 12 months.

The Accidental Death Benefit and Aviation Death Benefit shall not be effective if death results: (1) From injuries intentionally self-inflicted while sane or insane, or (2) From injuries sustained while committing a felony, or (3) Either directly of indirectly from bodily or mental infirmity, poisoning or asphyxiation from carbon monoxide, or (4) During any period a member's coverage is being continued under the waiver of premium provision, or (5) From an aviation accident, either military or civilian, in which the insured was acting as pilot or crew member of the aircraft involved, except as provided under AVIATION DEATH BENEFIT.

ELIGIBILITY

All members of the Air Force Association are eligible to apply for this coverage provided they are under age 65 at the time application for coverage is made.

*Because of certain restrictions on the issuance of group insurance coverage, applications for coverage under the group program cannot be accepted from non-active duty personnel residing in New York.

OPTIONAL FAMILY COVERAGE
PREMIUM: $2.50 per month

Member's Attained Age	Life Insurance Coverage for Spouse	Life Insurance Coverage for each child*
20-39	$20,000.00	$4,000.00
40-44	15,000.00	4,000.00
45-49	10,000.00	4,000.00
50-54	7,000.00	4,000.00
55-59	5,000.00	4,000.00
60-64	3,000.00	4,000.00
65-69	2,000.00	4,000.00
70-75	1,000.00	4,000.00

*Children under six months are provided with $250 coverage once they are 15 days old and discharged from the hospital.
Upon attaining age 21, and upon submission of satisfactory evidence of insurability, insured dependent children may replace this $4,000 group coverage (in most states) with a $10,000 permanent individual life insurance policy with guaranteed purchase options.

Please Retain This Medical Bureau Prenotification For Your Records

Information regarding your insurability will be treated as confidential. United Benefit Life Insurance Company may, however, make a brief report thereon to the Medical Information Bureau, a nonprofit membership organization of life insurance companies, which operates an information exchange on behalf of its members. If you apply to another bureau member company for life or health insurance coverage, or a claim for benefits is submitted to such a company, the Bureau, upon request, will supply such company with the information in its file.

Upon receipt of a request from you, the Bureau will arrange disclosure of any information it may have in your file. (Medical information will be disclosed only to your attending physician.) If you question the accuracy of information in the Bureau's file, you may contact the Bureau and seek a correction in accordance with the procedures set forth in the federal Fair Credit Reporting Act. The address of the Bureau's information office is P.O. Box 105, Essex Station, Boston, Mass. 02112. Phone (617) 426-3660.

United Benefit Life Insurance Company may also release information in its file to other life insurance companies to whom you may apply for life or health insurance, or to whom a claim for benefits may be submitted.

IOW AVAILABLE (30% Dividend—1981)

APPLICATION FOR
AFA GROUP LIFE INSURANCE

United of Omaha

Group Policy GLG-2625
United Benefit Life 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 (Mo. / Day / Yr.)	Height	Weight	Social Security Number

This insurance is available only to AFA members

☐ I enclose $15 for annual AFA membership dues (includes subscription ($9) to AIR FORCE Magazine).

☐ I am an AFA member.

Name and relationship of primary beneficiary

Name and relationship of contingent beneficiary

Please indicate below the Mode of Payment and the Plan you elect:

Mode of Payment	Standard Plan		High Option Plan		High Option PLUS Plan	
	Member Only	Member And Dependents	Member Only	Member And Dependents	Member Only	Member And Dependents
Monthly government allotment (only for military personnel). I enclose 2 month's premium to cover the necessary period for my allotment (payable to Air Force Association) to be established.	☐ $ 10.00	☐ $ 12.50	☐ $ 15.00	☐ $ 17.50	☐ $ 20.00	☐ $ 22.50
Quarterly. I enclose amount checked.	☐ $ 30.00	☐ $ 37.50	☐ $ 45.00	☐ $ 52.50	☐ $ 60.00	☐ $ 67.50
Semi-Annually. I enclose amount checked.	☐ $ 60.00	☐ $ 75.00	☐ $ 90.00	☐ $105.00	☐ $120.00	☐ $135.00
Annually. I enclose amount checked.	☐ $120.00	☐ $150.00	☐ $180.00	☐ $210.00	☐ $240.00	☐ $270.00

Names of Dependents To Be Insured	Relationship to Member	Dates of Birth Mo. Day Yr.	Height	Weight

Have you or any dependents for whom you are requesting insurance ever had or received advice or treatment for: kidney disease, cancer, diabetes, respiratory disease, epilepsy, arteriosclerosis, high blood pressure, heart disease or disorder, stroke, venereal disease or tuberculosis? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance been confined to any hospital, sanatorium, asylum or similar institution in the past 5 years? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance received medical attention or surgical advice or treatment in the past 5 years or are now under treatment or using medications for any disease or disorder? Yes ☐ No ☐

If YOU ANSWERED "YES" TO ANY OF THE ABOVE QUESTIONS, EXPLAIN FULLY including date, name, degree of recovery and name and address of doctor. (Use additional sheet of paper if necessary.)

I apply to United Benefit Life Insurance Company for insurance under the group plan issued to the First National Bank of Minneapolis as Trustee of the Air Force Association Group Insurance Trust. Information in this application, a copy of which shall be attached to and made a part of my certificate when issued, is given to obtain the plan requested and is true and complete to the best of my knowledge and belief. I agree that no insurance will be effective until a certificate has been issued and the initial premium paid.

I hereby authorize any licensed physician, medical practitioner, hospital, clinic or other medical or medically related facility, insurance company, the Medical Information Bureau or other organization, institution or person, that has any records or knowledge of me or my health, to give to the United Benefit Life Insurance Company any such information. A photographic copy of this authorization shall be as valid as the original. I hereby acknowledge that I have a copy of the Medical Information Bureau's prenotification information.

Date _____, 19 ___ _____
Member's Signature

FORM 3767GL App REV. 10-79

Application must be accompanied by a check or money order. Send remittance to:
Insurance Division, AFA, 1750 Pennsylvania Avenue, NW, Washington, D.C. 20006

6/82

Bob Stevens'

"There I was..."

SINCE THIS ISSUE DEALS WITH THE USAF IN SPACE, WE THOUGHT MISSILES WOULD BE A GOOD SUBJECT... AFTER ALL, WHAT ELSE CAN PUT YOU INTO SPACE THAT ISN'T ILLEGAL?

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Clouds or darkness engulf most nations 70% of the time. When such conditions prevail, "day fighter" aircraft are little more than ceremonial cannon, their diminutive airframes limiting their radar size, their heat-seeking missile firepower "blinded" by moisture-laden skies.

To survive and win, you must be ready to fight on terms the adversary will choose. That's why the F-15 Eagle was designed so that it doesn't have to pick its day to fight—why it's been given longer range—why it can go where it is needed when it is needed. Day or night. Good weather or bad.

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F-15 Eagle

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