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AIR FORCE

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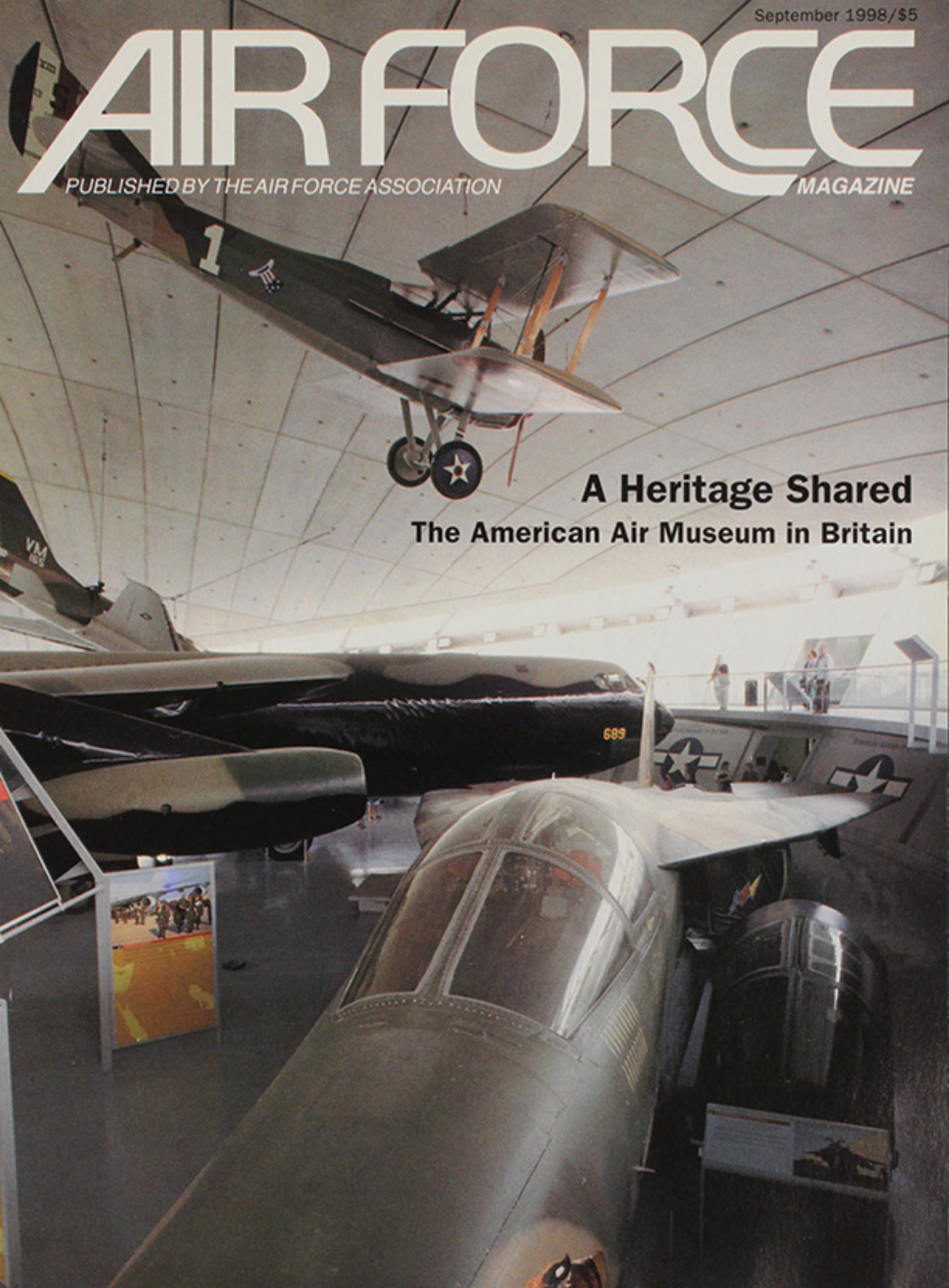
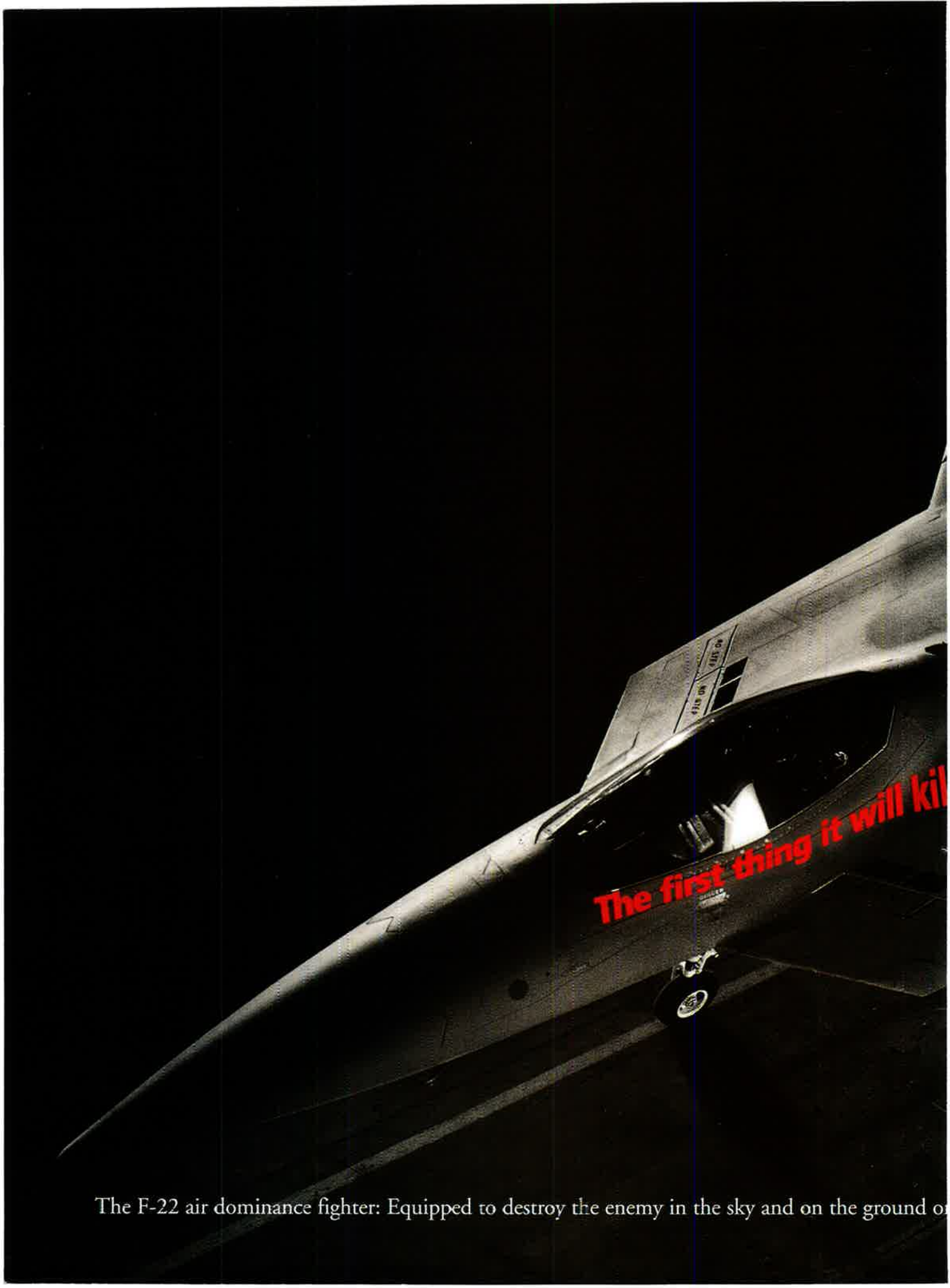


A Heritage Shared

The American Air Museum in Britain



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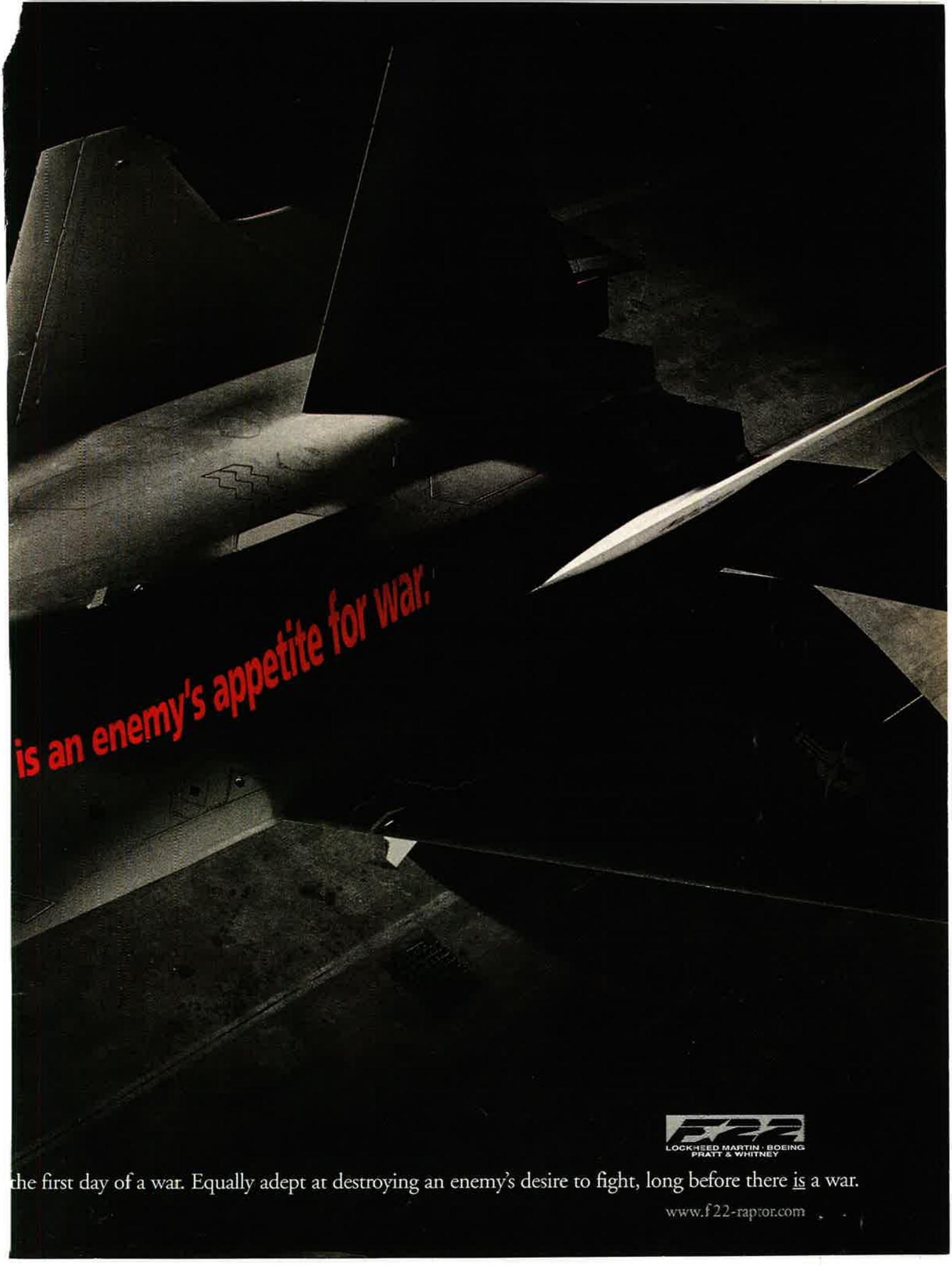

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AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

About the cover: Decades of American airpower in the UK are on display at the American Air Museum in Britain, paying homage to those who lost their lives in the pursuit of freedom. See "A Heritage Shared," p. 30. Photo by Paul Kennedy.

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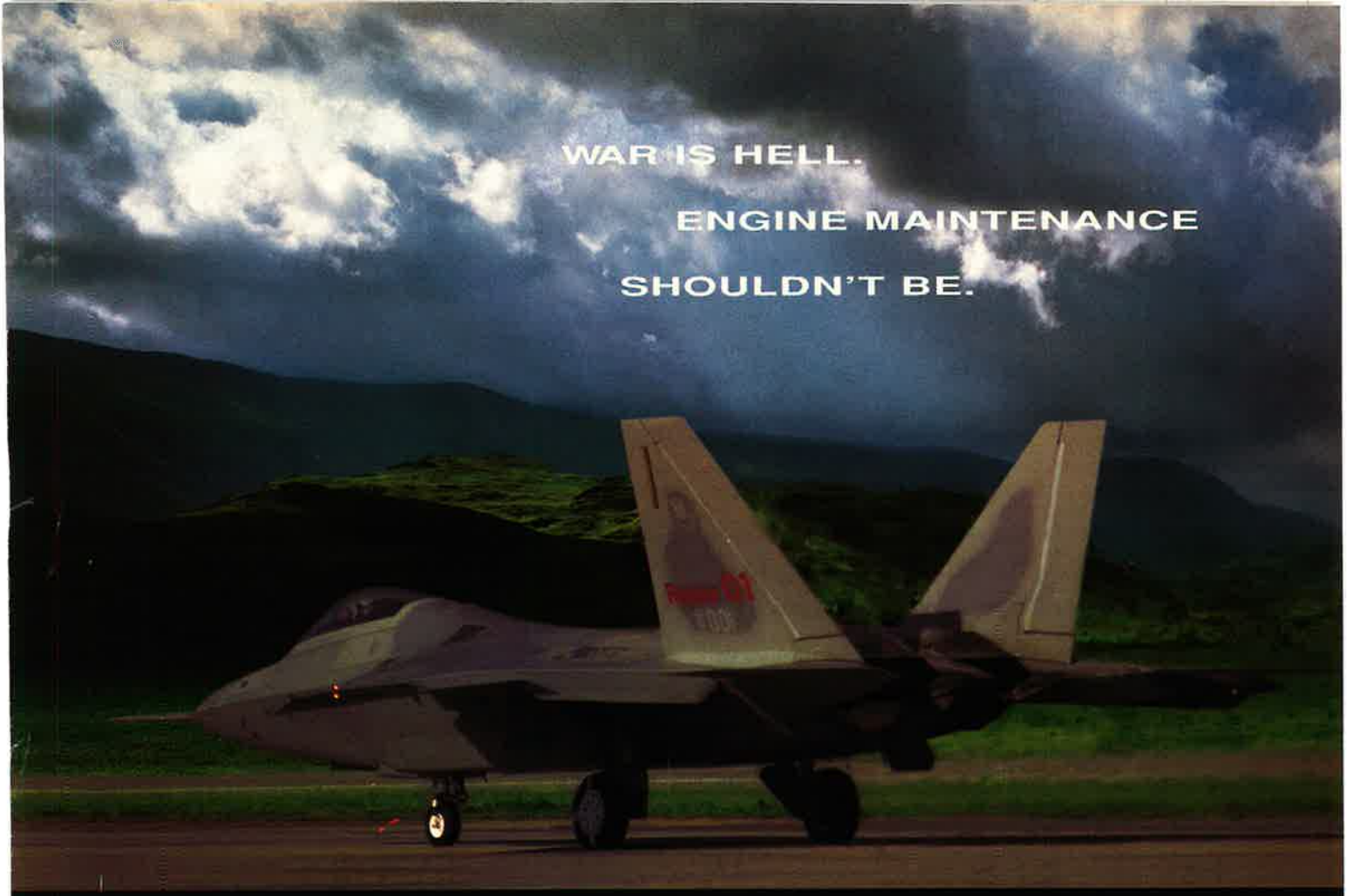

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Editorial

By John T. Correll, Editor in Chief

Strung Out

As a usual thing, it is senior officers and Pentagon officials who testify to Congress, but last March, the House National Security Subcommittee on Military Readiness wanted to get closer to the situation. Accordingly, the subcommittee moved its hearing out to the field and called on senior NCOs from operational units to speak.

Among those testifying was MSgt. Eugene D. Mehaffy, a C-5 flight engineer from Travis AFB, Calif. He described the grueling pace of long duty shifts and one contingency deployment after another, made worse by problems en route with refueling, repairs to the aircraft, crew billeting, and meals—because at almost every stop along the way, the support personnel are also overworked and short of resources.

The slogans can talk about "doing more with less" to overcome the force cuts and budget reductions, but Mehaffy said, "I only hope everyone now understands that 'more with less' is not going to happen."

Mehaffy was not alone in his observation. Earlier in the year, Speaker of the House Newt Gingrich (R–Ga.) told the Budget Committee that "our defense structure is getting weaker, our equipment is getting obsolete, our troops are stretched too thin." Deteriorating readiness and mission capable rates have begun to evoke memories of the "hollow force" of the 1970s.

The roots of this problem go back to the summer of 1993. The US armed forces were drawing down toward a "Base Force" configuration. Nevertheless, the Clinton Administration—new in office and with little analysis to determine the feasibility or impact—announced a further and much deeper defense budget cut. The notorious Bottom–Up Review tried to devise a defense program to fit the arbitrarily reduced budget. The eviscerated force thus created did not meet demands of the declared defense strategy.

Concurrently, a "procurement holiday" postponed weapon system purchases. Problems with aging equipment were compounded by insufficient spending on spare parts. Modernization funding was siphoned off to pay for current operations. Then forces and systems were cut again by the Quadrennial Defense Review in 1997.

What is *not* decreasing is the mission. The armed forces are strung out around the world on "Engagement and Enlargement" missions, the end of which may be nowhere in sight. In Southwest Asia, airmen live in tents in the eighth year of a "temporary" mission. US forces were supposed to be gone from Bosnia by 1996. They are still there, and their departure date is said to be "indefinite."

We have too few forces and too little money chasing too many open-ended deployments.

Since the end of the Cold War, the Air Force has reduced its active duty strength by a third and cut its forces stationed abroad by half. Meanwhile, though, contingency deployments have increased by 400 percent. In addition to ongoing operations in Southwest Asia and the Balkans, the Air Force deploys for six or seven "pop-up" contingencies a year.

Until recently, few of us had even heard of "personnel tempo," a term that has come into constant use to describe the impact of operations tempo on people. "Airmen and their families are telling us they are getting tired of a way of life that cycles between four to six months per year TDY [temporary duty] and 65-hour work weeks when they are back home," Gen. Patrick K. Gamble, then USAF deputy chief of staff for air and space operations, told Congress in March.

The loss of experienced people hurts. The Air Force expects to be 800 pilots short this year, on track toward a shortage of more than 2,300 pilots by 2002. The Air Force would like to retain 75 percent of its second-term airmen; about half of them are thinking about leaving service. In 1995, less than 10 percent of F-16 crew chiefs were new graduates; by 1999, half of them will be new graduates.

To relieve the operating tempo, the Air Force has curtailed exercises and combat skills competitions. A new concept groups combat and support forces into 10 air expeditionary teams, two of them on call at any time for peacetime contingency deployments. This will help organize the workload in the best way possible and make the schedule stable and predictable.

However, a senior Air Force officer acknowledges that if full-scale regional conflict breaks loose, "all bets are off." That is a critical point. How would a force that has been struggling to cover the peacetime mission be able to meet its duties in wartime?

The assumption has prevailed for too long in the Pentagon and elsewhere that the defense budget cannot be increased—only cut further—and that shortages can be met only by the diversion of funding from other defense programs. That assumption is not shared by a substantial number of senators and congressmen.

In April, for example, House National Security Committee leaders from both parties called for renegotiating the Balanced Budget Act, saying that "short of an unwise retrenchment and overhaul of US national military strategy, fixing the nation's long-term defense program will require increased defense spending."

The armed services have been cut too much. It is time to give them the people, the force structure, and the money they need before the operating pressures tear them apart—or before a genuine armed conflict comes along with disastrous consequences. ■

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Letters

Thinking Aerospace

The "Destiny in Space" editorial in August *[p. 2]* made it clear to any thinking citizen that the American people expect their armed forces to be able to cope effectively with any threat to our country from space—now or in the future. But I was surprised that John Correll did not mention airpower or aerospace power as an integral element of military dominance in space. To my thinking, an effective space force unsupported by effective airpower is inconceivable. The time has come to ensure that we have aerospace power.

As you know, the new Air Force Chief of Staff, Gen. Michael E. Ryan, has stated emphatically that the term "aerospace" most clearly represents the Air Force's primary region of technical and operational expertise. He described aerospace as a "seamless medium" saying that the term was preferable to "air and space." It's true that the three-word term "air and space" implies a nonexistent operational separation, while "aerospace" conveys the idea of a single operational continuum.

"Aerospace" was commonly used by Air Force leaders and doctrine specialists, beginning in 1958, and was continued until Gen. Merrill A. McPeak became Air Force Chief of Staff in 1990. [He] preferred the term "air and space," and his preference was reflected in the terminology used throughout the Air Force in the years that followed. His successor, Gen. Ronald R. Fogleman, used "aerospace" infrequently, but he did state in 1995, "I think as we move into the 21st century, the United States of America will be defined by the fact that it is an aerospace nation." Evidently, Ryan is not waiting for the next millennium.

It is ironic, I believe, that the Air Force, which originated the term "aerospace" some 40 years ago, has seen the word embraced more enthusiastically by industry and in education and other fields than by itself. The reason for its widespread usage is the word's plain meaning and value. "Aerospace" is simply another word for "sky." Air Force doctrine has held from the beginning that "aerospace is the total expanse beyond the Earth's surface." The exultant lyrics in the Air Force's traditional song, "Off we go into the wild blue yonder, climbing high into the sun," soar free from the restraining thoughts of an arbitrary altitude limit. Aerospace is our planet's natural realm in the universe.

I hope that we'll begin soon to see a wider use of terminology in the Air Force that reflects the recognition that its primary missions in aerospace are essentially and properly interrelated, interdependent, and noncompetitive.

Frank W. Jennings
San Antonio

■ *The term "aerospace" was invented by Jennings in 1958 when he was a civilian writer and editor for the Air Force News Service. It was used publicly for the first time by Gen. Thomas D. White, USAF (Ret.), in an* Air Force *Magazine article in August 1958.*—THE EDITORS

Do you have a comment about a current article in the magazine? Write to "Letters," *Air Force* Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. (E-mail: letters@afa.org.) Letters should be concise and timely. We cannot acknowledge receipt of letters. We reserve the right to condense letters. Letters without name and city/base and state are not acceptable. Photographs cannot be used or returned.—THE EDITORS

An Unbelievable Road Map

Correll's June editorial, "Long Range Blind Spot," *[p. 3]* correctly identified the biggest single gap in current Air Force planning: the absence of a credible road map for carrying the heavy bomber fleet into the next century. The problem is not that the Air Force lacks a road map. The problem is that the road map is not believable.

The present plan makes a series of improbable assumptions about future threats and requirements that have

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more to do with balancing today's budgets than they do with meeting tomorrow's operational challenges. Need access to foreign bases to operate effectively? Assume it will exist. Worried about the growing sophistication of overseas air defenses? Assume they can be suppressed—early. Need lots of precision weapons to compensate for low sortie rates from an aging bomber fleet? Assume huge numbers of high-tech munitions are available. Concerned the planned force structure can't cope with simultaneous contingencies? Assume they are "nearly" simultaneous.

This sort of logic can make the emerging bomber force look adequate, but as long as we're going to indulge in such self-deception, why not simply assume there are no wars at all?

If, on the other hand, we begin with the assumption that a reasonably resilient and resourceful adversary will emerge overseas sometime in the next generation, then it is clear USAF needs to get serious about fielding a sufficiently survivable and versatile bomber fleet to prevail in the absence of regional allies or bases. The place to begin is by getting the most out of what we already possess, in particular, by continuing to upgrade the service's 21 B-2 "silver bullets" to derive maximum operational leverage from their unique capabilities.

We also need to continue enhancing the less capable but more numerous B-52 and B-1 legs of the bomber fleet. Whatever their weaknesses may be, these aircraft will provide the preponderance of US long-range strike assets until at least the second decade of the next century, and we must be prepared to exploit their full potential. In the end, though, there is no substitute for modern technology: If B-2 production really is dead, then the nation needs to move decisively to begin development of a next-generation bomber.

Along with many people, I spent years trying to convince policy-makers that 20 B-2s simply were not enough. The main reason that view did not prevail (despite vigorous bipartisan support in Congress) was the unrelenting opposition of the Air Force leadership to buying more. The B-2 debate is now over except for the scope and pacing of upgrades. But the broader debate about the future of long-range airpower continues, as Correll so eloquently demonstrates. It is time for the Air Force to get serious about its future.

Loren B. Thompson
Chief Operating Officer,
Lexington Institute
Arlington, Va.

Uncertain Strategy

The editorial "A Strategy of Uncertainty" was right on target. *[See May 1998, p. 4.]* After returning from Desert Thunder—the 33,000+ mobilization to send Saddam [Hussein] a message—I could not agree more that DoD is being misused. One point the article mentioned in passing was the "coalition that stood with the United States in the Gulf War atrophied." That was an exceptional understatement. It no longer exists.

However, I would also argue that the first element of the Weinberger Doctrine was misrepresented by the Bush Administration almost a decade ago when we started Desert Shield. What vital US interest was at stake? The only value the oil reserves in Kuwait would have to Saddam is through sales on the open market. Those reserves would not have been lost to the world. At the outset and after we started deploying into theater, Saddam's troops in Kuwait adopted defensive positions. He clearly announced his intentions of taking his "19th Province" back. He had no intention of rolling beyond the Kuwaiti border into Saudi Arabia. And even if he had, had not the US ambassador told him President Bush had no position on an Arab vs. Arab conflict?

The continuing policy of keeping troops in countries where they are not welcome; where their personal safety is in question from internal terrorists groups; where the host nations are unwilling or unable to provide realistic defense of their own borders; and where the host nations inflict their "defenders" with unrealistic restrictions [on] clothing, magazines, beverages, and airspace in which they fly, should be immediately stopped. It is time the Administration realizes the futility of the policy they are employing in the Persian Gulf. We are being used by the Gulf nations and are wasting valuable resources and [jeopardizing] our people needlessly.

Lt. Col. David J. Wallace,
USAF
Navarre, Fla.

Base Closure Flap

Lawmakers have more [in mind] than just protecting major industrial activities when they oppose new [Base Realignment and Closure] legislation and have every right to be suspicious of DoD studies supporting closures and [citing] supposed cost savings. *[See "The Base Closure Flap," July, p. 60.]* For example, the Air Force provided a study to the 1995 BRAC commission which recommended closing Eglin AFB's [Fla.] Electro-Magnetic Test [Environment] and moving

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[its] facilities west. Only after last minute lobbying by the USAF Chief of Staff did the 1995 commission adopt that recommendation as a concession to the Air Force for closing the Sacramento [Calif.] and [San Antonio] Air Logistics Centers. Further, the commission made the decision in opposition to the BRAC staff's recommendation. The study was flawed and misleading because its authors chose to ignore facts favoring the EMTE and included fictional capabilities about the western ranges. The result was a loss of capability that can never be recovered and no cost savings. The [General Accounting Office] agrees. In a [1997] report, the GAO found, among other things, that implementation of [the DoD] master plan will result in less effective electronic combat testing capabilities, and relocation of the EMTE will eliminate DoD's capability to test electronic combat systems in conditions that typify many potential threat locations.

Col. Jim R. Sharp,
USAF (Ret.)
Niceville, Fla.

Ending the Color Line

[In the caption with the] picture of Daniel "Chappie" James Jr. [the] location is wrong. *[See "When the Color Line Ended," July, p. 79.]* It [was] taken at Udorn AB, Thailand, 8th Fighter Wing, [when James was] deputy commander of operations, 1967.

Bill Larson
Fort Walton Beach, Fla.

For the record, I think the photo [of James] was taken at Ubon RTAB, Thailand. As a former member of the 8th Tactical Fighter Wing at Ubon [I know that] the revetment shown is typical of those at Ubon. The F-4D pictured is carrying what appears to be a full combat load, and James is wearing a fully provisioned combat survival vest. I doubt if pilots conducting [training] sorties out of Wheelus AB [Libya] would have been been dressed in full-combat attire or flying in combat-loaded aircraft.

Col. Tom Geary,
USAF
Bucharest, Romania

No question that African–Americans were the overt target of discrimination in the services prior to the Truman executive order. But Herman S. Wolk does a disservice to others by not at least noting that blacks were not the only victims of abuse.

Let me illustrate my point by repeating what was said to me the day in 1943, when I went to volunteer for the Navy [pilot] program. "Young man," the lieutenant said, "we don't take [three racially derogatory terms deleted] in this program. If you want to join the Navy I suggest you go down the hall; I think they're taking you guys as stewards right now."

Obviously, I didn't "go down the hall," nor did he dissuade me from my quest to fly.

Lt. Col. Hank Cervantes,
USAF (Ret.)
Marina del Rey, Calif.

While reading your recent articles on the Tuskegee Airmen, I was reminded of an unusual event that took place over the night skies of Alabama in 1944. I was an Army Specialized Training Program student at Alabama Polytechnic Institute in Auburn and was out one evening on campus when we heard the sound of aircraft. We looked up and there were two AT-6s doing some odd maneuvers in the moonlit night sky. They apparently were chasing each other. [Each] had [its] (single) landing light on. We suddenly realized they were actually dogfighting, and each was attempting to touch the other aircraft with the beam of the landing light! I don't think that was standard night flying practice, but it illustrates the fine flying ability and courage of those great airmen. I [don't know] if this was an isolated case or routine practice.

Oscar J. Dorr
Orlando, Fla.

Which Lady?

I was interested to see the "Lady in the Lake" photo *[p. 16]* in your July issue. I was, however, a little dismayed at the information provided in the caption. To set the record straight, you should have read the information board next to the lake itself. The aircraft tail number was 44-6221, built at Boeing at the close of [World War II]. It was last flown out of Eielson AB, Alaska, on Sept. 16, 1954, by Capt. C.T. Gustafson and Lt. R.E. Parry.

On Sept. 24, 1954, the aircraft was placed on Aircraft Out of Commission for Parts status. It was then listed as P.E. (Loss Code) status on Nov. 15, 1954, [and] dropped from the inventory in 1955 due to a ground accident. I quote from the [board]: "A thorough search of aircraft accident files at Norton AFB [Calif.] failed to

reveal an accident investigation for 214." There is more [about] the aircraft, but it is not as you [described] it. The information that you provided may have been for some other plane; it was not for the one shown.

TSgt. Kenneth Herman
Luke AFB, Ariz.

■ *You are right, but it's the Air Force that did not read the information board. We relied entirely on a USAF news release, datelined Eielson AFB, Alaska, but, as we found out, not written by someone from Eielson, be correct. The information on the board is "based on the best we can find." The Air Force journalist who wrote the news release, apparently, found the other stories more interesting.*—THE EDITORS

Check the Pointy End

The photo on p. 32 of the July issue shows a crew loading an Advanced Cruise Missile, not an Air Launched Cruise Missile. The ACM is, indeed, an air-launched cruise missile, but since you capitalized the four words, you tied it to the rather round-nosed AGM-86B/C, rather than the pointy-nosed AGM-129A.

Maj. Greg Ogletree
Vandenberg AFB, Calif.

Air Guard Power

As a current Air National Guard member, I support a lot of what was said in "Sizing Up the Air Guard" *[July, p. 50].* I joined the Guard in 1991. Most of my unit was deployed to the Gulf at some point during the war. And [like] most Guard units, they really showed USAF, the country, and the world what they can do.

One of the biggest incentives that drew me to the Guard was the change of pace from my day-to-day work. It is true that some members are in it for the money or just to wait out retirement. But I do believe that most gain something more from it, whether or not they freely admit it. Face it: For weekenders, especially enlisted, the pay is not high and the work is hard. There are dangers that we may not face elsewhere. So there is more to it than money.

Since being in the Guard I have traveled the world and been to other states that I would probably never have gotten a chance to see. I would like to see more deployments. I average about one out-of-area deployment every two years. Personally, I could go for one every year.

There is one complaint I do have, though. Currently Guard members cannot fly Space-A overseas. I would understand if we were way down on the priority list, but I still think we should have that option. There are empty Space-A seats, and I would like to be able to fill one. This is a benefit that would not cost USAF a dime. The plane is already going; we just want to hitch a ride.

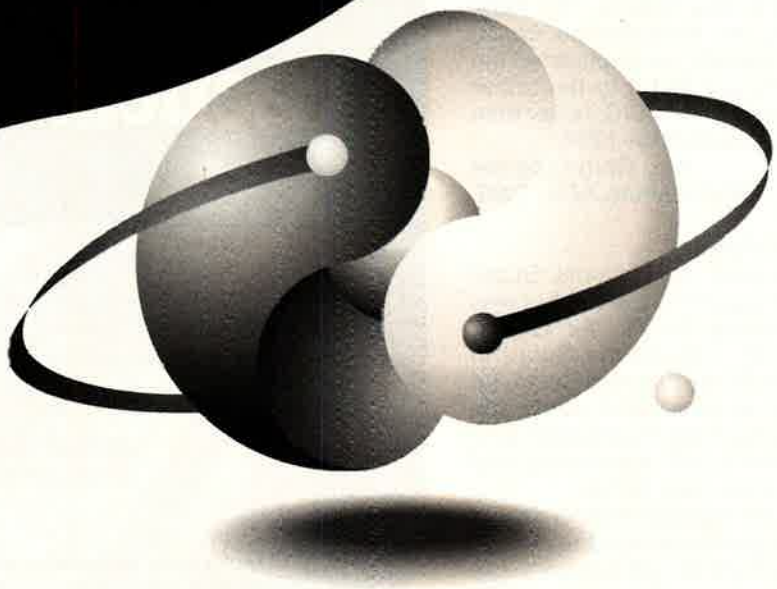
[That said,] in my seven years in the Air Guard I have gotten to do more and see more than I could ever imagine. We do work hard and are there to ensure the safety of our nation, but I think the benefits are well worth the risk we take.

Brian T. Turpin
Oak Park, Ill.

PJs

As a former Air Force rescue helicopter pilot I know firsthand, in battle

Offense Defense



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situations, how [pararescue] training has paid off. *[See "That Others May Live," June, p. 40.]* It can be heart wrenching to lower a pararescueman into thick jungle on a forest penetrator, have him load an injured pilot on the hoist, and fly away, leaving [the PJ] to survive in enemy territory until you can return for him. This is especially hard if they are only a few years older than your own teenage son. Their training and personal determination helped us get them back each time. Many Air Force pilots escaped death or capture through the efforts of these heroic men.

Thomas C. Seebo
Air Rescue Association
Burkburnett, Texas

Tricare Troubles

I was shocked to read in "Troubles With Tricare" *[June, p. 68]* that "most Tricare managed care contractors have negotiated physician reimbursement rates that are even lower than those paid by Medicare." I also took little comfort in the prediction that rates for all medical services under Tricare should soon be at least as high as those provided by Medicare. I don't think receiving the rates Medicare pays will be any great incentive for doctors to remain in the provider network over the long haul. It's no small wonder, just as an example, that in the entire Memphis area (population of [more than] one million) only two orthopedists are Tricare participants. It should also come as no surprise that doctors continue to leave the provider networks. The gastroenterology group that has been treating my daughter for over two years notified me it will no longer accept Tricare. [The reason:] "administrative aspects of dealing with Tricare that have made our relationship untenable." Based on my own experience with Tricare, I expect more doctors in this area to follow suit. The surgeon who performed routine, preauthorized surgery on our daughter 12 months ago has yet to be paid a dime for his services. Continued administrative delays of this type, coupled with an unacceptably low payment rate for service, will produce predictable results: fewer doctors providing less than adequate care for Tricare enrollees.

Lt. Col. J.C. Bryant,
USAF (Ret.)
Germantown, Tenn.

I hope that you do follow-up health care articles. A good reporter with medical or insurance background could answer a lot of questions for us. Who establishes the ridiculously low payment schedules to physicians, specialists, and other care providers? How are these schedules established, and how often are they reviewed? A designated neurology Tricare Prime provider was "allowed" $12.97 for an authorized follow-up office visit. How many doctors, particularly specialists, do you know [who] are willing to accept $12.97 for an office visit? The truth is, there are very few quality doctors who are willing to accept Tricare patients. Fortunately there are a few, but in general, we are being relegated to the cheapest bidder with no regard toward quality.

How are the contractors rated in their performance and by whom? These contracts are not classified. Maybe it's time that we, the customer, knew what we are supposed to get and who to see when we don't get it—someone other than our congressmen.

Lt. Col. Dwight Miles,
USAF (Ret.)
Fort Collins, Colo.

Correction

In the August issue, the caption for the lower photograph on p. 55 in "The F-22 Out Front," should have identified an F-16, not an F-15.

Aerospace World

By Peter Grier

F-22 Passes New Milestones

The Air Force's F-22 fighter development program in late summer chalked up several notable successes.

On July 30, USAF aircraft and crews working at Edwards AFB, Calif., completed the first aerial refueling of the Raptor. The operation featured the first F-22 aircraft—Raptor 01—and a KC-135 flying at 20,000 feet, said officials.

This feat came on top of the first flight, June 29, of the second Raptor airframe. The first flight of Raptor 02 came a full 11 days ahead of schedule.

The F-22's chief test pilot, Paul Metz, was at the controls when the aircraft lifted off from Dobbins ARB, Ga., at 11:29 a.m. During the hour-long flight he performed flying-qualities maneuvers, including bank-to-bank rolls, landing gear retraction and extension, and flight at varied engine settings.

"We worked hard to incorporate the lessons we learned on Raptor 01, and we succeeded," said Tom Burbage, F-22 Team Program Office general manager. "This airplane was brought to flight much more easily and efficiently than the first."

The Air Force is hoping to complete 183 flight test hours with these aircraft by the end of November.

USAF photo by TSgt. Joe Bela

Following the Aug. 7 bombing of two US embassies in Africa, USAF forces transported injured US personnel to medical facilities in Germany. Here, an airman from Ramstein AB, Germany, stands guard at a C-141 from McGuire AFB, N.J., after its arrival at Nairobi IAP, Kenya. Among the 12 Americans killed was Air Force SMSgt. Sherry Lynn Olds of Panama City, Fla., and Air Force civilian employees Jean R. Daliza of Kenya and Arlene Kirk of South Bend, Ind.

The first aerial refueling of an F-22 Raptor took place July 30 at 20,000 feet and an air speed of about 345 mph over Edwards AFB, Calif. A specially instrumented KC-135 handled the test, which included multiple contacts to determine aircraft/boom capability. This KC-135 can measure fuel flow and stress loads on the boom and has an automatic disconnect feature.

USAF General Dies in Crash

Lt. Gen. David J. McCloud, the commander of Alaskan Command and 11th Air Force, died July 26 in an aircraft crash at Ft. Richardson, Alaska.

McCloud perished while piloting his personal YAK-54, a Russian-built, single-engine acrobatic aircraft. Also killed in the crash was a civilian passenger, Lewis Cathrow of Alexandria, Va. The aircraft crashed in a paratrooper drop zone just east of Anchorage.

The cause of the crash was unknown. It is currently under investigation by the National Transportation Safety Board.

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In his Alaskan post, McCloud was responsible for more than 21,000 USAF active duty, Guard, and Reserve military members.

McCloud and his passenger had taken off from Elmendorf AFB, Alaska, where McCloud kept the airplane.

He took the Alaskan post in December. Before his transfer, McCloud had worked for the Joint Chiefs of Staff as director for force structure, resources, and assessment.

F-16 Fires on Iraqi Radar

An Iraqi targeting radar lingered a little too long on a British Tornado fighter June 30—and a USAF F-16 fired a HARM missile at the ground-based site in return. The weapon missed after the radar blinked off, and Secretary of Defense William S. Cohen said he hoped the incident was an isolated one that did not presage increased tensions in the region.

The radar "painting" of the British airplane followed a period of relative calm in the skies over the Iraqi theater of operations. US intelligence had reported no recent movement of Iraqi air defense batteries or other military actions that might be considered a prelude to a new confrontation. Though the US military presence has been reduced in recent months, there are still 20,000 American troops in the region. Some 200 US and allied warplanes continue to patrol the skies above Saddam Hussein, flying between 80 and 120 sorties a day.

The firing of the AGM-88 HARM was standard operating procedure under the strict rules of engagement that govern allied flights. If a targeting radar locks on to an aircraft for even a brief time, a radar-guided anti-aircraft missile may soon follow. Pilots are allowed to quickly strike preemptively in such cases for their own protection.

Such incidents last only a few moments. "It was a split-second type of operation, a lock on of the radar for only seconds at a time," said Cohen in a Pentagon briefing. "So, this decision [to fire] was made on that kind of a split-second decision-making status."

The targeted June 30 patrol consisted of four British aircraft and six American jets. The Iraqis said the missile hit a drinking water reservoir near Basra.

Senate Panel Rejects Jones

On July 22, the Senate Armed Services Committee rejected President Clinton's nominee for Secretary of the Air Force, Daryl L. Jones. The panel deadlocked 9–9 on a vote on whether to forward Jones' name to the full Senate—effectively dooming the nomination.

The defeat marked the end of a long and torturous vetting process for Jones, who would have been the first African–American to serve in the top Air Force civilian post.

"This was a good man who had all the qualities to make a fine Air Force Secretary, and I regret this committee did not give the full Senate a chance to vote on him," said SASC Chairman Sen. Strom Thurmond (R–S.C.), a Jones supporter.

Florida state Senator Jones is a graduate of the Air Force Academy and a former active duty fighter pilot. He came in for heavy criticism from some former members of the Reserve fighter squadron he joined at Homestead ARB, Fla., after leaving the service.

His critics said that he was a dangerous pilot in the Reserves, almost running out of fuel on one occasion and scraping his F-16's tail on two others. They also accused him of embellishing his flight record and of wearing flight wings to which he was not entitled.

Jones faced additional questions about lobbying fees he received from a Florida bond firm and pressure he put on enlisted troops to buy Amway products he was selling.

Supporters noted that he was his Reserve unit's first African–American pilot and said prejudice may have played a part in his undoing.

USAF photo by SSgt. Angela Stafford

Retired Air Force MSgt. Jacob J. Chestnut, who spent 18 years as a US Capitol policeman after his military career, was buried at Arlington National Cemetery July 31. Chestnut, and fellow Capitol policeman John M. Gibson, were killed by a lone gunman who opened fire within the Capitol July 24.

B-2 Nuclear Readiness Rated High

The B-2–equipped 509th Bomb Wing, Whiteman AFB, Mo., has won top grades in a series of inspections that measured its readiness to carry out its nuclear mission.

The wing passed its Nuclear Operational Readiness Inspection and Nuclear Surety Inspection with flying colors, even though the wing is not slated to reach full operational capability until next January.

Among other things, the drills involved scrambling six B-2s at once and flying two simulated missions to replicate a nuclear strike. Though all flights were carried out without nuclear weapons on board, such weapons were loaded before takeoff to show the wing could accomplish the task within an allotted timeline.

Lockheed, Northrop Call It Off

It looks like the wave of mergers that swept through the defense industry in the early and mid-1990s is finally over. Lockheed Martin gave up on its planned $8 billion purchase

of Northrop Grumman on July 16, giving in to Pentagon concerns that the deal would have stifled weapons competition.

Lockheed Martin and Northrop Grumman officials negotiated with the government for months in an effort to allay antitrust worries. Reports indicated that they even went so far as to offer to split off their combined defense electronics businesses in a separate firm, in which the new Lockheed–Northrop would have maintained some kind of limited financial stake.

But even though defense electronics was the area government trust busters were most worried about, the actions were not enough for the Justice Department, which had sued to block the merger in March.

Joel Klein, head of Justice's antitrust division, praised the decision to abandon the merger. "This means that the US government and the American people will continue to receive the highest possible quality of military products and services," he said in a statement.

Lockheed Martin and Northrop Grumman thus tripped over a sudden change in government sentiment. Beginning in 1992, Pentagon officials had urged defense contractors to consolidate, saying the future market would not support numerous players. Between 1992 and 1997 some $55 billion worth of defense mergers took place.

Lockheed was one of the main acquiring firms. By buying such historic suppliers as Martin Marietta and Loral, it has grown to be the Pentagon's No. 1 supplier and is well-positioned for continued growth even without the addition of Northrop.

Tobacco-Related Disabilities

Outraged veterans and their political supporters prevailed on Congress to reverse course and restore VA disability benefits to former military members who are or may become afflicted with smoking-related ailments.

As matters now stand, veterans with such illnesses will not be branded as having engaged in "willful misconduct" and will not be hampered in filing a compensation claim.

Congress' full-scale retreat was contained in a provision attached to the IRS Restructure and Reform Bill, which passed the House and Senate. President Clinton signed the measure into law July 22.

The elimination of tobacco-related disability benefits for vets and the use of the "willful misconduct" condemnation sailed through Congress earlier this year as a provision attached to the popular highway bill. The cut in veterans benefits was used to offset some of the increased cost of roads, bridges, and other new projects highly prized by many lawmakers.

Then, however, came a storm of protest. Typical of the veterans' complaints was this one from Doyle E. Larson, Air Force Association president: "We cannot say to our veterans with smoking-related illnesses that you are not allowed to receive compensation for your disability. When the day comes that a veteran has poison ivy, will we reject providing care for that individual because [he] should have worn long sleeves?" Said Harry R. McDonald Jr., national commander of the Disabled American Veterans: "Anti-veteran elements in the Congress have subverted the democratic process that Americans have valiantly fought to protect—often at great sacrifice to their health and well-being."

On July 8, the Senate narrowly defeated a measure that was seeking to force an open debate on Congress' action. Unwilling to face any more heat, congressional leaders attached the correction to the IRS reform bill, a popular measure guaranteed to sail to approval.

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The future of Northrop is now less certain, but company officials vowed that they would remain viable on their own.

"While we believed the merger was in the best interests of our constituencies, Northrop Grumman can and will continue as a strong, independent competitor," said Kent Kresa, chairman, president, and chief executive officer.

DoD IDs Vietnam "Unknown"

In the wake of the identification of Air Force 1st Lt. Michael J. Blassie as the Vietnam veteran buried in the Tomb of the Unknowns, it now appears unlikely that the famous monument in Arlington National Cemetery will ever receive another fallen hero.

The mitochondrial DNA testing used to identify Blassie from a handful of bones is a new process that was unavailable when he was interred, unidentified, during a Memorial Day ceremony in 1984. MtDNA does not decay after death, unlike the nuclear DNA often tested in criminal cases. It is passed down only by the mother and changes little from generation to generation, making definitive matches relatively easy.

"It may be that forensic science has reached the point where there will be no other unknowns in any war," said Secretary of Defense William S. Cohen. "So we have to look very carefully at where we go from here."

Blassie was reburied in Jefferson Barracks National Cemetery near St. Louis at the end of two days of solemn ceremonies. Participants included Cohen, Gen. Michael E. Ryan, Air Force Chief of Staff, and a flight of F-15s from the Missouri Air National Guard.

Since the end of the Vietnam War, US scientists have identified the remains of 496 Americans. Some 2,087 sets of remains are still officially listed as unknown.

Panel Warns Missile Threat Is Close

On July 15, a blue-ribbon congressional panel of experts said they believe Third World nations such as North Korea, Iran, and Iraq are developing long-range missiles much faster than US intelligence estimates have said. The US could be threatened by such weapons in only five years, concluded the bipartisan commission, which was headed by former Secretary of Defense Donald H. Rumsfeld.

The Central Intelligence Agency still maintains that such a threat will not emerge until 2010, at the earliest. The distinction is both politically and militarily important, as it could heat up the national debate over development and procurement of ballistic missile defenses.

Clinton Administration plans now call for development of a limited protective shield by 2000 that could be deployed within three years, if the government gives the go-ahead. Some Republicans in Congress have long argued for a more ambitious schedule.

Rumsfeld commission members said that their estimate differed from that of US intelligence agencies because they had access to a broader array of information than individual analysts typically would. They also weighed the data in the manner of senior government officials, as opposed to technical experts.

The panel emphasized the role played by Russia and China in exporting missile technology and warned that North Korea and other nations do not follow the lengthy development and testing schedules common in US missile development.

North Korea, for instance, is already working hard on a missile that could reach Alaska or Hawaii, said the panel's report. Iran already has the technical capability to make long-range weapons, it noted.

Nerve Gas Story Takes Another Hit

Secretary of Defense William S. Cohen announced July 21 that the Pentagon's review of Operation Tailwind found no evidence to support allegations that the operation was mounted to hunt down American defectors or that US special operations forces used Sarin nerve gas during the operation.

CNN and *Time* magazine made the charges on "NewsStand: CNN & *Time*," a joint CNN/*Time* news program that first aired June 7, 1998. The same claims later were published in a *Time* magazine article.

"We studied scores of documents about Operation Tailwind and conducted interviews with soldiers and officials at all levels of command," Cohen said. "We found no evidence to support the CNN/*Time* assertions on defectors or the use of Sarin nerve gas. No document—military order, after-action report, briefing paper, or official military history—mentions pursuit of US defectors as Tailwind's mission."

DoD added that, while Sarin was stored in Okinawa in 1970, there is no evidence the nerve gas ever was sent to or used in Vietnam or Laos, as the broadcast claimed.

Cohen added, "All Americans should know the 16 men who conducted this mission were heroes, but they have been hurt by this report."

The bombshell CNN report, titled "Valley of Death," started out to be a big scoop for CNN's April Oliver, producer of the program, and Peter Arnett, who lent his name to the enterprise, but it blew up in their faces.

On July 2, after an internal investigation, CNN news group chairman Tom Johnson retracted the story and apologized to viewers, colleagues at *Time*, and to the US military personnel involved in Operation Tailwind. Concurrently, CNN fired Oliver and another producer but gave Arnett only a reprimand.

THAAD Faces Cloudy Future

Following five straight test failures, the Pentagon is considering restructuring the missile portion of the Theater High Altitude Area Defense system.

Among its options: bringing in another contractor to compete with Lockheed Martin on the $15 billion effort, which is widely seen as a forerunner to a larger National Missile Defense program.

Such a re-jiggering could delay the program for years and would likely provide ammunition to critics who say the technology for defending even small units of US troops against ballistic missile attack is far from mature.

The THAAD program is supposed to be an improvement on the Patriot missile system, which was used as a defense against Iraqi Scuds during the Persian Gulf War. It is intended to produce technology that will defend concentrations of US military forces against both short- and long-range ballistic weapons.

In the most recent THAAD failure, a test missile failed in May to hit its target over the New Mexico desert. Lockheed Martin officials say there is no systemic cause for the string of defeats. Each has been caused by different problems.

Quake Rocks Turkish Air Base

A series of earthquakes that rippled through Turkey in late June and early

July damaged all 1,500 buildings at Incirlik AB, Turkey. The estimate for repairs: around $10 million, according to base officials.

Still, the US military installation was fortunate, compared to many surrounding civilian communities. The earthquakes—the strongest of which measured 6.3 on the Richter Scale—killed 144 people and left 60,000 homeless.

Twenty-three Americans were hurt, none severely. About 20 of the 200 US families who lived off base lost their homes.

Most of the damage sustained at the air base involved broken beams, windows, plaster, and other relatively minor damage. The chapel, fitness center, and exchange were more heavily hit.

The night of the first earthquake, US personnel and local employees worked hard to get a commissary and shoppette ready to handle an influx of needy customers. "People have been working miracles here," said Col. Brad Higginbotham, 39th Support Group commander. "We had Turkish employees with great losses and more damage than we'll know report for duty without being called in."

When the shoppette opened it took the place of the heavily damaged exchange. With electricity, and thus air-conditioning, unavailable, ice was a hot seller.

"We sold a thousand bags in the first few hours," said Bob Smith, Army and Air Force Exchange Service general manager.

DarkStar Resumes Flying

Air Force officials expressed relief at the resumption of testing of the DarkStar Unmanned Aerial Vehicle.

Flight testing resumed June 29 when the second model of the high-altitude endurance UAV took to the skies over Edwards AFB, Calif.

"We are very pleased with DarkStar's flight," said Col. (sel.) Thomas Di Nino, head of the Reconnaissance Mission Area Group at the Aeronautical Systems Center, Wright–Patterson AFB, Ohio.

The DarkStar program has been on hold for more than two years, following the crash of vehicle No. 1 during its second flight April 22, 1996.

The latest air vehicle flew for 44 minutes, completing preprogrammed basic flight maneuvers. It was a successful flight that was fully autonomous from beginning to end, thanks to precise guidance from Global Positioning System data.

The No. 2 UAV underwent a series of changes in response to the first's crash. Among them was the installation of a system that hikes the nose wheel on takeoff, for a more positive angle of attack and, hence, improved lift.

With its low observable characteristics, the DarkStar UAV is intended for aerial reconnaissance in highly defended areas. Its resumption of testing comes at a crucial time, as it is under heavy attack in Congress.

Explosion Damages DMSP Satellite

On July 1, a Defense Meteorological Satellite Program satellite was slightly damaged when an external battery used in testing exploded.

The incident occurred after electrical power was applied to the battery, which was used in testing electrical subsystems, according to a statement from Air Force Space and Missile Systems Center, Los Angeles AFB, Calif.

Air Force officials said that one contractor employee was injured in the mishap. The worker was treated at a local hospital and then released. The satellite's launch, currently set for late 1999, is not expected to change.

The satellite is the first of the 5D-3 DMSP configuration. Its upgrades include an improved sensor suite, enhanced power system, and larger solar array.

ABL Passes Key Milestone

The Airborne Laser passed an important milestone June 26 when Air Force acquisition officials gave it the green light to begin finalizing the system's design.

This authority to proceed to the next stage of the program also clears the way for the Air Force to release the rest of the ABL's 1998 development funds.

Producing a laser module with a specified amount of power, and within certain size and weight restrictions, was the key to the decision. Each operational anti-missile ABL aircraft will carry 14 of the modules, with each supposed to weigh less than 3,000 pounds.

Other requirements that the ABL program office had to meet include demonstrating an ability to track a mis-

sile in flight (completed last year in tests at the Army's White Sands Missile Range, N.M.) and demonstrating an understanding of how the atmosphere might affect a laser shooting across hundreds of miles to its target.

"The [ABL] program is following the acquisition streamlining path we mapped out in 1996," said Principal Deputy Assistant Secretary of the Air Force for Acquisition and Management Darleen A. Druyun. "The program is right on cost and schedule."

The next big hurdle under the acquisition schedule will be reached in 2001, as the program aims toward the test of a missile shootdown in 2002.

USAF Looks at Tactical Use of Lasers

On June 26, the Air Force announced the beginning of a new effort to study the possible use of lasers in tactical aircraft.

The Directed Energy Applications for Tactical Airborne Combat study will have two primary objectives. The first will be to identify promising ways in which directed energy weapons, such as lasers, can be used from airborne platforms in tactical roles. The second will be to figure out what the Air Force needs to do, technologically, to develop such weapons.

"We'll be looking exclusively at directed energy concepts at a range of power levels, to address weapon and mission-support applications," said study leader Bill Thompson of the Air Force Research Laboratory's Directed Energy Directorate at Kirtland AFB, N.M. "We'll also be considering a variety of airborne mediums, from manned aircraft to remotely piloted vehicles."

The Air Force interest in lasers as weapons dates back at least 20 years. In the early 1980s, USAF researchers conducted experiments with the Airborne Laser Laboratory, a laser-carrying KC-135 that shot down five air-to-air missiles and a target drone. This work has blossomed with the Airborne Laser.

Overall direction for the effort will be provided by retired Gen. Ronald R. Fogleman, former USAF Chief of Staff. The first phase is expected to take three months, with a final report due next February.

"The final results of the study will hopefully identify and justify high-payoff concepts for future warfighting," said Thompson.

Britain Plans C-17 Purchase

The British government has announced that it intends to acquire four C-17 airlifters, or equivalent aircraft, to meet new short-term air mobility requirements. If the Globemaster wins this contract—highly likely, given that no "equivalent aircraft" really yet exists—it would mark the first international sale for the C-17.

The UK Ministry of Defense announced the prospective purchase as part of its July 8 release of a new Strategic Defense Review.

The review calls for the restructuring of the nation's current Joint Rapid Deployment Force into several Joint Rapid Deployment Forces, each with its own land, sea, and air components. This strategic expansion would give Britain the capability to handle two Bosnia-sized confrontations simultaneously, according to the study.

A Boeing spokesman said, "We think the C-17 meets the needs for [the British] rapid reaction force, and we look forward to working with the UK to make this happen."

B-1B Pushes Swing-Wing Envelope

A flight test program now under

way at Edwards AFB, Calif., is studying the B-1B's flying qualities when its wings are set at a 45-degree sweep. The point of the Intermediate Wing Sweep Flight Test Program is not just theoretical: With its wings set at such an angle, Lancers can fly at airspeeds that are more compatible with other types of aircraft in a strike force package.

With a 45-degree angle "we also expect to see slightly improved efficiency at cruise altitudes," said project leader Capt. Duncan Dversdall, 419th Flight Test Squadron.

Currently, the adjustable wings of the B-1B are cleared for use at settings of 15, 25, 55, and 67.5 degrees. When moving wings between these positions, pilots must now observe strict maneuvering limits and transition the wings from one setting to the next without stopping.

Clearing a 45-degree wing sweep envelope will require a structured, step-by-step flight process.

"We don't just go out and fly to the edge of the envelope," said Keith Keller, the program's lead engineer. "We start flight testing at a certain altitude, airspeed, etc., determined to be safe by previously collected flight test data or simulation. We then expand the envelope, step by step."

Final flight in the program is scheduled to take place in mid-September.

Florida Wildfires Burn Eglin

Wildfires that ravaged tinder-dry Florida in early summer burned Eglin AFB in the process, flaming across at least 2,200 acres of the installation by early July.

The constant threat of new fires kept Eglin wildland fire managers in a constant state of alertness. Resources came from all parts of the base.

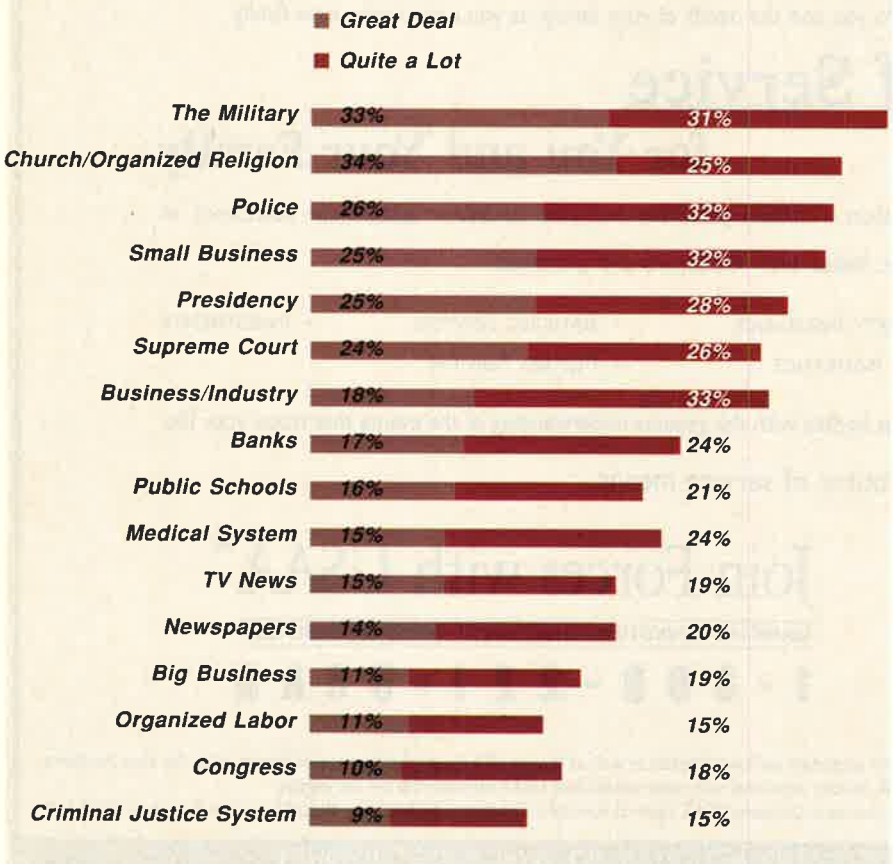
"To monitor the fires from the air and to direct the firefighters, we've used Eglin Aero Club aircraft. The 40th Test Squadron flew their UH-1 with a 'Bambi' bucket and dropped water on the fire, and members of the 796th Civil Engineer Squadron helped the firefighters on the perimeter of the fires," said Lt. Col. Mike Newberry, Air Force Development Test Center environmental management director.

The northwest panhandle of Florida, where Eglin is located, received less than two inches of rain from April through June. Temperatures averaging 95 to 100 degrees have only compounded the problem.

"It's taking its toll, but we're managing," said Newberry.

Military Tops in Public Confidence

The June Gallup poll on the public's confidence in major American institutions placed the military in first place in the overall rankings. Gallup found that 64 percent of the public had a "great deal" or "quite a lot" of confidence in the armed forces, surpassing the second place finisher, "church/organized religion," by 5 percentage points. The military actually moved up in the past year, overtaking "small business," which topped the list in 1997.



AU Launches New Air and Space Basic Course

USAF officially opened its new Air and Space Basic Course School July 20 at Air University, at Maxwell AFB, Ala., with Class 98-A. This initial test class comprised 312 students, said Air Force officials.

The course was the brainchild of retired Gen. Ronald R. Fogleman when he was USAF Chief of Staff. Following some 15 months of planning and preparation, the ASBC launched its seven-week test course.

"Over the past decade, we've lost the knowledge of what it means to be an airman," claimed Gen. Lloyd W. "Fig" Newton, commander of Air Education and Training Command, which operates AU. "This course will bring all of our newly commissioned officers together and create a common understanding of how all the elements of our force fit together."

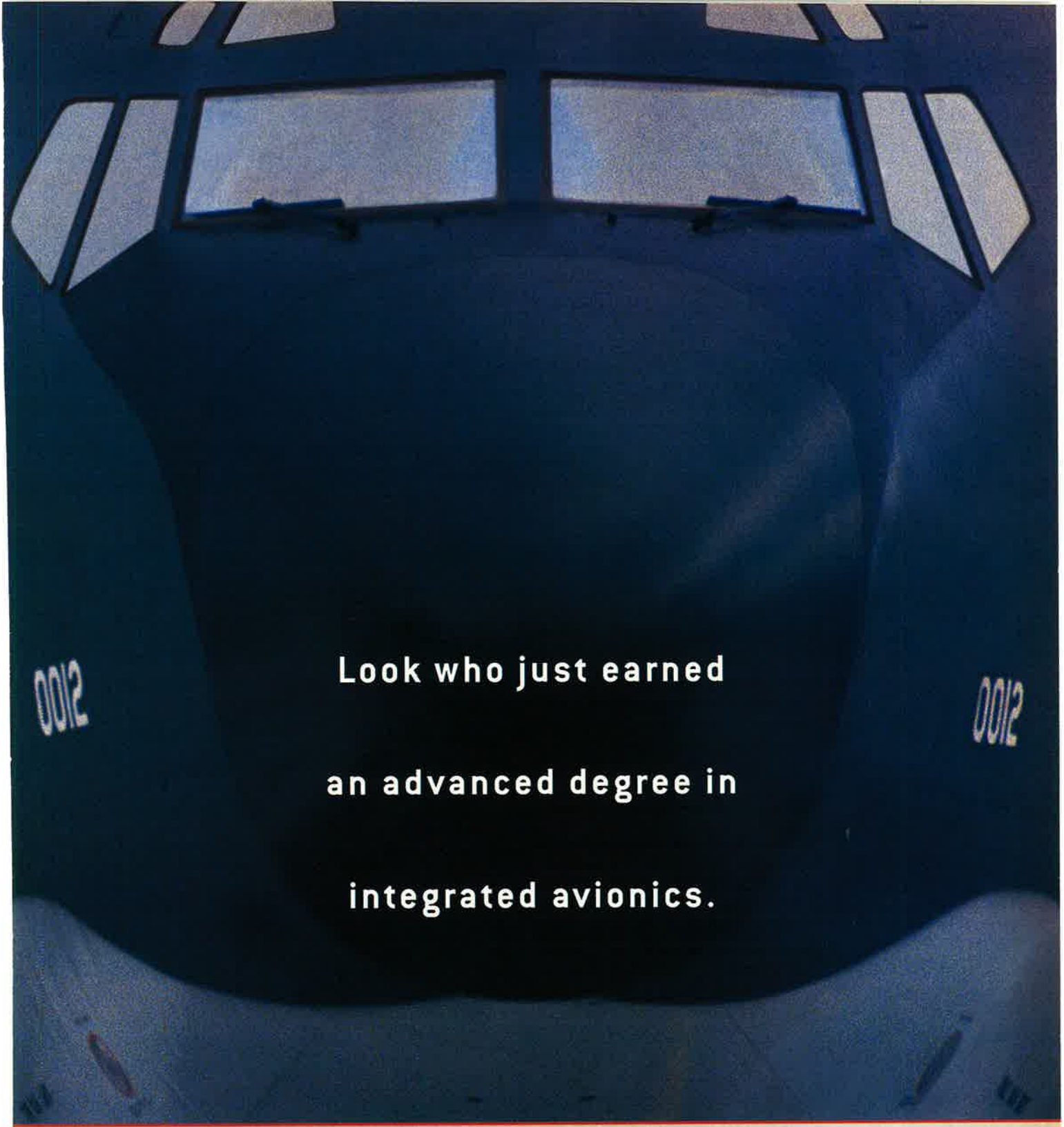
ASBC's curriculum aims to strengthen knowledge of and adherence to Air Force core values and core competencies. Besides presenting concepts like air and space superiority and agile combat support, ASBC is centered around Professional Military Education, potentially becoming an integral part of officer PME.

The general said, "It will help move us away from being Air Force specialists and move us much closer to being warfighting strategists."

Navy Commissions New Carrier

The US Navy on July 25 commissioned USS *Harry S. Truman,* the eighth Nimitz-class carrier to sail in the American fleet.

The nearly 100,000-ton nuclear-powered warship, designated CVN-75, "came alive" during a ceremony at Pier



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The first production T-6A Texan II flew for the first time in July. The Raytheon turboprop trainer lifted off the runway at about 97 mph and rose to 13,000 feet. The Joint Primary Aircraft Training System program calls for more than 700 T-6As, split between the Air Force and the Navy, to be built through 2014.

12, at Norfolk Naval Base, Va. The event drew numerous dignitaries, including Secretary of Defense William S. Cohen and President Bill Clinton, who served as the principal speaker at the commissioning ceremony.

Harry S. Truman joins the Navy's Atlantic Fleet with a crew of 3,300. An air wing of 2,500 personnel will support the 80 aircraft on board.

Other ships of the class are *Nimitz, Eisenhower, Vinson, Theodore Roosevelt, Lincoln, Washington,* and *Stennis.* These will be joined by at least two more Nimitz-class carriers, *Reagan* and an unnamed warship, CVN-77.

EFX 98 Gets Under Way

For two weeks this month, the 366th Wing, Mountain Home AFB, Idaho, deploys to Eglin AFB/Hurlburt Field, Fla., to play a major role in the 1998 Expeditionary Force Experiment, or EFX 98.

EFX is a new series of annual experiments that explore emerging technologies, procedures, and requirements to strengthen Air Force competencies.

This year's experiment will integrate improved command-and-control capabilities with an air expeditionary force to validate how the Air Force will look and fight in the next century, according to Air Force officials.

The wing will provide the largest contingent of people and aircraft. The scenario calls for the unit to deploy to "Southwest Asia" and halt an armored attack.

FAA Honors AWACS Members

Two members of the 552d Air Control Wing from Tinker AFB, Okla.,

were honored July 21 for rescuing a lost private pilot.

The Federal Aviation Administration awarded Capt. Craig Wilson, 552d Operational Support Squadron, and Maj. Conrad Namiesniowski, 965th Airborne Air Control Squadron, certificates of appreciation for their role in saving the pilot's life.

On May 15, the two were aboard an E-3 Sentry aircraft en route to an air show in Montreal. As the aircraft commander, Wilson was monitoring VHF Guard, an emergency frequency used by pilots. He heard a distress call and monitored the conversation between the FAA and the pilot, who was on her first solo cross-country flight. Hazy conditions caused the pilot to become disoriented and unable to navigate, said Wilson.

Wilson opened communications with the pilot as the air surveillance officer identified the aircraft and entered into the computer the coordinates for the airport she was trying to find. Namiesniowski, the Sentry's mission crew commander, reported to Wilson that the pilot was 50 miles from her intended destination and was flying directly away from it. Wilson then gave her vectors to get her headed in the correct direction and guided her to the landing.

Relief Flights Reach New Guinea

The first US shipment of relief supplies for Papua New Guinea, devastated by a tidal wave, arrived July 23 on an Air Mobility Command C-141 Starlifter.

The aircraft, from the 8th Airlift Squadron, McChord AFB, Wash., delivered 20,000 pounds of medical supplies, clean water, tents, cots, and plastic coverings to Red Cross workers who distributed the supplies to villages in the region.

A 30-foot-high tidal wave struck the northern coast of the island nation July 17. More than 2,000 people were confirmed dead and thousands more were listed as missing, presumably sucked out to sea when the wave receded.

Once the supplies reached the island, the Australian Defense Forces flew the supplies to the remote areas where they were needed most. Smaller Australian C-130s were able to land on short and remote runways near the hardest hit areas.

News Notes

■ The first production T-6A Texan II primary training aircraft took to the skies July 15 at Raytheon Aircraft's Beech Field in Wichita, Kan. USAF and the US Navy will eventually train all new pilots in the Texan II, with the

Air Force scheduled to activate the new aircraft at Randolph AFB, Texas, in April 1999.

■ In St. Louis July 8 Boeing workers began assembling their firm's entry in the Joint Strike Fighter competition. Some 190 workers are putting together the airplane's first piece—the 16-foot-long forebody.

■ The Air Force took delivery of its first Joint Direct Attack Munition June 24 at the Boeing JDAM facility in St. Charles, Mo.

■ The 3d Wing from Elmendorf AFB, Alaska, won the crown of Best Air Mobility Wing at this year's Rodeo competition at McChord AFB, Wash. The 3d's victory denied 19th Air Refueling Group's quest for a "three-peat" in the wake of its 1994 and 1996 victories.

■ The C-17 Globemaster *Spirit of Berlin* delivered a sculpture commemorating the fall of the Berlin Wall, a gift from the US to Germany, in time for an unveiling by former President George Bush in a July 2 ceremony. The sculpture, produced by New Mexico artist Veryl Goodnight, is a bronze depicting five horses racing to freedom as they jump over the remains of the graffiti-covered wall.

■ On July 8, Raytheon Systems held a rollout ceremony for the first production AGM-154A Joint Standoff Weapon produced under the first low rate initial production contract awarded in February 1997.

■ The World War II Memorial design concept won final approval from the National Capital Planning Commission July 9. The design, which features granite arches opening onto a central memorial plaza, will be constructed on a site at the east end of the Reflecting Pool on the National Mall, between the Lincoln Memorial and the Washington Monument.

■ Damage to two unoccupied trailers, which were part of a cosmic-ray observatory, at the US Army's Dugway Proving Grounds, Utah, caused by an Advanced Cruise Missile AGM-129 during a test, happened partly because the University of Utah placed the observatory in an area reserved for hazardous operations, and the missile's communications suite was not configured adequately, according to a USAF accident report released July 10. However, the missile had completed all test objectives, officials stated.

■ Defense officials unveiled a mural celebrating the 25th anniversary of the All Volunteer Force during a Pentagon ceremony July 7. The mural, which hangs outside the office of Undersecretary of Defense for Personnel and Readiness Rudy DeLeon, is composed of photos illustrating such military virtues as courage, honor, and teamwork.

■ MSgt. Tim Brown, 30th Security Forces Squadron, Vandenberg AFB, Calif., received the Airman's Medal June 26 for saving three people in the waters off Vandenberg's coast on Christmas Day.

■ An F-16 assigned to the 514th Test Squadron at Hill AFB, Utah, crashed on the flight line June 19. The pilot ejected safely.

■ In a surprise ceremony at a Rotary Club luncheon in Gilmer, Texas, former Army Air Corps Lt. Richard Potter finally received the Distinguished Flying Cross he had earned as a B-17 navigator while flying missions over Germany. The presentation was arranged by a fellow Rotarian and retired Air Force pilot Steve Dean.

■ Denise Daly, a secretary with Air Force Materiel Command's Mission Systems Branch in the Communication and Information Directorate at Wright–Patterson AFB, Ohio, helped save a driver in diabetic shock during an otherwise-typical drive home in late May. After noticing a red pickup's erratic behavior, Daly parked her own car and reached in to turn off the slow-moving truck's ignition. The barely conscious driver revived after being given insulin by ambulance medics.

■ After 20 years, Air Force Reserve Command has a new slogan: "Air Force Reserve—Above & Beyond."

■ Bennie L. Cole, an employee in the Manpower and Quality Office at

Index to Advertisers

Kelly AFB, Texas, saved an airman from serious injury or worse by crashing his car into a moving station wagon. The wagon's driver was trying to escape from A1C Patrick Villarreal, a member of the 76th Security Forces Squadron on base. Villarreal had ordered the driver out of the car, then attempted to remove an infant from the rear seat, when the driver jumped back in and took off with Villarreal caught and hanging from the car's doorframe.

Obituaries

Alan B. Shepard Jr., the first American to fly in space and the fifth to walk on the moon, died July 21 in Monterey, Calif., at 74. He had leukemia.

Shepard was one of the great heroes of the early manned space program. He was one of the original seven astronauts chosen in 1959. On May 5, 1961, he rode the Mercury Freedom 7 spacecraft on a suborbital flight that took him into space for five minutes and returned to Earth after only 15 minutes. Despite the brevity of the flight, its impact was electrifying and brought Shepard lasting fame.

On Feb. 4, 1971, as commander of the Apollo 14 flight, he and Edgar D. Mitchell spent 33 hours on the moon. They and the third crew member, Stuart A. Roosa, splashed down in the Pacific Feb. 9. It was on this flight that Shepard produced a golf club that he had carried on board and hit two golf balls, one of which sailed a tremendous distance in the moon's weak gravity.

Shepard was a graduate of the US Naval Academy, a World War II veteran, and noted test pilot. His decorations included the Medal of Honor for his exploits in space. He retired from the Navy with the rank of rear admiral.

World War II Civil Air Patrol pioneer **Col. William D. "Pappy" Madsen** died June 23 in his native Colorado Springs, Colo. He was 85. Madsen had gained fame as the architect of a massive effort to link defense plants and military installations in the western US via a CAP "airline" consisting of volunteer pilots flying light aircraft.

Retired **Maj. Gen. Marion E. Carl,** one of the leading Marine air aces of World War II and a record-setting test pilot, was shot to death June 28 in a robbery at his home in Roseburg, Ore. He was 82. Carl, credited with 18.5 kills in the Pacific, set a world airspeed record Aug. 25, 1947, flying a Douglas Skystreak at more than 650 mph over Muroc Dry Lake, Calif. ■

Senior Staff Changes

RETIREMENTS: Brig. Gen. Theodore C. **Almquist,** Brig. Gen. James R. **Beale,** Brig. Gen. John S. **Boone,** Maj. Gen. James S. **Childress,** Maj. Gen. Clinton V. **Horn,** Gen. James L. **Jamerson,** Maj. Gen. George P. **Lampe,** Gen. Walter **Kross,** Lt. Gen. Eugene D. **Santarelli,** Maj. Gen. Ervin C. **Sharpe Jr.,** Brig. Gen. William E. **Stevens.**

NOMINATIONS: To be **Lieutenant General:** Maxwell C. **Bailey,** Charles R. **Heflebower.**
To be **Major General:** Kenneth W. **Hess.**
To be **Brigadier General:** David A. **Wagie.**

CHANGES: Lt. Gen. (sel.) Maxwell C. **Bailey,** from Dir., Ctr. for Ops., Plans & Policy, USSOC, MacDill AFB, Fla., to Cmdr., 21st AF, AMC, McGuire AFB, N.J. ... Brig. Gen. Paul L. **Bielowicz,** from Cmdr., Defense Supply Ctr. Columbus, DLA, Columbus, Ohio, to Cmdr., San Antonio ALC, AFMC, Kelly AFB, Texas ... Brig. Gen. John L. **Clay,** from Vice Cmdr., SMC, AFMC, Los Angeles AFB, Calif., to Dir., Space & Nuclear Deterrence, Asst. SECAF for Acq., Pentagon ... Lt. Gen. Russell C. **Davis,** from Vice Chief, NGB, Pentagon, to Chief, NGB, Pentagon ... Lt. Gen. Phillip J. **Ford,** from Cmdr., 8th AF, ACC, Barksdale AFB, La., to Dep. CINC, USSTRATCOM, Offutt AFB, Neb. Brig. Gen. (sel.) Michael A. **Hamel,** from Mil. Advisor to the Vice President, Washington, to Vice Cmdr., SMC, AFMC, Los Angeles AFB, Calif. ... Lt. Gen. John W. **Handy,** from Cmdr., 21st AF, AMC, McGuire AFB, N.J., to DCS, Instl. & Log., USAF, Pentagon.

Lt. Gen. (sel.) Charles R. **Heflebower,** from Asst. C/S, Ops./Log. Div., SHAPE, NATO, Belgium, to Vice Cmdr., PACAF, Hickam AFB, Hawaii ... Maj. Gen. Charles R. **Henderson,** from Dir., Ops. & Tng., Air & Space Ops., USAF, Pentagon, to Dir., Strategic Plans & Policy, USSTRATCOM, Offutt AFB, Neb. ... Lt. Gen. Nicholas B. **Kehoe** III, from Dep. Chairman, NATO Mil. Cmte., Brussels, Belgium, to IG, OSAF, Pentagon ... Brig. Gen. Michael S. **Kudlacz,** from Dep. Dir., Ops. & Tng., Air & Space Ops., USAF, Pentagon, to Dir., Ops. & Tng., Air & Space Ops., USAF, Pentagon ...

Lt. Gen. Ronald C. **Marcotte,** from Dir., Strategic Plans & Policy, USSTRATCOM, Offutt AFB, Neb., to Cmdr., 8th AF, ACC, Barksdale AFB, La. ... Brig. Gen. (sel.) David L. **Moody,** from Dir. of Inspections, OSAF, Pentagon, to Dep. Dir., Ops. & Tng., Air & Space Ops., USAF, Pentagon ...Brig. Gen. (sel.) Quentin L. **Peterson,** from Chief, Checkmate Div., DCS, Air & Space Ops., USAF, Pentagon, to Dir., Trnsp., DCS, Instl. & Log., USAF, Pentagon ... Maj. Gen. (sel.) Harry D. **Raduege** Jr., from Dir., C^4, USCENTCOM, MacDill AFB, Fla., to Dir., C^2 Sys., NORAD and USSPACECOM and Dir., Comm. & Info., AFSPC, Peterson AFB, Colo. ... Maj. Gen. James E. **Sandstrom,** from Dir., C^2, Air & Space Ops., USAF, Pentagon, to PAD (Intl. Affairs), SECAF, Pentagon ... Brig. Gen. Mary L. **Saunders,** from Dir., Trnsp., DCS, Instl. & Log., USAF, Pentagon, to Cmdr., Defense Supply Ctr. Columbus, DLA, Columbus, Ohio ... Brig. Gen. (sel.) Robert P. **Summers,** from Dep. Dir., Ops., AFSPC, Peterson AFB, Colo., to Vice Cmdr., Sacramento ALC, AFMC, McClellan AFB, Calif. ... Maj. Gen. Eugene L. **Tattini,** from Cmdr., Sacramento ALC, AFMC, McClellan AFB, Calif., to Cmdr., SMC, AFMC, Los Angeles AFB, Calif. ... Brig. Gen. Michael P. **Wiedemer,** from Vice Cmdr., Sacramento ALC, AFMC, McClellan AFB, Calif., to Cmdr., Sacramento ALC, AFMC, McClellan AFB, Calif. ... Lt. Gen. (sel.) John L. **Woodward** Jr., from Dir., C^2 Sys., NORAD and USSPACECOM and Dir., Comm. & Info., AFSPC, Peterson AFB, Colo., to Dir., C^4 Sys., Jt. Staff, Pentagon.

SEA CHANGES: CMSgt. Gary R. **Broadbent** to Air National Guard Bureau, Pentagon.

SENIOR EXECUTIVE SERVICE RETIREMENTS: Joseph K. **Black,** Carl F. **Klele,** Robert A. **Lach,** Florence W. **Madden,** Charles V. **Van Norman.**

SES CHANGES: Donald L. **Cazel** II, to Dir. Financial Mgmt., San Antonio ALC, Kelly AFB, Texas ... Grover **Dunn,** to Assoc. Dir. of Maintenance, Instl. & Log., Pentagon ... Don W. **Fox,** to Dep. General Counsel, Civilian Personnel & Fiscal Law, General Counsel, OSAF, Pentagon ... Sandra G. **Grese,** to Dep. Dir., Personnel Force Mgmt., USAF, Pentagon ... Jacqueline **Henningsen,** to Assoc. Dir. for Modeling, Simulation, & Analysis, Air & Space Ops., USAF, Pentagon ... Joseph T. **Kammerer,** to Dep. Asst. Secy., Cost & Economics, Fin. Mgmt., OSAF, Pentagon ... Margaret **Leclaire,** to Dep. Dir., Global Combat Support Sys., Instl. & Log., USAF, Pentagon ... Albert F. **Lowas,** to Dir., AF Base Conversion Agency, Arlington, Va. ... Charles F. **McBrearty,** to Dir., Materials Technology, Patrick AFB, Fla. ... Terry L. **Neighbor,** to Assoc. Dir., Air Platforms, AFRL, Wright–Patterson AFB, Ohio ... Clifford E. **Rhoades** Jr., to Dir., Mathematics & Geoscience, Office of Scientific Research, Bolling AFB, D.C. ... David Jan **Steele,** to Program Dir., Strategic & Nuclear Deterrence C^2, ESC Det. 5, Peterson AFB, Colo. ■

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Verbatim

Permanent Crises

"We finally got the message; some of these contingencies are not going to go away."

Gen. Michael E. Ryan, USAF Chief of Staff, at an Aug. 4, 1998, unveiling of a new "Expeditionary Aerospace Force" structure designed to help the Air Force cope with the strains of post–Cold War operations.

Horner on the War

"I disagree [with assertions that] there were tensions [among Desert Storm campaign planners] between bombing the Iraqi army and [bombing] Baghdad. That thought might be gained from listening to Col. [John] Warden, who wanted not to bomb the Iraqi army. He didn't think it necessary, and that is why he didn't get the job as head planner. From the start of the war, we bombed both. ...

"There were some tensions between some of the land forces, as to who should get priority of effort from the air strikes in January and February, but this was always resolved [for me] by [Army Gen. H. Norman] Schwarzkopf, who was the Land Force Component Commander, because he was also the CINC [commander in chief]. ...

"In the end, some [Army] Corps tried to get more air by submitting longer lists; it didn't work, as much of their list was bogus. Others knew I knew what I was doing and sent in very short lists and no requests for CAS [close air support]. They trusted the airmen. ...

"That's about the only tensions I am aware of, between the corps commanders, some with each other and some with Schwarzkopf. But they pretended they were mad at me. [It] made life much easier for them."

Gen. Charles A. Horner, USAF (Ret.), the Desert Storm air boss, in an interview on the* Washington Post *web site Aug. 2, 1998.

Iran and the Bomb

"We believe that [Iran] does have a clandestine nuclear weapons program. ... People tend to say that it [acquisition by Tehran of such a weapon] is many years off. ... I would want to be a bit cautious about that because I think there are large gaps in our knowledge as to what is going on there. [Iran is seeking to] acquire technologies for that program that are quite disturbing."

Ambassador Martin Indyk, assistant secretary of state for Near Eastern Affairs, at July 28, 1998, Defense Writers Group session.

Not So Fastidious

"The fact of the matter is, it [ballistic missile attack against the United States] is going to come quicker, in my opinion, than I think many of us would realize. ... We're finding that countries who are developing these systems today are not doing it the way we [the superpowers] did. They're not going for accuracy. They're going for having the capability—which, in fact, is an indication of military might and national power. ...

Nobody has a crystal ball and knows exactly what's happening. Based on what we've seen going on elsewhere, you get this feeling that there's more going on than we know about."

Gen. Howell M. Estes III, head of North American Aerospace Defense Command, US Space Command, and Air Force Space Command, in a July 29, 1998, session with the Defense Writers Group.

Blame Enough for All

"We have failed to modernize the force. We're losing qualified men and women. We're having to lower our recruiting standards. ... I've got to also tell you that Congress ... has great culpability in this degeneration of our military capability. The pork-barrel spending is at an all-time high. ...

The lack of appreciation of the problems [that] the men and women in the military face—and now the belief that, somehow, the defense budget is a way to fund a hometown pork-barrel project and pump up the National Guard at the expense of the regular forces—I think is really very serious."

Sen. John McCain (R–Ariz.), member of the Senate Armed Services Committee, in a July 5, 1998, broadcast of "Fox News Sunday."

Much Greater Dependence

"We have staked our way of life on the use of information. We rely more and more on computer networks for the flow of essential information. Like electricity, we now take information infrastructures for granted. Reliability breeds dependence, and dependence produces vulnerabilities. ...

Disruptions in information-based technologies can range from being a serious nuisance ... to potentially disastrous. Consider what such a disruption would have caused in Operation Desert Storm, where our information systems had to accommodate a communications volume of 100,000 electronic messages and 700,000 telephone calls a day.

Seven years later, those figures would be far greater, and our reliance on computers is much greater as well."

George J. Tenet, director of Central Intelligence, in a June 24, 1998, statement to the Senate Governmental Affairs Committee.

Thirties Something

"This year is the first since Ronald Reagan was elected President where I think we have to raise the alarm about our national survival. We should be very clear: The Clinton–Gore Administration is the most consistently misleading administration on the question of American survival that we have seen. I think it rivals, frankly, the administration of [1930s British Prime Minister] Stanley Baldwin, ... who came very close to destroying Britain by his refusal to tell the truth about Germany."

House Speaker Newt Gingrich (R–Ga.) in a July 23, 1998, address to a Young Republicans meeting in Washington, with reference to the growing worldwide ballistic missile threat. ■

The new American Air Museum in Britain is a working monument to a common aviation heritage.

A Heritage Shared

Photography by Guy Aceto, Art Director, **and Paul Kennedy**

Artifacts from more than 80 years of Anglo–American aviation history and camaraderie can be found within the American Air Museum in Britain—an important new addition to the famous Imperial War Museum complex at Duxford, United Kingdom.

Photo by Paul Kennedy

Staff photo by Guy Aceto

Less than 50 miles north of London stands the American Air Museum in Britain, at Duxford. Once an important base for the Royal Air Force, the airfield at Duxford has been part of the Imperial War Museum since 1977. The scene around this old airfield is just as much an attraction as its aircraft. Many of the vintage buildings have remained just as they were during World War II when the base was a hub of military activity. Today, Duxford still operates as an active airfield and is home to the world's largest restoration facility. It also enjoys an international reputation as the leading center of aviation history in Europe. At left, the sight of this British Spitfire taxiing down the runway is not uncommon here and adds to the museum's charm.

In 1986, as part of a plan to centralize its collection of American aircraft, the Imperial War Museum began making plans for what would later become known as the American Air Museum in Britain. Designed by renowned architect Sir Norman Foster and funded almost entirely by the Heritage Lottery Fund, as well as donations from British patrons and the museum's 60,000 American founding members, the museum's doors officially opened to the public Aug. 1, 1997. Queen Elizabeth II attended the dedication ceremony. Within the colossal complex resides 21 restored aircraft along with a host of other equipment and memorabilia. The 70,000 square-foot space is home to the largest collection of historic American combat aircraft outside the US.

Staff photo by Guy Aceto

Staff photo by Guy Aceto

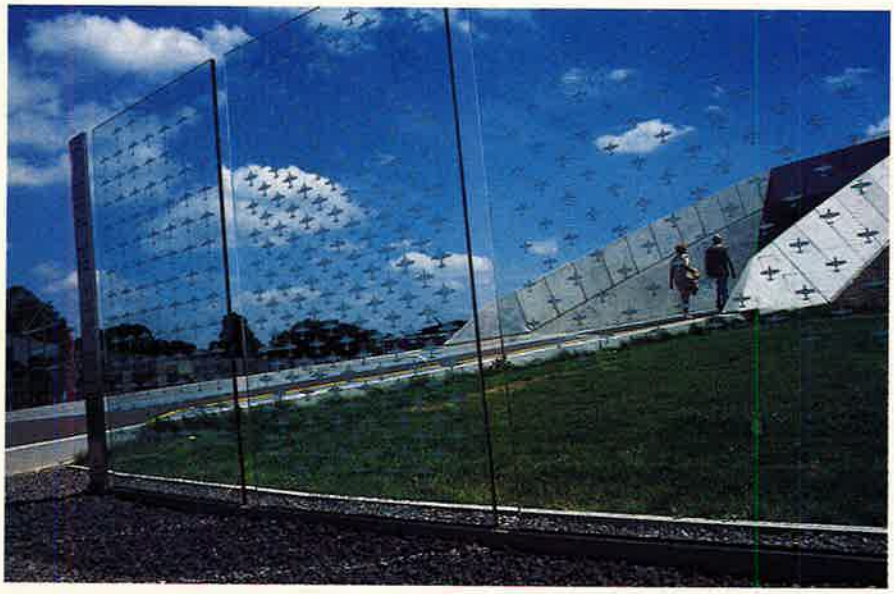


Photo by Paul Kennedy

Lining the walkway at the museum's entrance is this beautiful glass sculpture entitled "Counting the Cost." Etched on 52 glass panels is an outline of each aircraft missing in action from Eighth and Ninth Air Forces and US Navy operations out of Britain during World War II. Above, local schoolchildren move in for a closer look.

Photos by Paul Kennedy

Inside the complex, from floor to ceiling, the aircraft are divided into four theme zones: World War II in Europe, World War II in the Pacific, the Cold War, and the Persian Gulf War. They are arrayed to depict the history of the American aviation experience in Britain in a chronological and accurate fashion. Above, this T-33, part of the Cold War zone, appears to be going in for a landing from its position just above an F-86 Sabre. At right, a Soviet SA-2 Surface-to-Air Missile peacefully coexists near a B-52, while a U-2, just above it, appears as if in flight.

Each aircraft is symbolic of its particular period and may also have an individual story. For instance, the museum's B-52 represents the BUFFs stationed in Britain during the Cold War. At the same time it is a 200-mission veteran of the Vietnam War.

Below right, this PT-17 Stearman trained hundreds of pilots during World War II.

Staff photo by Guy Aceto

Inside Hangar 5, Duxford's team of restoration experts mesh the past with the present. The conservation and restoration of large exhibits and aircraft are its primary and most important functions. At any given time, there are a number of "works in progress," usually in full view of visitors, many of whom return to follow the progress of their favorite project. At right, two technicians work on a rare Avro Anson twin-engine RAF utility aircraft using the small model in the lower right to capture every detail and create as authentic a look as possible.

Photo by Paul Kennedy

Staff photo by Guy Aceto

Due to the large number of projects under way, the museum relies heavily on volunteers to help complete many of its works. This rare Junkers Ju-52 is currently undergoing long-term restoration and isn't expected to be finished until sometime in 1999. At left, in the chair underneath the aircraft's fuselage, full-time employee Eric Perrott painstakingly fashions a part for this delicate aircraft. Next to him and also in the photo below right, volunteer Veronica Mitton, an aerospace engineering student at the University of Bath in Britain, cleans grease from the control rods in one of the tighter spots on the aircraft.

Photo by Paul Kennedy

Above, technician Terry Gilroy takes his time over every detail to bring into pristine condition this British Hurricane, which was rescued from a crash site in Russia.

Staff photo by Guy Aceto

Photo by Paul Kennedy

The Duxford complex is also home to privately owned vintage aircraft collections. The Old Flying Machine Company, one of the museum's tenants, helps maintain Duxford's collection and, in turn, receives assistance in keeping its aircraft in top flying condition. Above, technician Robert Vernon works on the company's T-33. Many of these aircraft have appeared in movies and are favorites at air shows around the world. On most days, visitors can see these classics in the sky or revving up on the ground.

Another Duxford tenant, Classic Wings, offers visitors the opportunity to fly around the airfield in this 1934 De Havilland Dragon Rapide, a biplane airliner, at right and below.

The Duxford countryside may seem familiar since it was the setting for the 1969 movie "The Battle of Britain" and the 1990 version of the movie "Memphis Belle."

Staff photos by Guy Aceto

Staff photos by Guy Aceto

What American aircraft collection would be complete without the B-17 Flying Fortress? Perfect right down to the name on its nose, this B-17 is presented with the markings of Mary Alice, *an aircraft flown by the 401st Bomb Group out of Deenethorpe.*

Inside this beautifully restored B-17, the waist gunner positions look ready for actual combat. Perhaps the best known American bomber of World War II, the B-17 made a name for itself as the Eighth Air Force's main aircraft during the daylight bombing raids over Germany.

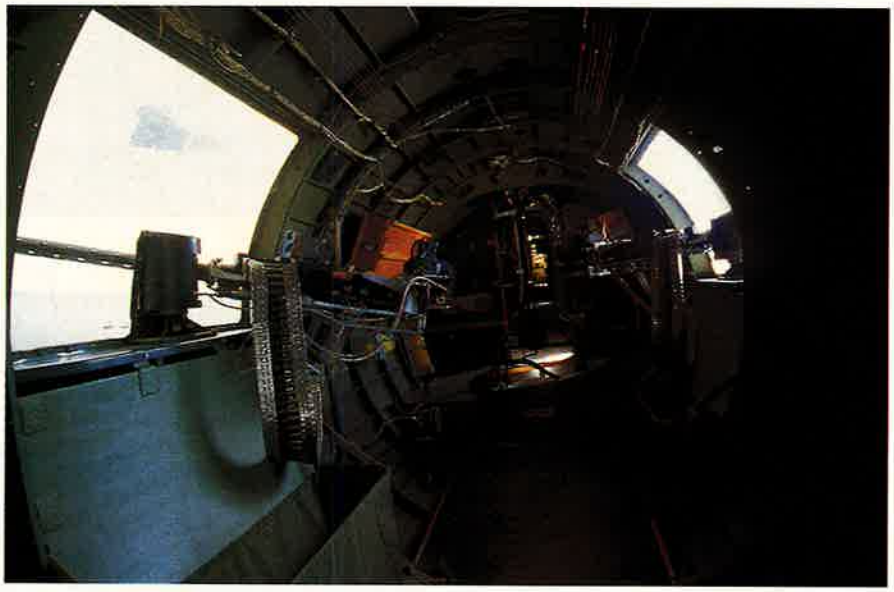


Photo by Paul Kennedy

Photo by Paul Kennedy

Also among the museum's collection is its growing exhibition of US military uniforms and memorabilia donated by charter members and collectors. At left, a curator puts the finishing touches on a brigadier general's uniform. It belonged to the late Hollywood film star Jimmy Stewart, a B-24 pilot during World War II.

Staff photo by Guy Aceto

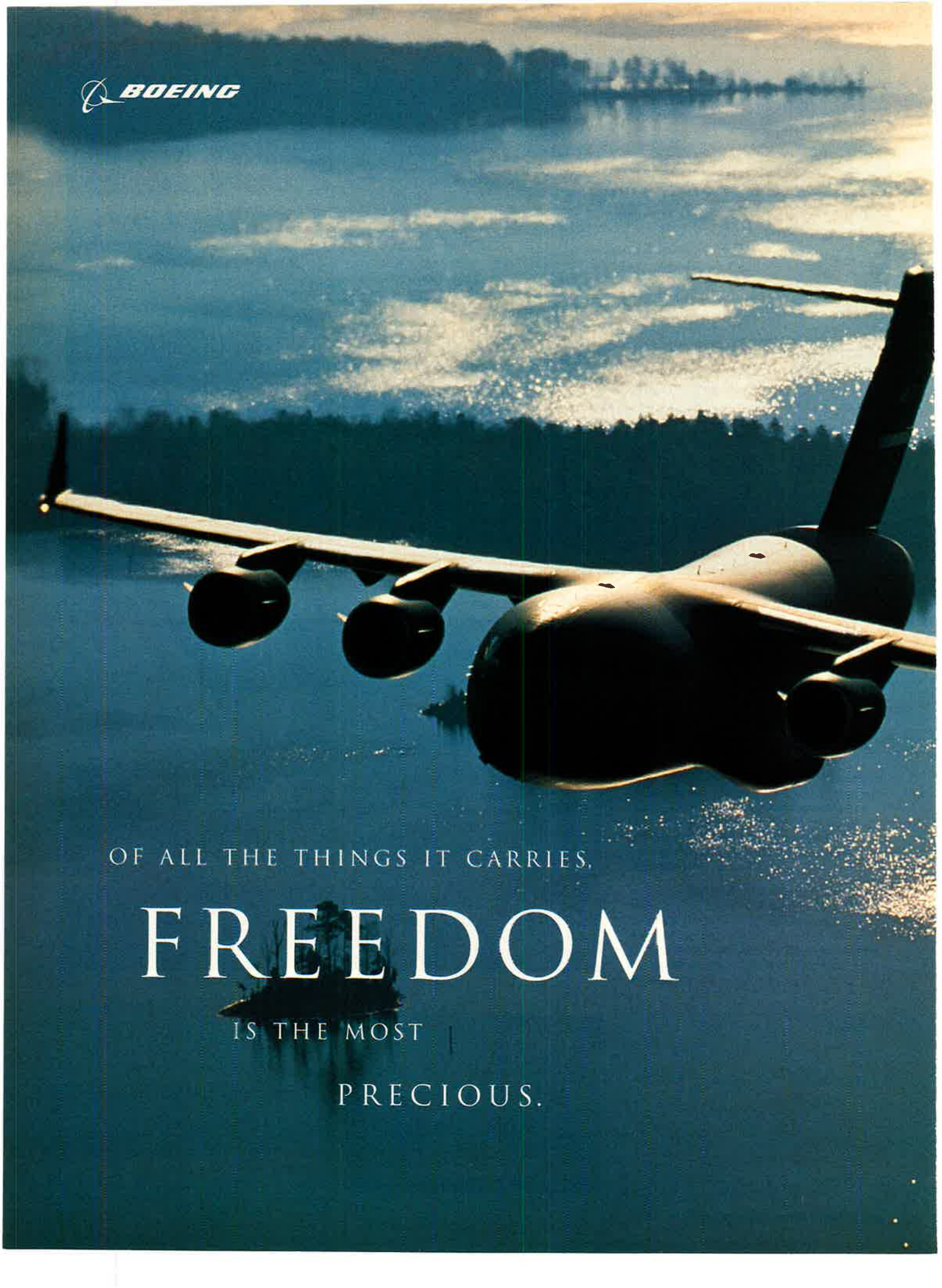
A veteran of the Normandy Invasion, this C-47 transport (above) arrived at the museum in top condition and stands today as it did just over 50 years ago. Above it, the AT-6 Texan trainer was another staple of World War II.

The museum's large collection houses some rare pieces, including a B-29 (its tail shown in the bottom photo) displayed in Korean War markings. The largest restoration project the museum has ever undertaken involved a B-52, much of which had to be moved into and assembled within the building before construction crews completed the walls.

More than 30,000 American airmen serving in Britain lost their lives during World War II. The American Air Museum in Britain helps preserve testimony to their courage and sacrifice that will live on for generations to come. ■

Photo by Paul Kennedy

Staff photo by Guy Aceto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Staff photo by Guy Aceto

Evolving theater airlift requirements are forcing USAF to re-evaluate its organization and equipment needs.

Local

Lift

THEATER airlift may have finally found a permanent home. Having been passed back and forth between airlift and warfighting commands since World War II, the theater lift community has been adopted by Air Mobility Command, and the relationship, now in its second year, seems healthy. While there are still some bugs to be worked out, the mission and the tools needed to accomplish it are getting renewed attention and priority.

In fact, while other mission areas throughout the Air Force will continue to struggle with ever-lengthening equipment age, theater lift assets will actually modernize ahead of schedule, and a long-term plan recently approved by the Air Staff calls for consistent improvements that should keep intratheater lift mechanically sound for the foreseeable future.

The theater lift force—dominated by the C-130 Hercules fleet—joined AMC "a little over a year ago, and that is working out very well," according to Brig. Gen. Duncan J. McNabb, commander of AMC's Tanker Airlift Control Center at Scott AFB, Ill. Addressing a June AFA symposium in St. Louis, McNabb noted that the "repatriation" of C-130s to AMC was undertaken to foster a more "seamless" air mobility structure.

Theater airlift had been within the purview of the old Military Air Transport Service, or MATS, from the Korean War into the Vietnam era, when Tactical Air Command took it over. The reasoning at the time was that TAC, as the main player in Southeast Asia, should have control over intratheater, or "tactical," assets. The arrangement stuck until after Vietnam, when Military Airlift Command took over the theater lift role to more efficiently manage peacetime usage of the C-130s.

By John A. Tirpak, Senior Editor

At left is the flight deck of a C-130 Hercules, still the workhorse of theater airlift after more than 30 years.

Photo by Ted Carlson

Two years ago, most of USAF's C-130s transferred to AMC to provide a "seamless" structure. Some still belong to USAFE and PACAF, but AMC handles repair and upgrade requirements for all Hercules aircraft.

After the War

After the 1991 Gulf War, and the dissolution of TAC and MAC, the new Air Combat Command assumed the theater lift portfolio, based on wartime experience and the necessity of fitting tactical lift into a theater air tasking order. Subsequently, the need for a unified chain of command for training, program management, logistics, and operations mandated yet another change, and the C-130 fleet joined Air Mobility Command in April 1997.

The transfer isn't complete, even today. Because of the unique day-to-day requirements of moving cargo around overseas, not all theater lift assets belong to AMC. Pacific Air Forces and US Air Forces in Europe each "own" a squadron of 12–16 C-130s, to be used for the command's own short-haul lift needs. McNabb noted that "we work that very closely to make sure the overall airlift [system] is seamless, indeed."

Just as ACC manages the supply, repair, equipage, and upgrade of fighters "belonging" to PACAF and USAFE, AMC does the same for the C-130s under those commands.

The C-130s go into action when requested by regional commanders in chief. A number of squadrons may be dispatched, depending on the nature of the contingency; as few as a dozen airplanes or as many as a dozen squadrons will deploy. In the Gulf War, 149 C-130s were sent to that region.

"Straw man" plans covering theater lift needs and deployment are already in place for most world trouble spots, and a particular unit or group of units are usually designated in the plan as the first to go. Advance teams go to the designated operating sites and determine what must be brought and what can be left behind.

Once units receive the "go" order, they virtually self-deploy to the theater, taking along most of the equipment and some of the personnel they will need to operate from forward bases. Contrary to some popular notions, they do not transport any warfighting equipment—such as Army troops or vehicles—from the continental US to a theater of operations.

"We don't bring anything to the theater except ourselves," one pilot pointed out.

Moreover, moving a C-130 unit to a contingency will require some backup lift of C-141s, C-5s, or C-17s to carry additional personnel and gear to the forward operating location.

"Think of it as deploying a fighter squadron," one C-130 pilot suggested. "You need some help to get over and set up."

C-130s will not typically set up shop at a major airport receiving large strategic transport airplanes from CONUS. Ramp space at these facilities is usually at a premium and must be given over to the "heavies." Theater lift forces will set up somewhere nearby—usually within two hours' flying time—and only come in when off-loaded cargo is ready to be transshipped to its next, and usually final, destination. Crews and maintainers will often be located at an austere site where the C-130, but few other airlifters, can operate.

In the Gulf War, C-130s operated out of Oman, Saudi Arabia, United Arab Emirates, and other Gulf sites, flying into the Saudi port city of Dhahran for pickups and carrying the materiel to wherever it was needed in the region.

The cargo is varied.

"We carry food, artillery shells, missiles, Army troops, trucks, medical supplies, the mail—you name it," said one C-130 pilot. With its rough-field capability, the C-130 can carry its cargo directly to the front lines. While that is usually avoided in the heat of battle, C-130s can and sometimes will fly directly into a live-fire situation if the need is great enough.

Blue and Green

The Air Force's theater airlift force dedicates much of its capability to the Army, which needs the airplanes to move soldiers or drop paratroops and to haul lighter vehicles and all the gear and consumables necessary for quick movement in the war zone. Army Gen. H. Norman Schwarzkopf's famous "left hook" maneuver in the Gulf War was made possible in large part by C-130s shuttling troops from initial garrisons to their invasion start points. These were, often as not, roads or mere dirt landing strips.

"I sometimes think we speak 'Army' better than we speak 'Air Force,' " one C-130 veteran observed. "We have to know how to talk to those guys so we can understand what they need from us."

The main example of the C-130-and-Army cooperation can be seen at Pope AFB, N.C., where Air Force units constantly provide airplanes to train the paratroopers at the Army's nearby Ft. Bragg.

During the Gulf War, theater lift forces not only brought items to forward areas but also carried back many things—broken airplane parts, sick and injured troops, and, of course, the mail. During the Gulf War, a common load item was helicopter rotor blades; blowing desert sand tended to delaminate their edges, and the Army ran through new rotors for their forward-based attack, scout, and utility helicopters at a high rate.

Wartime theater airlift is the pri-

mary mission of the "slick" C-130, meaning the cargo version. Airplanes are "chopped" to the Joint Task Force commander in the event of war. In turn, the JTF commander's air boss—the role filled by then–Lt. Gen. Charles A. Horner in the Gulf War—gives the C-130s their orders.

"We never belong to AMC during a war," a C-130 programmer noted. In situations such as Southern Watch, where there is no fighting but hostilities are always imminent, deployed slicks belong to the theater commander in chief.

Busy Crews

Like their fighter counterparts, C-130 crews are busy, and every effort is being made to share the burden with considerable Air National Guard and Air Force Reserve Command capability in theater lift. Some Guard and Reserve units, which have a higher percentage of "full-time" participants, may volunteer for such deployments. Other units, where the number of full-time participants is not so large, will not be called for such duty unless certain certifications are made by the President that the nation is indeed at war or imminently going to war.

In Bosnian operations, which alone could consume all the capacity of USAFE's C-130 squadrons, stateside units are rotated into the theater for deployments of about 45 to 65 days and during that time are chopped to USAFE.

Such assignments, based as they are on volunteerism, are planned well in advance.

"We practice this on a regular basis," a C-130 pilot noted. "We can get out of town in 24 to 48 hours, depending on the warning time."

When deploying to an area as far away as the Gulf, the C-130s will make numerous hops, since they lack the capability for aerial refueling. Some crews will have flown ahead, gotten their requisite crew rest, and are ready to take the controls at an interim field when the airplane is refueled and checked out. Sometimes, extra, or augmented crews will fly on a single airplane and trade off the flying as crew rest demands.

Once in theater, the airplanes are to be ready for operations within a few hours of landing and unloading their gear.

Though deploying C-130s always chop to the theater commander, longer-legged C-141s or C-5s involved in theater lift operations do not. They may perform missions for a theater commander, but they still are "owned" by AMC and "on loan" for specific missions.

The C-17 Globemaster III played an important intratheater lift role in Bosnia where, early in the Army deployment in late 1995, it was able to move outsize equipment rapidly to small airfields. In fact, the C-17 is "writing a new page" in the theater lift manual, said the AMC programmer, but it is still too soon to tell if it will be given more than an ad hoc role in the theater mission. While it has been suggested that some C-17s be purchased specifically for intratheater duties, no such plan has been approved, he said.

Although the transition from ACC to AMC has been largely trouble-free, an AMC official said that there are still some "command-and-control problems." He explained, "We still have some gaps in who commands what. It's a never-ending, constantly shifting process" of determining ownership of airplanes and missions alike.

"We need better representation on a CINC's staff," he said. "Army guys and fighter guys don't understand theater lift" well enough to plan their operations, and there are usually too few knowledgeable officers available "to run what is a 24-hour-a-day operation" of tactical lifters moving around the theater.

AMC officials are developing a system to deploy liaison people to

C-130 Performance Variations

Capability or Capacity	C-130E	C-130H	C-130J	C-130J-30
Cruise speed (knots)	280	300	340	340
Max. payload (pounds)	39,000	39,000	41,700	39,300
Max. payload range (n.m.)	1,860	1,745	2,450	2,450
Max. effort takeoff roll (feet)	3,300	3,000	1,950	1,950
Paratrooper capacity	64	64	64	92
Troop seats	92	92	92	128
Cargo floor length (feet)	40	40	40	55
Litter capacity	74	74	74	97
Airdrop 463L pallets	5	5	5	7
Container delivery system bundles	16	16	16	24
Min. runway length (feet)	3,000	3,000	3,000	3,000
Min. runway width (feet)	60	60	60	60
Min. runway taxiway (feet)	45	45	45	45

Note: The C-130J-30 is a proposed stretched version of the C-130J.

Lockheed Martin photo by John Rossino

The new C-130J, shown here in a max power takeoff, offers major improvements over its predecessors. Despite heavy congressional backing, it is currently low on USAF's priority list.

help plan operations at the start of a contingency. In addition, AMC is trying out some new ideas on how to manage theater lift and is succeeding in paring away loose ends. The command learned a great deal from Desert Storm and is still finding ways to apply those lessons. Exercises like Red Flag and the joint Blue Flag also help point up deficiencies, which AMC is trying to swiftly correct.

Enter the C-130J

One of the most controversial aspects of the intratheater lift force concerns how the nation has gone about equipping it, particularly in the 1990s. The Air Force owns about 510 C-130E and C-130H slicks, in about five different configurations. These airplanes—bought in lots as small as eight a year on up to 27 a year since the 1960s—for the most part are in good shape and have many thousands of hours of service life left. Only about 25 C-130s will need to retire in the next 10 years.

In the early 1990s, Lockheed Martin, the C-130 producer, unveiled a new model known as C-130J. It offered an all-digital flight control system, new materials, a new engine and propeller system, a glass cockpit flight deck, a two-person crew (vs. three on previous models), and improvements in climb rate, speed, and range.

The Air Force was not yet ready to start replacing its C-130s, but it agreed to request two examples of the new airplane per year to "get the ball rolling," a senior Air Force official said. By the time the airplane was certified and tested, the Air Force reasoned, it would be time to start ordering new airplanes to replace the oldest C-130Es in the inventory. Moreover, Lockheed Martin offered the airplane as a commercial buy, underwriting with its own funds the C-130J's development and presumably saving USAF money.

Guard and Reserve C-130 Airlifters, 1998

Location	Component	Model	Number
Baltimore	Guard	E	8
Boise, Idaho	Guard	E	4
Channel Island ANGB, Calif.	Guard	E	12
Charleston, W. Va.	Guard	H	8
Charlotte, N.C.	Guard	H	12
Cheyenne, Wyo.	Guard	H	8
Dallas	Guard	H	8
Dobbins, Ga.	Reserve	H	8
Gen. Mitchell IAP, Wis.	Reserve	H	10
Hickam AFB, Hawaii	Guard	H	4
Keesler AFB, Miss.	Reserve	E	8
Kulis ANGB, Alaska	Guard	H	8
Little Rock, Ark.	Guard	E	8
Louisville, Ky.	Guard	H	12
Mansfield, Ohio	Guard	H	8
Martinsburg, W. Va.	Guard	H	12
Maxwell AFB, Ala.	Reserve	H	8
McEntire ANGB, S.C.	Guard	H	1
Minneapolis/St. Paul	Guard	H	8
Minneapolis/St. Paul	Reserve	E	8
Nashville	Guard	H	12
New Orleans	Guard	H	1
Niagara Falls, N.Y.	Reserve	H	8
Oklahoma City	Guard	H	8
Peterson AFB, Colo.	Reserve	H	14
Peoria, Ill.	Guard	E	8
Pittsburgh	Reserve	H	8
Quonset, R.I.	Guard	E	8
Reno, Nev.	Guard	E	8
Savannah, Ga.	Guard	H	8
Schenectady, N.Y.	Guard	H	4
Selfridge, Mich.	Guard	E	8
St. Joseph, Mo.	Guard	H	8
Willow Grove, Pa.	Reserve	E	10
Wilmington, Del.	Guard	H	8
Youngstown, Ohio	Reserve	H	16
Total			300

Source: GAO from ANG, AFRC data.

Congress has taken a strong interest in the new program, adding C-130Js to the Air Force's budget in each of the last five years and touting its enhanced performance and lower projected cost of ownership compared to currently serving types. Moreover, the program has top political support. Until his retirement in 1997, Sen. Sam Nunn, the Georgia Democrat, exerted great influence on military affairs on Capitol Hill. The district of House Speaker Newt Gingrich (R–Ga.) lies close to the Marietta, Ga., facility that produces the C-130Js.

Not everyone in Congress supports these purchases. The addition of the C-130Js to the USAF budget at a time when higher-priority programs are getting shortchanged "defies logic," said Sen. John McCain (R–Ariz.), a member of the Senate Armed Services Committee and leading critic. The C-130 ranks 15th on AMC's list of funding priorities.

In addition, Congress has tended to provide money to buy these new airplanes without adequately supplying the spares and support capabilities necessary for their proper operation. When it comes to supporting the new aircraft, the old C-130 equipment won't do. Gen. Walter Kross, AMC commander, noted that the C-130J is "70 percent a new airplane" by virtue of sophisticated new systems and engines, requiring new support gear as well as simulators and training aids. The General Accounting Office, for its part, estimates that USAF will be short $302 million in C-130J support funds by 2003.

Playing Games?

Gingrich argues that, on the C-130J issue, the Air Force has been "playing games," deliberately failing to request airplanes because it knew Congress would fund them anyway.

"This is definitely an abnormal program," one senior Air Force official said. Congress not only is buying new airplanes in the absence of an Air Force request but also has ordered that they go, for the most part, to Guard and Reserve units and not the active duty Air Force, which has the most fatigued airplanes.

"There has not been a proper sense of ownership of this airplane," the official said. "We, as an Air Force, have also been corporately slow in defining support requirements for the

C-130J and figuring out how to fund them." He added, "We are finally getting off the dime."

The Air Force has undertaken an analysis to determine whether the support-funds deficit is really as large as claimed. "I have no confidence in those numbers," the official said. "I'm having an analyst scrub it for me, to find out what's real," he added.

USAF has conferred with Lockheed Martin, the airplane contractor and "gotten them to use our numbers" when promoting the C-130J's cost and performance advantages to Congress, the official reported. "Now that Congress is seeing one set of numbers, I think the ... [support-cost] deficit will be much lower."

Plans call for converting the first C-130J aircraft into hurricane-chasing WC-130J models and for basing them at Keesler AFB, Miss., a move that raised eyebrows because Mississippi is the home state of Senate Majority Leader Trent Lott. However, said the senior USAF official, this move makes sense because "you want them all in one place ... as much as you can" to save on support equipment. The "issue of beddown is still being worked" as to where the rest of the new airplanes will go. The Maryland Air National Guard will get the first slick C-130Js.

The senior official said that USAF hasn't really been hurt by the addition of C-130Js to its budget. "Are they early to need?" he asked rhetorically. "Yes, but they are not excessively early to need. Better to have them available if we should suddenly discover cracks or some bad problem" in the serving models.

Staff photo by Guy Aceto

This Maryland ANG C-130E could be replaced by the new C-130J. Congress has not only ordered J models without an Air Force request, it has said the aircraft should go first to the Guard and Reserve rather than active duty units.

Moreover, without the C-130J, all of Lockheed Martin's USAF–business overhead costs would be chargeable to the F-22 fighter (the plant's other major defense project), and that could hurt the fighter's affordability. The C-130J program "relieves pressure on the F-22," said an Air Force official.

The Air Staff has also blessed an AMC "Tiger Team" study on how best to modernize the C-130 fleet. The plan calls for buying 250 C-130Js over the next 12 years, replacing the oldest C-130Es as they retire. Some of the newer C-130Es and the C-130Hs—which were purchased in four versions—would all be upgraded to a new configuration, dubbed C-130X.

This new configuration would take advantage of many, but not all, of the technologies being put into the C-130J and make the airplanes compliant with new international air traffic avionics requirements.

The C-130X program would involve three phases. Phase 0, under way right now, upgrades the airplanes' electrical systems and autopilot. About a fifth of the fleet have already undergone this modification. Phase 1 of the C-130X effort would install a new glass cockpit and install new computers and radar and many of the Global Air Traffic Management–required avionics. This would include a Terminal Collision Avoidance System. Money for Phase 1 would be budgeted in 2000 and production would begin in 2002.

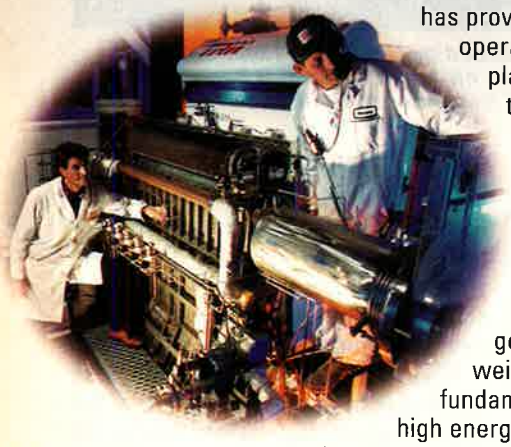
Phase 2 of the X program would upgrade the engines of whatever E models remain in the fleet to the same configuration as that on the C-130H: the Allison T56A-15. The Phase 2 effort would also install a common auxiliary power unit for all C-130Xs. If necessary, a wing box replacement would be added for the oldest Hercules airplanes to be retained. The entire C-130X effort would be completed in 2010. ■

Photo by Erik Hildebrandt

Based on its showing in Bosnia, some defense planners have suggested purchasing some of the new C-17 strategic airlifters strictly for the intratheater role. So far, it's just an idea.

First Light from a multi-hundred-kilowatt-class

chemical oxygen iodine laser designed for the Air Force Airborne Laser (ABL) program has proven that the hardware and operating procedures work as planned. This vital risk reduction test, conducted by Team ABL (Boeing, TRW, Lockheed Martin), is the first in a series of laser performance tests designed to reduce the technical risk of the ABL program, keeping it on schedule and on budget. The TRW-designed flight weighted laser module is the fundamental building block for the high energy laser that will be used by the 747-based ABL system to defend against theater ballistic missile attacks. Team ABL will produce, integrate and flight test the first prototype ABL demonstration system, culminating in 2002 with a boost-phase shoot down of a theater ballistic missile.



Champion Chips

A technical paper describing TRW's development of a record setting integrated circuit has been honored as the "Best of the Decade" by the International Conference on Indium Phosphide and Related Materials. The paper describes TRW's design and production of an indium phosphide (InP) low noise amplifier chip that can operate at 155 GHz, the highest operating frequency ever reported for a solid-state amplifier. InP is a next-generation semiconductor technology that promises to speed the rates at which information is processed and delivered. TRW has designed and fabricated a variety of InP circuits with operating frequencies in excess of 150 GHz. All have been fabricated at the company's Redondo Beach, Calif., production facility. The Best of the Decade award recognizes TRW as the leading designer and developer of InP high electron mobility transistor technology.

Electric Thrust You Can Trust

Spaceworthy advanced electric propulsion thrusters are now being tested in realistic space-like conditions using a new TRW test facility. Rounding out TRW's electric propulsion design, development and test capabilities, the new facility features a seven-foot diameter test cell, and three 48-inch cyrogenic vacuum pumps to simulate the space environment. It is also being outfitted with an autonomous data acquisition and control system for unmanned operation and data collection during long-duration testing. Electric propulsion thrusters have higher specific impulse than chemical thrusters and, therefore, use less propellant. This fuel efficiency can be leveraged to extend a satellite's life, deliver more payload to orbit, and/or launch payloads on smaller vehicles.

Hot and Cold Running AXAF

NASA's Advanced X-ray Astrophysics Facility (AXAF) has successfully undergone thermal vacuum tests, completing the last major phase of a rigorous environmental test program leading up to spacecraft delivery and launch. The 45-foot-tall spacecraft spent several weeks in the simulated space environment of a sealed vacuum chamber and was exposed to alternate periods of extreme hot and cold. During that time, its electrical subsystems and instruments were exercised to ensure that they will operate reliably throughout the observatory's mission life. The test also allowed the AXAF Operations Control Center in Cambridge, Mass., to send commands to the satellite, validating procedures that will be used on orbit. The X-ray observatory is on schedule for delivery in late August.

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Valor

By John L. Frisbee, Contributing Editor

The Right Touch

Blinded by enemy fire, Forrest Vosler guided rescuers to his crew, downed in the North Sea.

Forrest Vosler (second from right) was among the Medal of Honor recipients who made a special appearance at the 1948 Air Force Association convention's climactic event at Madison Square Garden in New York City. At far left, actor and Air Force Reservist Jimmy Stewart is at the microphone.

In October 1943, 20-year-old SSgt. Forrest Vosler, who had grown up in a small New York state town, was assigned to the 358th Bomb Squadron of the 303d Bomb Group, stationed at RAF Molesworth in the UK. After his first B-17 mission over Germany, the young radio operator–gunner was convinced that he could not survive 25 missions for completion of a combat tour. He was not alone in that conviction.

Nothing in the peacetime lives of thousands of young Americans had prepared them for the violence that lay ahead. Although such statistics were not circulated among Army Air Forces crews, the average life expectancy of an Eighth Air Force B-17 in late 1943 was 11 missions.

On Dec. 20, 1943, Vosler flew his fourth mission in a B-17F, called *Jersey Bounce Jr.,* against Bremen in northwest Germany. Eighth Air Force had attacked targets in that area on the 13th and 16th of the month. The *Jersey Bounce* crew knew how tough a mission it would be. Bremen was encircled by a ring of anti-aircraft guns a half-mile wide and protected by additional fighters that had been relocated from Germany's eastern front. Eighth Air Force would lose 27 aircraft on that mission.

Before "bombs away," Vosler's B-17 lost one engine to flak. From his position in the top turret, Vosler saw two B-17s explode into flames—not exactly a confidence builder. As *Jersey Bounce* began its long flight back to Molesworth, 120 miles of it over the cold winter waters of the North Sea, flak took out another engine and damaged the radio. With two engines out and other structural damage, the pilot could not stay with the formation.

The lone and limping B-17 immediately became the target for a succession of fighter attacks. The tail gun was destroyed and the gunner seriously wounded. Fragments of an exploding 20 mm shell hit Vosler in the arms, leg, and chest. He recalls that he was so shaken, he was unable to man his guns. Then he thought: "If I'm going to die, it will be fighting." Immediately all fear left him. He climbed back into his turret and fired continuously to protect the tail of the bomber. Then another 20 mm shell exploded near Vosler. Fragments entered his eyes, leaving him almost totally blind. In great pain and firing by instinct, he refused aid until the tail gunner was given emergency treatment.

As the enemy fighters ran low on fuel, their attacks diminished and finally ceased over the North Sea. The pilot announced they would have to ditch. Since their condition and general location were not known to friendly forces, Vosler knew the likelihood of rescue was reduced drastically. Only he could improve the odds. He groped his way to the radio compartment and, working entirely by touch, repaired the transmitter during periods of semiconsciousness. The distress signal he sent out, they learned later, was received in the UK.

After a successful ditching, Vosler, able only to distinguish light and darkness, found his way to a wing where he joined other crew members. The wounded tail gunner also reached the wing near Vosler. While uninjured crewmen were inflating a raft, the tail gunner began to slide toward the water on the wet, slippery wing. Vosler, himself in great pain, held the man with one hand while clinging to an antenna wire with the other. Both men were helped into the raft, subsequently picked up by a Norwegian fishing boat, and finally returned to the UK by a fast rescue boat that responded to Vosler's SOS.

Forrest Vosler spent many months in hospitals abroad and in this country. For a time, he was totally blind, but doctors were able to restore sight in one eye. He was discharged from the service in October 1944.

Vosler was promoted to technical sergeant and awarded the Medal of Honor, one of only three Eighth Air Force enlisted men of World War II to be awarded the nation's highest decoration for valor. President Franklin D. Roosevelt, who presented the medal, postponed the ceremony until Vosler had regained his sight.

As soon as he was able, Forrest Vosler enrolled in college and earned a bachelor's degree. He continued his interest in the Air Force which he had served so valiantly and, in 1946, along with other Air Force heroes, was named a member of the new Air Force Association Board of Directors. ■

Heads of USAF's six battlelabs make their first-year progress reports.

From the Battlelabs

By Peter Grier

BATTLELAB seems like a natural name for a cutting-edge military research organization, but one year ago, when the Air Force's six battlelabs began official operations, few service officials had a clear vision for what a battlelab should do or how it should be organized.

Not even the newly named battlelab commanders knew where they were headed. "I didn't really know what the battlelab was," said Col. Joe Grasso, head of the Unmanned Aerial Vehicle Battlelab, at a July 1 Defense Colloquium hosted by the Air Force Association's Aerospace Education Foundation in Arlington, Va. "I knew less about UAVs."

Today, all the Air Force battlelabs are up, running, and beginning to produce innovative ideas, said officials at the AFA discussion. Their work has involved everything from new types of munitions trailers to classified research on information war.

Said Col. Ronald Kurjanowicz, head of the Air Force Battlelab Integration Division, "The impression I want you to get straightaway is that the battlelabs are for real. One year later, they're here to stay."

The mission of the Air Force battlelabs is to rapidly measure the worth of innovative operations and logistics concepts and then recommend ways to insert the most promising ideas into service doctrine, operations, or acquisition.

The six battlelabs are the Air Expeditionary Force Battlelab, Mountain Home AFB, Idaho; Unmanned Aerial Vehicle Battlelab, Eglin AFB, Fla.; Force Protection Battlelab, Lackland AFB, Texas; Space Battlelab, Schriever AFB, Colo.; Command and Control Battlelab, Hurlburt Field, Fla.; and Information Warfare Battlelab, Kelly AFB, Texas.

Air Expeditionary Force Battlelab

Since it became operational July 1, 1997, the AEF Battlelab has received 111 ideas for ways to improve expeditionary strike package fighting power. Of these, 43 were industry responses to a broad area announcement the lab put out earlier this year.

Twelve initiatives are in an advanced state of development. At least two were put in the plan for Expeditionary Force Experiment 98, a major annual exercise designed to test futuristic concepts and technologies.

One of the demonstrations entails a new en route Expeditionary Operations Center, which is intended to allow AEF planning personnel to make better use of their time.

"Every wing that deploys has an operations center," said Lt. Col. Jeff Neuber, AEFB deputy commander. "Historically, this group of people, during the 14- to 18-hour flight time to the Area of Responsibility, they really haven't been able to do anything."

The point of the en route EOC is to allow them to do mission planning while still in the air. It involves sticking a phased array antenna on top of an aircraft—a KC-135R from the 366th Operational Support Squadron will be the platform of choice for the EFX demonstration—and connecting it to a discrete pallet of electronic planning equipment in the cargo compartment.

Mission planners will receive the up-to-date information they need before reaching their beddown location. Upon arrival, unit commanders with this capability will theoretically be able to roll out their Air Tasking Order and begin operations right away.

An Integrated Planning and Execution Capability will be the other

EFX demo for the lab. In essence, IPEC is an effort to automate the base support planning process.

The lab will send an advance squad equipped with a powerful laptop into a potential beddown location. The squad will do a site survey, take digitized pictures, even video, and download them into the computer. Using a 3-D capability to "build" a picture of the location graphically, they will then zap the data back to the oncoming deployers.

"You can lay out your parking plan, decide where you're going to put your security checkpoints, your vehicle yard; ... you can build your whole base before you get there," said Neuber.

A third initiative that AEF lab leaders believe has promise is the Next Generation Munitions Trailer.

Right now, the Air Force takes two kinds of trailers when it deploys: the 15-foot MHU-110 and the 10-foot MHU-141. A battlelab master sergeant had the bright idea of building a one-size-fits-all version that expands and contracts as needed, instead.

In addition to generating, receiving, and processing ideas, the battlelab has functioned as something of a meeting place, as it has sponsored several AEF conferences.

UAV Battlelab

In the past, the Air Force commitment to UAVs has waxed and waned, said UAV Battlelab Commander Grasso.

Today, "that interest is rising again, in part due to the technology that now exists and the commitment that industry has made to further that technology and expand concepts."

The first major UAV Battlelab initiative involved the use of unmanned aircraft in the Suppression of Enemy Air Defenses role. In a New Mexico demonstration, the lab showed that a UAV outfitted with a direction-finding package can find, identify, and very precisely geo-locate mobile emitting threats and then forward that data to an F-16 cockpit, via the UAV's command center.

The next step in this initiative will be what Grasso calls an active SEAD concept.

"We're saying, 'OK, now let's take this same UAV with that same capability and let's add the capability to jam or decoy the threat on demand from the fighter.' "

The lab is further working on an initiative to "liberate" UAVs from restricted airspace. Currently, the Federal Aviation Administration is wary of allowing UAVs into general US airspace. To get around this barrier (which Grasso described as "cultural") the lab will use a commercially available traffic alert system on a UAV and demonstrate that this gives the craft the ability to detect and avoid conflicting air traffic.

Another UAV lab concept is called "geo-reference." This involves taking imagery from Predator UAVs and from national reconnaissance assets and combining the two with specially developed computer software.

The result will be near real-time UAV images with precise location coordinates. Predator pictures on their own are not accurate enough to allow use of precision guided munitions, but "you'd be able to target against [a geo-located threat] if you wish," said Grasso.

Finally, the UAV battlelab is also investigating the use of UAVs as surrogate satellites. A Global Hawk long-endurance craft, outfitted with JTIDS Link 16 and UHF radio links, could serve as a quick, cheap substitute for space-based communications.

Force Protection Battlelab

Col. Don Collins, the commander of the Force Protection Battlelab, said the first thing he found out after his organization started working a year ago was that he needed a lot more than cops to solve force protection problems.

He needed experts in blast mitigation, which is a civil engineering discipline. He needed explosives scientists. He even needed talent oriented toward the medical issues inherent in food and water supplies.

Much of the lab's first year has been spent in helping those carrying out current operations to defend against bad guys.

During the Bright Star deployment to the Gulf, the lab pulled together an explosives detection team to help out on-site commanders. Last September, the lab sent experts to Izmir, Turkey, where a US military population lives and works downtown. The team bolstered the base force protection package.

The force protection folks also put together a multidiscipline package designed to protect a multilateral counterdrug center based at what was, at the time, Howard AFB, Panama.

When it comes to general initiatives, "the most important thing that I would tell you we have started working on is explosive detection," said Collins.

A large vehicle laden with explosives remains the No. 1 threat in the US Central Command AOR. Ion-scan technology and other high-tech solutions can at least help guard against such bombs.

"We wanted to take this kid with the mirror under the truck and put more sophisticated things like X-ray technology into the hands of the troops in the field," said Collins.

The lab has also joined forces with its UAV counterpart and has assembled a proof of concept demonstration of the use of a UAV in a force protection role.

Combining a UAV with a wide area surveillance thermal imager and other off-the-shelf tactical sensors could potentially provide an unprecedented peek at the surrounding area for ground commanders.

The lab is also working on detection of chemical and biological agents. While the Army and Marine Corps are developing equipment aimed at sniffing out airborne toxins advancing on troops, the Air Force battlelab's emphasis in this area is more prosaic: food and water.

The easiest way to attack Americans in an AOR might be to slip poison into their food and water, which is often provided by local contractors.

Initiatives for the future include software that combines such capabilities as blast modeling and injury-reduction modeling to give commanders some empirical help in making force protection decisions and microwave weapons that might be useful in clearing out hostile checkpoints in a nonlethal manner.

Space Battlelab

Space surveillance has been one of the primary focuses of the Space Battlelab. One of the lab's initiatives, for instance, involves evaluation of commercial off-the-shelf telescopes that might be able to provide accurate data on deep space objects to increase the capacity of the Space Surveillance Network. Another will test tracking satellites via use of ambient radio frequency energy.

The latter project "is basically taking advantage of physics," said Col. (sel.) Bob Bivins, Space Battlelab chief.

The Earth is studded with TV and radio transmitters that beam energy up into the sky and into space. This ambient energy then reflects off Low Earth Orbit satellites.

An Earth-based receiver might read these reflections and provide an accurate picture of where the satellites are and where their orbit will take them.

"There are obviously advantages here," said Bivins. "We don't pay for the power of this. We're just doing a passive receive. And it gives you a lot of advantages in identifying changes in orbital parameters without being too obvious about it."

In a non-surveillance project, the lab intends to evaluate the effectiveness of commercial wireless communications in a military environment. It will send 50 Motorola handsets to South Korea to see if they help operations.

Another space initiative involves placing a Hyper-Spectral Imagery collector on top of Pikes Peak in Colorado. This receiver will peer down at nearby military bases such as Ft. Carson and see if it can spot anything interesting. The intent is to validate future space-based HSI strategies.

The very environment of space is also of interest to the battlelab. An initiative named SEAM (Space Environmental Anomaly Monitoring) aims to take advantage of sensors mounted on some current satellites that measure fluctuations in space energy.

"What we're trying to do is leverage that information to try and see if we can figure out any trends developing," said Bivins. "If there's a lot of proton activity, is it going to cause a higher number of [satellite] upsets? It might allow us to more effectively manage our satellite assets."

C^2 Battlelab

The Hurlburt-based C^2 Battlelab has the distinction of having produced the first Air Force battlelab initiative that has been completed and entered the formal procurement system. That effort involved Air Tasking Order visualization and assessment.

"What it does is produce a cartoon of the Air Tasking Order, so that you can look at it more easily," said Col. John Gorman, lab commander.

The battlelab looked at eight different systems, bringing in "real warfighters" to help them, said Gorman. The finished product is being incorporated into the system.

"We'll see it in March '99," said the lab chief.

Many of the battlelabs have paid particular attention to off-the-shelf information technology, and the command and control lab is no exception. An initiative that focuses on future Joint Forces Air Component Commander command-and-control systems looked at commercial technology that might help out.

"The market is exploding with things, such as chat room capability, that have obvious applications to ... the Air Ops Center," said Gorman.

The organization is also looking at simply reducing the size of C^2 hardware. "I put that into the category of, 'Duh,' " said Gorman.

Flat screen displays, workstation laptops, and wireless local area networks could reduce the size of an Air Operations Center by the size of a C-17 load, according to C^2 Battlelab calculations.

Future projects might include C^2 systems that include speech recognition—something that might come in particularly handy to ops crews encased in bulky chemical protection gear. "You can just address it and say, 'I want to go to target list, strategic, electric grid,' and boom, you're there. You save about eight mouse clicks," said Gorman.

The C^2 lab also wants to draw more on lessons from industry. In recent months, lab representatives visited private concerns to see how they work global communications and control.

Information Warfare Battlelab

The IW battlelab deals with a subject of particular interest nowadays in the Air Force and in the military as a whole. Within a few weeks of opening its doors, the lab had received 50 to 60 ideas for initiatives from industry. Though the rate has since slowed down, their idea count stood at 113 in late June.

About 75 percent of their ideas come from private industry.

"As you can imagine, many contractors came forth with old marketing pitches that they dusted off, put a new cover sheet on, and fired at us," said lab chief Col. James C. Watkins.

Thirty-six percent of the pitches dealt with information security measures. Twenty-six percent involved information attack, and 20 percent focused on electronic warfare. The other defined pillars of Air Force info war—physical destruction, psychological operations, and military deception—all were in the single digits, when it came to percent of ideas.

Six ideas were funded for Fiscal 1997. Eight were picked for Fiscal 1998. A number of them deal with classified projects.

"We find that we deal with a considerably larger number of classified initiatives than the other battlelabs do," said Watkins.

Among the projects Watkins could talk about was IW Reachback. This initiative involves connecting remote users with Sensitive Compartmented Information through existing low-cost satellite relays, via portable electronic equipment.

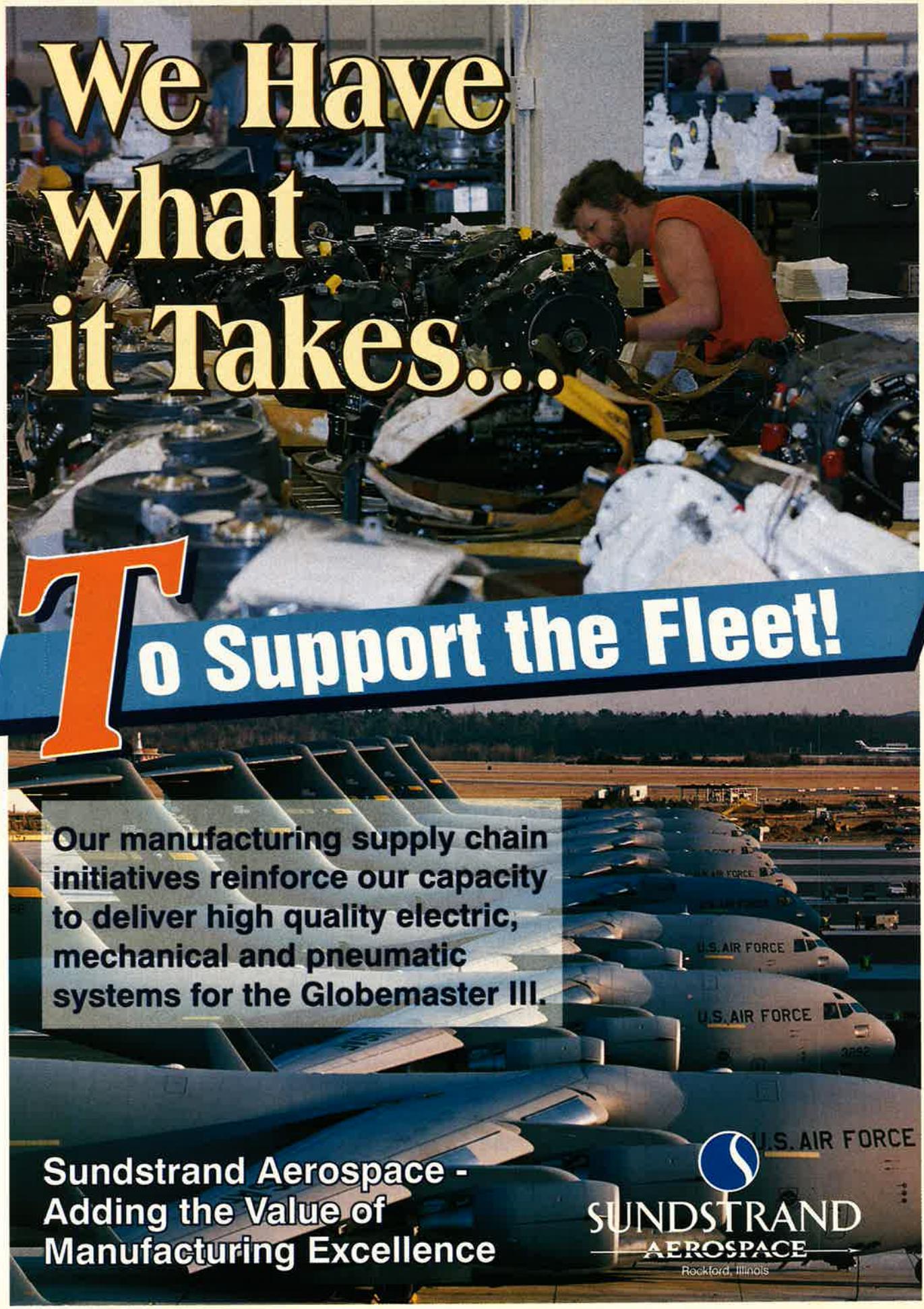
Another initiative is an attempt to visualize the information battlespace. This hardware–software combo produces a digitized, 3-D picture of information nodes and the data flow among them. One mouse click, and any node can be eliminated, with subsequent flow interruptions easily visible.

"This would be a powerful tool to do self-analysis to see where you're vulnerable," said Watkins.

To date most of the info war lab's work has involved small solutions to "mission gaps" that have been brought to its attention, said Watkins. In the future, the lab hopes to seize upon initiatives that have a broader operational impact at a higher level.

If nothing else, "I believe it is safe to say that the information systems protection portion of what we do will be with us forever," said Watkins. ■

Peter Grier, the Washington bureau chief of the Christian Science Monitor, *is a longtime defense correspondent and regular contributor to* Air Force Magazine. *His most recent articles, "Plotting a Course for Health Care" and "Readiness in a Downdraft," appeared in the July 1998 issue.*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The "Expeditionary Aerospace Force" will comprise 10 standing groups to deploy on operations short of theater war.

The New Expeditionary Force

By Bruce D. Callander

CIVILIANS call it "occupational stress," "the rat race," or "burnout." For Air Force members of the 1990s, the term of art is "the optempo problem"—shorthand for the collective stresses and strains afflicting an overworked Air Force. The problem affects not only members sent overseas with air expeditionary forces but also fellow troops who are forced to work longer and harder.

The service has long been aware of the problem, which it views as its top personnel concern. It provides numerous programs to combat the worst symptoms—family stresses, deferred training, lost professional education opportunities, and the like. Even so, the problem has lingered.

As a result, the Air Force is ready to take a more ambitious step and combat the underlying problem—in essence, the fact that too much work is being demanded of too few Air Force people. With this as the target, USAF believes it can score major gains with establishment of standing Air Expeditionary Forces and "robust" air bases.

Top leaders note that the burden of today's fast-paced operations has tended to fall unevenly on the force, with certain specific groups being asked to pick up a disproportionate share of work. These include E-3 AWACS and RC-135 Rivet Joint crews, A-10 and F-15E pilots, and special operations and security forces, among others. Spreading the work more equitably is the goal.

The Big 10

Step 1 is the creation of the standing AEFs. The idea is to divide all of the service's operational and support resources into 10 big organizations, each of which would be made available at predictable times for deployments. Constituent units would not be concentrated on a single base but nonetheless would have formal organizational ties.

USAF planners have looked at all the forces at their disposal and tentatively organized them into 10 AEFs. Then, they have cross-linked them so each AEF has units from bases around the country, all in an umbrella organization.

Then, in Step 2, the Air Force would beef up selected support forces at specific, highly active bases so that these bases would always have enough people on hand to meet continuing needs at home even as they provided support personnel for units sent TDY overseas.

Senior Air Force officials announced Aug. 4 that they had adopted the plan and will have it in place by Jan. 1, 2000.

Air Force officials concede that this approach would not eliminate the optempo problem. However, it would do much to help spread its negative effects more evenly and predictably over a broader segment of the force and thus lessen its impact on any single individual or unit.

That is the expectation of Lt. Gen. Lawrence P. Farrell Jr., deputy chief of staff for plans and programs and the architect of what is termed the "Expeditionary Aerospace Force."

Farrell outlined the optempo dilemma this way:

"The problem is that since about 1990, we found ourselves continuing to rotate forces to enforce the protocols from the desert war and for other purposes. We got involved in Northern Watch and Bosnia and, without really realizing it, we found ourselves in a series of ongoing, expeditionary operations.

"These are distinct from remote tours, where you have a permanent installation with permanent support

forces. These contingency operations are in places with runways but not much else. So, we slap down some pads and expandable shelters, and the people come TDY from existing bases in the States. What we anticipated would be a temporary situation has turned out to be almost permanent, and two problems have developed."

Farrell went on, "One [problem] is that because we have been approaching such deployments on what amounts to an ad hoc scheduling basis, they are not controlled in any demonstrable way. There is a high level of optempo in the units deployed. People in units with weapons systems such as U-2s, RC-135s, and A-10s have drawn repeated tours of TDY, and those were just the people associated with the weapons systems.

"The other problem is that, to keep a number of bases running overseas on a more or less permanent basis, [we] required security forces, engineers, cooks, personnel specialists, and other support skills. We found we were pulling these people from bases in the States. So, while we expected the optempo of the people we were deploying to be high, what we didn't realize was that we were also increasing the optempo of the bases we left behind in the States."

Recent USAF quality-of-life surveys confirmed that the impact of deployments has been almost as severe on some of the support specialists at domestic bases as on the overseas participants. Moreover, the polls show a close connection between increased optempo and falling retention rates.

Filling the Holes

Farrell said that Gen. Michael E. Ryan, Air Force Chief of Staff, tasked him to conduct a study of the problem. He made a list of bases that were involved with deployments and found that the Air Force was requiring many of them to support deployments without supplying them with the resources they needed.

"Say that I send a 44-man police flight from Base X to the desert and leave a 44-person hole back in the States," Farrell explained. "The home base still has three gates to guard, flight-line security to maintain, and training to do. So, not only are the guys overseas working 60 or 70 hours a week but the security [forces] back home are working 60 or 70 hours a week as well. The problem had just sort of slipped up on us."

Farrell said that Ryan concluded that "we aren't really organized for expeditionary operations" and instructed him to come up with an organizational plan that would properly posture the Air Force for such operations, "so that we can continue to do things like this on a consistent basis without driving the force into the ground."

Farrell recommended setting up 10 standing AEFs, a step that would not require more forces or moving people or equipment. The concept called for rapidly sending a large part of an AEF to an overseas commander while keeping a substantial piece at home on a 48-hour hook, ready to move forward if needed.

"These AEFs would be large organizations with a lot of firepower, a lot of support, and a mixture of assets," said the general. "You would have shooter units and support units and intelligence, surveillance, and reconnaissance capabilities. When we get ready to support a commander in a contingency operation, rather than his saying, 'Give me 10 F-15Es and 18 F-15Cs, and some A-10s,' he would ask for an AEF and we would give him one."

Farrell explained that each AEF would be built around a core unit, "which is kind of the leader of the band" and the central organizing element.

"Say that the core unit for AEF No. 1 comes from Base X, and its responsibility is to provide 18 F-15C air superiority jets," said Farrell. "Then, in that same AEF, Base Y is responsible for providing 18 F-15E Eagles. And we get F-16s from Base Z and A-10s from a consortium of [Air National] Guard units."

Farrell noted that the plan leans more heavily on Air Force reserve components than is now possible.

"When you build these virtual units, you align Guard and Reserve forces into one of them from the beginning," he noted. "Say you need 12 A-10s for a particular AEF and you find that the Guard has a total of 90 in five states. So, you tell the Guard its period of vulnerability, and it says, 'OK, don't worry about it. When we get to January of 1999, when it's our turn to rotate, we'll provide those 12 A-10s. Don't tell us they have to come from Michigan or Connecticut.' "

The theory is that, by structuring the forces into standing units, in peacetime they would train together, plan together, and perhaps go to Red Flag exercises together. Then, when their turn came to go on deployment, they would know a year ahead so they could plan for it.

For A-10s, Big Gains

"What we found was that, because we have been doing this largely on an ad hoc basis, we weren't taking advantage of the full capabilities of the Guard and Reserve," said Farrell. "As a result, the optempo of the active duty A-10s was pretty high. When we restructured these 10 theoretical AEFs and did an analysis just on the A-10 optempo, we found that it would reduce that for the active duty units by almost one-half, just by organizing another way and bringing the Guard and Reserve into full participation."

After working out the AEF issue, said Farrell, the next piece of the problem was: What do you do about the support forces that were left at US bases?

"We did an analysis," said the general, "to find out how many support people were involved, and it showed that we had about 5,000 people we were pulling from bases in the States to stand up all these bases overseas on a more or less permanent basis." The diversion of personnel forced US–based members into longer workdays just to take care of essential business.

Early this year, Ryan and F. Whitten Peters, acting Secretary of the Air Force, went to Congress seeking yet another round of base closures. They said that consolidating more bases would eliminate large numbers of support-related jobs and thereby free up support people to cover for those on overseas deployments and ease the optempo problem at the home bases. At one point, these officials used the term "superbases" to describe the remaining installations, which were to be "robusted" with more people to meet the added support requirements.

Lawmakers were cool to the idea of another round of Base Realignment and Closure activity, however, and, in recent weeks, USAF has taken pains to say that the AEF idea is not linked to any BRAC authorizations.

Farrell emphasized that point as well, saying of the AEF idea, "There

is not going to be a fundamental restructuring of the Air Force, basewise. We aren't going to change any major commands or groups or squadrons. It's more a virtual organization, and it has nothing to do with base closings. It's an attempt to solve the optempo problem."

5,000 Troops

Farrell said he told the Chief of Staff that the Air Force needed 5,000 people to manage TDY bases overseas. Next, said Farrell, he called for selecting certain US bases—primarily those which support overseas deployments—and strengthening them by the numbers needed to provide a complete complement of stay-at-home forces. That way, deployments wouldn't unduly burden the home bases.

"If you have 25 bases you want to participate, you're talking about each base getting in the neighborhood of an extra 200 people," said Farrell. "That's a far cry from ... a superbase, but what it does is solve a big optempo problem at home for the people who are going to have to participate."

Presumably, that still would require the service to add support personnel to a number of bases by subtracting them from other installations. But, Farrell said, the number of moves involved would be minimal.

"Actually," he explained, "we're not even talking about shifting many people around. We're going to source some of them by generating internal efficiencies. These are people we normally would take off the books entirely, but we will reallocate those slots that we save into the skills that we need to beef these bases up a bit."

The only actual additions to the forces, the general said, would stem from modest increases in the operational area.

"There probably will be some additional resources associated with the management of this thing on a day-to-day basis," he said. "If we get 10 AEFs and we assign 10 lead organizations, these organizations are going to need some kind of small planning cell to help them manage their participation and leadership of this AEF concept."

In any case, the general said, the AEFs would be deployed only in conditions short of open war. "In fact," he said, "if you get into theater war, all bets are off. This contingency concept is not designed to deal with a Major Theater War because we have war plans to do that, and all our people have orders associated with those plans. So, if a Major Theater War kicked off, we would just default to the war plans, and the units involved would go off and do their thing as we always have planned they should."

Under this plan, AEFs would be highly flexible, designed to take care of any foreseeable scenario.

Said Farrell, "We wanted to design the AEF to be applicable to any situation. We did not want to design a concept that would only serve Southwest Asia or Bosnia, so we tried to make it applicable to any notional situation. ... You've got to be flexible enough when you get called up for the contingency to take all of the elements assigned to your AEF and tailor them to whatever the requirement is. It could be fewer shooters, more shooters, or no shooters. It could be primarily an airlift package. We've got a baseline AEF with flexibility to tailor it."

For 90 Days

Air Force officials hope the new approach will ease the burden on those members who, so far, have carried an unduly large share of the load. Part of the answer, Farrell said, is to have different AEFs take turns handling the deployments.

"We've designed it so AEFs could serve two [Areas of Responsibility] at one time," he said. "One of the sizing requirements was to have no more than 90 days TDY for any AEF, so we start with 90 days. We could go longer or shorter, but at any one time we could have two AEFs in the field all the time on 90-day rotation. So that means any one unit would not be tasked within a 15-month cycle for more than 90 days.

"Each AEF is quite large when you have all the pieces in it, and we don't anticipate that we would ever deploy a full AEF. So, we can say, 'Well, this AEF is on tap and there is no crisis anywhere in the world, but they can still be ready to go, and if any commander shows the need, we could have the whole AEF moving forward in 48 hours if we get the airlift.'

"Or you can make the same argument if the threat is low and you have something you need us for, we can put a very small package in place and put the rest of the AEF on the hook and have them someplace when you need them. A central element in this is that an AEF has not only a lot of firepower but it also has a lot of flexibility, and it's very quick to get into place if it's not already in place."

That flexibility, the general said, should give members more notice of their vulnerability to deploy and more time between deployments.

Said Farrell, "What we would like to do, once we get people organized and assign them rotation elements, is schedule two AEFs to be vulnerable at all times, and once their 90-day period is up, we schedule two more AEFs. So, if a guy didn't get caught during that 90 days, he would not be vulnerable again for another 15 months."

Then, if a unit does deploy, it can come home and stand down at a predictable time and get on with regular business.

"They can start repairing airplanes and get back to some of their training programs that they didn't get to overseas, such as upgrading instructors," said Farrell. "You leave them alone for a while, so they can take leave and be with their families and do all that kind of stuff. Then, they can get ready for their normal training and do Red Flag exercises and that sort of thing. We might even have the AEF go as a unit to a Red Flag. Then, there is a period later on in the cycle when they start getting ready for their vulnerability period again and it's kind of spin-up time."

Well before the Aug. 4 announcement, the EAF idea already had gained solid support in a number of Air Force quarters, Farrell noted. In late June, he briefed top officials at one of USAF's Corona meetings. There, he found general acceptance but was asked to do some additional work on the plan.

"The emphasis is on stability and predictability," Farrell concluded, "and by bringing more people and more forces into the equation, you spread the optempo more fairly." ■

Bruce D. Callander, a regular contributor to Air Force *Magazine, served tours of active duty during World War II and the Korean War. In 1952, he joined* Air Force Times, *serving as editor from 1972 to 1986. His most recent story for* Air Force *Magazine, "The Views of the Force," appeared in the August 1998 issue.*

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The Magic Seven

NASA photo

A group of nomads in the middle of the Sahara Desert? Extras from the movie "Lawrence of Arabia"? Look closely. This weary group of "nomads" is none other than the original seven US astronauts after a four-day training mission in the Nevada desert in 1960. The desert training, as well as water and jungle survival courses, were all designed to teach the astronauts how to survive for a short time anywhere on Earth beneath their planned orbital track. Here, following their four days spent in isolation in the intense desert heat, are (l–r): L. Gordon Cooper Jr., M. Scott Carpenter, John H. Glenn Jr., Alan B. Shepard Jr., Virgil I. "Gus" Grissom, Walter M. Schirra Jr., and Donald K. "Deke" Slayton.

These seven astronauts were the first in the US man-in-space program—Project Mercury. Initiated in 1958, the project completed six manned flights from 1961 to 1963. Its first major success was the flight of the Mercury capsule dubbed Freedom 7 on May 5, 1961, in which then–Lt. Cmdr. Alan Shepard became the first US astronaut in space. Shepard died July 21, 1998.

While the desert training looks especially rugged, the Mercury 7 astronauts went through even more rigorous physical and psychological tests to get the opportunity to become the nation's first in space. The initial group of candidates, all military test pilots selected from their records, included five Marines, 47 from the Navy, and 58 from the Air Force. The volunteer rate was so high that not all of these 110 pilots were even interviewed. By March 1959, the number of candidates was down to 36. Of those, 32 accepted an invitation to undergo extensive physical examinations at the Lovelace Clinic in Albuquerque, N.M. Only one was dropped for a potential medical problem. The next stop was the Aeromedical Laboratory of the Wright Air Development Center, Wright–Patterson AFB, Ohio, for what was a set of stressful physical tests and, even more stressful, pyschological evaluations, known as "the week of truth." With this barrage of tests and evaluations complete, the number of candidates was down to 18 but the goal was for only six. The final decision came down to an analysis of the men's technical qualifications and how well they would complement each other.

In the end, the magic number became seven.

How Great Military Flying Careers Take Off.

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In the spring of 1972, a North Vietnamese invasion was stopped and then turned back by US airpower.

The Easter Halt

By Walter J. Boyne

THE year 1972 produced notable US battlefield victories in Vietnam, most of which, however, now are virtually forgotten. The American military managed to prevail in these struggles despite serious weakness caused by the US exodus from Southeast Asia. The 1972 battles marked the final major US engagements of the Vietnam War. Moreover, they illumined the future of the Air Force more than anyone imagined at the time.

Spring 1972 saw an onslaught of regular North Vietnamese units into South Vietnam, with Hanoi hoping to deliver a knockout punch to end its long war of conquest in the South. US politics had put the Air Force in the position of having to compensate for drastic reductions of ground forces. Faced with this challenge, USAF responded with a mass movement of troops and equipment and fearsome attacks with new systems, all of which were key factors in halting the invasion.

North Vietnam's patient and practical leaders had for several years observed the steady decline in American strength in the South. Then, on Good Friday, March 30, 1972, the Communists struck, launching a series of military drives collectively known as the "Easter Offensive."

Hanoi sought an outright military victory in order to establish Communist control over South Vietnam, drive US forces from the South, and prevent the re-election of President Richard Nixon. They called the action the "Nguyen Hue Offensive" in honor of a Vietnamese hero who had inflicted a massive defeat on Chinese forces in 1789.

Hanoi's desire for a military victory was understandable; the North Vietnamese had been fighting for decades, and a clear-cut triumph on the battlefield would be far more satisfying than one won at the negotiating table in Paris. Moreover, Communist strategy might have had a personal edge to it: The architect of the offensive was Gen. Vo Nguyen Giap, whose questionable tactics in the Battle of Khe Sanh and the Tet Offensive in 1968 ended in bloody debacles costing North Vietnam some 100,000 casualties.

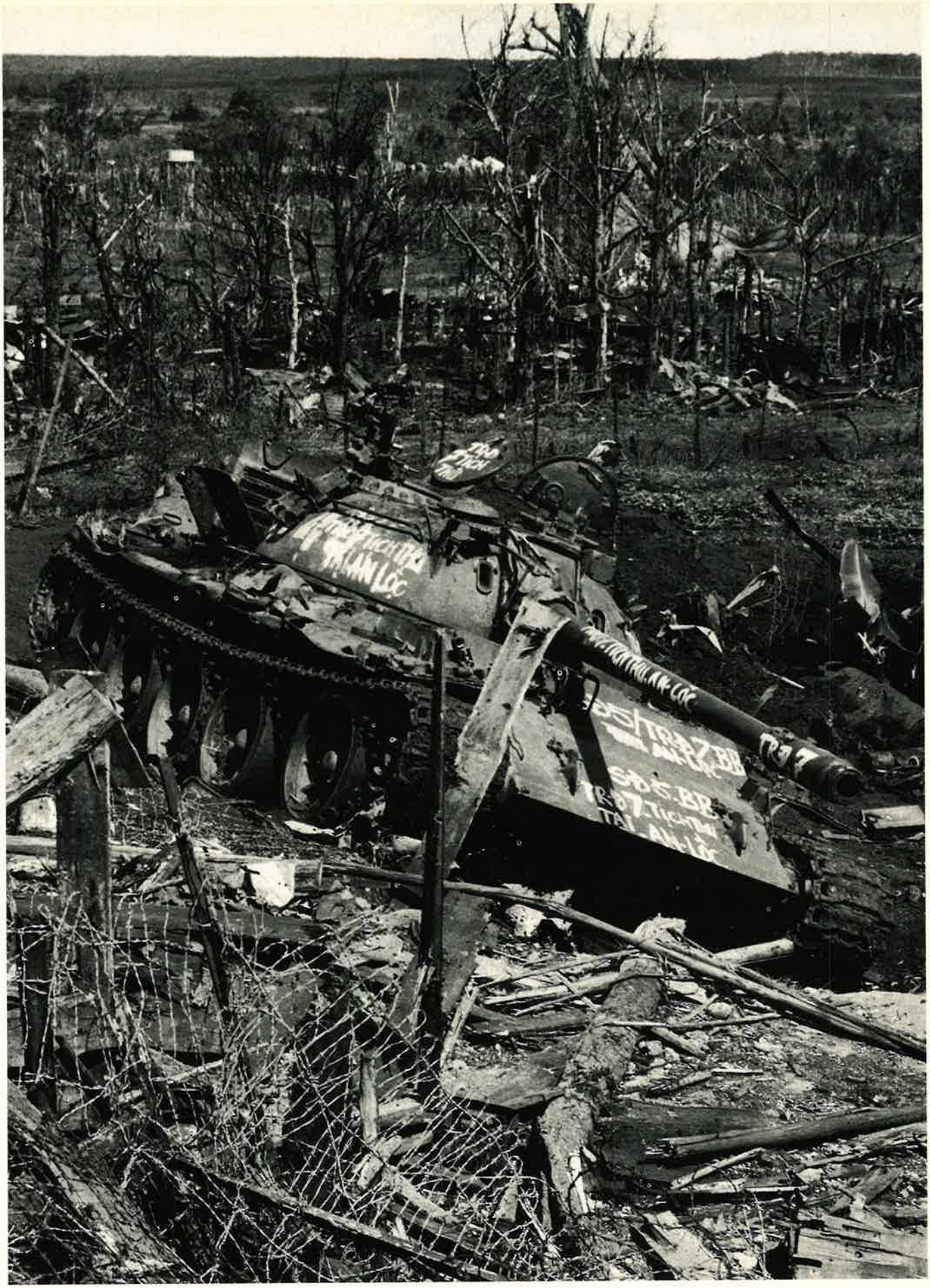
In the Soviet Image

These events vitiated Communist offensive capabilities for almost four years, but Giap rebuilt his forces. He created a new kind of North Vietnamese army built in the Soviet image—that is, well equipped with tanks, artillery, and, most importantly, an anti-aircraft system that could be taken into the field.

The Easter Offensive was a massive conventional attack. Giap committed to the battles 14 regular divisions, 26 regiments, and a massive amount of supporting armor—more than 600 T-54, T-55, and the amphibious PT-76 tanks. By comparison, the German Army launched the Battle of the Ardennes with 19 divisions and 950 tanks. The North Vietnamese ground forces also were fully equipped with artillery, including the dangerous and effective 130 mm and 152 mm artillery pieces and huge 160 mm mortars.

Even so, the key element of Giap's arsenal was a vastly expanded anti-aircraft system that traveled along with invading forces. The flak weapons included 23, 37, 57, 85, and 100 mm guns. Supplementing the familiar SA-2 surface-to-air missiles were deadly man-portable SA-7 Strela heat-seeking missiles, for which totally new tactics had to be devised.

At right, this North Vietnamese T-54 tank near An Loc fell prey to USAF airpower during the 1972 Easter Offensive.



On the eve of the Easter Offensive, Giap's confidence in his ability to gain military victory was high, but not unreasonably so, given the great decline in the number of American ground forces in South Vietnam. The US land component had shrunk from 550,000 troops at the height of the war in 1969 to only 95,000. During the same period, the strength of US air and naval forces fell to about one-third of their previous peak levels.

This across-the-board decline in power reflected the American policy of Vietnamization and disengagement. The United States wished to negotiate a face-saving settlement with North Vietnam that would permit withdrawal of all ground forces. At the same time it sought to arm and train South Vietnamese forces so that they could defend their country against the North.

This policy was pursued in the context of the so-called Nixon Doctrine, which stated that the United States would provide military aid to Asian countries under Communist assault. The aid would include air and naval forces if required but would under no circumstances involve US ground forces—a reversal of policies advocated for so long by President Lyndon B. Johnson and Secretary of Defense Robert S. McNamara.

Unfortunately, there was a fatal flaw in Vietnamization. South Vietnamese forces were trained in the American style of war in which, whenever possible, US planners would use overwhelming airpower to destroy enemy resistance before sending in US ground forces for battle. Though strengthened in recent years, South Vietnam's air force (VNAF) was too small to provide such support. It did not have the correct training and equipment. Moreover, it lacked helicopters and the transports to provide the air-mobile forces and prompt, generous air resupply to which the South Vietnamese Army had become accustomed.

Because these elements were lacking, only the best-led units of the South Vietnamese army (ARVN) were capable of resisting the Communist assault. The quality of ARVN leadership varied and was often dependent upon the extent and expertise of US advisors still in the field.

Tactical Surprise

In the months before Easter 1972, the Communist buildup had been noted, but Washington and Saigon underestimated the scope, magnitude, and character of the coming attack. Thus, the North Vietnamese achieved considerable tactical surprise. Hanoi's invading forces thrust into three of South Vietnam's four military regions. (See map at left.) Just as Hitler had used clouds and low ceilings to mask the advance of German armor in the Battle of the Bulge, so did Giap count on bad weather hampering USAF reconnaissance and air strikes.

In Military Region I, more than 40,000 North Vietnamese troops swarmed southward through the DMZ and eastward from camps in Laos. By April 2, the enemy had captured all intervening fire-support bases and was moving directly on Quang Tri City, the provincial capital. Interdiction by US Air Force fighter–bombers and B-52 bombers slowed the advance, but Quang Tri City was evacuated May 1. The enemy then reorganized for a drive on Hue.

In Military Region II, 20,000 Communist soldiers surged out of Laotian and Cambodian sanctuaries to attack the major cities of Kontum and Pleiku. The intent was to cut Pleiku off, then drive on to split South Vietnam in half. South Vietnamese

troops fought well, stiffened by US advisors. Kontum, however, was cut off and surrounded. The city was sustained by a massive aerial resupply effort. In addition, the Communist military attack failed. US Air Force B-52s and tactical fighters combined with TOW–toting US Army UH-1s to defeat the northern invaders in the field, despite a monumental effort by huge numbers of North Vietnamese tanks and artillery.

In Military Region III, one regular North Vietnamese division and two Viet Cong divisions—some 30,000 men combined—sallied from their Cambodian salient to attack An Loc and Loc Ninh in hopes that a quick victory would lead to a drive down Highway 13 to Saigon itself.

The Easter Offensive engaged the full weight of USAF's in-theater forces which, though much reduced, were still formidable. The B-52 force, which had proved to be key in the relief of Khe Sanh four years earlier, had been reinforced. There were 53 of the heavy bombers at U Tapao RTAB, Thailand, and 85 at Andersen AFB, Guam. By the end of May, another 33 BUFFs were deployed against the attackers, bringing the force total to 171 B-52s.

Despite three years of Vietnamization, some 102 Air Force fighters remained in South Vietnam—64 F-4s, 15 A-1s, and 23 A-37s. These were supplemented by 15 AC-119 gunships. Also on hand outside of South Vietnam were 91 F-4s and 16 F-105 fighters, 10 B-57s, and 13 AC-130 gunships based in Thailand. (An AC-130 would fall victim to a Strela, the first loss of its type.)

In all, 171 B-52s participated in the Easter Offensive. The return to Southeast Asia was called "Bullet Shot." Here, some BUFFs await bomb loading. The number of sorties rose from 689 in March to 2,223 in May.

Desperate Situations

These forces were committed as soon as weather permitted. The combination of Tactical Air Control Systems, Forward Air Controllers, radar, and airborne command posts enabled American commanders to get the maximum effectiveness from the limited resources. B-52 bomber and tactical fighter attacks were provided in the most desperate situations as they arose, and gunships were allocated to the outposts under the heaviest fire. The gunships also provided mobile cover for retreating forces, laying down gunfire as roadblocks to the pursuing enemy armor.

While the in-theater forces were putting on a maximum effort, the orders went out for a worldwide mobilization of USAF units to return to Southeast Asia prepared to fight a vicious, protracted battle. The transfer of B-52s was called "Bullet Shot." The return of tactical fighters went by the name "Constant Guard" (I–IV).

The 45 days following the start of the Easter Offensive saw the Air Force demonstrate global mobility and power on a massive scale. From bases in Korea, the Philippines, and the United States, additional fighters, bombers, gunships, electronic warfare birds, search and rescue units, transports, and tankers moved in a swift, smooth flow to Southeast Asia. In some instances, units were in combat just three days after they received orders to move.

The strike forces built up rapidly: Fighters doubled to almost 400, B-52 bomber strength increased to 171, and the number of tankers rose to 168. The Navy and Marines also responded, with the carrier force building to six.

In many instances, USAF's airmen were coming back for their second or third tours in the area, often to the same bases from which they had op-

Several A-1 Skyraiders, such as this one heading in to attack a North Vietnamese target, were among the 102 USAF fighters on hand in South Vietnam at the start of the offensive.

United States only 72 hours earlier) hammered Communist troop concentrations, while tactical aircraft carried out surgical strikes at specific targets. Tankers once again became the true force multipliers, refueling both bombers and fighters. At bases such as Bien Hoa in South Vietnam, "turn-around" tactics permitted fighters from Thailand to land, rearm, and make another sortie before returning to home base.

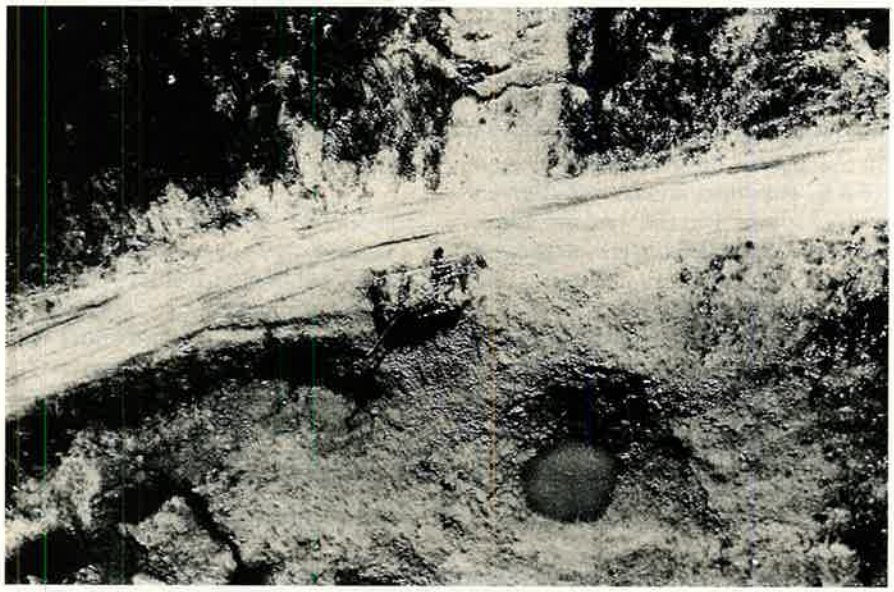
Significantly, the Air Force made use of "smart bombs" against key targets. Cargo aircraft weaved their way through smoke, flak, and the dangerous Strela missiles to land when they could or drop when they could not. Gunships flew protective sorties around embattled garrisons,

erated previously. The bases themselves were in varying states of readiness; after the years-long drawdown, the local population had stripped them of useful material, from radar gear down to household wiring, toilets, and window panes.

Air Force units returned to find runways intact, but not much else on hand, and tent cities sprouted where there had once been a complete base complex that had included air-conditioned hootches, clubs, theaters, and swimming pools.

Creature comforts were of little consequence, however, as the new units were immediately thrown into desperate battle. B-52 sorties in South Vietnam built from 689 in March to 2,223 in May. Fighter strike sorties of all branches (including the South Vietnamese air force) rose from 4,237 in March to 18,444 in May and were held at 15,951 in June.

USAF suffered heavy casualties. Between the start of the offensive and its withering away in June, the Air Force lost 77 aircraft, including 34 F-4 Phantoms. The scope of the conflict had been expanded on May 8 when Nixon authorized extensive strikes into North Vietnam itself under the code name Operation Linebacker. As it turned out, Nixon's decision to take the war north was crucial, because North Vietnam, as a result, could never muster the kind of logistical flow necessary to support such an intense offensive.



The new AC-130 gunships, such as the one in the top photo, joined AC-119s in supporting outposts under the heaviest fire. Above, another Communist T-54 tank has been put out of commission near a bomb crater.

USAF and the Halt Phase

The relative degree of Air Force responsibility for halting the invasion varied from region to region and depended in large part upon the effectiveness of the South Vietnamese army in defending its homeland. Where the ARVN fought effectively, as it did in Military Region II, the demands on USAF, while still crucial, were moderate. Where events or poor leadership caused ARVN to waver, as in Military Region I, massive USAF intervention was absolutely essential.

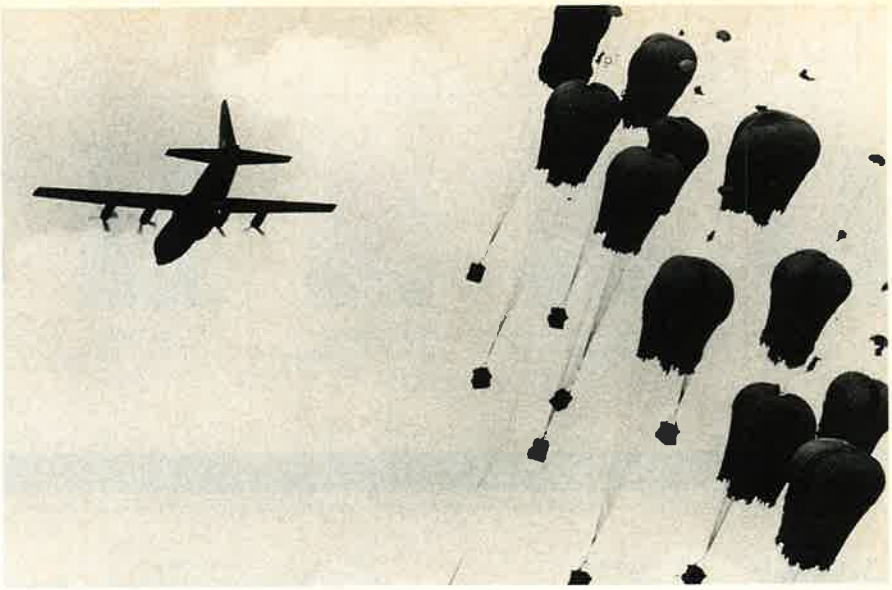
Yet in every region, the same combination of USAF capabilities worked effectively. Massive B-52 strikes (some by aircraft that were in the laying down a curtain of fire to suppress enemy attacks. Amidst the carnage, FACs flew calmly, calling out targets and monitoring enemy movements. And through it all, the search and rescue units worked to recover downed airmen.

The bottom line was that, in under two months, USAF had returned to Southeast Asia—in strength and fully proficient—and went on to break up and halt Giap's powerful offensive and thereby thwart Hanoi's drive to take over South Vietnam.

Of the three major invasion thrusts, the stakes had been greatest in Military Region III where a

decisive North Vietnamese drive past An Loc and into Saigon might well have won the war in a single battle. The fight for MR III typifies the struggle that unfolded in all three areas and can be used as a model to illustrate the powerful results achieved by USAF in all three regions. The strength of the Air Force effort was heightened by its use of battle-proven techniques.

The enemy had brushed by weak ARVN resistance to put the town of An Loc under a siege that would last for two months and would become a byword for hardship and misery. The ARVN units invested at An Loc had no artillery with which they could respond to the almost continuous shelling of the city. The South Vietnamese army depended entirely upon aircraft for critical supplies.



Aerial resupply was critical, but it also proved extremely hazardous because of the intense anti-aircraft fire. The arrival of an improved parachute system permitted successful use of the Ground Radar Aerial Delivery System.

Burning Hulks

Continuous sorties by B-52 bombers, using "Bugle Note" tactics that had been so effective at Khe Sanh in 1968, smashed the enemy buildup and made North Vietnamese commanders spread out their force, inhibiting their ability to concentrate for an attack. US Air Force FACs flew through the intense anti-aircraft fire to spot artillery, mortar, and rocket batteries and call in strikes by the fighter–bombers. When the enemy, using tanks and infantry, surged past the city's outer fortifications into the heart of An Loc's defenses, the F-4s and gunships ground them down with a series of ferocious attacks that left the tanks destroyed in the streets.

Just as at Khe Sanh, Allied air forces operated in two modes. On the one hand, they were at the front lines, blunting attacks with bombs and rockets. On the other, they placed the besieging Communist forces under siege themselves by bombing supply dumps and routes.

The demand for aerial resupply was crucial in the battle for An Loc, where more than 20,000 personnel required everything to be brought in by air. South Vietnamese air force efforts at resupply had failed, for the anti-aircraft fire was too intense. Their aerial drops had been inaccurate. Initial USAF resupply efforts were both ineffective and costly. The C-130s began Container Delivery System drops immediately, but these were too hazardous. Intense anti-aircraft fire had brought down one C-130 and caused heavy damage to four others.

The C-130 crews turned to a Ground Radar Aerial Delivery System, but a series of parachute malfunctions aborted the effort. Knowing that the defenders at An Loc were desperate for food and ammunition, the CDS operations were resumed with some success until another C-130 was shot down. Night CDS drops were tried but proved unsuccessful. It was impossible to deliver the supplies to the drop zone with any accuracy.

The supply situation was finally resolved with the resumption of GRADS sorties, this time with an improved parachute system. The difference was remarkable, and about 1,000 tons of supplies per day were dropped to the defenders. (At Kontum, in MR II, the All Weather Air Delivery System had been the delivery system of choice.)

The massive weight of the American aerial effort finally paid off in the field; North Vietnamese forces suffered enormous casualties and were forced to withdraw in all three military regions. South Vietnamese forces were able to recapture their badly damaged cities.

In retrospect, it becomes clear that the American air assaults of spring 1972 bought South Vietnam three more years of existence. The United States in December 1972 forced Hanoi to resume serious peace negotiations by unleashing Linebacker II, 11 days of heavy bombing of key targets in the North. At the end of it, the North Vietnamese had had enough for a while. In February 1973, the warring parties signed the Paris peace accords, and American POWs returned home.

Giap, after suffering a third major battlefield fiasco, licked his wounds and waited for the right time to attack again. It came in spring 1975, when American forces had withdrawn, Nixon was no longer in the White House, and it was clear the American public no longer had the will to defend South Vietnam. Then, he attacked, and this time, without US backing, South Vietnamese military units offered scant resistance. Communist tanks finally rolled into Saigon on April 30, 1975. American airpower had been withheld, and Giap had his victory at last. ■

Walter J. Boyne, former director of the National Air and Space Museum in Washington, is a retired Air Force colonel and author. He has written more than 400 articles about aviation topics and 28 books, the most recent of which is Beyond the Wild Blue: A History of the United States Air Force, 1947–1997. *His most recent article for* Air Force *Magazine, "Airpower at Khe Sanh," appeared in the August 1998 issue.*

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Keesler AFB, Miss.

19th Air Force
Maj. Gen. Kurt B. Anderson
Randolph AFB, Texas

Air Force Recruiting Service
Brig. Gen. Peter U. Sutton
Randolph AFB, Texas

Air University
Lt. Gen. Joseph J. Redden
Maxwell AFB, Ala.

Wilford Hall USAF Medical Center (59th Medical Wing)
Maj. Gen. Paul K. Carlton Jr.
Lackland AFB, Texas

Air Force Materiel Command

Hq. Wright–Patterson AFB, Ohio

Commander
Gen. George T. Babbitt

Vice Commander
Lt. Gen. Stewart E. Cranston

Aeronautical Systems Center
Lt. Gen. Robert F. Raggio
Wright–Patterson AFB, Ohio

Electronic Systems Center
Lt. Gen. Ronald T. Kadish
Hanscom AFB, Mass.

Human Systems Center
Brig. Gen. John G. Jernigan
Brooks AFB, Texas

Space & Missile Systems Center
Maj. Gen. Eugene L. Tattini
Los Angeles AFB, Calif.

Air Force Development Test Center
Maj. Gen. Michael C. Kostelnik
Eglin AFB, Fla.

Air Force Flight Test Center
Brig. Gen. Richard V. Reynolds
Edwards AFB, Calif.

Arnold Engineering Development Center
Col. Michael L. Heil
Arnold AFB, Tenn.

Ogden Air Logistics Center
Maj. Gen. Richard H. Roellig
Hill AFB, Utah

Oklahoma City Air Logistics Center
Maj. Gen. Charles H. Perez
Tinker AFB, Okla.

Sacramento Air Logistics Center
Brig. Gen. Michael P. Wiedemer
McClellan AFB, Calif.

San Antonio Air Logistics Center
Brig. Gen. Paul L. Bielowicz
(as of Sept. 30, 1998)
Kelly AFB, Texas

Warner Robins Air Logistics Center
Maj. Gen. Richard N. Goddard
Robins AFB, Ga.

Air Force Research Laboratory
Maj. Gen. Richard R. Paul
Wright–Patterson AFB, Ohio

Aerospace Maintenance & Regeneration Center
Col. Gregory O. Stanley
Davis–Monthan AFB, Ariz.

Air Force Security Assistance Center
Brig. Gen. Antonio J. Ramos
Wright–Patterson AFB, Ohio

Cataloging & Standardization Center
Col. Thomas L. Shively
Battle Creek, Mich.

Joint Logistics Systems Center
Lorna Estep
Wright–Patterson AFB, Ohio

Air Force Office of Scientific Research
Joseph F. Janni
Bolling AFB, D.C.

US Air Force Museum
Charles D. Metcalf
Wright–Patterson AFB, Ohio

Major Commands

Air Force Reserve Command

Hq. Robins AFB, Ga.

Commander
Maj. Gen. James E. Sherrard III
(Nominated)

Vice Commander
Maj. Gen. David R. Smith

4th Air Force
Maj. Gen. Wallace W. Whaley
McClellan AFB, Calif.

10th Air Force
Brig. Gen. John A. Bradley
NAS Fort Worth JRB, Carswell Field, Texas

22d Air Force
Maj. Gen. James E. Sherrard III
Dobbins ARB Ga.

Air Force Space Command

Hq. Peterson AFB, Colo.

Commander
Gen. Richard B. Myers

Vice Commander
Lt. Gen. Lance W. Lord

14th Air Force
Maj. Gen. Gerald F. Perryman Jr.
Vandenberg AFB, Calif.

20th Air Force
Maj. Gen. Donald G. Cook
F.E. Warren AFB, Wyo.

Space Warfare Center
Brig. Gen. William R. Looney III
Schriever AFB, Colo.

Air Force Special Operations Command

Hq. Hurlburt Field, Fla.

Commander
Maj. Gen. Charles R. Holland

Vice Commander
Brig. Gen. Edward L. LaFountaine

16th Special Operations Wing
Col. Donald C. Wurster
Hurlburt Field, Fla.

352d Special Operations Group
Col. John W. Zahrt
RAF Mildenhall, UK

353d Special Operations Group
Col. Jerald Folkerts
Kadena AB, Japan

720th Special Tactics Group
Col. James L. Oeser
Hurlburt Field, Fla.

USAF Special Operations School
Col. Brian Maher
Hurlburt Field, Fla.

Air Mobility Command

Hq. Scott AFB, Ill.

Commander
Gen. Charles T. Robertson Jr.

Vice Commander
Lt. Gen. Walter S. Hogle Jr.

15th Air Force
Lt. Gen. John B. Sams Jr.
Travis AFB, Calif.

21st Air Force
Lt. Gen. Maxwell C. Bailey
McGuire AFB, N.J.

Air Mobility Warfare Center
Maj. Gen. William Welser III
Ft. Dix, N.J.

Tanker Airlift Control Center
Brig. Gen. Duncan J. McNabb
Scott AFB, Ill.

Pacific Air Forces

Hq. Hickam AFB, Hawaii

Commander
Gen. Patrick K. Gamble

Vice Commander
Lt. Gen. (sel.) Charles R. Heflebower
(Nominated)

5th Air Force
Lt. Gen. John B. Hall Jr.
Yokota AB, Japan

7th Air Force
Lt. Gen. Joseph E. Hurd
Osan AB, South Korea

11th Air Force
Unannounced
Elmendorf AFB, Alaska

13th Air Force
Maj. Gen. Thomas C. Waskow
(as of Sept. 30, 1998)
Andersen AFB, Guam

United States Air Forces in Europe

Hq. Ramstein AB, Germany

Commander
Gen. John P. Jumper

Vice Commander
Lt. Gen. William J. Begert

3d Air Force
Maj. Gen. William S. Hinton Jr.
RAF Mildenhall, UK

16th Air Force
Lt. Gen. Michael C. Short
Aviano AB, Italy

Senior Enlisted Advisors

CMSgt. Frederick J. Finch
Air Combat Command
Langley AFB, Va.

CMSgt. Kenneth E. Hair
Air Education and
Training Command
Randolph AFB, Texas

CMSgt. Marc A. Mazza
Air Force
Materiel Command
Wright–Patterson AFB, Ohio

CMSgt. Carol A. Smits
Air Force
Reserve Command
Robins AFB, Ga.

CMSgt. Dennis Fritz
Air Force Space Command
Peterson AFB, Colo.

CMSgt. Michael C. Reynolds
Air Force Special
Operations Command
Hurlburt Field, Fla.

CMSgt. Kenneth F. Van Holbeck
Air Mobility Command
Scott AFB, Ill.

CMSgt. Ronald W. Crowl
Pacific Air Forces
Hickam AFB, Hawaii

CMSgt. Kenneth W. Casey
United States Air Forces
in Europe
Ramstein AB, Germany

CMSgt. Gary R. Broadbent
Air National Guard
Andrews AFB, Md.

CMSgt. David I. Priest
Air Force Office of Special
Investigations
Bolling AFB, D.C.

CMSgt. David Hill
Air Intelligence Agency
Kelly AFB, Texas

Unannounced
11th Wing
Bolling AFB, D.C.

CMSgt. Mike L. Myers
United States
Air Force Academy
Colorado Springs, Colo.

Field Operating Agencies

Air Force Agency for Modeling and Simulation
Orlando, Fla.

Commander
Col. Jimmy H. Wilson

Air Force Audit Agency
Washington

Auditor General
Jackie R. Crawford

Air Force Base Conversion Agency
Arlington, Va.

Director
Albert F. Lowas Jr.

Air Force Center for Environmental Excellence
Brooks AFB, Texas

Director
Gary M. Erickson

Air Force Center for Quality and Management Innovation
Randolph AFB, Texas

Commander
Col. John C. Vrba

Air Force Civil Engineer Support Agency
Tyndall AFB, Fla.

Commander
Col. H. Dean Bartel

Air Force Cost Analysis Agency
Arlington, Va.

Commander
Unannounced

Air Force Flight Standards Agency
Andrews AFB, Md.

Commander
Col. Richard P. Packard

Air Force Historical Research Agency
Maxwell AFB, Ala.

Commander
Col. William E. Mathis

Air Force History Support Office
Washington

Commander
Col. Christine L. Jaremko

Air Force Inspection Agency
Kirtland AFB, N.M.

Commander
Col. James C. Robertson III

Air Force Legal Services Agency
Bolling AFB, D.C.

Commander
Col. Jerald D. Stubbs

Field Operating Agencies (continued)

Air Force Logistics Management Agency
Maxwell AFB, Gunter Annex, Ala.

Commander
Col. Richard M. Bereit

Air Force Medical Operations Agency
Bolling AFB, D.C.

Commander
Maj. Gen. Earl W. Mabry II

Air Force Medical Support Agency
Brooks AFB, Texas

Commander
Col. Sidney Brandler

Air Force News Agency
Kelly AFB, Texas

Commander
Col. Harold J. Smarkola Jr.

Air Force Office of Special Investigations
Bolling AFB, D.C.

Commander
Brig. Gen. Francis X. Taylor

Air Force Operations Group
Washington

Commander
Col. Dave P. Jones

Air Force Personnel Center
Randolph AFB, Texas

Commander
Maj. Gen. Donald A. Lamontagne

Air Force Personnel Operations Agency
Washington

Director
Susan A. O'Neal

Air Force Program Executive Office
Washington

Air Force Acquisition Executive
Unannounced

Air Force Real Estate Agency
Bolling AFB, D.C.

Director
William E. Edwards

Air Force Review Boards Agency
Andrews AFB, Md.

Director
Joe G. Lineberger

Air Force Safety Center
Kirtland AFB, N.M.

Director
Maj. Gen. Francis C. Gideon Jr.

Air Force Services Agency
San Antonio

Commander
Col. Horace L. Larry

Air Force Studies and Analyses Agency
Washington

Commander
Col. Kurt A. Chichowski

Air Force Technical Applications Center
Patrick AFB, Fla.

Commander
Col. John T. Wigington III

Air Force Weather Agency
Offutt AFB, Neb.

Commander
Col. John L. Hayes

Air Intelligence Agency
Kelly AFB, Texas

Commander
Brig. Gen. John R. Baker

Air National Guard Readiness Center
Washington

Commander
Brig. Gen. Craig R. McKinley

Joint Combat Rescue Agency
Langley AFB, Va.

Commander
Col. Denver L. Pletcher

Joint Services Survival, Evasion, Resistance, and Escape Agency
Ft. Belvoir, Va.

Commander
Col. Mike Bergstresser

Direct Reporting Units

Air Force Communications and Information Center
Washington

Commander
Lt. Gen. William J. Donahue

Air Force Doctrine Center
Maxwell AFB, Ala.

Commander
Maj. Gen. Timothy A. Kinnan
(as of Sept. 30, 1998)

Air Force Operational Test and Evaluation Center
Kirtland AFB, N.M.

Commander
Maj. Gen. Jeffrey G. Cliver

Air Force Security Forces Center
Lackland AFB, Texas

Commander
Brig. Gen. Richard A. Coleman

United States Air Force Academy
Colorado Springs, Colo.

Superintendent
Lt. Gen. Tad J. Oelstrom

11th Wing
Bolling AFB, D.C.

Commander
Col. Dwayne W. Deal

Air Force Generals Serving in Joint and International Assignments

Office of the Secretary of Defense

Lt. Gen. Normand G. Lezy
Deputy Asst. Secretary of Defense (Military Personnel Policy)
Asst. Secretary of Defense (Force Management Policy)
Undersecretary of Defense (Personnel & Readiness)

Maj. Gen. James E. Andrews
DASD for Reserve Affairs (Readiness, Training, & Mobilization)

Maj. Gen. Shirley "Sam" M. Carpenter
Military Executive to the Reserve Force Policy Board and Military Advisor to the Chairman, RFPB

Maj. Gen. Kenneth R. Israel
Director, Defense Airborne Reconnaissance Office, and ADUSD (Airborne Reconnaissance)

Maj. Gen. Leslie F. Kenne
Director, Joint Strike Fighter
USD for Acquisition & Technology

Brig. Gen. James R. Beale
Acting DASD for Command, Control, Communications, Intelligence, Surveillance, & Reconnaissance (C³ISR) & Space Systems

Brig. Gen. Richard L. Comer
DASD for Policy & Missions
ASD for Special Operations & Low Intensity Conflict

Brig. Gen. John L. Hudson
Senior Military Asst. to the USD for Aquisition & Technology

Department of Defense Agencies

Lt. Gen. Lester L. Lyles
Director, Ballistic Missile Defense Organization

Lt. Gen. Kenneth A. Minihan
Director, National Security Agency
Ft. Meade, Md.

Maj. Gen. Gary L. Curtin
Director, Defense Special Weapons Agency
Alexandria, Va.

Maj. Gen. Timothy P. Malishenko
Commander, Defense Contract Management Command
Defense Logistics Agency
Ft. Belvoir, Va.

Maj. Gen. William F. Moore
Deputy Director, Defense Threat Reduction Agency
Alexandria, Va.

Brig. Gen. Richard W. Davis
Deputy for Theater Air & Missile Defense Programs
Ballistic Missile Defense Organization

Brig. Gen. Gary L. Salisbury
Deputy Director, Engineering & Interoperability
Defense Information Systems Agency
Arlington, Va.

Brig. Gen. Mary L. Saunders
Commander, Defense Supply Center Columbus
(as of Sept. 30, 1998)
Defense Logistics Agency
Columbus, Ohio

Brig. Gen. Arthur D. Sikes Jr.
Director, Customer Support Office
National Imagery & Mapping Agency
Fairfax, Va.

Joint Chiefs of Staff

Gen. Michael E. Ryan
Chief of Staff, United States Air Force

Gen. Joseph W. Ralston
Vice Chairman, Joint Chiefs of Staff

Lt. Gen. Frank B. Campbell
Director, Force Structure, Resources, & Assessment

Lt. Gen. Robert H. Foglesong
Assistant to Chairman, Joint Chiefs of Staff

Lt. Gen. John L. Woodward Jr.
Director, Command, Control, Communications & Computer (C⁴) Systems
(as of Oct. 31, 1998)

Maj. Gen. John W. Brooks
Vice Director, Logistics

Maj. Gen. John H. Campbell
Deputy Director, Operations (Current Readiness & Capabilities)

Maj. Gen. Robert A. McIntosh
Asst. to Chairman for Reserve Affairs

Brig. Gen. Patrick O. Adams
Director, Manpower & Personnel

Brig. Gen. Russell J. Anarde
Deputy Director, Operations
National Military Command Center

Brig. Gen. John R. Baker
Director, Joint Command & Control Warfare Center
Kelly AFB, Texas

Brig. Gen. Robert R. Dierker
Deputy Director, International Negotiations

Brig. Gen. Carol C. Elliott
Vice Director, Intelligence

Brig. Gen. Richard B.H. Lewis
Deputy Director, Operations, National Military Command Center

Brig. Gen. T. Michael Moseley
Deputy Director, Politico–Military Affairs

Brig. Gen. Ralph Pasini
Vice Director, Operational Plans & Interoperability

National Guard Bureau

Lt. Gen. Russell C. Davis
Chief, National Guard Bureau

Joint Service Schools

Maj. Gen. Richard L. Engel
Commandant, Industrial College of the Armed Forces
National Defense University
Ft. McNair, D.C.

Brig. Gen. Franklin J. Blaisdell
Commandant, Armed Forces Staff College
National Defense University
Norfolk, Va.

US Atlantic Command

Gen. Richard E. Hawley
Commander, Air Force Component
Langley AFB, Va.

Maj. Gen. John F. Miller Jr.
Director, Plans & Policy
Norfolk, Va.

Brig. Gen. James W. Morehouse
Deputy Commander, Joint Warfighting Center
Ft. Monroe, Va.

US Central Command

Lt. Gen. Thomas R. Case
Deputy Commander in Chief and Chief of Staff
MacDill AFB, Fla.

Lt. Gen. Hal M. Hornburg
Commander, US Central Command Air Forces
Shaw AFB, S.C.

Maj. Gen. Stephen B. Plummer
Commander, Joint Task Force–Southwest Asia
Riyadh, Saudi Arabia

Brig. Gen. Hugh C. Cameron
Deputy Commander, US Central Command Air Forces
Shaw AFB, S.C.

Brig. Gen. John W. Meincke
Director, C⁴ Systems
MacDill AFB, Fla.

US European Command

Gen. James L. Jamerson
Deputy Commander in Chief
Stuttgart–Vaihingen, Germany

Gen. John P. Jumper
Commander, Air Force Component
Ramstein AB, Germany

Maj. Gen. Robert J. Boots
Chief, Office of Defense Cooperation to Turkey
Ankara, Turkey

Maj. Gen. Ronald E. Keys
Director, Operations
(as of Sept. 30, 1998)
Stuttgart–Vaihingen, Germany

Maj. Gen. Charles J. Wax
Director, Plans & Policy
Stuttgart–Vaihingen, Germany

Brig. Gen. Charles E. Croom
Director, C³ Systems
Stuttgart–Vaihingen, Germany

Brig. Gen. David A. Deptula
Commander, Combined Task Force–Operation Northern Watch
Incirlik AB, Turkey

Brig. Gen. Glen D. Shaffer
Director, Intelligence
Stuttgart–Vaihingen, Germany

US Pacific Command

Gen. Patrick K. Gamble
Commander, Air Force Component
Hickam AFB, Hawaii

Unannounced
Commander, Alaskan Command
Elmendorf AFB, Alaska

Lt. Gen. John B. Hall Jr.
Commander, US Forces Japan
Yokota AB, Japan

Maj. Gen. Kenneth W. Hess
Deputy Director, Strategic Plans & Policy
Camp H.M. Smith, Hawaii

Brig. Gen. Norton A. Schwartz
Commander, Special Operations Command, Pacific
Camp H.M. Smith, Hawaii

US Southern Command

Lt. Gen. Lansford E. Trapp Jr.
Commander, US Southern Command Air Forces
Davis–Monthan AFB, Ariz.

Maj. Gen. Daniel M. Dick
Vice Commander, US Southern Command Air Forces
Davis–Monthan AFB, Ariz.

Brig. Gen. Howard G. DeWolf
Director, Joint Interagency Task Force–South
Howard AFB, Panama

US Space Command

Gen. Richard B. Myers
Commander in Chief and DoD Manager for Manned Spaceflight Support Operations
Peterson AFB, Colo.

Maj. Gen. Rodney P. Kelly
Director, Operations
Peterson AFB, Colo.

Maj. Gen. Gerald F. Perryman Jr.
Commander, Air Force Component–Space Operations
Vandenberg AFB, Calif.

Maj. Gen. Harry D. Raduege Jr.
Director, Command Control Systems
(as of Sept. 30, 1998)
Peterson AFB, Colo.

Brig. Gen. Thomas L. Baptiste
Commander, Cheyenne Mountain Operations Center
Cheyenne Mountain AS, Colo.

US Special Operations Command

Maj. Gen. Charles R. Holland
Commander, Air Force Component
Hurlburt Field, Fla.

Brig. Gen. Michael N. Farage
Deputy Commanding General, Joint Special Operations Command
Ft. Bragg, N.C.

Brig. Gen. Gary W. Heckman
Chief of Staff and Director, Center for Command Support
MacDill AFB, Fla.

US Strategic Command

Lt. Gen. Phillip J. Ford
Deputy Commander in Chief
Offutt AFB, Neb.

Lt. Gen. Ronald C. Marcotte
Commander, Air Force Component Task Force–Bombers
Barksdale AFB, La.

Lt. Gen. Lansford E. Trapp Jr.
Commander, Air Force Component Task Force–Battle Management
Davis–Monthan AFB, Ariz.

Maj. Gen. Donald G. Cook
Commander, Air Force Component Task Force–ICBMs
F.E. Warren AFB, Wyo.

Maj. Gen. Daniel M. Dick
Vice Commander, Air Force Component Task Force–Battle Management
Davis–Monthan AFB, Ariz.

Maj. Gen. Charles R. Henderson
Director, Plans & Policy
(as of Sept. 30, 1998)
Offutt AFB, Neb.

Maj. Gen. Tiiu Kera
Director, Intelligence
Offutt AFB, Neb.

Brig. Gen. Robert F. Behler
Director, C⁴I
Offutt AFB, Neb.

Brig. Gen. Timothy J. McMahon
Deputy Director, Operations & Logistics, and Director, Combat Operations Staff
Offutt AFB, Neb.

US Transportation Command

Gen. Charles T. Robertson
Commander in Chief
Scott AFB, Ill.

Maj. Gen. Charles H. Coolidge Jr.
Director, Operations & Logistics
Scott AFB, Ill.

Maj. Gen. Leonard M. Randolph Jr.
Command Surgeon
Scott AFB, Ill.

Brig. Gen. Walter I. Jones
Director, C⁴ Systems
Scott AFB, Ill.

Brig. Gen. Gilbert J. Regan
Chief Counsel
Scott AFB, Ill.

North Atlantic Treaty Organization

Gen. John P. Jumper
Commander, Allied Air Forces Central Europe
Ramstein AB, Germany

Lt. Gen. Michael C. Short
Commander, Allied Air Forces Southern Europe
Aviano AB, Italy

Maj. Gen. John R. Dallager
Asst. Chief of Staff, Operations & Logistics
Supreme Headquarters Allied Powers Europe
Mons, Belgium

Maj. Gen. Jeffrey R. Grime
Chief of Staff, Allied Forces Northwest Europe
Stavanger, Norway

Maj. Gen. David R. Love
Deputy Commander, 6th Allied Tactical Air Force, Allied Air Forces Southern Europe
Izmir AS, Turkey

Maj. Gen. Garry R. Trexler
Deputy Commander, 5th Allied Tactical Air Force, Allied Air Forces Southern Europe
Vicenza, Italy

Maj. Gen. Gary A. Voelliger
Commander, NATO Airborne Early Warning Force
(as of Oct. 31, 1998)
Mons, Belgium

Brig. Gen. Walter E. Buchanan III
Deputy Director, Allied Command Europe Reaction Force Air Staff
Kalkar, Germany

Brig. Gen. Marion E. Callender Jr.
Deputy US Military Representative to the NATO Military Committee
Brussels, Belgium

Brig. Gen. Carrol H. Chandler
Chief of Staff, Allied Air Forces Southern Europe
Naples, Italy

Brig. Gen. John W. Rutledge
Asst. Chief of Staff, Operations
Allied Air Forces Northwest Europe
RAF High Wycombe, UK

North American Aerospace Defense Command

Gen. Richard B. Myers
Commander in Chief
Peterson AFB, Colo.

Unannounced
Commander, Alaskan NORAD Region
Elmendorf AFB, Alaska

Maj. Gen. Harry D. Raduege Jr.
Director, Command Control Systems
(as of Sept. 30, 1998)
Peterson AFB, Colo.

Brig. Gen. Thomas L. Baptiste
Commander, Cheyenne Mountain Operations Center
Cheyenne Mountain AS, Colo.

Brig. Gen. William F. Hodgkins
Deputy Commander, Canadian NORAD Region
Winnipeg, Canada

Brig. Gen. Paul D. Nielsen
Director, Plans
Peterson AFB, Colo.

United Nations Command Korea

Lt. Gen. Joseph E. Hurd
Deputy Commander in Chief; Deputy Commander, US Forces Korea; and Commander, Air Component Command, ROK/US Combined Forces Command
Osan AB, South Korea

Maj. Gen. Michael V. Hayden
Deputy Chief of Staff and Deputy Chief of Staff, US Forces Korea
Yongsan, South Korea

Central Intelligence Agency

Gen. John A. Gordon
Deputy Director, Central Intelligence

Departments of the Army and the Air Force

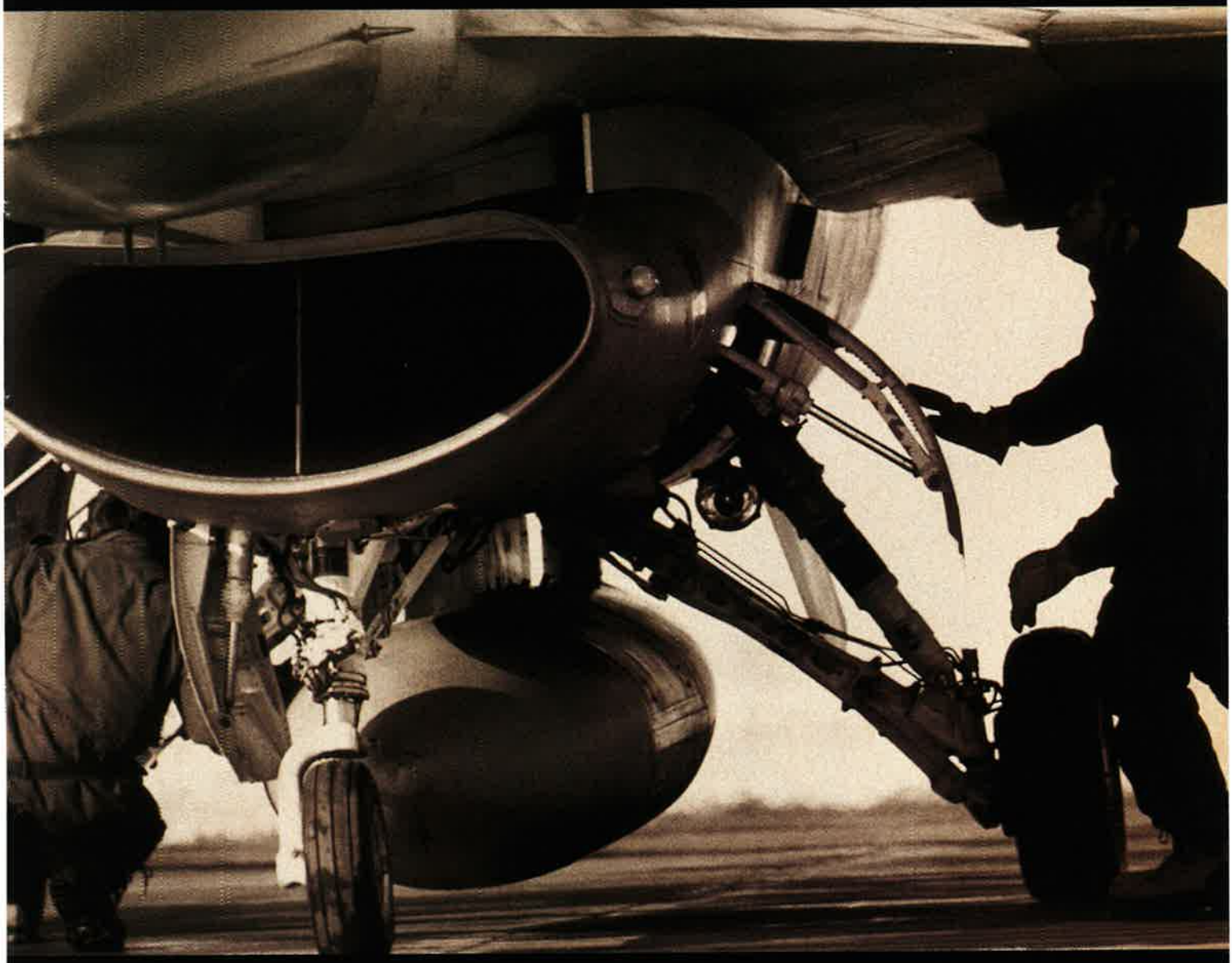
Brig. Gen. Rodney W. Wood
Deputy Commander, Army & Air Force Exchange Service
Dallas

Department of Energy

Brig. Gen. Thomas F. Gioconda
Principal Deputy Asst. Secretary for Military Application
Washington

27,000 pounds of thrust is a small part of the force it takes to propel an F-16. From the launchers to the refuelers to the air traffic controllers, weapons loaders and end of runway personnel, it takes a team. We give airmen the technological edge they need to rise to the challenge. We are as dedicated to the success of the United States Air Force as they are to the security of our country. And we know that it's about more than our technologies: it's about the people who use them.

IT TAKES ONE PERSON TO GET THIS PLANE INTO THE AIR AND A CREW TO KEEP IT THERE.



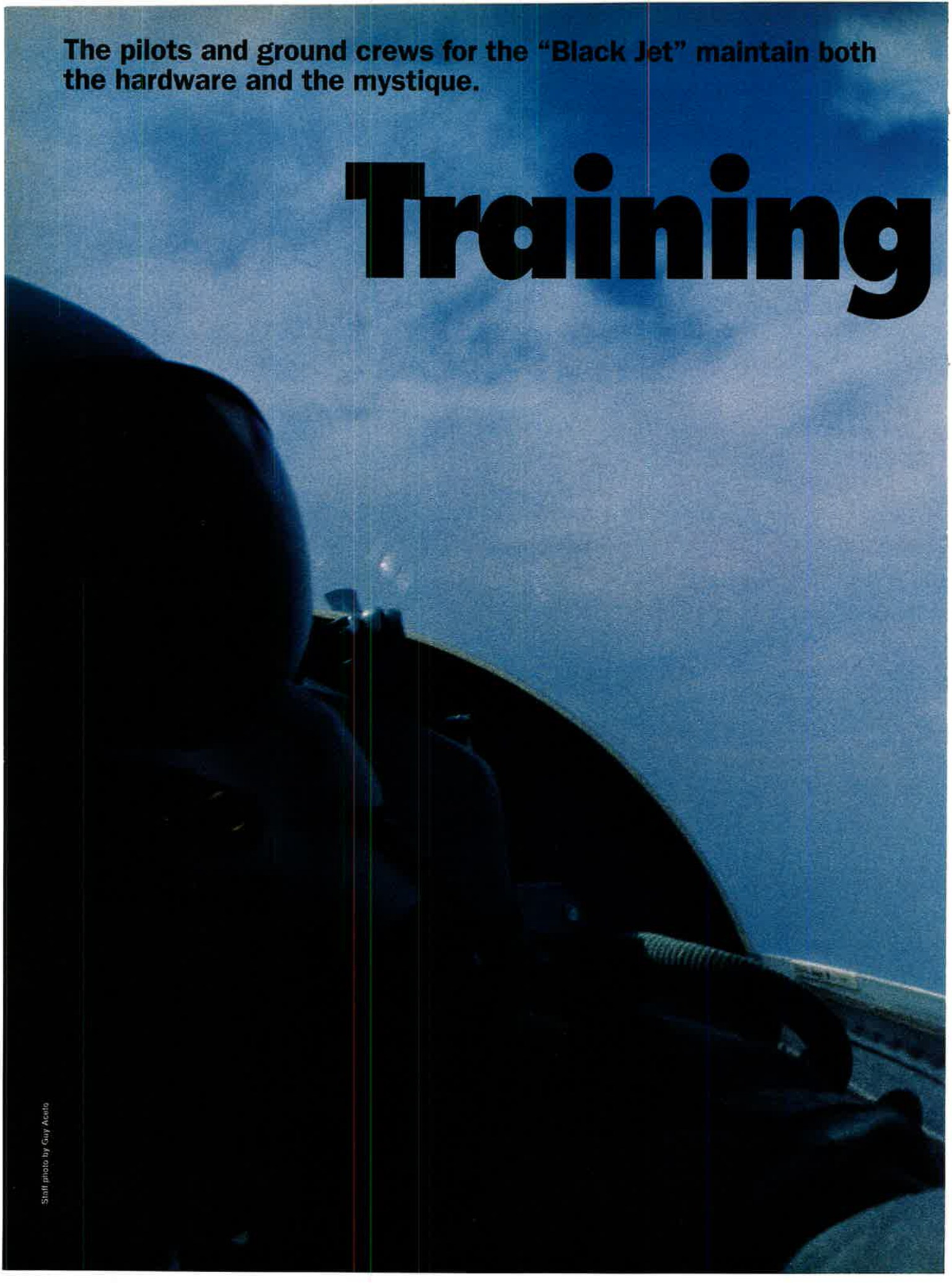
RAYTHEON SYSTEMS COMPANY

Raytheon

EXPECT GREAT THINGS

The pilots and ground crews for the "Black Jet" maintain both the hardware and the mystique.

Training



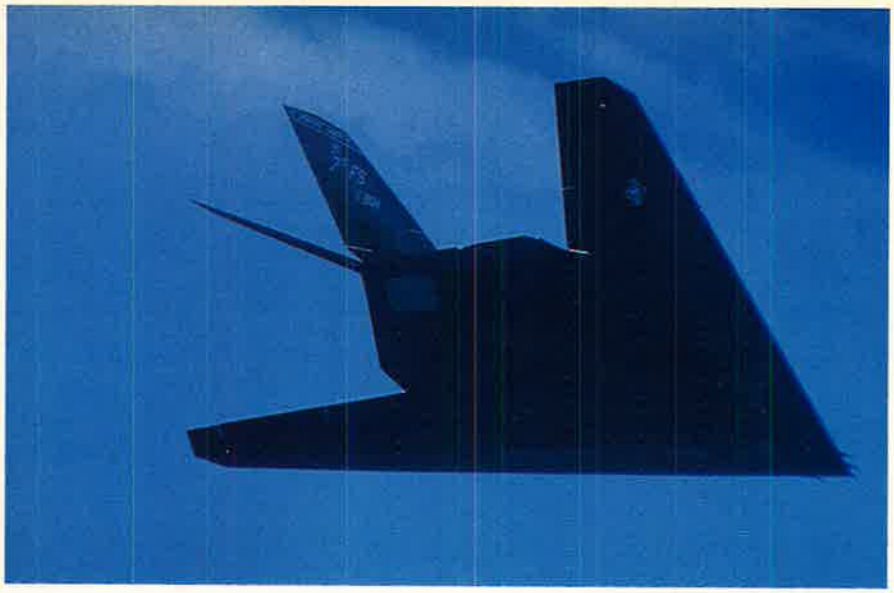
Staff photo by Guy Acuto

for Stealth

Photography by Guy Aceto, Art Director, **and Paul Kennedy**

Because there are no two-seat F-117 trainers, a pilot's first flight in the stealth fighter is also his first solo, though by that time he's had nearly a dozen hours in a high fidelity simulator. Help is only a wingtip away. Flying chase in a T-38, instructors must have an excellent hand on the stick to juggle teaching technique while piloting a very dissimilar airplane.

Photos by Paul Kennedy



Retaining an air of mystery despite being "out of the black" for more than a decade, the stealthy and exotically shaped F-117 Nighthawk also remains one of the most potent weapons in the US arsenal. A stellar performance in the Gulf War only added to the mystique, making it one of the capabilities most requested by theater commanders, with almost nonstop taskings in Saudi Arabia, Kuwait, and exercises worldwide. The 49th Fighter Wing at Holloman AFB, N.M., has three squadrons of F-117s. The wing's 7th Fighter Squadron is the one charged with training "Black Jet" pilots and maintainers. At left, a student on a training sortie cuts through the Holloman skies on his best behavior: It's the squadron commander's airplane.

While the standard mechanical elements of the F-117 are fairly easy to keep up, maintaining the jet's stealthy low observables requires more work. Applying, removing, and patching the linoleum-like Radar-Absorbent Materials on the F-117's surfaces is an exacting, labor-intensive job. Maintenance repair specialists like A1C Kenneth Sheppa at right must keep the RAM in perfect condition and alignment or the F-117's stealth could be compromised. Frustrations are common: Even if the job is done flawlessly, there's no guarantee it will stay that way. If something inside the airplane breaks, the RAM will have to come off to provide access to a panel, then be reapplied after the fix is made.

No matter how standard the guts of the F-117 may be, maintainers of the Black Jet know they are part of a unique wing. At left, A1C Erin Kipo opens a panel on her airplane. One of the few women on the maintenance line, she has her name on the nose gear door, along with that of the two other specialists who work on this particular fighter.

Photo by Paul Kennedy

F-117 pilot training soon will change. The 7th FS will take on academic as well as flying training, but its airplanes will become part of the operational 8th and 9th Fighter Squadrons—a move designed to make more aircraft available for real-world missions. The 7th will retain its T-38 companion trainers and use F-117s from the two other squadrons as necessary.

Above, a pilot prepares to strap on a Nighthawk under the watchful eyes of the crew chief. F-117s have their own hangars to facilitate the care of these extremely limited and precious assets. Arranged in two rows along the ramp leading to the flight line, the hangars form the "canyon" through which a pilot taxis en route to takeoff at right. A pilot's first flight in the F-117 may be a challenging solo, but it comes only after 10 simulator rides and 45 days of ground school, not to mention the experience in other aircraft necessary just to get here.

Gear up, and the mission begins. Training sorties take pilots all over the Southwest. The White Sands Missile Range nearby is a common workout spot.

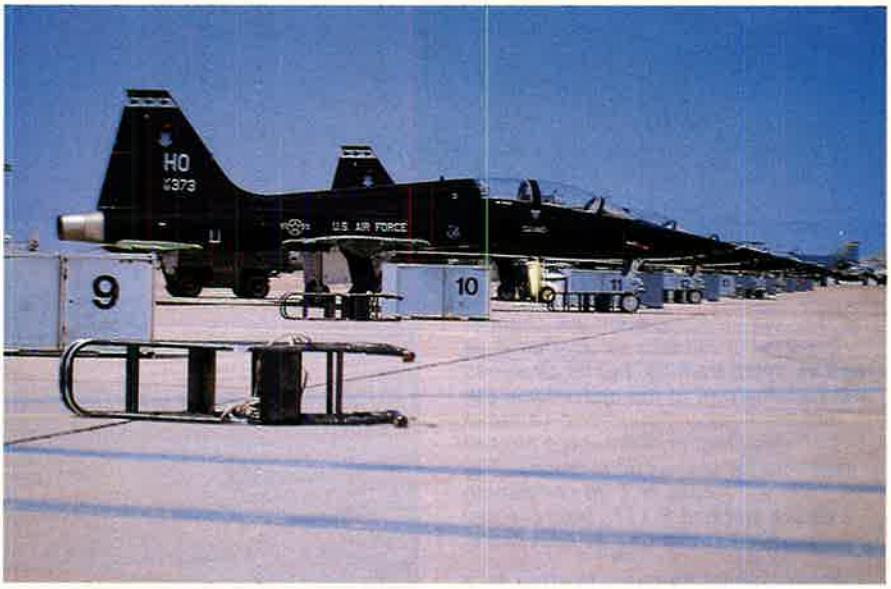
Staff photos by Guy Aceto

Photo by Paul Kennedy

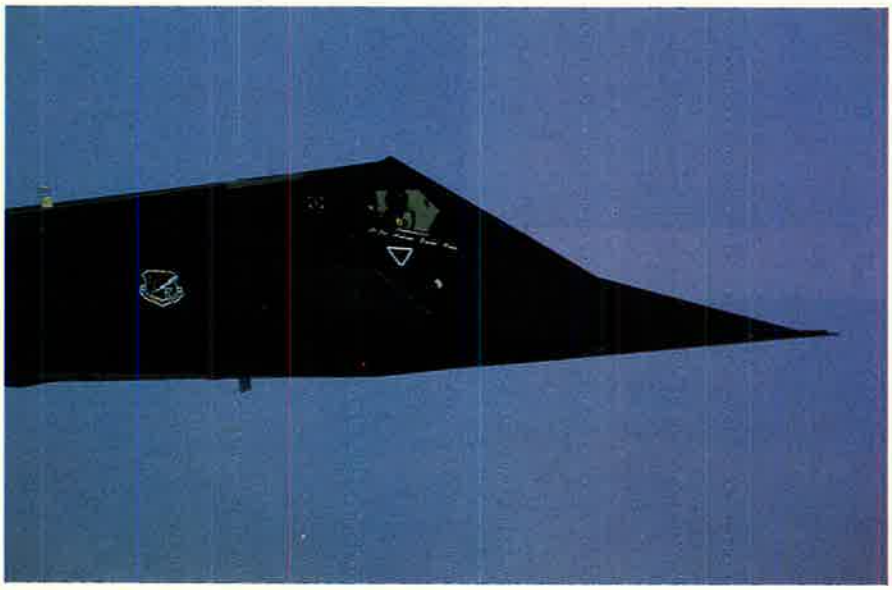
Mission planning: vital in any system but especially critical with the F-117. The physics of its unique stealth shaping require an exact and precise approach to or around threat radars, and at the 7th FS, mission planning is emphasized in the curriculum. At left, Instructor Pilot Capt. Chris Babbidge looks on as SrA. Nick Zimmerman signs off on his part of the pre-brief. Daytime flying is the rule during training, but once a pilot joins his operational squadron, nighttime operations begin, as he learns employment and tactics. About 60 percent of operational sorties are flown at night.

Painted black like their stealthy wing mates, sleek T-38 Talons are used by IPs to fly chase on their students. Instructors may have as many as three or four students, but all training is a one-on-one affair.

IPs must be masters of the T-38 as well as experts in the F-117. According to 7th FS Commander Lt. Col. Andy Papp, "You've got to get instructors who are very good instructors, because they're instructing from another airplane. You can't see exactly what the guy's doing, you can't hear what he's saying to himself, and you don't get the same feel that you get when you're in the same aircraft."

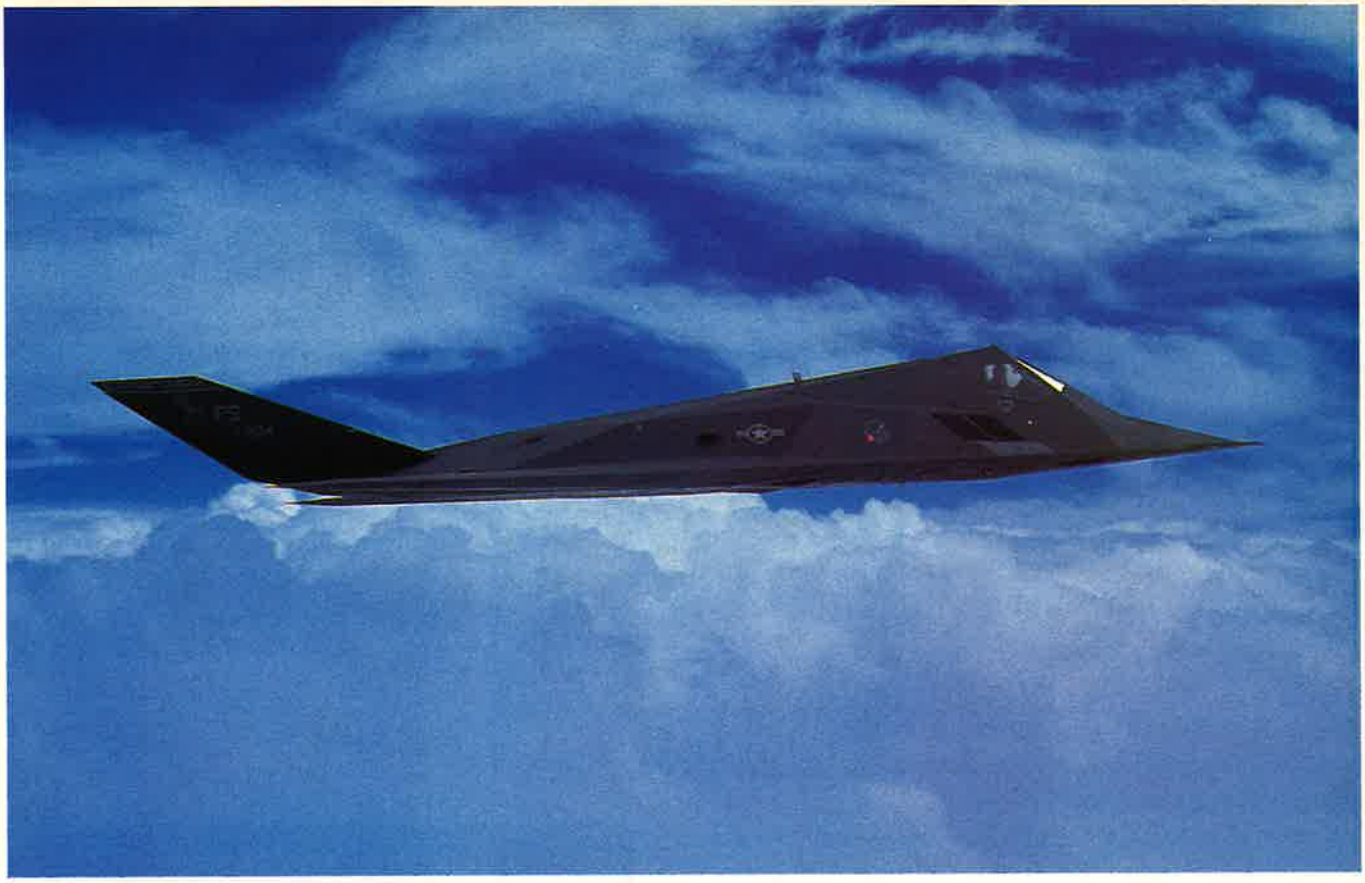


Staff photos by Guy Aceto



The price of admission to the F-117 cockpit is 750 hours in fighter aircraft. Only recently were two former B-1B pilots accepted; both had been flying the T-38 in conjunction with their bomber duties. The short training period and direct-to-solo first flight in the F-117 pose little problem for the veterans. Students "dive right in and do very well," said Papp. "It's a very easy aircraft to fly."

Staff photos by Guy Aceto



Above, Maj. "Tripp" Stallings, an F-117 IP, pops out above some puffy white clouds in a Nighthawk. The thin air and bright sunshine give the fighter a razor-sharp look as it cuts through the air, no longer the awkward-looking jumble of angles it seems on the ground.

After a month-and-a-half of intense academics and simulator rides, it's time for the real thing. When a student in an F-117 begins his takeoff roll, an instructor is already airborne in a T-38, ready to do a "chase pickup." The IP will take up a position above and slightly behind the F-117 and stay glued to the tail of the Black Jet, watching the student's every move. The T-38 is nimble enough to put the IP anywhere he needs to be to give advice and correction.

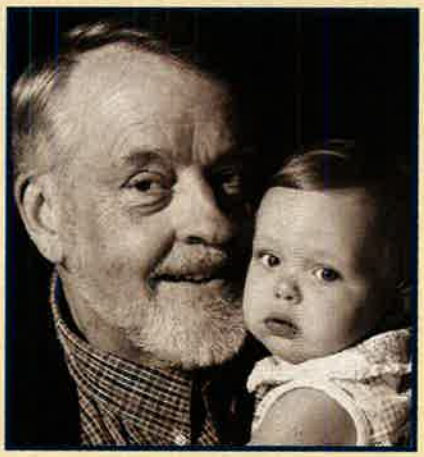
At right, Capt. Greg Pantle, another IP, keeps the T-38 locked in formation as he flies a typical student training profile with Stallings. Below right, touchdown, but the T-38 maintains its airborne vigil until the F-117 comes to a complete stop. Once a pilot graduates and moves "down the street" to one of the operational squadrons, emphasis shifts away from flying basics to getting the fighter to a target with stopwatch timing and delivering ordnance with breathtaking accuracy.

Given the F-117's track record, even student pilots express confidence in the system. Former F-15 pilot Capt. Larry Guichard commented that if he has to be "in combat, this is the aircraft I want to be in." ■

AFA Long-Term Care Program on the Horizon

(A Closer Look)

You could go through your life savings paying for care. Anyone can need care for a long time and that care can be expensive. Most long-term care expenses generally aren't covered by health or disability insurance or Medicare.



It Can Happen to Anyone

Sixty percent of those 65 and older will require some form of long-term care.[1] And 43 percent will enter a nursing home at some point in their lives.[2] But anyone, at any age, might need long-term care after an accident, an operation or because of a chronic medical condition. In fact, of the more than 13 million Americans who need long-term care, 40 percent of them are working age - 18 to 64.[3]

You May Need Care For A Long Time

You or a family member may need care for a long time. On average, people 65 and older stay in a nursing home two and a half years.[2] And over 20 percent of those who enter a nursing home will stay longer than five years.[2]

Long-Term Care Is Expensive

Some people go through their entire life savings to pay for long-term care. Nursing home care averages over $40,000 a year.[4] Care at home costs over $20,000 annually.[5] And both are rising.

You're Not Covered

The truth is, Medicare and other government programs were not designed to cover long-term care expenses. Your health insurance may cover very little long-term care, typically only short-term recuperative care after a hospital stay. Additionally, long-term disability insurance doesn't pay for long-term care; it only covers income loss.

The government program that *does* pay for long-term care is Medicaid. But most people don't qualify for Medicaid assistance and they're forced to "spend down" their assets until they do. As a result, most of the bill for long-term care services is paid by the people who need the care, or in many unfortunate cases, their extended families.

Plan Now, Before It's Too Late

Information on AFA's new long-term care program will be sent to members early next year and will be available to current and former military personnel as well as spouses, parents and parents-in-law. ***Watch for more information about this important program.***

Evaluating a Long-Term Care Program

Here's what you should consider when evaluating a long-term care program:

- ✓ Comprehensive plans and flexible coverage
- ✓ Choice of plans to fit your individual needs and budget
- ✓ Choice of automatic inflation protection or future purchase option
- ✓ Choice of care and the providers you prefer
- ✓ Coverage that is fully portable anywhere in the United States
- ✓ Premiums that do not increase because of age or illness
- ✓ Coverage that is guaranteed renewable
- ✓ Expert Care Advisors available to help you choose the best services to meet your needs

References:

1. Project Report Prepared for HIAA, 1990.
2. *New England Journal of Medicine*, 1991.
3. United States General Accounting Office, 1995.
4. Health Insurance Association of America, 1997.
5. Long Term Care Group, Inc., 1997.

Gallery of Russian Aerospace Weapons

By Kenneth Munson

Bombers

Tupolev Tu-22M (NATO Backfire)
Brief: Variable-geometry bomber, capable of high- or low-level nuclear strike, conventional attack, and anti-ship missions against deep theater targets.
Function: Medium-range bomber.
Operator: Air Forces, Navy.
First Flight: Aug. 30, 1969 (Tu-22M); June 20, 1977 (Tu-22M-3).
Delivered: 1971.
IOC: not available
Production: 497 (nine prototypes; nine Tu-22M-1s; 211 Tu-22M-2s; 268 Tu-22M-3s).
Inventory: 130 (Air Forces); 105 (Navy).
Contractor: Kazan.
Power Plant: two Samara/Kuznetsov NK-25 turbofans; each 55,115 lb thrust with afterburning; provision for JATO rockets.
Accommodation: crew of four, in pairs on zero/zero ejection seats.
Dimensions: span 112 ft 6 in spread, 76 ft 5 in swept (Tu-22M-3); length 139 ft 4 in; height 36 ft 3 in.
Weight: gross 273,370 lb (278,660 lb with JATO).
Ceiling: 43,635 ft.
Performance: max speed at high altitude Mach 1.88, at low altitude Mach 0.86, nominal cruising speed 560 mph, T-O run 6,560–6,890 ft, landing run 3,940–4,265 ft, max unrefueled combat radius with 26,455 lb weapons: supersonic hi-hi-hi 930–1,150 miles, subsonic lo-lo-lo 930–1,035 miles, subsonic hi-lo-hi 1,495 miles.
Armament: max offensive weapon load comprises three Kh-22 (AS-4 Kitchen) ASMs; or 52,910 lb of conventional bombs or mines, half of them carried internally. Internal bombs can be replaced by a rotary launcher for six Kh-15P (AS-16 Kickback) SRAMs, with four more under wing as alternative to Kh-22s. The Tu-22M-3 can also carry Kh-31A/P (AS-17 Krypton) and Kh-35 (AS-20 Kayak) ASMs. Normal weapon load is a single Kh-22 or 26,455 lb of bombs. Typical loads are two FAB-3000, eight FAB-1500, 42 FAB-500, or 69 FAB-250 or -100 bombs (figures indicate weight in kg), or eight 3,300-lb or 18 x 1,100-lb mines. Tu-22M-2 has two GSh-23 twin-barrel 23 mm guns in radar-directed tail mounting. Tu-22M-3 has single GSh-23M gun, with barrels one above the other and 4,000 rds/min rate of fire, in aerodynamically improved tail mounting.

COMMENTARY

Bureau designation, Tu-145. Development funding obtained in preference to opposing Sukhoi design by subterfuge of presenting Tu-145 as modification of Tu-22 (Blinder).

Tu-22M-1 flew July 1971 and issued to operational trials unit.

Tu-22M-2 (Backfire-B): First major production version, with 48,500-lb-thrust NK-22 turbofans; deliveries to 185th Regiment at Poltava began 1975; operational by 1978. Three position wing sweep: 20°, 30°, or 60°. Slightly inclined lateral engine air intakes, with large splitter plates. Above-nose fairing replaces in-flight refueling probe that made possible strategic roles before SALT treaty restrictions. Few remain in service.

Tu-22M-3 (Backfire-C): Advanced version with more powerful engines and wedge-type air intakes; strengthened wings for increased weapon load; maximum sweep 65°; upturned nosecone with no flight-refueling probe; improved avionics including INS, active and passive ECM, new radios, and electro-optical bombsight; and automated flight controls. Deliveries began in 1981; 185th Regiment re-equipped by 1983; also to Navy from 1985. Production ended in 1992.

***Tu-22M-3** Backfire-C* (Yefim Gordon)

***Tu-95MS** Bear-H* (Paul Jackson)

Tu-22M-5: Proposed upgrade (Tu-245) of M-3 version with new avionics and armament, having capability of automatic terrain-following and delivery of next-generation ASMs.

Tupolev Tu-95 (NATO Bear-H)
Brief: Turboprop-powered Bears serve as the prime component of the Russian strategic bomber fleet.
Function: Long-range bomber.
Operator: Air Forces.
First Flight: Nov. 12, 1952.
Delivered: 1955.
IOC: 1956; 1984 (Bear-H).
Production: not available
Inventory: 28 Tu-95MS6 and 35 Tu-95MS16 (Strategic Forces).
Contractor: Taganrog.
Power Plant: four Samara/Kuznetsov NK-12MA turboprops; each 14,795 ehp. Equipped for in-flight refueling.
Accommodation: crew of seven.
Dimensions: span 164 ft 2 in, length 161 ft 2 in, height 43 ft 8 in.
Weight: empty 208,115 lb, gross 412,258 lb.
Ceiling: 39,370 ft.
Performance: max speed at 25,000 ft 575 mph, at S/L 404 mph; nominal cruising speed 442 mph; combat radius with 25,000-lb payload 3,975 miles, with one in-flight refueling 5,155 miles.
Armament: refer to individual versions.

COMMENTARY

At first dismissed as an anachronism when compared to the contemporary USAF B-52, the Bear remained in production for 38 years, initially in the free-fall nuclear role. The Bear-B cruise missile carrier appeared in 1959, and later variants were used for reconnaissance, Elint, and maritime duties. All original Tu-95 airframes have been retired; the Tu-95MS employs a shortened Tu-142 airframe incorporating improvements including increased rudder chord, more cambered wing airfoil, double-slotted flaps, and longer fuselage forward of the wings.

Tu-95MS16: Carries six Kh-55 (AS-15 Kent) long-range cruise missiles on an internal rotary launcher, two more under each wing root and a cluster of three between each pair of engines, for a total of 16.

Tu-95MS6: All of the -16 version will be modified to this final production standard, with the pylons for 10 under-wing missiles removed to conform with SALT/START treaty limitations. Features include a larger and deeper radome (Clam Pipe) built into the nose and a small fin tip IR warning receiver fairing. Some aircraft have a single twin-barrel 23 mm gun, instead of the usual pair, in the tail turret. An active electronic jammer, RWR, missile warning receivers, and chaff/flare dispensers are standard. The Bear is expected to remain in service for up to 20 more years and may be rearmed with Kh-101 cruise missiles with conventional warheads.

Tupolev Tu-142 (NATO Bear-F)
Brief: Bear-F was produced to provide long-range support to the Soviet fleet but now suffers reduced utilization.
Function: Anti-submarine aircraft.
Operator: Navy.
First Flight: July 1968; Nov. 4, 1975 (Tu-142MK); 1985 (Tu-142M-Z prototype).
Delivered: 1972.
IOC: 1980 (Tu-142MK).
Production: about 100.
Inventory: 55.
Contractor: Kuybyshev and Taganrog.
Power Plant: four NK-12MR turboprops; rated as Tu-95MS.
Accommodation: crew of 10, incl two surveillance systems operators.
Dimensions: length (Mod 3) 174 ft 2 in, otherwise as Tu-95MS.

Weight: empty 202,380 lb, gross 407,850 lb.
Ceiling: not available
Performance: similar to Tu-95MS.
Armament: Eight Kh-35 (AS-20 Kayak) active radar homing anti-ship missiles in under-wing pairs, and 450 mm ASW torpedoes, 533 mm ASV torpedoes, or depth charges in two stores bays in rear fuselage; defensive armament in tail turret only, containing two 23 mm NR-23 guns.
COMMENTARY

First application of the stretched and modified second-generation Bear airframe was the F variant (Bear-G was a converted C). Specific features include a large under-fuselage blister fairing for Berkut J-band surface-search radar; glazed nose with in-flight refueling probe; and MAD fairings on tailplane tips. Radar and other systems based on Ilyushin Il-38 May. Able to attack submarines 3,100 miles from its base.

Tu-142: First three prototypes and 12 production aircraft had 12-wheel main landing gear bogies retracting into enlarged nacelles and chin-mounted navigation and weather radar. Later variants are identified as follows:

Tu-142 (Mod 1): Reverted to standard-size nacelles and four-wheel main landing gear bogies. Chin radar deleted; fewer protrusions; weight reduced by 8,000 lb.

Tu-142M (Mod 2): Roof of flight deck raised. Angle of refueling probe lowered by 4°. Interim Tu-142M-2 (Mod 3) carried MAD.

Tu-142MK (Mod 3): Full Mod 3 standard, with Korshun radar and MMS-106 Ladoga MAD in fin fairing. In production from 1978. Observation blister on each side of rear fuselage deleted.

Tu-142M-Z (Mod 4): Detection systems further improved; RWR thimble radome on nose; chin-mounted weather radar reintroduced, together with FLIR, radar altimeter, and com antennas in under-nose fairing; ESM receiver and antennas under rear fuselage. More powerful NK-12MP engines.

Tupolev Tu-160 (NATO Blackjack)
Brief: The Tu-160 is the heaviest and most powerful bomber and standoff cruise missile carrier ever built.
Function: Long-range bomber.
Operator: Air Forces.
First Flight: Dec. 19, 1981.
Delivered: May 1987.
IOC: not available
Production: 39.
Inventory: six.
Contractor: Kazan.
Power Plant: four Samara NK-321 turbofans; each 55,115 lb thrust with afterburning. Provision for in-flight refueling.
Accommodation: crew of four, in pairs, on zero/zero ejection seats.
Dimensions: span 182 ft 9 in spread, 116 ft 10 in swept; length 177 ft 6 in; height 43 ft.
Weight: empty 257,940 lb, gross 606,260 lb.
Ceiling: 49,200 ft.
Performance: max speed at 40,000 ft Mach 2.05, nominal cruising speed 596 mph, T-O run 7,220 ft, landing run 5,250 ft, combat radius at Mach 1.5 1,240 miles, max unrefueled range 7,640 miles.
Armament: no guns; internal stowage for up to 88,185 lb of free-fall bombs, mines, or ASMs. Typically, two rotary launchers, in forward and rear weapons bays, for a total of 12 Kh-55 (AS-15B Kent) ALCMs or 24 Kh-15P (AS-16 Kickback) SRAMs. Conventional warhead Kh-101 missiles are in prospect.
COMMENTARY

The Tu-160 has a smaller radar cross section and lower aerodynamic drag than USAF's B-1. It is in no way a scale-up of Tupolev's earlier Tu-22M. Common features include low-mounted, variable-geometry (20°, 35°, and 65°, manually selected) wings and a massive dorsal fin with all-moving upper half. When the wings are fully swept, the inboard flap ends hinge upward as large fences. Control is fly-by-wire, but the flight deck has no HUD or CRTs. The Tu-160 carries SRAMs for defense suppression during low-altitude penetration missions at transonic speed. An active jamming self-defense system is standard.

Early in 1998, Russia abandoned attempts to purchase 19 Tu-160s grounded at the former base at Priluki, since Ukraine became independent.

Fighter and Attack Aircraft

MiG I-42
Brief: Intended originally as Russia's counterpart to USAF's F-22, the MiG I-42 was conceived as a single-seat, twin-engine, and twin-fin fighter with air-to-air and air-to-surface potential. Russian designation MFI: Multirole Tactical Aircraft.
Function: Technology demonstrator for multirole fighter.
Operator: MiG bureau.
First Flight: planned mid-1998.
Delivered: none
IOC: not applicable
Production: two prototypes (designated I-44).
Inventory: not applicable
Contractor: MAPO.
Power Plant: two Saturn/Lyulka AL-41F turbofans, each rated at about 40,785 lb thrust with afterburning.
Accommodation: pilot only.
Dimensions: span approx 48 ft.
Weight: gross reportedly in 77,160-lb class.
Ceiling: not available
Performance: supercruise capability.
Armament: not available
COMMENTARY

Configuration is of a tailless delta, with foreplanes. Designed to have thrust-vectoring engine nozzles to ensure optimum agility. Assumed stealth provisions likely to result more from careful conventional airframe configuration, use of radar absorbent materials (RAMs), and use of countermeasures, than from such operationally restrictive features as internal weapons stowage. New phased-array fire-control radars have been developed by NIIP (N011M) and Phazotron (N014 Zhuk RN).

Flight testing has been delayed by funding problems for about three years. The Air Forces have abandoned their requirement for a fighter of this size, but MAPO announced early in 1998 that the I-42 will fly as a technology demonstrator in parallel to the Sukhoi S-37.

MiG-29 (NATO Fulcrum)
Brief: The standard Russian tactical fighter with primary operational role as a single-seat counterair fighter; dual-role air combat/attack capability.
Function: Tactical fighter.
Operator: Air Forces.
First Flight: Oct. 6, 1977; May 5, 1984 (MiG-29S); 1995 (MiG-29SM); Nov. 29, 1997 (MiG-29SMT avionics prototype).
Delivered: 1983.
IOC: early 1985.
Production: 1,260, incl exports.
Inventory: 460.
Contractor: MAPO; Nizhny Novgorod for MiG-29UB.
Power Plant: two Klimov/Sarkisov RD-33 turbofans; each 18,300 lb thrust with afterburning.
Accommodation: pilot only, on zero/zero ejection seat.
Dimensions: span 37 ft 3 in, length 56 ft 10 in, height 15 ft 6 in.
Weight: empty 24,030 lb, normal T-O 33,600 lb, gross 40,785 lb.
Ceiling: 59,055 ft.
Performance: max speed at height Mach 2.3, at S/L Mach 1.225; T-O run with afterburning 820 ft; landing run with brake chute 1,970 ft; range on internal fuel 888 miles, with three external tanks 1,800 miles.
Armament: six close-range R-73/E (AA-11 Archer) AAMs, or four R-73/E and two medium-range R-27R-1 (AA-10A Alamo-A), on three pylons under each wing. Alternative AAMs incl R-60T/MK (AA-8 Aphid). Able to carry bombs, submunitions dispensers, napalm, 80 mm, 130 mm, and 240 mm rockets, and other stores in attack role. One 30 mm GSh-301 gun in port wing-root leading-edge extension, with 150 rds.
COMMENTARY

The basic MiG-29 is described by the commander of the Luftwaffe wing that operates a single squadron as the best of the best for close combat but with limitations in other respects. Its N019 Sapfir-29 coherent pulse-Doppler look-down/shoot-down radar (search range 62 miles, tracking range 43 miles; ability to track 10 targets simultaneously and engage one) is supplemented by a laser range finder and infrared search/track sensor forward of the windscreen. Both systems operate in conjunction with the pilot's helmet-mounted target designator. During takeoff and landing, hinged doors shield the engine air intakes against foreign-object ingestion; engine air is then taken in through louvers in the upper surface of the wing-root extensions. Flying controls actuated hydraulically. Air brakes above and below rear fuselage.

Production for the Russian armed forces (a Navy regiment recently disbanded) ended in 1992, but continues for export at reduced rate. Significant versions are detailed below.

MiG-29 (Fulcrum-A): Single-seater. IRCM flare dispensers, each with 30 cartridges, in fences forward of dorsal tail fins. At least some Russian aircraft were wired for carriage of tactical nuclear weapons. Max armament load 4,409 lb.

MiG-29UB (Fulcrum-B): Combat trainer. Second seat forward of the normal cockpit, under a continuous canopy, with periscope and HUD repeater for rear occupant. No radar. Gun, IRST sensor, laser range finder, and under-wing stores pylons retained. Phazotron offers radar retrofit to MiG-29UB operators.

MiG-29 (Fulcrum-C): Generally as Fulcrum-A but with slightly raised upper fuselage decking aft of cockpit, housing additional avionics, including Gardeniya active jammers. Internal fuel increased by 20 gallons. Optional external fuel tanks under wings and belly. Weapon load up to 6,615 lb. Built in parallel with later Fulcrum-As.

MiG-29M: Greatly redesigned derivative, now unlikely to be ordered for Russian use. First of six prototypes flown April 25, 1986. Fly-by-wire controls; glass cockpit; N010 Zhuk terrain-following and ground-mapping radar (able to engage four targets simultaneously); laser designator/marked-target seeker; new wing airfoil; increased permissible angle of attack. Max external stores load increased to 9,920 lb.

MiG-29S (Fulcrum-C): Multistage upgrade of MiG-29 Fulcrum-C, with increased angle-of-attack range. Upgraded radar (N019M) can engage two targets simultaneously. Able to carry R-77 (AA-12 Adder) AAMs or up to 8,820 lb of bombs, rockets, or cluster bombs. Air Forces had two regiments in Germany before Russian withdrawal.

MiG-29SD (Fulcrum-A): Export version; upgraded A with most SE improvements.

MiG-29SE (Fulcrum-C): Export version; optional Western radios and IFF and Imperial instrument calibration.

MiG-29SM: As MiG-29S including dual target-engagement capability; also can carry ASMs, including two Kh-29T/TE (AS-14 Kedge) or Kh-31A/P (AS-17 Krypton), or four KAB-500KR TV–guided bombs. Gross weight 44,090 lb.

MiG-29SMT: Retrofit, including many features of MiG-29M. Avionics prototype first flew in 1997 with glass cockpit including two main 6 x 8 inch color screens and three 3.75 x 3 inch monochrome auxiliary screens, upgraded HUD, digital moving map, possibly with addition of terrain profile matching, and N019MP radar, having increased field of view and synthetic aperture air-to-ground mode. Spine of SMT is further enlarged to provide bigger fuel tank, plus optional extra tank in enlarged tailcone protruding aft of jet pipes; additional 2,205 plus 1,047 lb of fuel, respectively, permits doubling of mission radius. Further gain of 385

MiG-29SMT (Yefim Gordon)

lb possible with deletion of auxiliary engine air intake louvers. RD-43 (RD-333) engines of 22,046 lb thrust have later provision for thrust-vectoring. Max T-O weight 46,300 lb and eight under-wing hardpoints. First full prototypes flew July 14, 1998. MAPO and Air Forces' Kubinka repair plant will begin upgrading 150–180 later MiG-29s from September 1998 onwards, ramping up to a rate of 40 per year from 2000.

MiG-33. Export designation for MiG-29M. Normal gross weight 37,037 lb. Performance as for MiG-29S, except range 1,242 miles on internal fuel, 1,988 miles with three external tanks.

MiG-31 (NATO Foxhound)
Brief: The MiG-31 is an all-altitude, all-weather home-defense fighter which closely resembles the MiG-25, the type it has almost completely replaced.
Function: All-weather interceptor.
Operator: Air Forces.
First Flight: Sept. 16, 1975.
Delivered: from 1979.
IOC: 1982.
Production: not available
Inventory: 320.
Contractor: Nizhny Novgorod.
Power Plant: two Aviadvigatel D-30F6 turbofans; each 34,170 lb thrust with afterburning.
Accommodation: crew of two, on tandem zero/zero ejection seats.
Dimensions: span 44 ft 2 in, length 74 ft 5 in, height 20 ft 2 in.
Weight: empty 48,105 lb, gross 90,390–101,850 lb (MiG-31M 114,640 lb).
Ceiling: 67,600 ft.
Performance: max speed at height Mach 2.83, at S/L Mach 1.23; T-O run 3,940 ft; landing run 2,625 ft; combat radius at Mach 2.35 447 miles, at Mach 0.85 with two external tanks 901 miles.
Armament: basic armament of four R-33 (AA-9 Amos) radar-homing, long-range AAMs, in pairs under fuselage; two R-40T (AA-6 Acrid) medium-range, IR-homing AAMs on inner under-wing pylons; and four R-60 (AA-8 Aphid) close-range, IR-homing AAMs on two outer under-wing pylons. One 23 mm GSh-6-23 six-barrel Gatling-type gun in fairing on starboard lower fuselage, with 260 linkless rds.
COMMENTARY
The MiG-31 Foxhound-A's design requirement was for an all-altitude, all-weather, two-seat aircraft with advanced digital avionics. There was no need for higher redline speed than the MiG-25's Mach 2.83, but a longer range was specified, together with a redesigned airframe that would permit supersonic flight at low altitude. Mikoyan reduced the airframe's welded nickel steel content from 80 to 49 percent, with 16 percent titanium, 33 percent aluminum alloy, and 2 percent composites.

Its N007 Zaslon (Flash Dance) fire-control radar was the first electronically scanned phased-array type to enter service, with a search range of 124 miles in the forward clutter-free sector and the ability to track 10 targets and engage four simultaneously. In typical Russian style, Foxhound can take off from a semi-prepared airstrip and be guided automatically to engage targets under ground control. Operational equipment includes a semiretractable IRST sensor, RWR, and active IR and ECM. A semiretractable flight refueling probe is mounted on the port side of the front fuselage. Following a recent spate of accidents, the commander in chief of air defense was quoted as describing the MiG-31 as unsafe. Production has now ended.

MiG-31M (Foxhound-B): No recent progress has been reported with this advanced version, under development since 1984. The seventh prototype was recently displayed carrying AA-X-13 (R-37) AAMs on centerline pylons in addition to the side-mounted R-33s. Reflecting reduced expectations, the Air Forces are now being offered a Foxhound-A upgrade to near B capability, including R-37.

MiG-31B: Entered production in late 1990; improved radar and ECM, plus the ability to launch the upgraded R-33S version of AA-9 Amos. Some baseline MiG-31s converted to this standard, designated MiG-31BS.

MiG-31F: Proposed addition of air-to-ground capability to existing Foxhound-As through compatibility with AS-17 Krypton, AS-18 Kazoo and AS-14 Kedge ASMs, plus KAB-500 and KAB-1500 LGBs and their associated guidance pod.

MiG-35
Brief: A relatively low-cost competitor or backup to the Su-37, this aircraft should have flown in 1997 but has been noticeably absent from the MiG announcements since then. There is no known Air Forces requirement.
Function: Multirole fighter.
Operator: TBD
First Flight: TBD
Delivered: TBD

***MiG-31M** Foxhound* (Paul Jackson)

IOC: TBD
Production: TBD
Inventory: TBD
Contractor: MAPO (assigned).
Power Plant: two Klimov RD-133 turbofans (each 18,660 lb thrust) with afterburning. More powerful RD-333 engines (each 22,050 lb thrust) and foreplanes are expected to be installed later.
Accommodation: pilot.
Dimensions: span approx 39 ft.
Weight: not available
Ceiling: not available
Performance: not available
Armament: R-77 (AA-12 Adder) and other AAMs, on 10 stations.
COMMENTARY
Derived from the MiG-29M, the MiG-35 will have new wings with increased root chord and reduced tip chord and no sweep on the trailing edge of the inner panels. Engines will be located 3 ft farther aft to make room for 3,307 lb of additional fuel, with provision for thrust-vectoring nozzles. A Phazotron RP-35 electronically scanned phased-array radar, with 31.5-inch aerial, will offer a detection range of 87 miles, with the ability to track 24 targets and engage four simultaneously.

There are suggestions that MiG has suspended the -35 program in order to concentrate on the -29SMT but that it will now fly in 1999.

Sukhoi Su-24M (NATO Fencer-D)
Brief: Variable-geometry wings enhance the physical similarity between the major element of the Russian theater strike/attack forces and its USAF parallel, the F-111.
Function: All-weather interdiction.
Operator: Air Forces, Navy.
First Flight: July 2, 1967; June 29, 1977 (Su-24M Fencer-D prototype).
Delivered: 1973–circa 1990.
IOC: 1975.
Production: not available
Inventory: 347 (Air Forces); 70 (Navy).
Contractor: Novosibirsk and Komsomolsk.
Power Plant: two Saturn/Lyulka AL-21F-3A afterburning turbojets; each 24,690 lb thrust.
Accommodation: pilot and weapon systems officer, on side-by-side zero/zero ejection seats.

***Su-24M** Fencer-D* (Yefim Gordon)

***Su-25** Frogfoot-A* (Yefim Gordon)

Dimensions: span 57 ft 10 in spread, 34 ft swept; length 80 ft 8 in; height 20 ft 4 in.
Weight: empty (equipped) 49,163 lb, gross 87,523 lb.
Ceiling: 57,400 ft.
Performance: max speed at height Mach 1.35, at S/L (clean) Mach 1.08; T-O run 4,265 ft; landing run 3,120 ft; combat radius (lo-lo-lo) more than 200 miles, (hi-lo-hi, with 6,615 lb of weapons and two external tanks) 650 miles.
Armament: one GSh-6-23M six-barrel 23 mm Gatling-type gun on starboard side of belly; nine pylons under fuselage, wing-root gloves, and outer wings for 17,857 lb of air-to-surface weapons, incl TN-1000 and TN-1200 nuclear weapons, up to four TV- or laser-guided bombs, conventional bombs (typically 38 x 220-lb FAB-100), 57 mm to 330 mm rockets, 23 mm gun pods, and such ASMs as Kh-23 (AS-7 Kerry), Kh-25ML (AS-10 Karen), Kh-58 (AS-11 Kilter), Kh-25MP (AS-12 Kegler), Kh-59 (AS-13 Kingbolt), Kh-29 (AS-14 Kedge), and Kh-31A/P (AS-17 Krypton). Two R-60 (AA-8 Aphid) AAMs can be carried for self-defense.
COMMENTARY
The first Su-24 generation comprised the limited-capability Fencer-A; major production of Fencer-Bs; and electronic warfare Fencer-C, all with terrain-avoidance radar. A prototype Su-24M Fencer-D flew in 1977, introducing the PNS-24M navigation/attack system, Kaira laser/TV targeting and weapon guidance system, and other upgraded avionics. Cockpit instrumentation remains 1970s vintage, but efficient nav/attack and true terrain-following radars make possible low-level flight at high speed at night or in adverse weather, to deliver ordnance within 180 ft of any target. Ability to carry a wide range of ASMs provides defense suppression and some hard-target kill potential. An in-flight refueling probe is standard, and some Su-24Ms can operate as a buddy tanker, carrying an underbelly hose/reel pod.

Sukhoi Su-25 (NATO Frogfoot)
Brief: Successor to the World War II Shturmovik, the Su-25 is heavily armed and heavily armored for low-level operations over the battlefield.
Function: Close air support.
Operator: Air Forces; Navy.
First Flight: Feb. 22, 1975; Aug. 10, 1985 (Su-25UB prototype); September 1988 (Su-25UTG); 1989 (Su-25BM).
Delivered: 1980–92.
IOC: April 1980.
Production: not available
Inventory: 255 (Air Forces); 40 (Navy).
Contractor: Tbilisi and Ulan-Ude.
Power Plant: two Soyuz/Gavrilov R-195 turbojets; each 9,921 lb thrust. To reduce IR signature, a small pipe in the tailcone of each turbojet on later aircraft expels air to lower exhaust temperature.
Accommodation: pilot only, on zero height/62 mph ejection seat, protected by titanium armor almost one in thick.
Dimensions: span 47 ft 1 in, length 50 ft 11 in, height 15 ft 9 in.
Weight: empty 20,950 lb, gross 32,187–38,800 lb.
Ceiling: 22,965 ft.
Performance: max level speed at S/L 606 mph; max attack speed, air brakes open, 428 mph; T-O run 1,970–3,935 ft; landing run 1,315–1,970 ft; range with 9,700 lb of weapons and two external tanks at S/L 466 miles, at height 776 miles.
Armament: one twin-barrel AO-17A 30 mm gun in port side of nose, with 250 rds. Eight under-wing pylons for nominal 9,700 lb of air-to-surface weapons, although 3,086 lb is usual limit. Armament can incl Kh-23 (AS-7 Kerry), Kh-25ML (AS-10 Karen), and Kh-29L (AS-14 Kedge) ASMs, SPPU-22 pods for 23 mm guns with twin barrels that pivot downward, 57 mm to 370 mm rockets, bombs, laser-guided rocket-boosted bombs, and 1,100-lb incendiary, anti-personnel, and other cluster bombs. Two small outboard pylons for R-3S (AA-2D Atoll) or R-60 (AA-8 Aphid) self-protection AAMs. Some equipped to carry RN-61 tactical nuclear weapon; Su-25BM reportedly equipped for Kh-58 (AS-11 Kilter) ASM and Vynga data link pod.
COMMENTARY
With large wings and maximum speed of Mach 0.8, Frogfoot might appear vulnerable in any contemporary combat area; yet Su-25s sent to the war in Afghanistan suffered only 23 losses, with eight pilots killed, in 60,000 sorties. One aircraft survived more than 80 hits.

Survivability was a key design requirement for the Su-25. Pushrods rather than cables actuate the control surfaces, main load-bearing members are damage-resistant, the engines are widely separated in stainless-steel bays, and the fuel tanks are filled with reticulated foam for explosion protection. A total of 256 flares can be packed into dispensers above the engine nacelles and tailcone for use during up to eight attack

runs. The engines will run on any fuel likely to be found in a combat area, including MT gasoline and diesel oil.

Su-25 (Frogfoot-A): Basic single-seat CAS aircraft. Standard 9,039-lb-thrust R-95Sh turbojets replaced by R-195s in late production aircraft.

Su-25UB (Frogfoot-B): Tandem two-seat operational conversion and weapons trainer. Raised rear cockpit. Taller tail fin. Gun and weapons pylons retained. Production, only at Ulan-Ude, from 1987.

Su-25UTG (Frogfoot-B): As Su-25UB but without weapons; ILS standard; arrester hook (G for *gak* hook) added under tail for deck landing training on dummy flight deck marked out on runway at Saki Naval Airfield, Ukraine, and for use on the carrier *Admiral of the Fleet Kuznetsov.* Ten built; four assigned to Su-33 regiment for service on *Admiral Kuznetsov;* Navy negotiating for further 12.

Su-25BM (Frogfoot-A): Standard Su-25 with added under-wing pylons for a Kometa towed target or PM-6 rocket-powered targets released for missile training by fighter pilots; R-195 engines; 50 built.

Su-25T/TM

Brief: This developed Frogfoot takes advantage of all-weather navigation and attack systems and new missiles in a dedicated anti-tank role.
Function: Close air support.
Operator: Air Forces.
First Flight: Aug. 17, 1984.
Delivered: from 1990.
IOC: 1990.
Production: eight Su-25Ts; further 12 being delivered and upgraded to TM; requirement for further 12.
Inventory: 20.
Contractor: Tblisi (T) and Ulan-Ude (TM).
Power Plant: as for Su-25.
Accomodation: as for Su-25, but zero/zero ejection seat.
Dimensions: span 47 ft 8 in, length 50 ft 4 in, height 17 ft 1 in.
Weight: gross 45,194 lb.
Ceiling: 32 800 ft.
Performance: max speed at S/L 590 mph; T-O run 2,135 ft; landing run 2,465 ft; combat radius with 4,410 lb of weapons at S/L 248 miles, at height 391 miles.
Armament: one twin-barrel NNPU-8M 30 mm gun, with 200 rds. Ten under-wing pylons for 9,612 lb of weapons, incl two eight-rd clusters of Vikhr M (AT-X-16) tube-launched ASMs able to penetrate 35 in of reactive armor, KAB-500 laser-guided bombs, S-25L laser-guided rockets, Kh-25ML (AS-10 Karen), Kh-58 (AS-11 Kilter), Kh-29L (AS-14 Kedge), Kh-31 (AS-17 Krypton) and Kh-35 (AS-20 Kayak) ASMs, and R-27R/RE (AA-10 Alamo-A/C), R-73 (AA-11 Archer), or R-77 (AA-12 Adder) AAMs.
COMMENTARY

Su-25T: The three original aircraft utilized converted Su-25UB airframes, with the humped rear cockpit faired over and used to house new avionics and an extra metric ton of fuel.

The Voskhod navigation system, with two digital computers and an inertial platform, permits flights to and from combat areas under largely automatic control. The Shkval subsystem in the widened nose comprises a Merkury LLTV and Prichal laser range finder and target designator. The TV can be activated five miles from a target the size of a tank, after which target tracking to an accuracy of two feet, weapon selection, and release are automatic. The Irtysh defensive aids suite includes chaff/flare dispensers in a large cylindrical housing at the base of the rudder. This housing also contains a Shokgruz L166S1 IR jammer, optimized against Stinger and Redeye frequencies, and a Pastil radar warning/emitter location system is standard. MSP-25 Omul ECM pods are carried on outboard wing pylons.

Su-25TM: First shown in 1995, this further improved version can carry a podded Phazotron N027 Kopyo-25 radar on the centerline pylon (although a later alternative will be the Kinzhal MMW radar) and a Khod imaging IR pod. Through upgrades and new production, Russia plans to equip six regional rapid-deployment groups, each having a squadron of four Su-25TMs and 12 standard Frogfoot-As, plus helicopters. The export equivalent, which has been offered for licensed production in Poland, is designated Su-39 Strike Shield.

Sukhoi Su-27 (NATO Flanker)

Brief: Principal manned defender of Russian airspace, the Su-27 also serves as an escort to attack aircraft on deep penetration missions. Requires no external fuel tanks.
Function: Air superiority fighter.
Operator: Air Forces.
First Flight: May 20, 1977; March 7, 1985 (Su-27UB); April 20, 1987 (Su-27P).
Delivered: 1985–90.
IOC: not available
Production: about 600, incl exports.
Inventory: 420.

***Su-25TM** Frogfoot* (Paul Jackson)

Su-30 (Paul Jackson)

Contractor: Komsomolsk, plus two-seaters at Irkutsk.
Power Plant: two Saturn/Lyulka AL-31F turbofans; each 27,557 lb thrust with afterburning.
Accommodation: pilot only, on zero/zero ejection seat.
Dimensions: span 48 ft 3 in, length excl nose probe 72 ft, height 19 ft 5 in.
Weight: empty 36,110 lb, gross 50,705–72,750 lb.
Ceiling: 59,060 ft.
Performance: max speed at height Mach 2.35, at S/L Mach 1.1, T-O run 1,475 ft, landing run 2,035 ft, combat radius 930 miles, max range 2,285 miles.
Armament: one 30 mm GSh-301 gun, with 150 rds, in starboard wing-root extension. Up to 10 AAMs, incl pairs of R-27 (AA-10 Alamo-A/B/C/D), or R-33 (AA-9 Amos), and four R-73A (AA-11 Archer) or R-60 (AA-8 Aphid). Able to carry 8,818 lb of air-to-surface weapons, incl 550-lb and 1,100-lb bombs, packs of 80, 130, and 250 mm rockets, cluster bombs, or a podded 30 mm gun with downward-deflecting barrel for air-to-ground and air-to-air use.
COMMENTARY

Preproduction Flanker-As were used only for development work and differed in several respects from the definitive model.

Su-27P (Flanker-B) is the basic single-seat production version. Square wingtips carry launchers for AAMs or, on those aircraft assigned to ground-attack, Sorbtsya electronic jammer pods. Four-channel analog fly-by-wire flight controls without mechanical backup. No ailerons; one-piece differential/collective tailerons operate in conjunction with flaperons and rudders for pitch and roll control. Wing leading-edge flaps and flaperons are controlled manually for takeoff and landing, computer-controlled in flight. Fine-grille hinged screens in the engine air intake ducts guard against FOD during takeoff and landing, when additional air enters the ducts through louvers surrounding the intake. No composites, but extensive use of aluminum–lithium alloys and titanium in the airframe. Integrated fire-control system enables the NIIP N001 Myech (Slot Back) track-while-scan coherent pulse-Doppler radar, IRST, and laser range finder to be slaved to the pilot's helmet-mounted target designator and displayed on the wide-angle HUD. Radar has search range of 62 miles and can track 10 targets simultaneously and attack one. Provision for reconnaissance pack on centerline pylon. Chaff/flare dispensers in tail sting.

Su-27SK: Export version; up to 8,818 lb of air-to-ground ordnance on 10 hardpoints.

Su-27SMK: Multirole export version; announced 1995. Stores load of 17,635 lb, incl two fuel tanks, on 12 hardpoints. Provision for R-77 (AA-12 Adder) AAMs.

Su-27UB (Flanker-C): Tandem two-seat trainer with full combat capability, based on Flanker-B. Instructor in raised rear seat. Taller fin; height 20 ft 10 in.

Sukhoi Su-30

Brief: Superficially similar to the Flanker-C trainer, the Su-30 is actually an operational two-seat, long-range interceptor, built for home defense. Roles incl airborne fighter control.
Function: Long-range interceptor.
Operator: Air Forces.
First Flight: 1988.
Delivered: 1991–date.
IOC: 1991.
Production: approx 20.
Inventory: approx 20.
Contractor: Irkutsk.
Power Plant: as Su-27.
Accommodation: normal crew of two, on zero/zero ejection seats in tandem identical cockpits; rear seat raised.
Dimensions: as Su-27, except height 20 ft 10 in.
Weight: normal gross 52,910 lb, max 73,850 lb.
Ceiling: 57,420 ft.
Performance: max speed at height Mach 2.35, at S/L Mach 1.1, T-O run 1,805 ft, landing run 2,300 ft, combat range with internal fuel 1,865 miles, with one in-flight refueling 3,230 miles.
Armament: (Su-30) gun and AAMs as Su-27, plus R-77 (AA-12 Adder) AAMs. (Su-30M) as Su-30 for air-to-air role. Up to 17,635 lb of stores on 12 hardpoints for ground-attack role, incl Kh-59M (AS-18 Kazoo), Kh-31A/P (AS-17 Krypton), and Kh-29L/T (AS-14 Kedge) ASMs, bombs, KAB-500KR and KAB-1500KR TV–guided bombs, and rockets.
COMMENTARY

The Su-30 is a production development of two Su-27PU prototypes and is known by that designation in the Air Forces. Capable of missions of 10 hours or more, with two in-flight refuelings, including group actions with four Su-27s. Only the Su-30 would operate its radar, to assign targets to the other aircraft by radio data link, while Su-27s maintained radar silence. New avionics: nav system based on Loran and Omega; N001 Slot Back radar, with detection range of 62 miles, tracking range 34 miles, able to track 10 targets and engage two simultaneously. Flight refueling probe and buddy refueling standard. Two early deliveries to Zhukovsky test center, but supplies to training regiment at Savostleyka did not begin until 1996.

Su-30M: As Su-30 but equipped for multirole operations, with high-precision guided weapons; first demonstrated in 1994.

Sukhoi Su-33 (NATO Flanker-D)

Brief: Russia's first carrier-based jet interceptor is a navalized Flanker.
Function: Air defense fighter, with limited anti-ship capability.
Operator: Navy.
First Flight: Aug. 17, 1987.
Delivered: 1991–93.
IOC: 1992.
Production: 18, plus nine prototypes/trials aircraft.
Inventory: 18.
Contractor: Komsomolsk.
Power Plant: as Su-27.
Accommodation: pilot only, on zero/zero ejection seat.
Dimensions: span 48 ft 3 in, width wings folded 24 ft 3 in, length 69 ft 6 in, height 19 ft 4 in.
Weight: gross 66,135 lb.
Ceiling: 55,775 ft.
Performance: max speed at height Mach 2.165, at S/L Mach 1.14; T-O run with 14° ramp 395 ft; range on internal fuel 1,865 miles.
Armament: as Su-27, plus Kh-31 (AS-17 Krypton) ASMs.
COMMENTARY

At least 10 Su-33s were based on the Russian Navy carrier *Admiral of the Fleet Kuznetzov* when it deployed temporarily to the Adriatic in late 1995. Designated Su-27K by the operator and Su-33 by its designers, the airframe differs from that of the Flanker-B in having collectively movable foreplanes, folding outer wings and tailerons, strengthened landing gear with twin nose wheels, a hydraulically operated arrester hook, and navaids for maritime operations. The original flaperons are replaced by high-lift, two-section slotted flaps. The long tailcone of the land-based version is shortened to prevent tail scrapes during takeoff and landing. A retractable in-flight refueling probe is mounted on the port side of the nose, and there is provision for a centerline external fuel tank or buddy refueling pack. The IRST has a wider field of vision.

Sukhoi Su-34

Brief: Designated replacement for the Su-24 Fencer interdictor, this development of the Su-27 family is slowly progressing through the prototype stage.
Function: Long-range, all-weather interdiction.
Operator: Air Forces (assigned).
First Flight: April 13, 1990.
Delivered: TBD
IOC: TBD
Production: five prototypes only.
Inventory: TBD
Contractor: Novosibirsk.
Power Plant: two Saturn/Lyulka AL-31F turbofans; each 27,557-lb-thrust with afterburning. (Two 28,220–30,865-lb-thrust AL-35F turbofans in later aircraft.)
Accommodation: crew of two, on side-by-side zero/zero ejection seats.

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S-37 Berkut (Sukhoi via Yefim Gordon)

Dimensions: span 48 ft 3 in, length 76 ft 5 in, height 21 ft 4 in.
Weight: gross (normal) 85,980 lb, (max) 99,430 lb.
Ceiling: 65,000 ft.
Performance: max speed at height Mach 1.8, at S/L Mach 1.14; combat radius with 8,818 lb of weapons 373 miles.
Armament: one 30 mm GSh-301 gun in starboard wing-root extension; 12 pylons for up to 17,635 lb of high-precision ASMs, KAB-500 laser-guided bombs, R-73 (AA-11 Archer) and R-77 (AA-12 Adder) AAMs.
COMMENTARY
The Su-34 has a dielectric nose, wider than that of the Su-27, to house a Leninetz B004 phased-array nav/attack and terrain-following/avoidance radar (with secondary air-to-air capability); foreplanes; a deep fairing behind the canopy, containing a toilet and galley; and wing extensions carried forward as chines to the tip of the nose. Additional fuel is carried in the tail fins. There are no ventral fins. The twin-wheel, nose-wheel leg now retracts rearward into a large bay that contains the hatch for crew access to the cockpit. The main landing gear units are new, with smaller, tandem wheels. Titanium armor, 17 mm thick, protects the cockpit, which has multifunction displays.
The longer, larger diameter tail sting has been raised and now extends as a spine above the rear fuselage, blending into the cockpit fairing. It houses twin cruciform brake chutes and, at its tip, a rearward-facing radar. A retractable flight refueling probe is fitted under the port windshield.
Su-34 undesignated variants: A tactical reconnaissance Su-34, under development, will replace the Fencer-E, using SLAR, Elint, TV, IR, laser, and photographic sensors simultaneously as part of the integrated BKR system. Also in prospect is an electronic warfare version to supplant the Fencer-F.
Su-27IB: Despite high priority, development plans for the Air Forces interdictor version of the Su-34 are behind expectations. Delivery of 12 before the end of this year now is unlikely, as the fifth prototype only flew in January.
Su-32FN: Sukhoi is promising a land-based naval strike/attack version with appropriate avionics and equipment changes, including Sea Snake radar, Sea Dragon navigation/attack system, MAD, and sonobuoys. Sea Snake is claimed capable of locating the surface trace of a shallow-running submarine at 93 miles.

Sukhoi Su-35/Su-37
Brief: Multirole, canard-equipped development of the basic Flanker, additionally possessing thrust-vectoring in its Su-37 form.
Function: All-weather, multirole fighter.
Operator: Air Forces (assigned).
First Flight: June 28, 1988; April 2, 1996 (Su-37 prototype).
Delivered: TBD
IOC: TBD
Production: 11 prototypes only.
Inventory: TBD
Contractor: Komsomolsk.
Power Plant: (Su-35): two Saturn/Lyulka AL-35F turbofans; each 28,220 lb thrust with afterburning. (Su-37, two-dimensional, 31,970-lb-thrust AL-37FUs; eventually, 3-D vectoring AL-37PPs.) In-flight refueling probe standard.
Accommodation: pilot only, on zero/zero ejection seat.
Dimensions: span over ECM pods 49 ft 9 in, length 72 ft 10 in, height 20 ft 10 in.
Weight: (Su-35) empty 37,480 lb, gross 56,590–74,955 lb.
Ceiling: 59,060 ft.
Performance: (Su-35) max speed at height Mach 2.35, at S/L Mach 1.14; runway required 3,940 ft; max range on internal fuel more than 2,485 miles, with one in-flight refueling more than 4,040 miles.
Armament: one 30 mm GSh-30 gun. Fourteen weapon mounts for R-27 (AA-10 Alamo-A/B/C/D), R-40 (AA-6 Acrid), R-60 (AA-8 Aphid), R-73E (AA-11 Archer), and R-77 (AA-12 Adder) AAMs. Optional air-to-surface weapons incl Kh-25ML (AS-10 Karen), Kh-25MP (AS-12 Kegler), Kh-29T (AS-14 Kedge), Kh-31 (AS-17 Krypton), and Kh-59 (AS-18 Kazoo) ASMs, S-25LD laser-guided rockets, S-25IRS IR-guided rockets, laser- and TV–guided bombs of up to 3,307 lb, KMGU cluster weapons, KAB-500 bombs, and rocket packs. Max external stores 17,635 lb. Su-37 adds R-37 (AA-X-13) and planned Novator KS-172 AAMs, plus Kh-15 (AS-16 Kickback) and Kh-65 ASMs.
COMMENTARY
Developed as the Su-27M, the Su-35 had been intended to enter Russian Air Forces service in 1995 as an upgraded Flanker with better close combat capability, higher Angle-of-Attack limits and new BVR armament. There is no evidence of production, although prototypes have been noted at the Air Forces test center at Akhtubinsk. Official interest may have switched to the Su-37.
Su-35: Compared with the Su-27, the airframe (with many carbonfiber components), power plant, and armament are all upgraded. The NIIP N011 electronically scanned, phased-array primary radar is of an improved look-down/shoot-down type, with the ability to acquire fighter-size airborne targets at ranges up to 62 miles. Fifteen targets can be tracked, and four to six engaged, simultaneously. An N012 rearward-facing radar (range 2.5 miles) is fitted in the tailcone. A small external TV pod, new-type IRST, enhanced ECM with wingtip jammer pods, and RWR are standard. All combat flight phases are computerized; cockpit displays include three-color CRTs.
Su-37: The prototype is fitted with two-dimensional collective/differential thrust-vectoring engine nozzles. Cockpit controls are new, comprising an articulated side-stick controller and a fixed side-bar throttle with thumbswitch actuation. There are four Sextant Avionique liquid-crystal color multifunction displays and modified N011M radar. Its air show performances have included a maneuver known as a *Kulbit*, which involves pitching up rapidly beyond the vertical, through a tight 360° somersault within its own length, and pulling out to resume level flight with minimal height loss. Opinion is divided on whether such tactics could make this fighter a uniquely difficult target in air-to-air combat.

Sukhoi S-37 Berkut
Brief: Despite borrowing some Flanker components for ease of manufacture, the S-37 (originally known as S-32) appears to be a "clean sheet" fighter design. At present, the bureau-funded S-37 is a technology demonstrator for a future generation of combat aircraft.
Function: Experimental fighter.
Operator: TBD
First Flight: Sept. 25, 1997.
Delivered: TBD
IOC: TBD
Production: one prototype only.
Inventory: TBD
Contractor: Sukhoi
Power Plant: two Aviadvigatel D-30FT turbofans; each 34,170 lb thrust, with afterburning. Provision for two- or 3-D thrust-vectoring engines.
Accommodation: pilot only, on zero/zero ejection seat.
Dimensions: (approx) span 55 ft, length 74 ft, height 21 ft.
Weight: gross (normal) 56,600 lb, (max) 74, 960 lb.
Ceiling: 59,050 ft.
Performance: max speed at S/L Mach 1.12, range 2,050 miles.
Armament: provision for internal cannon; external weapons TBD.
COMMENTARY
Optimized for demonstration of post-stall maneuverability and supermaneuverability, this integrated-triplane design has distinctive, forward-swept wings (last seen in the West on the Grumman X-29), canards, highly sweptback horizontal tail surfaces, and twin fins canted slightly outwards. Large, curved LERX extend above fixed-geometry engine air intakes. Some measures have been taken to bestow frontal-sector stealthiness, including S-shaped engine ducting and, reportedly, radar-absorbent coatings. Despite its trials status, the S-37 has obvious provision for nose radar, tail radar, RWR and other sensors, IRST, and, possibly, internal weapon stowage.

Reconnaissance Aircraft

Antonov An-12 (NATO Cub-A, B, C, and D)
Brief: Conversions of this aging transport are employed on electronic reconnaissance and jamming duties.
Function: Elint and ECM.
Operator: Air Forces, Navy.
First Flight: not available
Delivered: not available
IOC: not available
Production: (conversions only).
Inventory: 125 (Air Forces); 7 (Navy).
Contractor: Irkutsk, Tashkent, and Voronezh.
Power Plant: four ZMKB Progress/Ivchenko AI-20M turboprops; each 4,190 ehp.
Accommodation: five flight crew, plus systems operators.
Dimensions: span 124 ft 8 in, length 108 ft 7 in, height 34 ft 6 in.
Weight: not available
Ceiling: 33,500 ft.
Performance: max speed 416 mph, range 2,236 miles with max payload.
Armament: none
COMMENTARY
Four variants were produced for special duties:
Cub-A: Elint version. Generally similar to basic An-12BP transport but with blade antennas on front fuselage, aft of flight deck, and other changes.
Cub-B: Conversions of Cub transport for Elint missions. An-12PS has two additional radomes under the forward and center fuselage, plus other antennas. Later version has more streamlined radomes.
An-12PP (Cub-C): Anti–SAM jamming variant carrying several tons of electrical generation, distribution, and control gear in the cabin and palletized jammers for at least five wave bands faired into the belly, plus chaff/flare dispensers. System may be known as Buket. Glazed nose and under-nose radar of transport retained. An ogival solid fuselage tailcone, housing jamming equipment, is fitted in place of the usual gun position. About 25 produced.
An-12BK-PPS (Cub-D): As Cub-C but also has Sirena jamming pods on each side of front fuselage and tail fin. Later aircraft have conventional An-12 tail turret. Escort jammer for formations of transport aircraft.

Antonov An-26RTR (NATO Curl-B)
Brief: The An-26RTR is a special duties version of the An-26 transport.
Function: Sigint.
Operator: Air Forces.
First Flight: not available
Delivered: not available
IOC: not available
Production: (conversions only).

Inventory: 20.
Contractor: Kiev.
Power Plant: two ZMKB Progress/Ivchenko AI-24VT turboprops; each 2,780 ehp. One 1,765-lb-thrust RU 19A-300 auxiliary turbojet in starboard nacelle for turboprop starting and to provide additional power for T-O, climb, and cruising flight, as required.
Accommodation: five flight crew, plus systems operators.
Dimensions: span 95 ft 10 in, length 78 ft 1 in, height 28 ft 2 in.
Weight: not available
Ceiling: 24,600 ft.
Performance: cruising speed at 19,675 ft 270 mph; T-O run 2,855 ft; landing run 2,135 ft; range with max payload of 12,125 lb 770 miles, with max fuel 1,652 miles.
Armament: none
COMMENTARY
The An-26RTR version of the An-26 transport is characterized by many short blade antennas above and below the fuselage.

MiG-25R (NATO Foxbat-B and D)
Brief: Derived from the Foxbat-A high-speed interceptor, the MiG-25R is a single-seat reconnaissance aircraft, fitted with an inertial/Doppler automatic navigation system that makes possible all-weather, day and night precision passes at supersonic speed and from heights above 65,600 ft.
Function: Reconnaissance.
Operator: Air Forces.
First Flight: March 6, 1964.
Delivered: circa 1969–85.
IOC: not available
Production: not available
Inventory: 50.
Contractor: Nizhny Novgorod.
Power Plant: two Soyuz/Tumansky R-15BD-300 turbojets; each 24,675 lb thrust with afterburning.
Accommodation: pilot, on zero-height/80–775 mph ejection seat.
Dimensions: span 43 ft 11 in, length 70 ft 8 in, height 21 ft 4 in.
Weight: gross 81,570–90,830 lb.
Ceiling: 68,900 ft.
Performance: max speed at height Mach 2.83, at S/L Mach 0.98; range at supersonic speed on internal fuel 1,015 miles, subsonic with underbelly tank 1,490 miles.
Armament: provision for four to 10 1,100-lb bombs under wings and fuselage.
COMMENTARY
Reconnaissance Foxbats carry no gun or AAMs for self-defense because the aircraft's high speed, ceiling, and ECM were considered adequate to ensure survival when it was designed.
MiG-25RB series (Foxbat-B): Carries any one of three interchangeable reconnaissance or SRS-4A Elint packs in its nose, offering combinations of cameras and SLAR. Secondary bombing capability. Later subtypes were **MiG-25RBV** (SRS-9 Elint, plus Virazh SLAR) and **MiG-25RBT** (Tangazh Elint). Foxbat-B can be identified by its five camera windows.
MiG-25RU (Foxbat-C): Training version of the MiG-25R, with separate cockpit for instructor, under individual canopy, forward of standard cockpit and at lower level. No reconnaissance sensors or combat capability. Limited to Mach 2.65.
MiG-25RBK series (Foxbat-D): Dedicated Elint versions; produced simultaneously with RB series in 1971–80 and lacking camera windows. Kub SLAR with small, flush antennas on side of nose and extended nosecone. **MiG-25RBS** had Sablia SLAR, and all RBSs were upgraded to **MiG-25RBSh** standard, with Shompol SLAR, from 1981. The **MiG-25RBF** is an updated RB, to RBK standard but retaining cameras and with Szar replacing Kub. Both have larger flush antennas positioned further back in the nose.

Sukhoi Su-24MR (NATO Fencer-E)
Brief: Multisensor reconnaissance version of the Su-24M interdictor.
Function: Tactical reconnaissance.
Operator: Air Forces, Navy.
First Flight: September 1980.
Delivered: 1985–date.
IOC: not available
Production: not available
Inventory: 80 (Air Forces); 32 (Navy).
Contractor: Novosibirsk and Komsomolsk.
Power Plant: two Saturn/Lyulka AL-21F-3A afterburning turbojets; each 24,690 lb thrust.
Accommodation: pilot and weapon systems officer, on side-by-side zero/zero ejection seats.
Dimensions: span 57 ft 10 in spread, 34 ft swept; length 80 ft 8 in; height 20 ft 4 in.
Weight: not available
Ceiling: 57,400 ft.
Performance: max speed at S/L limited to 746 mph.
Armament: cannon and self-defense AAMs, as Su-24M.
COMMENTARY
Su-24MR (Fencer-E): As Su-24M, but attack capability deleted; refueling probe retained; no over-wing fences. Internal equipment includes Shtik side-looking airborne multimission radar in shorter radome, Zima IR reconnaissance system under center fuselage and Aist-M TV reconnaissance system, with panoramic and oblique cameras in fuselage. Film cassette can be parachuted to ground station and data sent by electronic link. Optional Shpil-2M laser pod on the centerline, with a Tangazh Elint pod or Efir-1M radiation detector pod on the starboard under-wing swiveling pylon.

Tupolev Tu-22MR
Brief: The Tu-22MR is a conversion of the Tu-22M-3 bomber, used for multisensor surveillance.
Function: Reconnaissance.
Operator: Air Forces, Navy.
First Flight: not available
Delivered: not available
IOC: not available
Production: (conversions only)
Inventory: 40.
Contractor: Kazan.
Power Plant: two Samara/Kuznetsov NK-25 turbofans; each 55,115 lb thrust with afterburning; provision for JATO rockets.
Accommodation: not available
Dimensions: span 112 ft 6 in spread, 76 ft 5 in swept (Tu-22M-3); length 139 ft 4 in; height 36 ft 3 in.
Weight: not available
Ceiling: 43,635 ft.
Performance: max speed at high altitude Mach 1.88, at low altitude Mach 0.86, nominal cruising speed 560 mph, T-O run 6,560–6,890 ft, landing run 3,940–4,265 ft, max unrefueled combat radius with 26,455 lb weapons: supersonic hi-hi-hi 930–1,150 miles, subsonic lo-lo-lo 930–1,035 miles, subsonic hi-lo-hi 1,495 miles.
Armament: not available
COMMENTARY
TU-22MR: First of a dozen ex-Tu-22M-3s entered service in the late 1980s. Shampol SLAR in ventral canoe, Tangazh Sigint suite, Osen IR sensors, and conventional cameras.
Tu-22M2R: Further Tu-22M-2s were converted from 1994 with new designation.

Special Duty Aircraft

Beriev A-50 (NATO Mainstay)
Brief: One regiment of this second-generation airborne warning and control aircraft is responsible for the whole of Russia.
Function: AEW&C.
Operator: Air Forces.
First Flight: not available
Delivered: 1980–date.
IOC: 1984.
Production: approx 20.
Inventory: approx 16.
Contractor: Beriev OKB; Chkalov.
Power Plant: four Aviadvigatel D-30KP-2 turbofans; each 26,455 lb thrust.
Accommodation: five flight crew and 10 systems operators.
Dimensions: span 165 ft 8 in, length 152 ft 10 in, height 48 ft 5 in.
Weight: gross 418,875 lb.
Ceiling: 33,000 ft.
Performance: endurance four hours at 620 miles from base; extendable with flight refueling.
Armament: none
COMMENTARY
This modified Ilyushin Il-76 transport operates with MiG-29, MiG-31, and Su-27 counterair fighters of the Russian Air Forces' home defense and tactical air components, mainly in the northwestern TVD centered on the Kola Peninsula. It normally operates on a figure-eight course at 33,000 ft, with 62 miles between orbit centers, to detect and track aircraft and cruise missiles flying at high or low altitude over land and water.
Mainstay's configuration is conventional, with a 29 ft 6 in diameter pylon-mounted rotating saucer radome, satellite nav/com, IFF, RWR, comprehensive ECM, and flight refueling probe. Nose navigator's station and rear gun turret are replaced by nontransparent fairings. The rear ramp and cargo fittings are also deleted. The radar operators have color CRT displays.
A-50U: An improved version was first seen at the 1995 Moscow Air Show. Enhanced performance is provided by the Vega Shmel-M radar system that includes a passive mode to detect hostile ECM sources without transmission-induced vulnerability, a computer-based 3-D pulse-Doppler radar, and a digital subsystem that gives the altitude of all moving targets. Search radius is 143 miles for small aircraft, 248 miles for ships. Up to 50 targets can be tracked and interception of 10 guided simultaneously. Gross weight of 462,970 lb for this version would imply service entry of the planned improved-thrust D-30KP engine. The A-50U was said to be entering service with capabilities equivalent to those of USAF's E-3C Sentry.
A-50M: This version has also been reported with a Shmel-2 AEW&C system and upgraded computers.

Ilyushin Il-22 (NATO Coot-B)
Brief: The Il-22 is the airborne command post adaptation of the Il-18 airframe.
Function: Airborne command post.
Operator: Air Forces.
First Flight: not available
Delivered: mid-1970s.
IOC: not available
Production: up to 30.
Inventory: about 20.
Contractor: Khodinka.
Power Plant: four ZMKB Progress/Ivchenko AI-20M turboprops; each 4,190 ehp.
Accommodation: not available
Dimensions: span 122 ft 9 in, length 117 ft 9 in, height 33 ft 4 in.
Weight: not available
Ceiling: not available
Performance: max cruising speed 419 mph, T-O run 4,265 ft, range with one hour reserves 4,000 miles.
Armament: none
COMMENTARY
The Il-22 has a bullet-shaped pod on the fin tip, a long and shallow container under the front fuselage, and many small blade antennas above and below the fuselage. The electronics and their fairings initially varied from one aircraft to another but are now more standardized, perhaps explaining the later designation **Il-22M.**

A-50 Mainstay (Yefim Gordon)

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Ilyushin Il-76PP
Brief: Conversion of Il-76MD transport for electronic warfare.
Function: Airborne jamming.
Operator: TBD
First Flight: not available
Delivered: TBD
IOC: TBD
Production: (conversion only)
Inventory: one converted prototype.
Contractor: Tashkent.
Power Plant: four Aviadvigatel D-30KP-2 turbofans; each 26,455 lb thrust.
Accommodation: not available
Dimensions: span 165 ft 8 in, length 152 ft 10 in, height 48 ft 5 in.
Weight: not available
Ceiling: not available
Performance: (generally as for Il-76) cruising speed at 29,500–39,350 ft 466–485 mph; T-O run 5,578 ft; landing run 2,950–3,280 ft; range with max payload 2,360 miles, with 44,090 lb payload 4,535 miles.
Armament: none
COMMENTARY
Yet to be operationally deployed, the Il-76PP is characterized by modified landing gear panniers which have been extended forward beyond the starboard side crew door and contain a forward-facing dielectric panel. The chin radome is retained.

Ilyushin Il-82
Brief: Civil-registered special-mission version of the Il-76MD.
Function: Communications relay for Il-87 command posts.
Operator: Air Forces.
First Flight: not available
Delivered: about 1991.
IOC: not available
Production: two.
Inventory: two.
Contractor: Tashkent.
Power Plant: four Aviadvigatel D-30KP-2 turbofans; each 26,455 lb thrust.
Accommodation: not available
Dimensions: span 165 ft 8 in, length 152 ft 10 in, height 48 ft 5 in.
Weight: not available
Ceiling: 39,375 ft.
Performance: (generally as for Il-76) cruising speed at 29,500–39,350 ft 466–485 mph; T-O run 5,578 ft; landing run 2,950–3,280 ft; range with max payload 2,360 miles, with 44,090 lb payload 4,535 miles.
Armament: none
COMMENTARY
Configuration of this modified Il-76 transport includes a large fairing above the fuselage forward of the wing over satcom/IR equipment; a ventral canoe-shaped radome and strakes; five small antennas above the center section; other small antennas and air intake scoops under the front fuselage and at the rear of the main landing gear fairings; a long, shallow fairing forward of the dorsal fin on each side at the top of the fuselage; a large, downward-inclined, flat-plate antenna on each side of the tailcone; and a long, pod-mounted probe on a pylon under each outer wing. Two AI-24 turbines are housed in the landing gear fairings to supply power for the mission avionics. The usual nose glazing around the navigator's compartment has been deleted, and the flight deck rear side windows are covered. The basket-drogue of a VLF trailing-wire antenna can be seen under the rear fuselage.

Ilyushin Il-87 (NATO Maxdome)
Brief: These special-mission versions of the Il-86 transport, with modifications similar to those seen on the Il-82, serve as strategic command posts for use by Russian General Staff, with the reported service designation Il-87 Aimak.
Function: Strategic command post.
Operator: Air Forces.
First Flight: not available
Delivered: 1985.
IOC: not available
Production: four.
Inventory: not available
Contractor: Khodinka.
Power Plant: four Samara NK-86 turbofans; each 28,660 lb thrust.
Accommodation: four flight crew, plus communications operators.
Dimensions: span 157 ft 8 in, length 195 ft 4 in, height 51 ft 10 in.
Weight: not available
Ceiling: not available
Performance: (as transport) normal cruising speed at 30,000–36,000 ft 559–590 mph, nominal range with max fuel 2,858 miles.
Armament: none

Il-76PP (Yefim Gordon)

Il-82 (Paul Jackson)

COMMENTARY
Each Il-87 has a large boat-shaped fairing above the front fuselage, as well as a shallow dished fairing forward of the fin root, strake antenna under the rear fuselage, large blade antennas above the center and rear fuselage and under the front fuselage, and large turbine-powered electric generator pods with a ram air intake under the wings inboard of the inner engines. A drogue for a VLF trailing-wire antenna is mounted on the lower fuselage on the port side. At least some of the four aircraft may have been withdrawn.

Tupolev Tu-22MP
Brief: Proposed conversion of Tu-22M-3s for special duties. Not yet fully funded.
Function: EW/escort jamming.
Operator: Air Forces.
First Flight: circa 1986.
Delivered: TBD
IOC: TBD
Production: TBD
Inventory: three prototypes.
Contractor: Kazan.
Power Plant: two Samara/Kuznetsov NK-25 turbofans; each 55,115 lb thrust with afterburning; provision for JATO rockets.
Accommodation: not available
Dimensions: span 112 ft 6 in spread; length 139 ft 4 in; height 36 ft 3 in.
Weight: not available
Ceiling: 43,635 ft.
Performance: max speed at high altitude Mach 1.88, at low altitude Mach 0.86, nominal cruising speed 560 mph, T-O run 6,560–6,890 ft, landing run 3,940–4,265 ft, max unrefueled combat radius with 26,455 lb weapons: supersonic hi-hi-hi 930–1,150 miles, subsonic lo-lo-lo 930–1,035 miles, subsonic hi-lo-hi 1,495 miles.
Armament: not available
COMMENTARY
Second and third prototypes produced in 1992. One was seen at Akhtubinsk test center in 1995 and has a Miass jamming system, with a semirecessed pod in the weapons bay and dielectric fairings on the side of each engine duct and forward of the root of the dorsal tail fin. No details are available.

Tupolev Tu-142MR (NATO Bear-J)
Brief: Equivalent to the US Navy's E-6 TACAMO aircraft.
Function: Submarine communications aircraft.
Operator: Navy.
First Flight: not available
IOC: 1980.
Production: not available
Inventory: 10.
Contractor: Kuybyshev.
Power Plant: four NK-12MR turboprops; rated as Tu-95MS.
Accommodation: not available
Dimensions: length (Mod 3) 174 ft 2 in, otherwise as Tu-95MS.
Weight: not available
Ceiling: not available
Performance: max speed at 25,000 ft 575 mph, at S/L 404 mph; nominal cruising speed 442 mph; combat radius with 25,000-lb payload 3,975 miles, with one in-flight refueling 5,155 miles.
Armament: NR-23 23 mm tail gun.
COMMENTARY
Modified Tu-142M-Z airframe. VLF communications avionics to maintain an on-station/all-ocean link between national command authorities and nuclear missile armed submarines under most operating conditions. Large ventral pod for suspended-wire antenna, several kilometers long, under center fuselage in weapons bay area. Under-nose fairing as on Bear-F Mod 4. Fin tip IR warning pod like that on Bear-Hs. Satcom dome aft of flight deck canopy.

Tankers

Ilyushin Il-78M (NATO Midas)
Brief: Tanker version of the Il-76 transport, primarily assigned to the strategic bomber force but also available to tactical aircraft.
Function: Refueling tanker.
Operator: Air Forces.
First Flight: not available
Delivered: not available
IOC: 1987.
Production: 20.
Inventory: 20.
Contractor: as Il-76.
Power Plant: as Il-76.
Accommodation: crew of six.
Dimensions: as Il-76.
Weight: gross 462,965 lb, fuel weight 304,230 lb.
Ceiling: not available
Performance: nominal cruising speed 466 mph; refueling speed at 6,500–29,500 ft 267–366 mph; refueling radius with 110,231 lb transfer fuel 1,616 miles, with 44,090 lb transfer fuel 3,138 miles.
Armament: none
COMMENTARY
Using the probe-and-drogue technique, the Il-78M can refuel up to three aircraft simultaneously. Two UPAZ-1A Sakhalin refueling pods are mounted conventionally under the outer wings. The third drogue is streamed from a similar pod on the port side of the rear fuselage. (The interim Il-78 had only one pod and a reduced fuel load but—unlike the 78M—was able to revert to freighting.) The rear turret is retained as a flight refueling observation station. Special navigation systems allow all-weather day/night mutual detection and approach by receiver aircraft from distances up to 185 miles. Convergence is controlled automatically, but refueling is permitted only in direct visibility.

Strategic Transports

Antonov An-22 (NATO Cock)
Brief: The world's largest aircraft when first in service, An-22 transport can lift the Ground Forces' main battle tank and theater missile systems, although it is now overshadowed by the An-124 and numbers are decreasing.
Function: Transport.
Operator: Air Forces.
First Flight: Feb. 27, 1965.
Delivered: 1967–75.
IOC: not available
Production: three (prototypes), 40 (An-22s), and 28 (An-22As).
Inventory: 40.
Contractor: Tashkent.
Power Plant: four Samara/Kuznetsov NK-12MA turboprops; each 14,795 shp.
Accommodation: crew of five or six, 28–29 passengers in cabin forward of main freight hold.
Dimensions: span 211 ft 4 in, length 190 ft, height 41 ft 2 in.
Weight: empty 251,325 lb, max payload 176,350 lb, gross 551,160 lb.
Ceiling: not available
Performance: max speed 460 mph, range with 99,200 lb payload 6,800 miles.
Armament: none
COMMENTARY
Throughout their service careers, An-22s have operated in Aeroflot markings. Four traveling gantries and two winches to speed freight handling.

An-70 (Paul Jackson)

An-22A: Has upgraded navigation equipment and a modified electrical system, including airborne engine restart capability.

Antonov An-70
Brief: The An-70 wide-body freight carrier is a joint venture by Russia and Ukraine, the former supplying 80 percent of development funding.
Function: Transport.
Operator: TBD
First Flight: Dec. 16, 1994.
Delivered: TBD
IOC: TBD
Production: two prototypes.
Inventory: TBD
Contractor: Kiev (Ukraine).
Power Plant: four ZMKB Progress D-27 propfans; each 13,800 shp.
Accommodation: crew of three, plus loadmaster; freight in containers, on pallets, or unpackaged. Optional seating for 300 troops, using prefabricated, quickly installed upper deck to freight hold.
Dimensions: span 144 ft 7 in, length 133 ft 8 in, height 53 ft 9 in.
Weight: empty 160,496 lb, normal payload from unpaved runway 66,135 lb, gross 220,460–293,210 lb.
Ceiling: not available
Performance: (estimated) nominal cruising speed at 30,000 ft 466 mph, T-O run 4,920–5,905 ft, landing run 6,235 ft, max range with normal payload 3,107 miles.
Armament: none specified
COMMENTARY
The An-70 is unique as a large transport in being powered by propfans. Approximately 28 percent of the airframe, by weight, is made of composites. The freight hold is 62 ft 8 in long (73 ft 6 in with ramp, which can be loaded), 13 ft 1 in wide, and 13 ft 5 in high. Loading is via rear fuselage ramp/doors, with adjustable sill height and built-in cargo-handling system. Maximum payload is 77,160 lb. Control is fly-by-wire, with backup by a unique fly-by-hydraulics system immune to electromagnetic interference. Design life is 20,000 cycles and 45,000 flying hours in 25 years. Russia plans to obtain 400 An-70s and Ukraine a further 100. The Westernized An-77 has generated some interest in Germany.

Antonov An-124 (NATO Condor)
Brief: The An-124 is the world's largest production aircraft.
Function: Transport.
Operator: Air Forces.
First Flight: Dec. 26, 1982.
Delivered: 1985–90.
IOC: 1987.
Production: 26.
Inventory: 25.
Contractor: Kiev (Ukraine) and Ulyanovsk.
Power Plant: four ZMKB Progress D-18T turbofans; each 51,590 lb thrust.
Accommodation: crew of six, plus loadmaster and relief crew; up to 88 passengers on fully pressurized upper deck.
Dimensions: span 240 ft 6 in, length 226 ft 8 in, height 69 ft 2 in.
Weight: empty 385,800 lb, max payload 330,700 lb, gross 892,877 lb.
Ceiling: not available
Performance: max cruising speed 537 mph; T-O balanced field length 9,850 ft; landing run 2,955 ft; range with max payload 2,795 miles, with max fuel 10,250 miles.
Armament: none

Il-76MD Prototype (Paul Jackson)

COMMENTARY
An upward-hinged, visor-type nose and rear fuselage ramp/door allow simultaneous front and rear loading/unloading. Advanced features include a fly-by-wire control system, titanium floor throughout the main hold, and 12,125 lb of composites, making up more than 16,150 sq ft of the airframe surface area. The 24-wheel landing gear enables the An-124 to operate from unprepared fields, hard-packed snow, and ice-covered swampland. The nose wheels can be partially retracted so that the aircraft kneels to facilitate front loading. Payloads range from the largest battle tanks to complete missile systems. Freight is carried on the lightly pressurized lower deck, positioned by two electric traveling cranes with total lifting capability of 44,100 lb.
A few An-124s wear military markings, but most fly with civil registrations and Aeroflot insignia. Other An-124s, from 54 built to date, are owned by civilian firms, but Air Forces aircraft are sometimes provided for private contract work.

Ilyushin Il-76 (NATO Candid-B)
Brief: This four-turbofan transport is the standard medium/long-range workhorse of the Military Transport Aviation command.
Function: Transport.
Operator: Air Forces.
First Flight: March 25, 1971; Aug. 1, 1995 (Il-76MF).
Delivered: 1973–date.
IOC: 1975.
Production: approx 900 of all variants, incl civil and exports.
Inventory: approx 300.
Contractor: Tashkent.
Power Plant: four Aviadvigatel D-30KP-2 turbofans; each 26,455 lb thrust.
Accommodation: crew of seven, incl two freight handlers.

AN-26D Antonov (Paul Jackson)

Dimensions: span 165 ft 8 in, length 152 ft 10 in, height 48 ft 5 in.
Weight: max payload 110,230 lb, gross 418,875 lb.
Ceiling: 39,375 ft.
Performance: cruising speed at 29,500–39,350 ft 466–485 mph; T-O run 5,578 ft; landing run 2,950–3,280 ft; range with max payload 2,360 miles, with 44,090 lb payload 4,535 miles.
Armament: some have two 23 mm twin-barrel GSh-23L guns in tail turret.
COMMENTARY
Production began with the Il-76 Candid-A, only a few of which were produced. The Il-76M/MD Candid-Bs have rear guns and small ECM blisters on each side of the front and rear fuselage. When operating into combat areas, they can be fitted with packs of 96 x 50 mm IRCM flares on the landing gear fairings and/or on the sides of the rear fuselage.
Il-76M: The basic Il-76M is comparable to USAF's C-141 Starlifter, with a max payload of 88,185 lb and gross weight of 374,785 lb. It has rear-loading ramp/doors, full-span leading-edge slats and triple-slotted flaps for good field performance, a glazed navigator's station and weather radar in the nose, navigation and ground-mapping radar in a large under-nose fairing, and a 20-wheel landing gear. The entire accommodation can be pressurized, making it possible to carry 140 troops or 125 paratroops as an alternative to freight. Advanced mechanical freight-handling systems are fitted. Equipment for all-weather operation includes a computer for automatic flight control and automatic landing approach.
Il-76MD: The improved Il-76MD has a strengthened wing and center section, an increased gross weight, and additional fuel to extend max range by 745 miles.
Il-76MF: A stretched version, with the freight hold lengthened by 21 ft 8 in, payload increased to 114,640 lb, and updated avionics. It has 35,275-lb-thrust Aviadvigatel PS-90AN turbofans. Two were ordered for the Air Forces in 1996, and the MF is expected to become one of the principal transports of the early 21st century. Western CFM56 engines are offered on the export version.

Theater and Special Use Transports

Antonov An-12BP (NATO Cub)
Brief: 1950s-vintage four-turboprop transport.
Function: Transport.
Operator: Air Forces.
First Flight: 1958.
Delivered: 1961.
IOC: not available
Production: 1,243 incl civil and exports.
Inventory: 300.
Contractor: Irkutsk, Tashkent, and Voronezh.
Power Plant: four ZMKB Progress/Ivchenko AI-20M turboprops; each 4,190 ehp.
Accommodation: crew of six; 44,090 lb of freight, 90 troops or 60 paratroops.
Dimensions: span 124 ft 8 in, length 108 ft 7 in, height 34 ft 6 in.
Weight: empty 61,730 lb, gross 134,480 lb.
Ceiling: 33,500 ft.
Performance: max speed 416 mph, range 2,236 miles with max payload.
Armament: two 23 mm NR-23 guns in manned tail turret. Provision for carrying bombs on landing gear fairings.
COMMENTARY
The An-12's usefulness is limited by lack of an integral rear-loading ramp/door. Instead, the bottom of the rear fuselage is made up of two longitudinal doors that hinge upward inside the cabin to permit direct loading from trucks on the ground or airdropping supplies and equipment. Built-in freight-handling gantry with capacity of 5,070 lb.

Antonov An-26 (NATO Curl)
Brief: The An-26 is used primarily to carry and airdrop medium freight loads.
Function: Transport.
Operator: Air Forces, Navy.
First Flight: by 1969.
Delivered: 1969–85.
IOC: not available
Production: approx 1,410, incl civil and exports.
Inventory: 80 (Air Forces); 40 (Navy).
Contractor: Kiev.

Power Plant: two ZMKB Progress/Ivchenko AI-24VT turboprops; each 2,780 ehp. One 1,765-lb-thrust RU 19A-300 auxiliary turbojet in starboard nacelle for turboprop starting and to provide additional power for T-O, climb, and cruising flight, as required.
Accommodation: crew of five, plus station for load supervisor or dispatcher. Provision for carrying 40 paratroops or 24 litters.
Dimensions: span 95 ft 10 in, length 78 ft 1 in, height 28 ft 2 in.
Weight: empty 34,943 lb, gross 52,911 lb.
Ceiling: 24,600 ft.
Performance: cruising speed at 19,675 ft 270 mph; T-O run 2,855 ft; landing run 2,135 ft; range with max payload of 12,125 lb 770 miles, with max fuel 1,652 miles.
Armament: none
COMMENTARY
Derived from the An-24 but with Oleg Antonov's unique rear-loading ramp which forms the underside of the rear fuselage when retracted. This ramp can be slid forward under the rear of the cabin to facilitate direct loading onto the floor of the hold or when the cargo is to be airdropped. Conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field.
An-26 (Curl-A): Air Forces variant.
An-26B (Curl-A): Has improved handling system, enabling two men to load and unload three 8-ft-long freight pallets in 30 minutes. Electrically powered mobile hoist, capacity 4,409 lb, and conveyor to facilitate loading and airdropping.
An-26D: Long-range variant for Siberian operations, revealed in 1997, having a 396-gallon fuel tank scabbed to each side of the fuselage. In Air Forces service. Range 2,038 miles at normal ambient temperatures, but gross weight increased to 57,320 lb at ISA -20°C, allowing fuel uptake for 2,236 miles.

Antonov An-30 (NATO Clank)
Brief: The An-30 transport and survey aircraft is based on the An-24 and An-26 airframe but has a generously glazed nose and raised flight deck.
Function: Transport.
Operator: Air Forces.
First Flight: 1974.
Delivered: not available
IOC: not available
Production: about 150, incl civil and exports.
Inventory: 30.
Contractor: Kiev.
Power Plant: two ZMKB Progress/Ivchenko AI-24VT turboprops; each 2,780 ehp. One 1,765-lb-thrust RU 19A-300 auxiliary turbojet in starboard nacelle for turboprop starting and to provide additional power for T-O, climb, and cruising flight, as required.
Accommodation: crew of five, plus two surveyors or 22 passengers and mixed cargo.
Dimensions: span 95 ft 10 in, length 77 ft 7 in, height 27 ft 4 in.
Weight: empty, equipped 34,370 lb, gross 50,706 lb.
Ceiling: 23,950 ft (27,230 ft with APU).
Performance: max cruising speed 267 mph, T-O run 2,330 ft, landing run 2,198 ft, range 1,634 miles.
Armament: none
COMMENTARY
Although fitted with cargo handling equipment, the An-30 has a freight door on the starboard side, front, and no rear ramp.

Antonov An-72/74 (NATO Coaler-C/B)
Brief: The An-72/74 is a STOL jet successor to the An-26.
Function: Transport.
Operator: Air Forces, Navy.
First Flight: Dec. 22, 1977.
Delivered: circa 1986–date.
IOC: not available
Production: over 150, incl civil and exports.
Inventory: 50 (Air Forces); 10 (Navy).
Contractor: Kharkov.
Power Plant: two ZMKB Progress D-36 turbofans; each 14,330 lb thrust.
Accommodation: crew of two or three; main cabin designed primarily for freight but with provision for 68 passengers or 57 paratroops on folding seats along side walls and removable central seats; or for 24 litter patients, 12 seated casualties, and attendant.
Dimensions: span 104 ft 8 in, length 92 ft 1 in, height 28 ft 8 in.
Weight: empty 42,000 lb, max payload 22,045 lb, gross 60,625–76,060 lb.
Ceiling: 35,100 ft.
Performance (at T-O weight of 72,750 lb): max speed 438 mph; normal cruising speed at 32,800 ft 342–373 mph; T-O run 3,050 ft; landing run 1,525 ft; range with max payload 497 miles, with max fuel 2,980 miles.
Armament: none
COMMENTARY
The An-72 has twin turbofans and the same type of slide-forward loading ramp as the An-26. Intended primarily for carrying freight, it can operate from unprepared airfields or from surfaces covered with ice or snow; the high location of the engines was adopted to avoid foreign-object ingestion. Their efflux is ejected over the wing upper surface and then down over large multislotted flaps to provide a considerable increase in lift for short-field operation. Other features include a Doppler-based automatic navigation system. The military version has the designation An-72P and type number An-76.
An-74 (Coaler-B): A civil version, optimized for all-weather operation, including Arctic missions. Features include advanced navigation aids; provision for wheel/ski landing gear; greatly increased fuel capacity; payload of 16,535 lb; and gross weight of 80,465 lb.

AN-72 Coaler (Paul Jackson)

Strategic Missiles

AS-4 (Kh-22 Burya; NATO Kitchen)
Brief: This large standoff missile is the primary armament of the Tu-22M Backfire bomber.
Function: Medium-range ASM.
Operator: Air Forces.
Inventory: about 300.
Contractor: Raduga.
Power Plant: liquid-propellant rocket.
Guidance: inertial, or inertial plus active or passive radar homing.
Warhead: alternative nuclear (350 kilotons) or HE (2,200 lb).
Dimensions: span 9 ft 10 in, length 38 ft 3 in, body diameter 3 ft 3 in.
Weight: 13,007 lb.
Performance: max speed Mach 4.6; range 185 miles at low altitude, 248 miles at 50,000 ft.
COMMENTARY
The original Kh-22, which entered service in 1964, had inertial guidance and a 350-kiloton nuclear warhead, needing no terminal homing.
Kh-22N: Developed in the early 1970s, the Kh-22N has an active radar terminal homing and alternative nuclear or 2,200-lb High-Explosive (HE) warhead.
Kh-22MP: Defense-suppression version, with passive radar homing and HE warhead, is also in service.

AS-15 (Kh-55; NATO Kent)
Brief: Russia's long-range bomber force of Tu-95MS Bear-Hs and Tu-160 Blackjacks is armed with two different versions of the AS-15 ALCM.
Function: Long-range ALCM.
Operator: Air Forces.
First Flight: 1978; 1987 (AS-15B).
Inventory: about 1,150.
Contractor: Raduga.
Power Plant: podded turbofan, extended down from rear of body after launch.
Guidance: inertial with terrain comparison.
Warhead: nuclear (200 kilotons).
Dimensions: span 10 ft 2 in, length 19 ft 10 in; 23 ft 4 in with booster (AS-15B), body diameter 1 ft 8 in; 2 ft 6 in (AS-15B).
Weight: 3,085 lb; 3,750 lb (AS-15B).
Performance: speed subsonic, range at height 1,490 miles; 1,865 miles (AS-15B). CEP 500 ft.
COMMENTARY
AS-15 appears to be similar in configuration and size to the US BGM-109 Tomahawk, with flip-out wings.
AS-15A (Kh-55/RKV-500): Deployment on the Tu-95MS16 began in 1984, with six on an internal rotary launcher in each aircraft and 10 more in four under-wing clusters. The Tu-95MS6 has only the rotary launcher.
AS-15B (Kh-55SM/RKV-500M): The Tu-160 has two rotary launchers for up to 12 which appear to have slender external fuel tanks scabbed onto their sides, giving a triangular cross section, with rounded corners.

AS-4 Kitchen (Paul Jackson)

AS-16 (Kh-15; NATO Kickback)
Brief: The AS-16 is in the same class as USAF's now-withdrawn AGM-69 SRAM.
Function: Medium-range ASM.
Operator: Air Forces.
First Flight: not available
Inventory: not available
Contractor: Raduga.
Power Plant: solid-propellant rocket.
Guidance: inertial, plus active or passive radar homing.
Warhead: nuclear (350 kilotons) or HE (330 lb).
Dimensions: span 3 ft, length 15 ft 8 in, body diameter 1 ft 6 in.
Weight: 2,645 lb.
Performance: max speed Mach 5; range 62 miles at low altitude, 93 miles at height.
COMMENTARY
Kh-15A and Kh-15P: An alternative nuclear or conventional warhead can be fitted, plus an active radar seeker in the Kh-15A anti-ship version and a passive radar seeker in the anti-radiation Kh-15P. Twelve can be carried as an alternative to six AS-15B ALCMs on each of the Tu-160 Blackjack's rotary launchers. Up to 10 can be carried by the Tu-22M-3 Backfire-C, and the Kh-15P is one of the ASMs specified for the Su-37.
Kh-15S: Anti-ship version with conventional warhead and active seeker, offered for export.

AS-X-19 (Kh-90/BL-10; NATO Koala)
Brief: Russian equivalent of USAF's AGM-129 Advanced Cruise Missile.
Function: Long-range ALCM.
Operator: TBD
First Flight: 1990.
Inventory: TBD
Contractor: Chelomey and/or Raduga.
Power Plant: turbofan.
Guidance: inertial with terrain comparison.
Warhead: two nuclear (each 90 kilotons), independently targeted.
Dimensions: span 11 ft 6 in, length 42 ft 8 in, body diameter 3 ft 7 in.
Weight: 9,260 lb.
Performance: max speed Mach 2.5–3 at 70,000 ft, range 2,485 miles.
COMMENTARY
Russia announced termination of this program in 1992, but Raduga test-flew a ramjet-powered test vehicle in 1994, and smaller, lower-cost versions may be under development.

SS-18 (RS-20 Voevoda; NATO Satan)
Brief: The SS-18 is the only Russian missile classified as a heavy ICBM in START terms.
Function: Heavy ICBM.
Operator: Strategic Forces.
First Flight: 1973.
Inventory: Under START I, the total deployed in converted SS-9 silos had to be reduced to 154 by 1998, all with 10 re-entry vehicles each. SS-18s are intended to be eliminated in 2000–03 under START II, and this has been partly achieved by recent live firing exercises.
Contractor: Yuzhnoye (Ukraine).
Power Plant: two-stage liquid-propellant rocket.
Guidance: inertial.
Warhead: single nuclear (24 megatons in Mod 1, 20 megatons in Mod 3). Eight MIRVs (each 900 kilotons) in Mod 2; 10 MIRVs (each 500 kilotons) in Mod 4.
Dimensions: length 110 ft 3 in (Mods 1 & 2), 117 ft 2 in (Mods 3 & 4), body diameter 9 ft 10 in.
Weight: 473,990 lb (Mods 1 & 2), 478,400 lb (Mods 3 & 4).
Performance: max range 6,525 miles (Mod 1), 5,750 miles (Mod 2), 9,940 miles (Mod 3), 6,835 miles (Mod 4). Throw weight 19,400 lb. CEP 820 ft.
COMMENTARY
Silo-based; cold-launched.

SS-19 (RS-18/UR100NU; NATO Stiletto)
Brief: The SS-19 Mod 3 is a light ICBM, comparable in size to USAF's Peacekeeper.

Function: ICBM.
Operator: Strategic Forces.
First Flight: 1973.
Inventory: The 170 currently emplaced were expected to be deactivated under START II, but 105 of the missiles may now be kept, probably converted to single warheads. Installation of SS-27s in some SS-19 silos began in December 1997.
Contractor: Salyut (not confirmed).
Power Plant: two-stage liquid-propellant rocket.
Guidance: inertial.
Warhead: six MIRVs (each 750 kilotons).
Dimensions: length 79 ft 9 in, max diameter 8 ft 2 in.
Weight: 232,805 lb.
Performance: range 5,640 miles. Throw weight 9,590 lb. CEP 985 ft.
COMMENTARY
Silo-based; hot-launched. Although less accurate than the SS-18, the SS-19 is reckoned to have significant capability against all but hardened silos. Following life-extension modifications, an SS-19 was test-launched in June 1997.

SS-24 (RS-22 Molodets; NATO Scalpel)
Brief: The SS-24 is a highly accurate, Peacekeeper-sized system for use against soft or semihardened targets. Name is Russian for Young Man.
Function: ICBM.
Operator: Strategic Forces.
First Flight: 1982.
Inventory: 36 Mod 1s & 10 Mod 2s; silos are at Tatishchevo.
Contractor: Yuzhnoye and Pavlograd (Ukraine).
Power Plant: three-stage solid-propellant rocket.
Guidance: computer-controlled inertial.
Warhead: up to 10 MIRVs (each 550 kilotons).
Dimensions: length 78 ft 1 in, body diameter 7 ft 10 in.
Weight: 230,380 lb.
Performance: max range 6,200 miles. Throw weight 8,930 lb. CEP 660 ft.
COMMENTARY
The Mod 1 version reflects the 1970s emphasis on survivability through weapon system mobility. The three rail-mobile garrisons for this system have the capability to roam more than 90,100 miles of track. Rail-mobile (Mod 1) or silo-based (Mod 2); cold-launched. Ukraine's 46 SS-24s have been or are being deactivated; those in Russia should go by the end of the decade.

SS-25 (RS-12M Topol; NATO Sickle)
Brief: As the designation RS-12M implies, Moscow regards this Minuteman-sized ICBM as a direct modernization of the now-retired SS-13 (RS-12). This enables Topol (Poplar) to conform with restraints embodied in the SALT treaty terms.
Function: ICBM.
Operator: Strategic Forces.
First Flight: 1982.
Inventory: over 360.
Contractor: Votkinsk.
Power Plant: three-stage solid-propellant rocket.
Guidance: computer-controlled inertial.
Warhead: single RV (550 kilotons).
Dimensions: length 73 ft 2 in, body diameter 5 ft 11 in.
Weight: 99,430 lb.
Performance: range 6,525 miles. Throw weight 2,205 lb. CEP 1,970 ft.
COMMENTARY
Basically road-mobile, with operational launch from inside garage or from silo; cold-launched. Most operational SS-25 deployments are to former SS-20 IRBM bases eliminated under the INF Treaty. At each base, a number of garages with sliding roofs house the system's massive off-road, wheeled Transporter Erector Launchers (TELs); other buildings shelter the mobile support equipment. The SS-25 is claimed to have a greater throw weight and nine times the accuracy of the SS-13, as well as greater survivability (because it is mobile in its basic form) and an inherent refire capability.
The number of operational road-mobile SS-25s increased by 45 to 363 in 1995. The total deployed could increase to 588 under START I, 690 under START II.

SS-27 (RS-12M1/2 Topol-M)
Brief: Improved version of SS-25; now entering service in both silo-launched and mobile forms.
Function: ICBM.
Operator: Strategic Forces.
First Flight: Dec. 20, 1994.
Inventory: two (270 planned).
Contractor: Votkinsk.
Power Plant: three-stage solid-propellant rocket.
Guidance: inertial.
Warhead: single RV.
Dimensions: length 74 ft 6 in, body diameter 6 ft 1 in.
Weight: 104,080 lb.
Performance: range 6,270 miles. Throw weight 2,645 lb. CEP 1,150 ft.
COMMENTARY
The upgraded SS-27 Topol-M is intended to replace the current RS-12M at the heart of Russia's strategic missile force. On Dec. 27, 1997, a token force comprising the first two silo-based RS-12M2s was declared operational in former SS-19 installations at Tatishchevo, Saratov region. Others are destined for SS-17 silos at Yedrovo/Vypolzovo, Moscow region, and 90 SS-18 silos in the South Urals and Altai. The balance of the 270 missiles expected to be deployed will be mobile RS-12M1s. All are to be in place by 2010, but initial progress has been slow.

SS-N-8 (RSM-48/R-29D Vysota; NATO Sawfly)
Brief: This SLBM (its Russian name means Altitude) was deployed from 1971 on 18 (now seven) Delta I submarines, which are being paid off progressively.
Function: SLBM.
Operator: Strategic Forces.
First Flight: not available
Inventory: 192.
Contractor: Makeyev.
Power Plant: two-stage liquid-propellant rocket.
Guidance: inertial, with stellar reference update.
Warhead: one RV at one megaton (Mod 1) or 800 kilotons (Mod 2).
Dimensions: length 45 ft 7 in, body diameter 5 ft 11 in.
Weight: 73,415 lb.
Performance: max range 4,850 miles (Mod 1), 5,655 miles (Mod 2). CEP 1,315 ft.
COMMENTARY
The number of missiles that can be carried in each ship is restricted to 12 but was restored to 16 in the four (now one) Delta IIs, which were built with a lengthened hull at the expense of a small speed reduction to 24 knots. Submarine-launched; intercontinental range.

SS-N-18 (RSM-50/R-29RL Volna; NATO Stingray)
Brief: The SS-N-18 introduced the first MIRVed warheads on a Russian SLBM.
Function: SLBM.
Operator: Strategic Forces.
First Flight: 1975.
Inventory: 208.
Contractor: Makeyev.
Data for Mod 1.
Power Plant: two-stage liquid-propellant rocket.
Guidance: inertial, with stellar reference update.
Warhead: three MIRVs, each 200 kilotons.
Dimensions: length 47 ft 11 in, body diameter 5 ft 11 in.
Weight: 77,825 lb.
Performance: max range 4,040 miles. CEP 2,950 ft.
COMMENTARY
Stingray was deployed on 14 (now 12) Delta III SSBNs, assigned to the Pacific and Northern Fleets, in 1976–82. Each ship carries 16 missiles, in two rows. Some are being replaced with SS-N-23 Skiffs. Submarine-launched; intercontinental range. Single-warhead Mod 2 and seven–MIRV Mod 3 no longer in service.

SS-N-20 and SS-NX-28 (RSM-52/R-39 Taifun and RSM-V/R-39U; NATO Sturgeon)
Brief: Largest and heaviest of Russian SLBMs, carried by Typhoon SSBNs.
Function: SLBM.
Operator: Strategic Forces.
First Flight: 1980.
Inventory: 120 SS-N-20s.
Contractor: Makeyev.
Data for SS-N-20.
Power Plant: three-stage solid-propellant rocket.
Guidance: inertial, with stellar reference update.
Warhead: ten MIRVs, each 200 kilotons.
Dimensions: length 52 ft 6 in, body diameter 7 ft 10 in.
Weight: 185,190 lb.
Performance: max range 5,160 miles. Throw weight 5,620 lb. CEP 1,640 ft.
COMMENTARY
The Typhoon class are by far the biggest submarines ever put into service, with a length of 562 ft and displacement of 26,500 tons submerged. Six entered service in 1981–89; they are intended to launch their missiles from protected waters near Russia.
SS-N-20: First Russian series-production solid-propellant SLBM. Twenty are loaded in each Typhoon in a unique configuration with the launch tubes forward of the sail.
SS-NX-28: Submarines are being modified to take the improved Sturgeon, with greater accuracy but only four or six MIRVs to meet the limits of START II. Development of this weapon, which adds GLONASS (Russian GPS)–guidance capability, is reported to have encountered serious problems. The new Borey submarine class will become operational with SS-N-28s in 2004.

SS-N-23 (RSM-54/R-29RM Shetal; NATO Skiff)
Brief: Thought to have been designed as successor to the SS-N-18 Stingray; entered service in 1985.
Function: SLBM.
Operator: Strategic Forces.
First Flight: 1983.
Inventory: 112.
Contractor: Makeyev.
Power Plant: three-stage liquid-propellant rocket.
Guidance: inertial, with stellar reference update.
Warhead: four MIRVs, each 100 kilotons, claimed; some US reports suggest up to 10.
Dimensions: length 50 ft 2 in, body diameter 6 ft 3 in.
Weight: 88,845 lb.
Performance: max range 5,160 miles. Throw weight 6,175 lb. CEP 1,640 ft.
COMMENTARY
The SS-N-23 has liquid propulsion, suggesting that this is still preferred by Russia's submariners. To carry it, seven Delphin-class (NATO Delta IV) submarines have been constructed at Severodvinsk, with a follow-on class planned. Each carries 16 SS-N-23s inside the conventional type of raised housing aft of the sail. They are based with the Typhoon class in the Kola Peninsula as part of the Northern Fleet. SS-N-23s are also replacing SS-N-18s in some Delta III SSBNs. Submarine-launched; intercontinental range.

Tactical Missiles

AA-6 (R-40/46; NATO Acrid)
Brief: This medium-range AAM can be carried by the MiG-25, MiG-31, and Su-35/37.
Inventory: not available
Contractor: Spetztekhnika Vympel.
Power Plant: two-stage, solid-propellant rocket motor.
Guidance: inertial, with semiactive radar (R & RD) or infrared (T &TD) homing.
Warhead: 154-lb fragmentation HE.
Dimensions: length 20 ft 4 in, body diameter 1 ft 2 in, wingspan 5 ft 11 in.
Weight: 1,047 lb.
Performance: cruising speed Mach 2.2; range (R-40) 45 miles, (R-46) 50 miles.
COMMENTARY
R-40T and R-46TD: Command-updated inertial guidance and a blunt-nosed infrared homing head.
R-40R and R-46RD: Semiactive radar homing versions with a pointed nosecone.

AA-7 (R-24; NATO Apex)
Brief: This medium-range AAM superseded the earlier R-23 in the early 1980s. It has been reported on the MiG-25 and MiG-29.
Inventory: not available
Contractor: Spetztekhnika Vympel.
Power Plant: solid-propellant rocket motor.
Guidance: command with midcourse update and semiactive radar (R-24R) or infrared homing (R-24T).
Warhead: 77-lb fragmentation HE.
Dimensions: length 14 ft 8 in (R-24R), 13 ft 8 in (R-24T), body diameter 8 in, wingspan 3 ft 5 in.
Weight: 518 lb (R-24R), 474 lb (R-24T).
Performance: range 12.5–31 miles.
COMMENTARY
Apex has a cylindrical body with four front-mounted, clipped triangular fins, four clipped delta wings amidships, and four raked control fins at the rear.
R-24R: Initial version, with radar homing in ogival nosecone.
R-24T: Infrared homing version, with shorter, blunter nose.

AA-8 (R-60/R-60M; NATO Aphid)
Brief: The highly maneuverable R-60 close-range AAM is now used mainly by attack aircraft for self-defense as well as by Mi-24D/24V helicopters.
Inventory: not available
Contractor: Molniya.
Data for R-60MK.
Power Plant: solid-propellant rocket motor.
Guidance: infrared homing.
Warhead: 7.7-lb fragmentation HE.
Dimensions: length 7 ft, body diameter 5 in, wingspan 1 ft 4 in.
Weight: 99 lb.
Performance: range 1,000 ft min, 7.5 miles max.
COMMENTARY
R-60T: Basic version, with active radar fuse.
R-60M: Employs new Arsenal UA-96 electro-optical fuse to bestow all-aspect engagement capability.
R-60MK: The R-60MK carried by MiG-29s is adapted for designation by the pilot's helmet-mounted sight.

AA-9 (R-33; NATO Amos)
Brief: Standard armament on the MiG-31, this long-range AAM is claimed to be capable of destroying targets, incl ALCMs, flying at up to Mach 3.5 at all altitudes from 80 ft to 92,000 ft, in all weather.
Inventory: not available
Contractor: Spetztekhnika Vympel.

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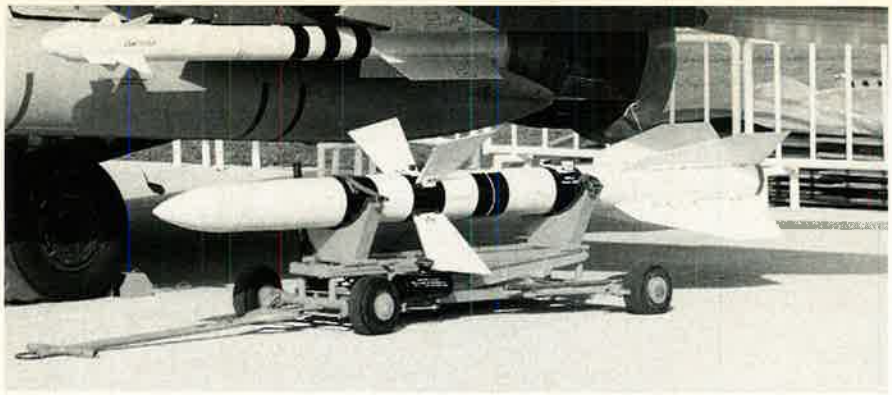

***AA-11** Archer and **AA-10** Alamo* (Paul Jackson)

Power Plant: solid-propellant rocket motor.
Guidance: inertial autopilot guidance with semiactive radar terminal homing.
Warhead: 104-lb blast/fragmentation HE.
Dimensions: length 13 ft 7 in, body diameter 1 ft 3 in, fin span 3 ft 10 in.
Weight: 1,080 lb.
Performance: range 1.5–62 miles.
COMMENTARY
The AA-9 has folding upper tail fins to facilitate stowage on the MiG's recessed launchers. It is an alternative weapon for the Su-27 and Su-33.
R-33S: The basic R-33 version has been followed by the R-33S with small cruciform front fins.

AA-10 (R-27; NATO Alamo)
Brief: Fourth-generation series of medium-range AAMs, first seen in 1986. Carried by MiG-29, Su-27, and Su-35/37. In service since about 1985.
Inventory: not available
Contractor: Spetztekhnika Vympel.
Power Plant: solid-propellant rocket motor.
Guidance: see commentary below.
Warhead: an 86-lb expanding-rod HE warhead is standard; 73 lb (R-27R/T).
Dimensions: length 13 ft 1 in (27R), 12 ft 2 in (27T), 15 ft 5 in (27ER), 15 ft 8 in (27AE/EM), 14 ft 9 in (27ET); body diameter 9 in (27R/T), 10 in (all others); fin span 2 ft 6 in (27R/T), 2 ft 7 in (all others).
Weight: 558 lb (27R), 560 lb (27T), 772 lb (27ER/AE/EM), 756 lb (27ET).
Performance: range 50 miles (27R), 45 miles (27T), 81 miles (27ER), 50 miles (27AE), 68 miles (27EM), 75 miles (27ET); min launching range (tail-chase) 1,540 ft.
COMMENTARY
The AA-10 has a complex configuration, with long-span, reverse-tapered, cruciform control surfaces to the rear of small foreplanes.
R-27R/R-27R1 (Alamo-A): Short-burn versions, with radio-corrected inertial guidance and semiactive radar terminal homing. Standard medium-range armament of MiG-29, Su-27, and Su-35/37.
R-27T/R-27T1 (Alamo-B): Short-burn, all-aspect, infrared homing versions without inertial midcourse guidance. Carried by MiG-29, Su-27, and Su-35/37.
R-27ER/R-27ER1 (Alamo-C): Long-burn versions for longer ranges. Guidance as R-27R. Carried by Su-27 and Su-35/37.
R-27AE (Alamo-C): As R-27ER but active radar guidance, better able to deal with active maneuvering counterattacks and countermeasures.
R-27EM (Alamo-C): As R-27ER, with added capability against sea-skimming ASMs down to 10 ft above water.
R-27ET/R-27ET1 (Alamo-D): Long-burn, all-aspect, infrared counterparts of R-27ER. Carried by Su-27 and Su-35/37.

AA-11 (R-73; NATO Archer)
Brief: This close-range AAM is standard armament on the MiG-29, Su-27, Su-32FN/34, Su-33, Su-35/37, and Ka-50/52.
Inventory: not available
Contractor: Spetztekhnika Vympel.
Power Plant: solid-propellant rocket motor.
Guidance: inertial, with terminal all-aspect infrared and ability to discriminate against decoy flares.
Warhead: 16.3-lb fragmentation HE.
Dimensions: length 9 ft 6 in, body diameter 7 in, fin span 1 ft 8 in.
Weight: R-73M1 231 lb.
Performance: range 18.6 miles (R-73M1), 25 miles (R-73M2), min launching range (tail-chase) 985 ft.

***AA-12** Adder* (Guy Aceto)

COMMENTARY
Archer's controls are complex, with movable sets of vanes and fins fore and aft of fixed cruciform surfaces at the nose, control surfaces at the trailing-edge of each of the cruciform tail fins, and four thrust-vectoring control vanes in the efflux of the two-phase rocket motor. They ensure 12g maneuverability, particularly when the missile is launched at large off-boresight target angles via the pilot's helmet-mounted sight.
R-73M1. Basic version; off-boresight capability ±45°. Exported as R-73E; projected K-74ME has Arsenal 160° seeker; R-73EL offered for export with laser fuse from 1997 and reportedly already in Russian service.
R-73M2. Off-boresight capability ±60°; narrower fin span; increased weight (243 lb), length (10 ft 6 in), and range; digital control electronics and IRCCM; reported capability against low-flying missiles.

AA-12 (R-77; NATO Adder)
Brief: This new medium-range AAM entered service in about 1994 and will gradually become standard armament on late-model Russian aircraft.
Inventory: not available
Contractor: Spetztekhnika Vympel.
Power Plant: solid-propellant rocket motor.
Guidance: inertial control, with midcourse radar updates and Agat 9B-1348E active radar home-on-jam terminal lock-on.
Warhead: 48-lb continuous rod/fragmentation HE.
Dimensions: length 11 ft 10 in, body diameter 8 in, wingspan 1 ft 4 in.
Weight: 386 lb (R-77), 408 lb (R-77M), 496 lb (R-77M-PD).
Performance: max speed Mach 3, range 47 miles (or 93 miles for R-77M-PD), min launching range 985 ft.
COMMENTARY
Adder is easily distinguished by its lattice tail fins, which fold for possible future internal stowage. Known also in Russia as the RVV-AE, this missile was designed to destroy highly maneuverable (12g) aircraft, helicopters, cruise missiles, SAMs, and AAMs at all aspects, by day and night, in all weather and intense ECM, over ground and sea, in fire-and-forget mode.
R-77M: Upgraded and lengthened variant with improved seeker. Deployment expected in 1999.
R-77M-PD: Still in development, this version will be able to attack AWACS aircraft at a range of 100 miles or more. It will have a rocket/ramjet motor and infrared homing.

AA-X-13 (K-37)
Brief: The K-37 (which will become R-37 when it enters service) is a greatly enhanced derivative of the R-33 (AA-9) first tested in 1989. A MiG-31M has been seen with two K-37 AAMs on centerline mounts in addition to R-33s on fuselage-side conformal weapon attachments. Offered for retrofit to MiG-31Bs.
Inventory: TBD
Contractor: Spetztekhnika Vympel.
Power Plant: solid-propellant rocket motor.
Guidance: inertial, with active radar terminal homing.
Warhead: 132-lb fragmentation HE.
Dimensions: length 13 ft 9 in, body diameter 1 ft 3 in, wingspan 2 ft 4 in.
Weight: 1,323 lb.
Performance: range 93 miles.
COMMENTARY
All four tail fins able to fold for internal stowage on future stealthy aircraft. Its cruciform wings are positioned farther forward than those of the R-33. Redesign may now have lowered the launch weight to some 990 lb. Careful trajectory shaping is claimed to permit a range of more than 155 miles.

AA-? (AAM-L; KS-172)
Brief: This long-range AAM is one of the weapons specified for the Su-37.
Inventory: TBD
Contractor: Novator.
Power Plant: two-stage solid-propellant rocket motor.
Guidance: inertial, with midcourse update and active radar terminal homing.
Warhead: estimated 110-lb fragmentation HE.
Dimensions: length 24 ft 3 in, body diameter 1 ft 8 in, fin span 2 ft 11 in.
Weight: 1,650 lb.
Performance: a range of 250 miles is claimed, against targets flying up to Mach 3.75 at heights from 10 ft to 98,000 ft.
COMMENTARY
This AAM was first shown in mock-up form at the 1993 Moscow Air Show. It is a slim cylindrical missile with small cruciform tail control surfaces.

AA-? (SA-15/9M96; NATO Gauntlet)
Brief: This medium-range AAM variant of Gauntlet was exhibited in 1996.
Inventory: TBD
Contractor: Fakel.
Power Plant: solid-propellant rocket motor.
Guidance: active radar command.
Warhead: not available
Dimensions: length 9 ft 6 in, body diameter 9.5 in.
Weight: 368 lb.
Performance: not available
COMMENTARY
Believed to be under development for the Su-27.

AA-? (new SRAAM)
Two new short-range AAMs are being developed, possibly in competition, as more capable successors to the R-73 (AA-11 Archer). One, by Fakel MKB, was exhibited in 1996 with the designation 9M100 and is controlled by four tail fins only. Approximate dimensions are length 8 ft 2 in, body diameter 5 in.
No designation is yet known for the Spetztekhnika Vympel SRAAM, which has four rear-mounted rectangular wings with movable control surfaces. It is claimed to have a fully steerable nozzle, making it more agile than Archer, and to have a longer range. It may also have a dual passive radar/IIR seeker head.

ALFA
Brief: Under development without state funding, ALFA is a supersonic anti-ship missile for launch from ships or such aircraft as the Su-32FN (Su-34).
Inventory: TBD
Contractor: Reutov (OKB 52) and NPO Mashinostroyenia.
Power Plant: turbofan with ventral intake, plus solid-propellant rocket boost.
Guidance: inertial and GPS midcourse guidance, with active radar terminal homing.
Warhead: 660-lb HE.
Dimensions: length 29 ft, body diameter 2 ft, wingspan 5 ft 2 in.
Weight: 5,510 lb ground-launched or 3,525 lb air-launched (estimated).
Performance: cruise altitude 65,600 ft, penetration altitude 15–50 ft, max speed Mach 3.0, range 155–186 miles.
COMMENTARY
The cylindrical body has an ogival nose, small delta wings under the midbody, and cruciform tail surfaces. Russian designations are thought to be 3M54 for the surface-launched version and ASM-MS for the air-launched variant.

AS-7 (Kh-23M Grom; NATO Kerry)
Brief: This short-range ASM may still be carried by the Su-24 and Su-25.
Inventory: not available
Contractor: Zvezda.
Power Plant: solid-propellant rocket motor.
Guidance: semiactive laser or radio command.
Warhead: 238-lb hollow-charge HE.
Dimensions: span 2 ft 7 in, length 11 ft 10 in, body diameter 11 in.

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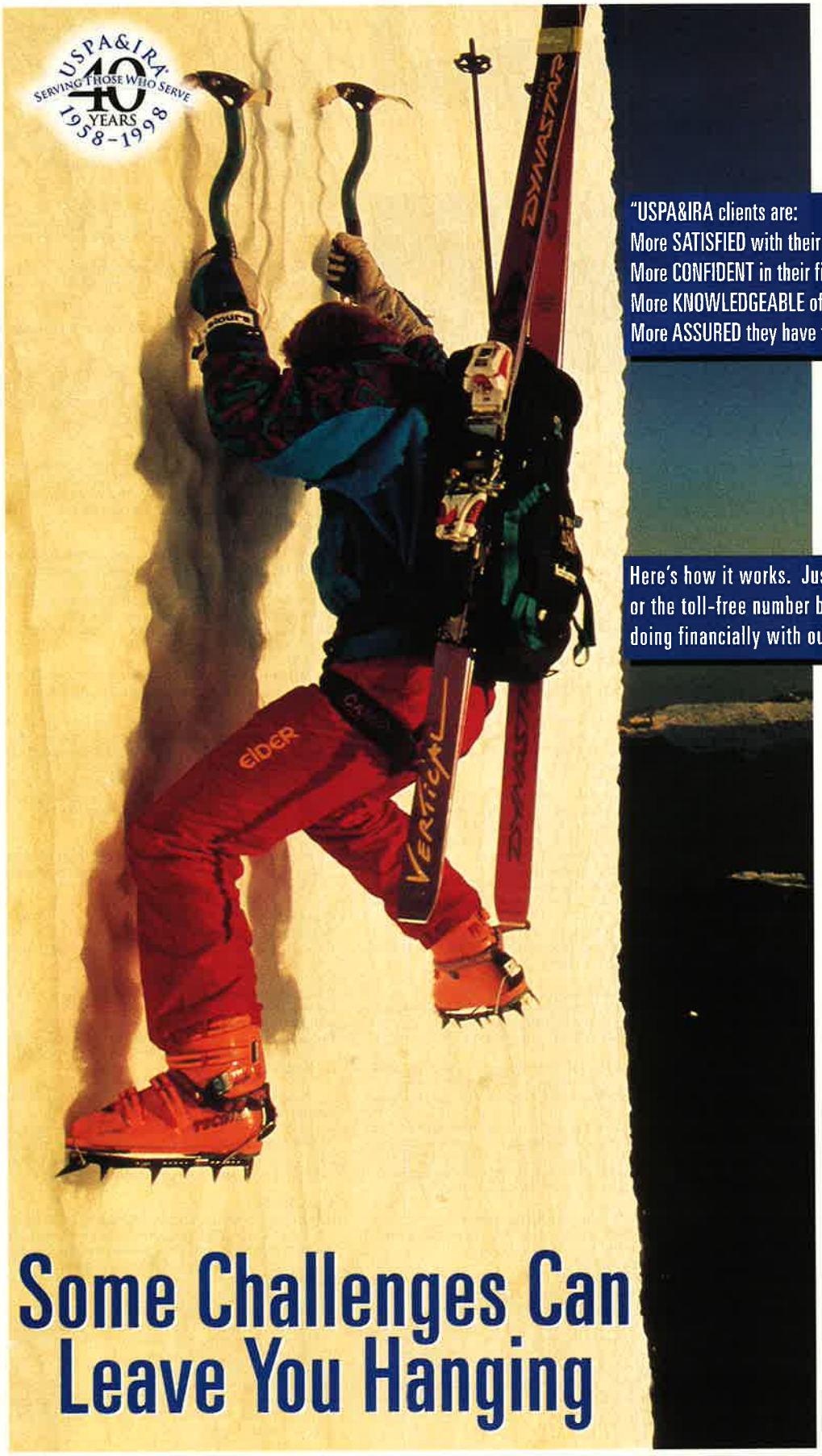

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Weight: 635 lb.
Performance: max speed transonic, range 3 miles.
COMMENTARY
This first-generation tactical ASM was developed (initially as Kh-66) from the air-to-air AA-1 (Alkali) and AA-3 (Anab) in the mid-1960s, and entered service in 1973; the improved Kh-23M followed in 1974. It is guided by joystick control from the launch aircraft.

AS-10 (Kh-25ML/MR; NATO Karen)
Brief: Short-range ASM, in service since 1981. See AS-12 for anti-radar version.
Inventory: not available
Contractor: Zvezda.
Power Plant: each version has a solid-propellant rocket motor.
Guidance: semiactive laser (Kh-25ML) or radio command (Kh-25MR).
Warhead: 198-lb HE (both).
Dimensions: span 2 ft 7 in, length 13 ft 3 in, body diameter 11 in.
Weight: 660 lb.
Performance: launch height 330–33,000 ft, max speed Mach 2.35, range 6.2 (MR) to 12.5 miles (ML).
COMMENTARY
Kh-25: Original version; entered service in 1974; semiactive laser guidance.
Kh-25MR: Uses the same kind of radio command guidance system as the Kh-23M (AS-7), to which it is similar.
Kh-25ML: Laser-guided, with target designation by the launch aircraft. These include the Su-24, Su-25, Su-25TM, and Su-35/37.

AS-11 (Kh-58; NATO Kilter)
Brief: The AS-11 is a third-generation anti-radiation missile which entered series production in 1980.
Inventory: not available
Contractor: Raduga.
Power Plant: dual-thrust solid-propellant rocket motor.
Guidance: inertial, with passive radar homing head.
Warhead: a nuclear warhead is reported to be optional in place of the usual 330-lb or 440-lb HE blast/fragmentation type.
Dimensions: span 3 ft 10 in, length 15 ft 9 in, body diameter 1 ft 3 in.
Weight: 1,433 lb.
Performance: max speed Mach 4; range from low altitude 6–43 miles, from high altitude 6–112 miles.
COMMENTARY
Kilter has a cruciform clipped-delta wing/tail fin configuration. In various forms, it is compatible with the Su-24 and the Su-25TM and can be retargeted several times while in flight. A version for use against ship radars has a range of 112 miles after high-altitude launch.

AS-12 (Kh-25MP; NATO Kegler)
Brief: Kegler differs from the AS-10 Karen ASM in having a passive radar homing head.
Inventory: not available
Contractor: Zvezda.
Power Plant: solid-propellant rocket motor.
Guidance: inertial, with passive radar homing head.
Warhead: 198-lb blast/fragmentation type HE.
Dimensions: as AS-10, except length 14 ft 4 in.
Weight: 705 lb.
Performance: launch height 330–49,200 ft; max speed Mach 2.5; range from low altitude 1.5–15.5 miles, from high altitude 1.5–37 miles.
COMMENTARY
The AS-12 entered service in 1981 and can be carried by the Su-24, Su-25, Su-35/37, Tu-22M, and Ka-50.

AS-13 (Kh-59 Ovod; NATO Kingbolt)
Brief: Medium-range ASM, developed between 1973 and 1980. See also AS-18.
Inventory: not available
Contractor: Raduga.
Power Plant: two-stage solid-propellant rocket motor.
Guidance: TV command.
Warhead: reported to have a 331-lb HE warhead.
Dimensions: span 4 ft 2 in, length 17 ft 9 in, body diameter 1 ft 3 in.
Weight: 1,764 lb.
Performance: range from low altitude 56 miles, from high altitude 100 miles.
COMMENTARY
Daylight/VMC capability only; supplements the short-range AS-10. Ovod (Gadfly) is carried by the Su-24M, but the improved AS-18 is also available.

AS-14 (Kh-29; NATO Kedge)
Brief: In the class of USAF's Maverick, this tactical ASM is carried on the extended wing-root glove pylons of the Su-24M and by the MiG-29, Su-25, Su-25TM, and Su-35/37.
Inventory: not available
Contractor: Spetztekhnika Vympel.
Data for Kh-29T.

AS-14 Kedge (Paul Jackson)

AT-2 Swatter (Paul Jackson)

Power Plant: solid-propellant rocket motor.
Guidance: TV command (Kh-29T) or semiactive laser (Kh-29L).
Warhead: each version has a 700-lb HE warhead.
Dimensions: span 3 ft 7 in, length 12 ft 10 in, body diameter 1 ft 4 in.
Weight: 1,477 lb. (Kh-29L 1,448 lb.)
Performance: launch height 650–16,400 ft, range 1.85–7.5 miles.
COMMENTARY
Kh-29T and Kh-29L: Basic versions; identical except for interchangeable seeker heads.
Kh-29MP: Reported (but unconfirmed) version, with passive anti-radiation seeker.

AS-17 (Kh-31A/P; NATO Krypton)
Brief: The AS-17 was developed from 1977 onwards, initially to attack US Patriot and AEGIS phased-array missile radars. It entered service in the 1980s and reportedly has a capability against AWACS aircraft.
Inventory: not available
Contractor: Zvezda.
Power Plant: integral rocket/ramjet, with four intakes for the ramjet disposed around the body, each carrying a wing and a separate control surface.
Guidance: inertial, with active (Kh-31A) or passive (Kh-31P) radar seeker. Three versions of the latter are readily interchangeable.
Warhead: 198-lb blast penetration HE.
Dimensions: span 3 ft 9 in, length see below, body diameter 1 ft 2 in.
Weight: 1,323 lb (all versions).
Performance: launch height 165–49,200 ft, max speed Mach 3, range see below.
COMMENTARY
Four versions have been identified:
Kh-31A Mod 1: Anti-ship missile with active radar seeker. Length 15 ft 5 in, range 3–31 miles.
Kh-31A Mod 2: As Mod 1, but length 17 ft 2 in, range 3–43 miles.
Kh-31P Mod 1: Anti-radiation missile with passive radar seeker. Length 15 ft 5 in, range 6–93 miles.
Kh-31P Mod 2: As Mod 1, but length 17 ft 2 in, range 6–125 miles.
All versions are designed for effectiveness in ECM environments. The Kh-31 has been seen mounted in inert form, or has been reported, on MiG-29M, Su-24, Su-34, and Su-35/37 aircraft. A Kh-31P development, designated KR-1, is a joint venture with China.

AS-18 (Kh-59M Ovod-M; NATO Kazoo)
Brief: Conventionally armed short-range cruise missile; believed in service since 1991.
Inventory: not available
Contractor: Raduga.
Power Plant: turbojet, pod-mounted under missile body.
Guidance: command-updated midcourse inertial, with terminal homing (to 6–10 ft CEP) via a Granit 7TM1 TV camera behind a glass nose. Terrain contour matching altimeter for 23 ft altitude hold over water or various heights down to 330 ft over land.
Warhead: 705-lb HE or 617-lb cluster submunitions.
Dimensions: span 4 ft 3 in, length 18 ft 8 in, body diameter 1 ft 3 in.
Weight: 2,028 lb.
Performance: speed at 330–660 ft Mach 0.7–0.82; range 25 miles with prelaunch lock-on, 71 miles with command update.
COMMENTARY
Kazoo is a modernized version of AS-13 Kingbolt. It has a cylindrical body with sweptback cruciform flip-out nose surfaces and a cruciform tail unit carrying inset control surfaces and can be launched from heights between 330 and 16,400 ft. Like AS-13, its guidance signals are received from a 573-lb, 13-ft-long APK-9 pod carried by the launch aircraft.

AS-20 (Kh-35; NATO Kayak)
Brief: Dubbed Harpoonski because of its similarity to the US AGM-84 Harpoon, the Kh-35 is an anti-ship ASM to arm combat aircraft and helicopters.
Inventory: not available
Contractor: Zvezda.
Power Plant: turbofan with ventral intake.
Guidance: midcourse guidance is inertial, with an active radar-guided sea-skimming approach to the target at 16–33 ft altitude.
Warhead: 320-lb blast/fragmentation HE.
Dimensions: span 4 ft 3 in, length 12 ft 4 in, body diameter 1 ft 5 in.
Weight: 1,058 lb.
Performance: launch height 650–16,400 ft, max speed 670 mph, range 3–80 miles.
COMMENTARY
With an added tandem booster, Kayak can be launched from Ka-27 helicopters. The 3M60 Uran (NATO SS-N-25) is a ship-launched version; 3K60 (SSC-6 Stooge) is the Bal coastal defense version.

AS-? (Kh-41 Moskit)
Brief: The Moskit (Mosquito) anti-ship missile has been described as a primary weapon for the Su-32FN (Su-34) coastal-based attack aircraft but too heavy for use from aircraft carriers at sea.
Inventory: TBD
Contractor: Raduga.
Power Plant: integral rocket/ramjet, similar to AS-17.
Guidance: inertially guided sea-skimming approach to target. Terminal guidance is by dual-mode active/passive radar seeker, with ECCM capability.
Warheads: 705-lb blast/fragmentation HE.
Dimensions: span (spread) 6 ft 11 in, length 31 ft 11 in, body diameter 2 ft 6 in.
Weight: 9,920 lb.
Performance: max speed Mach 2.1–3; range sea-skimming 93 miles, at high altitude 155 miles.
COMMENTARY
The configuration of Moskit resembles that of the much smaller Kh-31 (AS-17) but with the cruciform wings located toward the front of the wraparound ramjet air intakes. The wing and tail surfaces all fold to fit between the engine ducts of the Su-33, on which the Kh-41 has been exhibited. Design bureau designation is 3M80 and marketing designation ASM-MSS.

AS-? (Kh-65SE)
Brief: Possibly a shorter, conventional-warhead version of the AS-15 ALCM. It is intended for anti-ship use and is specified for the Su-37.
Inventory: TBD
Contractor: Raduga.
Power Plant: turbojet or turbofan.
Guidance: inertial, with terrain reference and active radar terminal command.
Warhead: 904-lb penetration HE.
Dimensions: length 19 ft 10 in, body diameter 1 ft 8 in, wingspan 10 ft 2 in.
Weight: 3,638 lb.
Performance: launch height 985–39,375 ft, range 155–174 miles at 365–585 mph at a height of 130–360 ft.
COMMENTARY
This ALCM has a basically cylindrical body, changing to a flat-bottom triangular section with rounded corners forward of the wings to reduce radar signature. The wings and three tail control surfaces fold for stowage on the missile launcher. After launch, these surfaces deploy, and the power plant pod extends through hinged doors in the weapon's undersurface.

AS-? (Kh-101)
Brief: This next-generation ALCM has been under test since at least 1995 as a replacement for the canceled Kh-90 (AS-19 Koala). Development is almost complete, and production could begin in 1998.
Inventory: TBD
Contractor: Raduga.
Power Plant: turbojet or turbofan.
Guidance: believed to be inertial, with midcourse update and electro-optical terminal homing.
Warhead: 880-lb penetration HE.
Dimensions: length (estimated) 24 ft 5 in.
Weight: 4,850–5,290 lb (estimated).
Performance: launch height 20,000 ft, cruising speed Mach 0.6–0.8 at 100–230 ft, max range (estimated) up to 1,860 miles.

COMMENTARY
The Kh-101 is said to be a priority development for carriage by the Tu-22M-3 (four), Tu-95MS (eight), and Tu-160 (12). The terminal accuracy requirement is reportedly 40–65 ft.

AT-2 (9M17 Skorpion; NATO Swatter)
Brief: This anti-tank missile (ATM) arms the Mi-24D and Mi-8TBK helicopters.
Inventory: not available
Contractor: Nudelman.
Data for Swatter-A/B.
Power Plant: solid-propellant rocket motor.
Guidance: radio command.
Warhead: HE.
Dimensions: span 2 ft 2 in, length 3 ft 10 in, body diameter 5 in.
Weight: 65 lb.
Performance: cruising speed 380 mph, range 1.85 miles.
COMMENTARY
Swatter-A/B: Employs radio command guidance and requires the helicopter's weapons operator to keep crosswires on his sight centered on the target.
Swatter-C: Is similar but has semiautomatic command to line-of-sight and a range of 2.5 miles.

AT-6 (9M114 Kokon; NATO Spiral)
Brief: The AT-6 is a tube-launched anti-tank missile developed in the late 1970s.
Inventory: not available
Contractor: Kolomna.
Power Plant: solid-propellant rocket motor.
Guidance: radio command.
Warhead: 16.3-lb HE.
Dimensions: span 1 ft, length 6 ft, body diameter 5 in.
Weight: 77 lb.
Performance: cruising speed 895 mph, range 3.1 miles.
COMMENTARY
Kokon (Cocoon) has two small flip-out control fins on the nose and four wraparound stabilizing fins at the rear. The warhead can penetrate 37 in of armor plate, and the basic AT-6 is standard armament on the Mi-24V/P, Mi-28, and Ka-29. A variant with an HE fragmentation warhead for attacking other battlefield targets has been reported.

AT-9 (9M114M1/2 Shturm; NATO Spiral 2)
Brief: The AT-9 Shturm (Storm) is an improved version of the anti-tank AT-6.
Inventory: not available
Contractor: Kolomna.
Power Plant: solid-propellant rocket motor.
Guidance: radio command.
Warhead: 16.3-lb HE.
Dimensions: span 1 ft, length 6 ft, body diameter 5 in.
Weight: 88 lb.
Performance: range 5 miles.
COMMENTARY
Seen in two eight-rd clusters on the outer under-wing weapon pylons of a mock-up Mi-35M Hind helicopter at the 1995 Paris Air Show, the AT-9 has an improved radio command link, greater armor penetration, and an increased range compared with the AT-6. It can be used in both air-to-surface and air-to-air modes.

AT-12 (9M120 Vikhr/Ataka)
Brief: This tube-launched ATM can be carried in eight-rd clusters under the wings of the Su-25TM attack aircraft.
Inventory: not available
Contractor: Shipunov or Kolomna.
Power Plant: solid-propellant rocket motor.
Guidance: radio command or semiactive laser beam riding.
Warhead: estimated 16.5 lb HE.
Dimensions: span 1 ft 1 in, length 5 ft 7 in, body diameter 5 in.
Weight: 95 lb.
Performance: range 3.7 miles.
COMMENTARY
The configuration of Vikhr (Whirlwind) is similar to that of the AT-6/9, but its nose projects from the launch tube. The AT-12 is cleared for use on Mi-24, Mi-28, and Ka-50 helicopters and the Su-25. An air-to-air version, with proximity fuse and rod warhead, was reported in 1995.

AT-16 (9M120M/9M121 Vikhr M)
Brief: This ATM appears to be a lengthened and improved AT-9.
Inventory: not available
Contractor: Shipunov.
Power Plant: believed to be two-stage solid-propellant rocket motor.
Guidance: semiactive laser guidance is standard.
Warhead: 17-lb shaped-charge HE.
Dimensions: length 9 ft 6 in, body diameter 5 in.
Weight: 99 lb.
Performance: launch altitude 15–13,120 ft, max speed Mach 1.8, range 0.3–6.2 miles.
COMMENTARY
The Vikhr M was first seen in 1992 on the Ka-50 combat helicopter in the form of six-rd under-wing clusters. Other possible carriers include the Mi-24, Mi-28, and Su-25TM. The warhead is reportedly capable of penetrating 39 in of reactive protected armor. Russian literature also mentions 9M120F and 9A-2200 subvariants.

SA-7, SA-14, SA-16, and SA-18
All of these man-portable SAMs have been adapted for air-to-air use on Mi-24 and other helicopters. Details in Surface-to-Air and Defensive Missiles section.

Surface-to-Air and Defensive Missiles

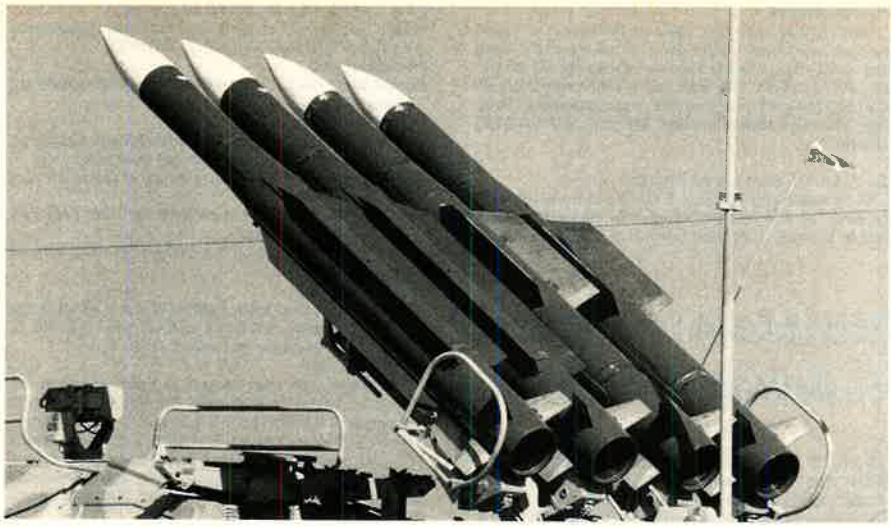
SA-2 (S-75 Dvina/Volkhov; NATO Guideline)
Brief: This veteran medium/high-altitude SAM, named after Russian rivers, is land-transportable on a semi-trailer and can be transferred to the standard single-rd launcher in 12 min. Deployment began in 1957.
Inventory: about 100.
Contractor: Lavochkin and Grushin OKBs (design); Fakel MKB (support).
Data for SA-2F.
Power Plant: storable liquid-propellant sustainer; solid-propellant booster.
Guidance: UHF radio command.
Warhead: HE fragmentation (430 lb, except on SA-2E), with proximity and/or command fusing.
Dimensions: length 35 ft 5 in, body diameter (second stage) 1 ft 8 in, wingspan (second stage) 5 ft 7 in.
Weight: 5,040 lb.
Performance: max speed Mach 3.5, slant range 3.7–18.6 miles (41 miles with Volga-M upgrade), effective ceiling 300–98,425 ft.
COMMENTARY
Of six versions (SA-2A/B Dvina, SA-2C to F Volkhov), only the SA-2E has alternative HE (650 lb) or command-detonated nuclear (15 kiloton) warheads, in a more bulbous nose.
The SA-2's Fan Song radar, with a crew of four to six, operates in target-acquisition and automatic-tracking modes. It can track up to six targets simultaneously before switching to automatic tracking and missile guidance against the selected target.
SA-2F (S-75M): Improved guidance offers a home-on-jam capability. About 100 SA-2s are still in service in Russia; replacement by SA-10s is expected to be complete by the end of this decade.
Volga-M: Upgrade packages have introduced digital subsystems for improved accuracy, 60 percent less maintenance requirement, fully automatic launch operation, and increased range.

SA-3 (S-125 Neva; NATO Goa)
Brief: The SA-3 was developed to be the low/medium-altitude complement to the SA-2 Guideline.
Inventory: about 25 SA-3 launchers, first deployed in 1961, remain operational in Russia, each carrying two or four SAMs.
Contractor: Lavochkin and Grushin OKBs (design); Fakel MKB (support).
Data for SA-3B.
Power Plant: two-stage solid-propellant rocket motor.
Guidance: UHF radio command.
Warhead: HE fragmentation (132 lb), with Doppler radar proximity and contact fusing. Lethal burst radius 41 ft.
Dimensions: length 22 ft, body diameter (second stage, max) 1 ft 10 in, wingspan (second stage) 4 ft.
Weight: 2,095 lb.
Performance: max speed Mach 3.5, slant range 1.5–15.5 miles, effective ceiling 165–59,050 ft.
COMMENTARY
Current versions are the SA-3A and SA-3B, the latter with improved command guidance. Reload time on four rails is 50 minutes.
The system's P-15M Squat Eye early warning and target acquisition radar has a range of 130 miles and is supplemented by PRV-11 height-finding radar. Low Blow radar used for target monitoring and missile control has an acquisition range of 68 miles and a tracking range of 25–52 miles. Six targets can be tracked simultaneously and one or two missiles guided. During operations in a dense ECM environment, 15-mile-range TV cameras on the later Low Blow systems provide the fire-control team with the same information as that from the radar without affecting the command guidance function. Exported Nevas are known as Pechoras; both are names of Russian rivers.

SA-5 (S-200 Angara; NATO Gammon)
Brief: This high-altitude theater defense missile was first deployed (SA-5A) in the mid-1960s.
Inventory: 400.
Contractor: Lavochkin and Grushin OKBs (design); Fakel MKB (support).
Data for S-200D.
Power Plant: dual-thrust solid-propellant sustainer; four wraparound solid-propellant boosters.
Guidance: radar command, with active radar terminal homing.
Warhead: HE fragmentation (478 lb), with proximity and command fusing.
Dimensions: length 35 ft 5 in, body diameter 2 ft 10 in, wingspan 9 ft 4 in.
Weight: 6,173 lb.
Performance: max speed above Mach 4, slant range 4.35–150 miles, effective ceiling 165–114,800 ft, max target engagement speed Mach 3.7.
COMMENTARY
The Angara (a river) exists in three versions deployed in Air Defense Rocket Brigades, made up of battalions of SA-3 and SA-5 launchers, plus 23 mm or 57 mm anti-aircraft guns. Each SA-5 battalion has a 200-mile-range P-35M Bar Lock B target search and acquisition radar with integral IFF, a 165-mile-range Square Pair missile guidance radar, and six single-rail missile launchers.
SA-5A (S-200): Initial production version with HE fragmentation warhead. Length 34 ft 5 in. Ceiling 65,600 ft. Operational from 1966.
SA-5B (S-200V): As SA-5A but with 25-kiloton nuclear warhead. Length as SA-5C. Ceiling 95,150 ft. Entered service 1969–70.
SA-5C (S-200D): HE warhead. Improved ceiling and terminal guidance. Standard version from 1975.

SA-6 (3M9 Kub; NATO Gainful)
Brief: The SA-6 Kub (Cube) self-propelled tactical SAM system consists of a tracked TEL carrying three missiles with integral solid rocket/ramjet propulsion. IOC was in 1970.
Inventory: Many hundred TELs are deployed in Russian anti-aircraft regiments.
Contractor: Toropov OKB (design); NIIP Zhukovsky (support).
Power Plant: solid-propellant booster; after burnout, its empty casing becomes a ramjet combustion chamber for ram air mixed with the exhaust from a solid-propellant gas generator.
Guidance: radar command; semiactive radar terminal homing.
Warhead: HE fragmentation (130 lb), with proximity and contact fusing. Lethal burst radius 16 ft.
Dimensions: length 18 ft 10 in, body diameter 1 ft 1 in, wingspan 4 ft 1 in.
Weight: 1,320 lb.
Performance: max speed Mach 2.8, slant range 1.8–15 miles, effective ceiling 330–36,000 ft.
COMMENTARY
Each Russian anti-aircraft regiment consists of a headquarters with EW, IFF, and height-finding radars, and five SA-6 batteries. Each battery has a 1S91 Straight Flush fire-control radar, mounted on the same kind of tracked chassis as the TEL; four SA-6 TELs; and four ZIL 131 TZM reload vehicles, each carrying three missiles. Straight Flush has a surveillance range of 34–46 miles and engagement range of 18 miles. It performs IFF interrogation, target tracking and illumination, and missile radar command guidance functions. Up to three missiles can be guided toward the same target, with a TV tracker available to assist operation in a dense ECM environment. Reloading of the TEL takes 10 minutes. All elements of the SA-6 system are air-transportable in Il-76 or larger aircraft. Russian designations cover at least nine subvariants, but these are not differentiated by NATO.

SA-7 (9M32 Strela-2; NATO Grail)
Brief: The air-to-air version of this man-portable SAM first appeared on Russian helicopters in the late 1970s.
Inventory: not available
Contractor: Kolomna KBM.
Data for SA-7B.
Power Plant: solid-propellant booster/sustainer.
Guidance: infrared passive homing.
Warhead: 4-lb fragmentation HE with contact and graze fusing.
Dimensions: length 4 ft, body diameter 3 in, fin span 6 in.
Weight: 22 lb. Launcher: 11 lb.
Performance: max speed Mach 1.70, slant range 0.5–3.1 miles, effective ceiling 165–7,550 ft.
COMMENTARY
SA-7A: This initial version of the shoulder-fired, tube-launched, passive IR homing Strela (Arrow) could be fired only from behind a target at a very hot exhaust area, over a narrow field of fire.



***SA-11** Gadfly* (Paul Jackson)

SA-7B Mod 1 (9M32M Strela-2M): From 1971, offered an extended field of fire of 30° each side of the target's tail, a seeker able to filter out spurious heat sources, including early IR decoys and flares, and an improved warhead. The operator could also have a small passive RF antenna fixed to his helmet, to provide audible warning of an approaching aircraft by picking up emissions from its radar and radar altimeter.

SA-7C Mod 2: Major version from the mid-1970s with improved launcher and more effective RF detector, mounted forward of the grip stock. The second member of an SA-7 team carries a reload missile. Reload time is six seconds.

SA-8 (9M33 Osa-M; NATO Gecko)
Brief: Entirely self-contained all-weather low-altitude SAM system. Its name is Russian for Wasp. The M suffix denotes development initially for use by the Russian Navy (as SA-N-4A); SA-8 is Ground Forces version.
Inventory: approx 400 in 1994; may have reduced since then following partial replacement by SA-15 Gauntlet.
Contractor: Grushin OKB (design); Fakel MKB (support).
Power Plant: single-stage (SA-8A) or dual-thrust (SA-8B) solid-propellant rocket.
Guidance: radar command, permitting two missiles to be guided simultaneously against a single target, on different frequencies, to complicate ECM.
Warhead: HE fragmentation (42 lb), with proximity and contact fusing. Lethal burst radius 16 ft.
Dimensions: length 10 ft 4 in, body diameter 8 in, fin span 2 ft 1 in.
Weight: 278 lb (SA-8B 375 lb).
Performance: max speed Mach 2.4, slant range SA-8A 0.9–7.5 miles, SA-8B 0.9–9.3 miles, effective ceiling 82–16,400 ft.
COMMENTARY
SA-8A Mod 0 (9M33): The original Mod 0 carried two pairs of exposed single-stage missiles, ready to fire. Service entry was in 1974.
SA-8B Mod 1 (typically 9M33M3): The Mod 1 system has six dual-thrust, increased-performance missiles in launcher/containers. Fire-control equipment and launchers are mounted on a rotating turret, carried by a BAZ-5937 six-wheel, fully amphibious, all-terrain vehicle. The Land Roll fire-control radar, to the rear of the one-man gunner/radar operator's position, has a 360° scan over a 22-mile range. It folds down behind the launcher, enabling the weapon system to be airlifted in An-22, An-124, and Il-76 transport aircraft. Range of the monopulse tracking radar is 15.5 miles. An LLLTV/optical system assists target tracking in low visibility and dense ECM. Reload time is five minutes.

SA-10 (S-300 Buk; NATO Grumble)
Brief: Buk (Beech tree) is Russia's counterpart to the US Army's MIM-104 Patriot.
Inventory: about 2,075 in 1996; production continuing.
Contractor: Grushin and Raspletin OKBs (design); Fakel MKB (support).
Data for SA-10B.
Power Plant: single-stage solid-propellant rocket.
Guidance: radar command and midcourse inertial, with semiactive radar terminal homing and proximity fusing.
Warhead: HE fragmentation (285 lb).
Dimensions: length 23 ft 9 in, body diameter 1 ft 6 in, wingspan 3 ft 3 in.
Weight: 3,300 lb.
Performance: max speed Mach 6, range 3–56 miles, effective ceiling 80–88,500 ft.
COMMENTARY
The SA-10 is effective against targets at heights up to 88,500 ft, including low-flying aircraft, cruise missiles, and re-entry vehicles from ballistic missiles in the class of the Scuds used by Iraq in the Persian Gulf War.
SA-10A Mod 0: Deployment of the initial Mod 0 began in 1980. In its S-300PT towed form, a regiment comprises three batteries and an F-band 3-D surveillance and tracking radar (Big Bird) at the command post for long-range target detection. Each battery has an engagement control center, a 3-D CW pulse-Doppler target acquisition radar (76N6 Clam Shell), an I-band phased-array engagement radar (Flap Lid A), and up to 12 four-rail container erector/launchers on semitrailers. These are positioned on concrete pads, and the 5V55K missiles are launched vertically, with ignition after launch. The track-via-missile system guidance enables up to six targets to be engaged simultaneously, with two missiles per target. A launcher can fire missiles at three-second intervals, against targets traveling at up to 2,610 mph. Max range of the SA-10A is 29 miles.
SA-10A (S-300PS): For improved mobility, a land-mobile version was developed, with the same missiles carried by a four-axle, four-rd 5P85S TEL vehicle. Reload missiles and a 30N6 Flap Lid B planar-array target-tracking and fire-control radar are carried on similar trucks. Readiness to fire is five minutes after the vehicles come to a halt.
SA-10B & SA-10C Grumble Mod 1 (S-300PM/PMU): Subsequent improvements increased the range to 56 miles with 5V55R missiles.
S-300PMU-1 (SA-10D): Further improved range of 93 miles with 48N6 missiles and can engage targets traveling at 6,200 mph. PMU-1 introduced new 64N6 Tombstone 3-D surveillance and acquisition radar, plus the 86M6 command-and-control system.
S-300PMU-2 Favorit (SA-10E): In 1997, the latest, export-orientated SA-10E was unveiled, including 48N6E2 missiles, 5P85TE2 vehicle, and an 86M6E2 command system. Surveillance is provided by either 64N6 or the new 96L6E.

SA-11 (9M38 Buk-M1; NATO Gadfly)
Brief: The SA-11 weapon system progressively replaced SA-4s in Ground Forces missile brigades, and some SA-6As at divisional level, from about 1979 onwards, for defense against high-performance aircraft and cruise missiles at low to high altitudes. Despite its Russian name, it is not related to the SA-10 Grumble.
Inventory: not available
Contractor: Ulyanovsk (production); NIIP Zhukovsky (support).
Power Plant: single-stage solid-propellant rocket.
Guidance: semiactive monopulse radar command.
Warhead: HE fragmentation (154 lb), with proximity and contact fusing.
Dimensions: length 18 ft 3 in, body diameter 1 ft 4 in, wingspan 2 ft 10 in.
Weight: 1,520 lb.
Performance: max speed Mach 2.8, slant range 1.85–20 miles, effective ceiling 50–72,000 ft, max target engagement speed Mach 2.8 (approaching), Mach 1 (receding).
COMMENTARY
The system is self-contained on a GM-569 tracked vehicle, which carries a 360° traversing four-rail launcher and Fire Dome monopulse guidance and tracking radar.
An SA-11 regiment is made up of four batteries, each with six TELs, and similar GM-569 vehicles carrying the two 62-mile-range radars, of the regimental target acquisition battery, and reload missiles. The same chassis carries the regiment's long-range early warning radar (Snow Drift). The original 9M38M1 missile can now be replaced by the new 9M317, announced in 1997. Weighing 1,565 lb, 9M317 is effective out to 26 miles and up to 81,800 ft. It also has a secondary anti-ship capability.

SA-12A (S-300V/9M83; NATO Gladiator)
Brief: The land-mobile tactical SA-12A is intended primarily for use against aircraft and ASMs.
Inventory: 100.
Contractor: Novator (production).
Power Plant: two-stage solid-propellant rocket.
Guidance: radar command and midcourse inertial, with semiactive radar terminal homing.
Warhead: HE focused fragmentation (330 lb), with selectable in-flight proximity fusing.
Dimensions (incl booster): length 23 ft, body diameter 2 ft 4 in, fin span 2 ft 7 in.
Weight: 5,500 lb.
Performance: max speed Mach 5.75, slant range 3.7–47 miles, effective ceiling 820–82,000 ft, max target engagement speed Mach 10.
COMMENTARY
All components of the system are based on the tracked MT-T chassis. The four batteries of a typical SA-12A brigade each have up to six TELARs, a 9S32 Grill Pan fire-control vehicle, and three reload transporters. The main 9S15MT Bill Board long-range target search and acquisition radar and sector-scanning radar (9S19M2 High Screen) vehicles are held at battalion headquarters level. The command post can monitor 200 targets, track 70 of them, and allocate 24 tracks to four guidance stations (each controlling six missile launchers). Each SA-12A TELAR carries a missile guidance radar and four recyclable missile container/launchers that can be raised independently to a vertical position for launch. The radar controls the missile in flight after its target has been tracked and handed on by Grill Pan.
The conical SA-12A missile can be readied for launch in 15 seconds. It ignites at a height of about 165 ft after ejection from its launcher. One missile can be fired every 1.5 seconds by each TELAR, with either two missiles from one launcher or four missiles from two launchers directed at each target. SA-12A is effective against aircraft maneuvering at up to 8g.

SA-12B (S-300V/9M82; NATO Giant)
Brief: This derivative of the SA-12A is optimized for the ABM role.
Inventory: not available
Contractor: Novator (production).
Power Plant: two-stage solid-propellant rocket.
Guidance: radar command and midcourse inertial, with semiactive radar terminal homing.
Warhead: HE focused fragmentation (330 lb), with selectable in-flight proximity fusing.
Dimensions (incl booster): length 27 ft 11 in, body diameter 2 ft 11 in, fin span 2 ft 7 in.
Weight: 10,140 lb.
Performance: max speed Mach 8, slant range 8–62 miles against aircraft (12–25 miles against incoming warheads), effective ceiling 3,300–98,400 ft, max target engagement speed Mach 10.
COMMENTARY
SA-12B was fielded in 1986 and appears to have the same 16.5 ft-long, 1,800-lb second stage mated to a first stage of about twice the length. It was intended to be deployed to defend road-mobile SS-25s and as part of the rail-mobile SS-24 Mod 1 ICBM system with its MT-T two-rd tracked TELs carried on low-loader railcars. After an SS-24 train emerged from its tunnel concealment to move to its launch area, the SA-12Bs were to disperse into the surrounding area to defend the Scalpel launchers from attacking and standoff jamming enemy aircraft, short-range ballistic missiles, and near-strategic missile re-entry vehicles.

SA-13 (9M37/9M333 Strela-10; NATO Gopher)
Brief: The SA-13 theater defense missile was developed in the early 1970s as a successor to the Nudelman OKB's SA-9 Gaskin.
Inventory: not available

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Contractor: Nudelman (OKB-16).
Power Plant: single-stage solid-propellant rocket.
Guidance: infrared passive homing in two frequency bands; optical photocontrast/IR (9M333).
Warhead: HE fragmentation rod; 6 lb and 100 rods. Lethal burst radius 16 ft. Contact and active xenon lamp proximity fusing; contact and active laser proximity fusing (9M333).
Dimensions: length 7 ft 3 in, body diameter 5 in, wingspan 1 ft 4 in.
Weight: 87 lb; 93 lb (9M333).
Performance: max speed Mach 2, slant range 0.3–6.2 miles, effective ceiling 33–16,400 ft, max target engagement speed Mach 1.25; Mach 1.6 (9M333).
COMMENTARY
SA-13 four-missile tracked launchers of the Russian Ground Forces and Navy were equipped initially with 9M37 missiles, followed by 9M37M Strela-10M2s, with infrared homing seeker, and all-aspect and IR counter-countermeasures capabilities. The missiles are carried in two twin-box launchers on TELAR vehicles, some with four Flat Box B passive radar detection antennas on their upper surface. Four reload missiles are normally carried by each of the vehicles, which are fully amphibious. The Dog Ear acquisition/tracking radar vehicle of the earlier SA-9 missile system is retained, with range-only radar (Snap Shot) on each TELAR.

9M333 Strela-10M3: Latest known version, intended for use in the mobile battle and to defend troops in movement from attack by low-level aircraft, helicopters, and precision guided weapons, as well as from observation by UAVs. It has a dual-mode optical photocontrast/IR seeker to improve adverse weather operation.

SA-14 (9M36 Strela-3; NATO Gremlin)
Brief: This man-portable SAM can also be launched from the Mi-24V helicopter.
Inventory: not available
Contractor: Kolomna KBM.
Power Plant: solid-propellant booster/sustainer.
Guidance: infrared passive homing.
Warhead: HE fragmentation (4.4 lb), with contact fusing.
Dimensions: length 4 ft 10 in, body diameter 3 in, fin span 12 in.
Weight: 23 lb. Launcher: 12.6 lb.
Performance: average speed Mach 1.38; slant range 0.31–2.6 miles; effective ceiling 50–9,840 ft; max target engagement speed Mach 0.9 (approaching), Mach 0.75 (receding).
COMMENTARY
Compared with the SA-7, the SA-14 shoulder-fired SAM has an uprated rocket motor and a cryogenically cooled IR seeker with proportional guidance that is effective in head-on as well as tail-chase firings and against targets maneuvering at up to 8g. Effectiveness against targets equipped with flare dispensers and IR jammers is claimed to be much enhanced. A passive RF direction-finder antenna system is optional. A second target can be engaged within 35 seconds of the first.

SA-15 (9M331 Tor-M1; NATO Gauntlet)
Brief: The Tor-M1 (Thor) highly automated mobile SAM system is immensely more formidable than the SA-8 it is replacing. Its modified GM-569 tracked vehicle is air-transportable but not amphibious. See also 9M96 air-launched version.
Inventory: not available
Contractor: Fakel MKB (support).
Power Plant: two-stage solid-propellant rocket.
Guidance: radar command.
Warhead: HE fragmentation (33 lb), with proximity fusing.
Dimensions: length 9 ft 6 in, body diameter 1 ft 2 in, wingspan 2 ft.
Weight: 368 lb.
Performance: max speed Mach 2.5, slant range 0.9–7.5 miles, effective ceiling 33–19,700 ft, max target engagement speed Mach 2.
COMMENTARY
A box-like turret on top of the hull houses eight vertically mounted missiles in two rows and carries the engagement radars. Above the rear of the box is a 3-D pulse-Doppler C-band surveillance radar able to detect up to 48 targets over a range of 15 miles. The radar then assesses in order of priority, and tracks, the 10 most threatening targets. The pulse-Doppler phased-array K-band target tracking and missile guidance radar at the front can simultaneously track and engage two targets traveling at 0–1,565 mph, by day or night, in all weather, and in dense ECM environments. It is supplemented by an autonomous automatic TV tracking system, with a range of 12.4 miles, that enhances the SA-15's capability in battlefield clutter and dense ECM. Reaction time is five to eight seconds from target detection. The missiles are cold-launched, at minimum three-second intervals, and able to maneuver at 23g to 30g against fixed-wing aircraft, helicopters, UAVs, precision guided weapons, and some types of guided missiles. The SA-15 vehicle carries a crew of three and is supported by a wheeled loader/transporter with two four-rd reload packs that can be installed in less than 20 minutes. There are normally four launch vehicles in each battery.

SA-16 (9M313 Igla-1; NATO Gimlet)
Brief: The configuration of the third-generation SA-16 is similar to that of the SA-7 and SA-14, but the Igla (Needle) is an entirely new weapon, with a conical nose.
Inventory: not available
Contractor: Kolomna KBM.
Power Plant: solid-propellant booster/sustainer.
Guidance: infrared passive homing.
Warhead: HE fragmentation (4.4 lb), with contact fusing.
Dimensions: length 5 ft 7 in, body diameter 3 in, fin span 10 in.
Weight: 24 lb. Launcher 13 lb.
Performance: average speed Mach 1.68, slant range 0.37–3.2 miles, effective ceiling 33–11,500 ft.
COMMENTARY
Deployment time is 13 seconds, and launch time from target acquisition is five seconds. The cooled infrared seeker improves resistance to countermeasures. Maximum target bearing angle for launch is ±40°.

SA-17 (9M38M2 Buk-2M; NATO Grizzly)
Brief: This low/medium-altitude SAM will eventually supersede the SA-11 (Gadfly).
Inventory: not available
Contractor: believed produced at Ulyanovsk; support by NIIP Zhukovsky.
Power Plant: two-phase solid-propellant rocket.
Guidance: radar command, midcourse inertial, and semiactive radar homing.
Warhead: HE fragmentation (110–155 lb), with proximity and contact fusing.
Dimensions: length 18 ft 1 in, body diameter 1 ft 4 in, wingspan 3 ft 7 in.
Weight: 1,587 lb.
Performance: max speed Mach 4; slant range 1.85–31 miles; effective ceiling 33–82,000 ft; max target engagement speed Mach 3.5 (approaching), Mach 1.18 (receding).
COMMENTARY
The SA-17 has a similar configuration to the SA-11 and is based on a similar tracked vehicle in its domestic form. A major innovation is a new jam-resistant, electronically scanned phased-array engagement radar known to NATO as Chair Back, which has a range of 75 miles and enables four targets to be engaged simultaneously. Other vehicles in the SA-17 system, basically similar to the four-missile TEL, include a mount for the 100-mile-range target acquisition radar and a loader/launcher carrying eight missiles but no radar.

SA-18 (9K38 Igla; NATO Grouse)
Brief: The basic 9K38 Igla fourth-generation shoulder-fired SAM is designed to engage low-flying maneuverable and nonmaneuverable targets and hovering helicopters.
Inventory: not available
Contractor: Kolomna KBM.
Data for 9K38 Igla.
Power Plant: solid-propellant booster/sustainer.
Guidance: two-channel infrared passive homing.
Warhead: HE fragmentation (2.8 lb), with contact and graze fusing.
Dimensions: length 5 ft 7 in, body diameter 3 in, fin span 10 in.
Weight: 23.4 lb. Launcher 16.4 lb.
Performance: slant range 0.31–3.2 miles; effective ceiling 33–11,500 ft; max target engagement speed Mach 1.18 (approaching), Mach 0.94 (receding).
COMMENTARY
Deployment time is 10 seconds, and launch time from target acquisition five seconds. Developed **Igla-2** versions are the **Igla-D** with improved performance and the **Igla-N** with improved lethality.

SA-19 (9M311 Treugolnik; NATO Grison)
Brief: The Treugolnik (Triangle) tube-launched missile forms one element of the 2S6M Tunguska gun/missile tracked regimental air-defense vehicle, designed primarily for use against anti-tank helicopters.
Inventory: not available
Contractor: Kolomna KBM; believed produced at Ulyanovsk.
Power Plant: two-stage solid-propellant rocket.
Guidance: semiautomatic command to line-of-sight (SACLOS), supplemented by thermal imaging sight, TV, and laser range finder/designator.
Warhead: HE fragmentation (19.8 lb).
Dimensions: length 8 ft 5 in, body diameter 7 in, fin span 1 ft 8 in.
Weight: 95 lb.
Performance: speed Mach 2.65, slant range 1.5–5 miles, effective ceiling 50–11,500 ft.
COMMENTARY
Eight SA-19s are mounted in clusters of four on each side of a turret that also carries four 30 mm guns and Hot Shot surveillance, target acquisition, and fire-control radars. A crew of four is standard. Support vehicles include a resupply truck that can load eight missiles and 1,904 rds of 30 mm ammunition in 16 minutes.

SA-? (9M335 Pantsir-S1)
Brief: This new air defense system, mounted on a Ural 53234 (8x8) cross-country truck chassis, uses a larger, improved version of the SA-19 missile. It was first seen in 1993 and may now be ready for service entry and/or export.
Inventory: not available
Contractor: Kolomna KBM.
Power Plant: two-stage solid-propellant rocket.
Warhead: HE rod/fragmentation (35 lb).
Dimensions: length 10 ft 6 in, body diameter 7 in, fin span 1 ft 8 in.
Weight: 143 lb.
Performance: speed Mach 3.25, slant range 4,900 ft to 7.5 miles, effective ceiling 10–19,680 ft.
COMMENTARY
The truck bed supports a box-like shelter, above which is a 360° rotating turret. On each side of the turret is a cluster of six tube-launched missiles, developed from the SA-19 (Grison), and a Type 2A72 30 mm gun. Surveillance radar is carried on top of the turret, with tracking radar and an LLLTV/IR sensor package between the missile clusters. Engagement can be fully automatic, against two targets simultaneously.

SH-08 (NATO Gazelle)
Brief: Operating in conjunction with SH-11 (next entry), this quick-reaction, high-acceleration interceptor missile is designed to destroy in the atmosphere re-entry vehicles that penetrate the outer layer of ABM defense. The missiles, first deployed in 1984, are silo-based around Moscow as the short-range second stage of the capital's ABM defenses.
Function: Silo-launched, endoatmospheric, anti-ballistic missile.
Operator: Air Defense.
First Flight: not available
Inventory: up to 64.
Contractor: Spetztekhnika Vympel.
Power Plant: solid-propellant rocket.
The data are estimated.
Guidance: command.
Warhead: nuclear (10 kilotons or less).
Dimensions: length 32 ft 10 in, max diameter 3 ft 3 in.
Weight: 22,000 lb.
Performance: range 50 miles.
COMMENTARY
Gazelle is described as being similar in general configuration to the long-abandoned US Sprint, with a low-yield nuclear warhead. There are reports of plans for a more accurate version with an IR terminal phase seeker and HE warhead. Moscow region SH-08 and SH-11 launch sites are at Kaliningrad, Klin, Kolodkino, Lytkarino, Muranovo, Novo Petrovskoye, Skhodnya, Turakovo, and Vnukovo.

SH-11 (UR-96; NATO Gorgon)
Brief: Silo-based Gorgon exoatmospheric intercept missiles form the medium-range element of the world's only operational ABM system, emplaced from 1980 to 1988 at nine sites around Moscow.
Function: ABM.
Operator: Air Defense.
First Flight: not available
Inventory: 36.
Contractor: Votkinsk.
The data are estimated.
Power Plant: three-stage solid-propellant rocket.
Guidance: inertial with command updates.
Warhead: nuclear (550 kilotons).
Dimensions: length 72 ft 2 in, body diameter 6 ft.
Weight: approx 99,200 lb.
Performance: range more than 310 miles.
COMMENTARY
Comprising the full 100 launchers permitted by the 1972 ABM Treaty, the ABM-3 (Russian designation A-135) system is considered capable of engaging small numbers of re-entry vehicles approaching from any direction during an accidental or unauthorized launch against the city. It offers a dual-layered defense against ballistic missiles and some use against satellites in Low Earth Orbit. Radars for identifying and tracking incoming re-entry vehicles are located at Sofrino-Krasnoarmeysk (DON; Pill Box), Naro-Fominsk (Chalach; Dog House), and Chekhov (Dounai-3U; Cat House). These would then be intercepted at high altitude and over long ranges by Gorgon ABMs. Any that penetrated this layer of defense would be engaged by Gazelle ABMs within the atmosphere. ■

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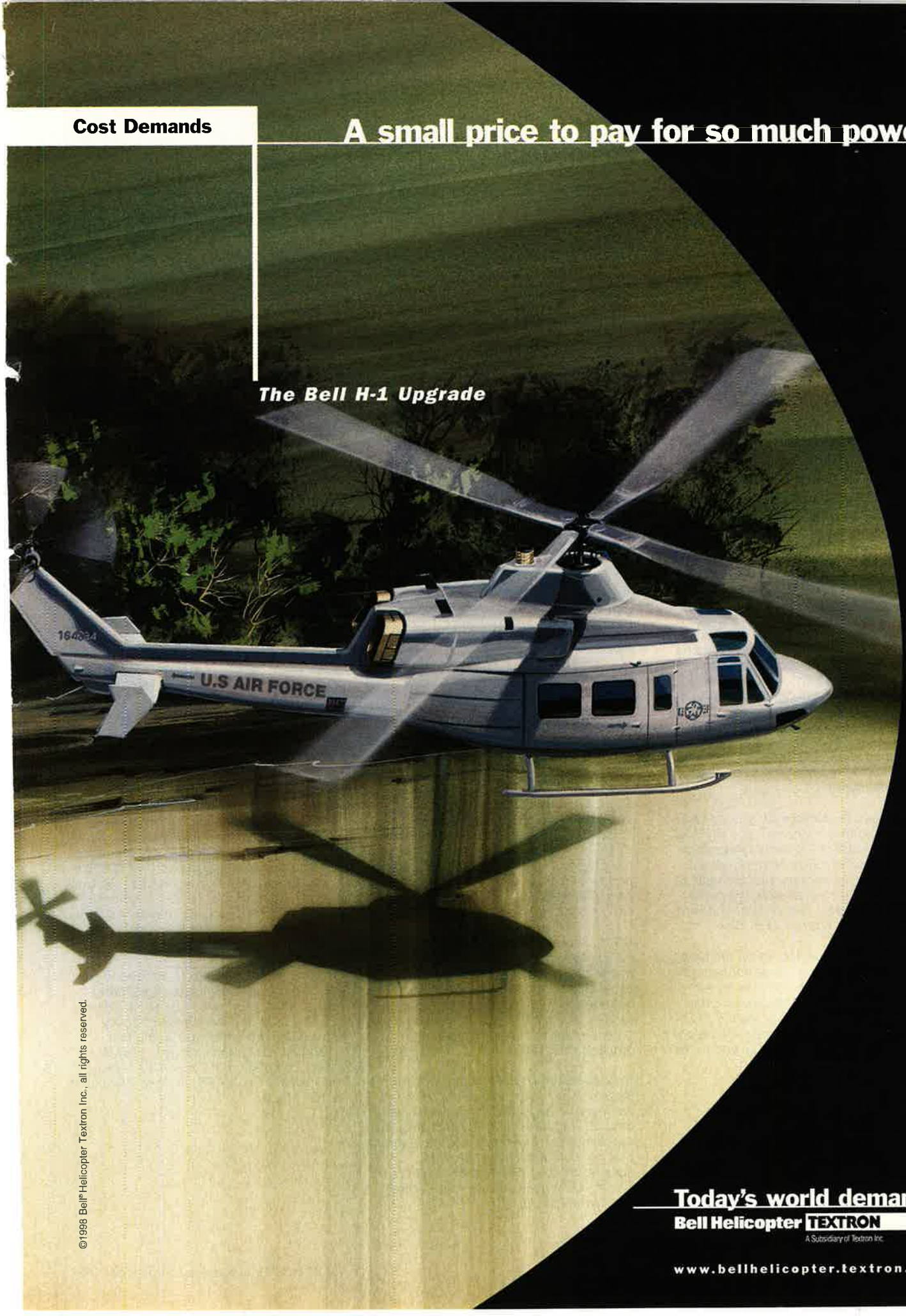

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(L–r) Aspinwall, Senick, Oatley, Romak, Wright, Eckrich, and Fleming

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He added, "They literally build communications systems from the ground up with a professional flair that has become legend in the communications community."

SSgt. Dean H. Aspinwall, *ground radio communications craftsman at Kelly AFB, Texas, specializes in security systems installations. In 1997, he devised and applied new and efficient techniques as team leader for installation of a fence protection system and vertical taut wire system at F.E. Warren AFB, Wyo.*

SrA. Corey M. Eckrich *was a full-time college student when he performed 134 days of active duty in 1997 as an Air National Guard communications cable antenna system specialist, based at Ft. Indiantown Gap, Pa. He also volunteered to attend fiber optic school to add to his USAF skills.*

SSgt. Michael D. Fleming, *from McClellan AFB, Calif., led a team installing a critical Instrument Landing System at Yokota AB, Japan, completing the project a week early. During a similar project in Korea, he developed a time-saving template for ILS repair that will carry over to future projects.*

SSgt. Scott J. Oatley, *an Air Intelligence Agency assistant team chief based at Kelly AFB, Texas, faced extremely harsh Arctic weather and austere living conditions to set up a radome and nine major communications antennas for national intelligence gathering efforts.*

SrA. Michelle D. Romak, *assigned to Keesler AFB, Miss., headed a team deployed to Lajes Field, Azores, to work on a Milstar satellite terminal project. In another effort, she fabricated modem and multipin connectors and directed installation of 15,500 feet of cable for US Central Command's Technical Control Facility in Florida.*

TSgt. Scott D. Senick, *serving at Tinker AFB, Okla., is one of only two enlisted telecommunications engineering managers in the Air Force. He manages design and planning support for telecommunications systems worldwide. His work in 1997 took him to various locations in the US, Europe, and Southwest Asia—all for key projects in which he increased efficiency with minimal cost.*

TSgt. Keith A. Wright *is a wideband equipment specialist and engineering installation team chief for the Air Guard in St. Louis. His management ability overcame project delays and offset frequent personnel changes, enabling early completion of Local Area Network projects at Scott AFB, Ill., and Whiteman AFB, Mo.* ■

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Gen. Curtis E. LeMay Award

Best Bomber Aircrew

Crew 3-C made history with the first B-1B combat deployment. As part of a Global Power mission to Bahrain for Operation Southern Watch, the mission also formed the first Air Combat Command Operational Readiness Inspection in conjunction with a real-world deployment. Assigned to the 34th Bomb Squadron, Mountain Home AFB, Idaho, the crew successfully overcame a series of en route problems: severe thunderstorms over New England, the Atlantic Ocean, and Mediterranean Sea, air traffic control language barriers, and denial of overflight permission from Spain. Once in Bahrain, the crew became part of Air Expeditionary Force 5. This marked the first use of bombers in an AEF. During the three week mission, the crew members devised a contingency strike package into Iraq and briefed the theater commander. An AEF logistics plan for six B-1Bs to deploy and fight for up to a month, that they developed, is now standard for all B-1B units, and has been sent to all theater CINCs.

Pictured (l–r): Capts. William Eldridge, David Baylor, James Pryor, and John Lyons.

CMSAF Thomas N. Barnes Award

USAF's Best Crew Chief

A crew chief with the 44th Fighter Squadron, 18th Wing, Kadena AB, Japan, SSgt. Michael Perkins' technical mastery of F-15 maintenance directly contributed to the unit's achievement of more than 4,000 flying hours with the best maintenance indicators in more than two years. Aircraft under his care operated at a 91 percent mission capable rate—far higher than the Pacific Air Forces standard of 83 percent. When a jet fuel starter disconnected prematurely during an F-15 engine ground run, sparking a fire fed by JP-8 fuel, Perkins quickly doused the blaze within two minutes. His prompt actions saved a $35 million aircraft. During a three-day surge, he efficiently directed hot pit refueling operations—pumping more than two million pounds of JP-8 fuel with no safety lapses or mishaps—for 97 F-15 aircraft. His thoroughness and skill translated into 127 sorties by the squadron.

Gen. Thomas S. Power Award

Best Missile Combat Crew

Capts. Kendra Eagan and Craig Ramsey led the standardization and evaluation team for the 91st Operations Group, Minot AFB, N.D., implementing revolutionary evaluation and ICBM system security standards that became the 20th Air Force benchmark. When the wing's security manning dropped below 65 percent, Eagan and Ramsey temporarily restructured security teams and devised a swing team to alleviate the shortages. They also consolidated 200 warfighting tasks and new timing standards into three training methods to streamline sweeping changes to evaluation standards imposed by higher headquarters. They were key figures in the unit's move from last place in 1996 to second in 1997 in Guardian Challenge, Air Force Space Command's annual competition. Their drive also helped the group achieve a phenomenal 99.71 percent alert rate.

Pictured (l–r): Capts. Kendra Eagan and Craig Ramsey.

Space Operations Award

Best Space Operations Crew

Despite three straight days of launch scrubs due to bad weather, the K-18 Titan IV Launch Team with 30th Space Wing, Vandenberg AFB, Calif., successfully launched an important National Reconnaissance Office satellite. During a 99-day execution period, the crew resolved numerous problems and applied their technical expertise to keep the mission on track. Once the satellite was launched, the NRO hailed the operation as "the most important mission in 10 years." The team also integrated Titan II and Titan IV launchpad processing operations, resulting in the simultaneous processing of a USAF operational mission and an NRO mission. They organized the first Western Range Anomaly Resolution Team to provide on-site rapid correction of launch day anomalies.

Pictured (l–r): Capt. Michael Sulek, SSgt. Keith Ward, Maj. Christopher Hale, and Capt. Tamara Parsons. Not pictured: Capts. Kent Dalton, Dean Helmick, John Knight, Christopher Kuklinski, Brian Miller, Joseph Nemeth Jr., Richard Purinton, and SSgt. Earli Prince.

Pictured (kneeling, l–r): SrA. Rock Reiff, A1C Tiffany Lewis, Col. Ben Robinson, SMSgt. Rick Ojeda, and TSgt. Chris Peterson. Standing (l–r): TSgt. Jim Vaughan, SSgt. Brian Davis, SSgt. Brian Schmutz, Col. Tom Owen, SrA. Dana Reynolds, MSgt. Earl Nichols, TSgt. Dave Feagan, Maj. Bo Newhouse, Lt. Col. Jim Ruth, Capt. Tim Manning, Maj. Kent Bennett, MSgt. Donald Penn, Capt. Jason Werchan, SMSgt. Jim Davis, Army Sgt. 1st Class Marlene Gilpin, SSgt. Jennifer Wade, Army Spc. Randy Swanson, Capt. Ed Monarez, Army Maj. Kenna McCurry, SSgt. Kevin Lechner, SSgt. Stephen Rogerson, and TSgt. Dale Dauer.

Airborne Battle Management Crew of the Year

Best Crew of the Year

In the first deployment for USAF's only E-8C Joint STARS squadron, the 12th Airborne Command and Control Squadron, an aircrew combined a long-duration mission in support of Operation Deny Flight, continuous satellite communication with its home station, and a test of interoperability with NATO forces. Less than 48 hours after receiving simulated orders, the crew departed Robins AFB, Ga., and arrived on station in Bosnia. The mission was marked by the first operational use of the "sensor to shooter" concept using laptop computers to send target coordinates directly to an F-16's Head Up Display. It was a success, paving the way for development of Joint STARS tactics, techniques, and procedures. The crew's mission was a powerful demonstration for an 18-month-old organization that was still six months away from Initial Operational Capability.

Gen. Jerome F. O'Malley Award

Best Reconnaissance Crew

The RC-135 Rivet Joint mission for the combined 4407th Reconnaissance Squadron and 4416th Intelligence Squadron crews was clear—help protect the high-flying U-2 spy airplane from Iraqi surface-to-air missiles and fighters. When serious equipment malfunctions stymied the crew's ability to detect threats and pass on data, the crew quickly conducted extensive in-flight maintenance and devised unique communications procedures which enabled the mission to continue. They also discovered a previously unknown SAM site, operating at special parameters. Their performance resulted in a safe U-2 flight and theater-wide protective measures for allied aircraft to offset the new SAM site.

Pictured (l–r): TSgt. Jeff Waldeck, Capt. Rod Cousins, SSgt. Stephen M. Helms, SMSgt. Joe Federation. Not pictured: Lt. Col. Jim Pollard, Capts. P.K. Cotter, Bruce Danskine, Mike O'Connor, and Greg Sellers; 1st Lt. Derek Gardener; SMSgt. Hal Moon; TSgt. Ben Thomas; SSgts. Kevin Hucks, Stefano Masi, Kay Miller, and Melissa Thompson; SrAs. Toby Bessent, Lionel Ducluzeau, Dave Hill, and Dawn Raymond; A1Cs Pat Buck, Thaleia Coon, and Aaron Howell.

Brig. Gen. Ross G. Hoyt Award

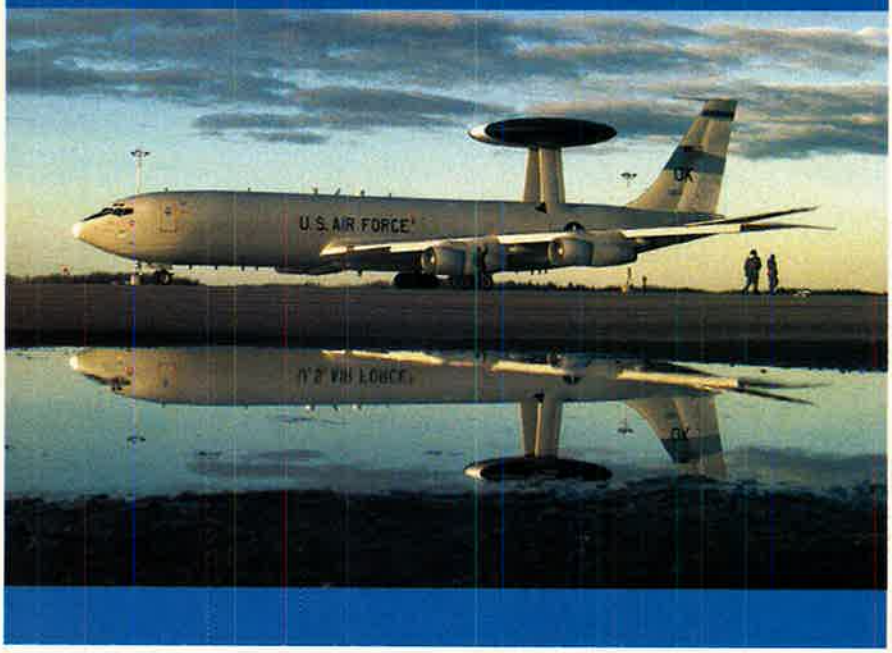
Best Air Refueling Aircrew

A severely damaged sleeve strut on the right main landing gear of their KC-135R challenged the airmanship and the nerves of the crew members of Mazda 85, 911th Air Refueling Squadron. Deployed to Incirlik AB, Turkey, from their Grand Forks AFB, N.D., base in support of Northern Watch, the crew was returning from a refueling mission and preparing for a series of practice touch-and-go landings. After the first pass, the crew discovered that the right main gear was not in an up-and-locked position. They lowered it, noted a safe down-and-locked condition, but they were told by air traffic controllers that something had fallen off. A visual inspection by the boom operator showed that the gear was hanging from the aircraft. Several low passes by the pilot, Capt. John C. Kratt, enabled ground crew to identify the exact problem: Although the gear itself was intact, the inner sleeve of the strut had almost separated from the outer sleeve. Incirlik ground crews prepared the airfield for an emergency landing. A sudden wind change forced the aircrew to land on a different runway, but Kratt smoothly set the aircraft down. Amazingly, the right gear lined itself up correctly, enabling the damaged inner sleeve to slip into the outer strut, providing a semistable gear platform. The aircrew safely brought the aircraft to a full stop, with less than a thousand feet of runway remaining.

The crew: Capts. Paul Alfonso Jr., Jon Fischbach, and John Kratt, SSgt. Michael Murray II, and A1C Daniel Regester.

AFA and USAF recognize the best Guard and Reserve airmen, crews, and units for their 1997 accomplishments.

Best of Guard and Reserve



Best Air Force Reserve Unit

Top AFRC Unit of the Year

The 513th Air Control Group, Tinker AFB, Okla., earned top marks in their first year of operation with the E-3 Sentry AWACS aircraft. Although not scheduled to reach Initial Operational Capability until September 1998, the unit made its first major deployment in June 1997. The group participated in NATO's month-long Central Enterprise '97, for which they mustered two fully qualified crews and maintainers less than a year after stand-up. While in Europe, the unit also participated in BALTOPS '97, a JCS exercise joining air and sea assets in support of a multinational fleet in the Baltic Sea. In August, the unit engaged in counterdrug operations for US Southern Command. During a Reserve, ANG, and Canadian air forces exercise in Florida in December 1997, the AWACS unit also assisted the Southeast Air Defense Sector with a real-world mission.

Best Air National Guard Unit

Top ANG Unit of the Year

Barely a week after completing a demanding 16-day ORI by Air Force Special Operations Command, the 193d Special Operations Wing at Harrisburg IAP, Pa., was called to support the NATO Stabilization Force in Bosnia. Within 96 hours of the order, the unit was operational, deploying three Commando Solo C-130s to Brindisi, Italy. The unit was a key part of US European Command's efforts to ensure Serb compliance with the Dayton peace accords. With the appearance of the Commando Solos, used for psychological warfare, the Bosnian Serb media toned down their rhetoric and allowed SFOR and Bosnian government programming to air. The 193d capped a rigorous year with the completion of 157,000 hours, or 41 years, of accident-free deployments.

President's Award

Best Air Force Reserve Aircrew

Battling near-hurricane conditions, the crew of Air Force Rescue 231, 920th Rescue Group, saved six sailors from certain death after a UK freighter foundered 275 nautical miles east of Patrick AFB, Fla. At the scene, the wildly pitching vessel precluded a rescue off the deck. Instead, the ship's sailors jumped off the ship and into the turbulent waters, where two pararescue specialists met them and towed them to a rescue hoist from the helicopter hovering above. The pararescuemen had to battle enormous waves and panicked sailors for 45 minutes, while the flight crew struggled to hold the helicopter in position—a feat that required constant control alignments.

Pictured (l–r): SSgt. Guillermo Toca, SrA. David Biddinger, SMSgt. Dana Beach, and Capts. Phillip Kennedy and Albert Lupenski.

Maj. Gen. Earl T. Ricks Award

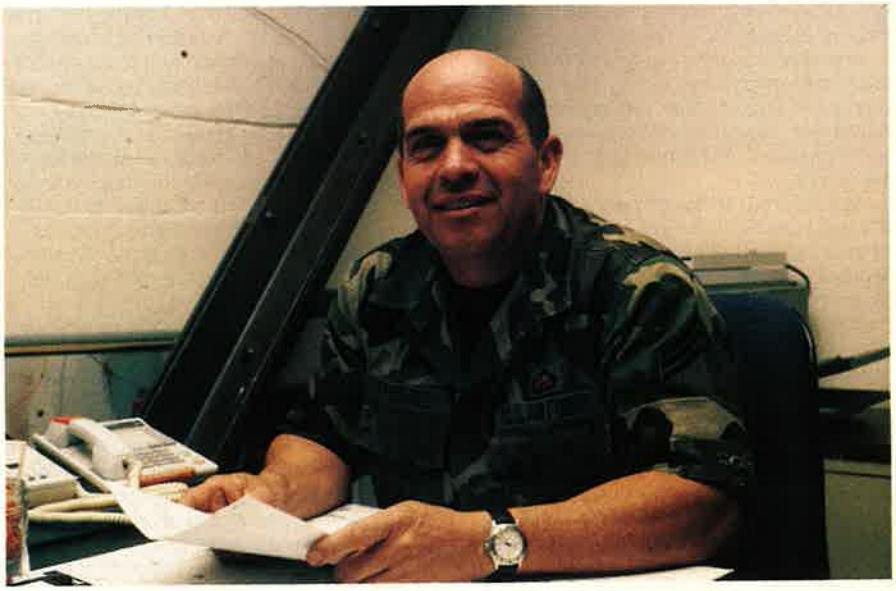
Best Airmanship in the Air National Guard

Minutes after takeoff for a night sortie, Maj. James Walker, 185th Fighter Wing (ANG), Sioux City MAP, Iowa, had his airmanship tested when his F-16, configured with two full wing tanks and practice munitions, suddenly began to vibrate as he reached 300 knots. He pulled the throttle out of afterburner and reduced thrust to clear the vibrations. He informed his flight lead and the tower that he was turning for a flameout pattern. Even at the lower power, the vibrations continued, so Walker further reduced power. Vibrations were so severe he no longer had any usable engine thrust, but he decided he had to keep his wing tanks since the aircraft was over a populated area. He managed a flawless landing. Walker saved his aircraft and also prevented possible loss of life and property.

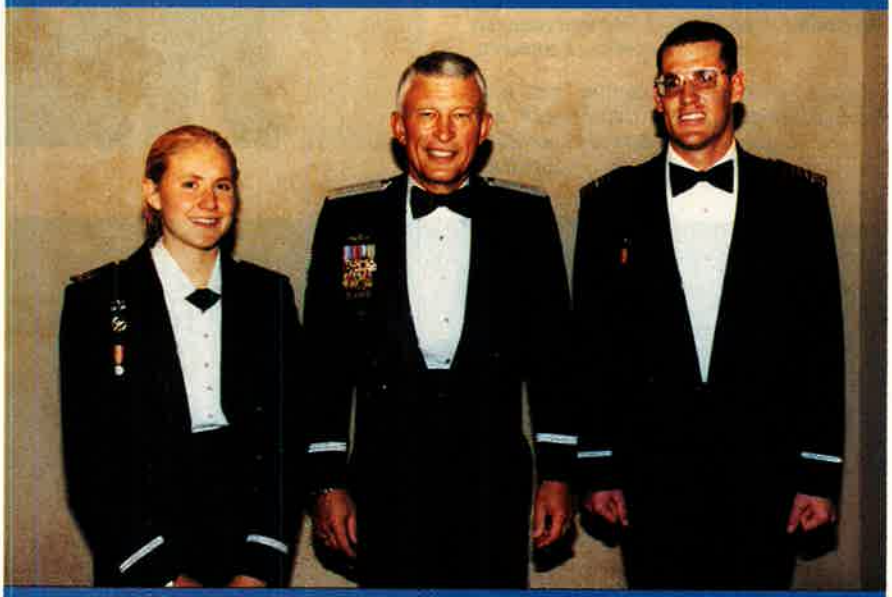
CMSgt. Dick Red Award

Best ANG Aerospace Maintenance

CMSgt. Faustino Gutierrez, a maintenance supervisor assigned with the 163d Maintenance Squadron, 163d Air Refueling Wing, March ARB, Calif., directly contributed to the unit's ability to fly 110 percent of its allotted flying hours with 100 percent mission effectiveness, even during worldwide deployments. He volunteered as superintendent of the base's Pacer Crag site for upgrade of radar systems on all ANG KC-135 aircraft. When the Oklahoma City Air Logistics Center wanted to test new hydraulically cooled air refueling pumps, the 163d was the only ANG unit to participate in the test, with Gutierrez serving as supervisor for the installation of the new pumps.



USAFA's Outstanding Squadron, 1998



Wolfpack's Wendy J. Volkland and Jeremiah O. Klomp with Gen. Ralph E. Eberhart, USAF vice chief of staff.

In 1998, for the second time in its history, Cadet Squadron Five, known as the "Wolfpack," of the US Air Force Academy was named the winner of the Air Force Association's Outstanding Squadron Trophy. The Wolfpack amassed the best overall record among 40 squadrons in military, academic, and athletic achievements.

The squadron was honored at the 39th annual dinner salute held in Colorado Springs, Colo., in May and cosponsored by AFA's Colorado Springs/Lance Sijan Chapter, with support from the USAFA Association of Graduates and corporate sponsors.

The squadron continually ranked No. 1 all year in the combined three judging areas and never fell lower than sixth at any one time in any individual area, according to Maj. Stephen V. Gustafson, air officer commanding.

Among the Wolfpack's military accomplishments: four members were on the group staff and one on the wing staff. The squadron's fall commander, Cadet 1st Class Wendy J. Volkland, was named the Academy's Outstanding Female Cadet of the Year. Additionally, three of this year's graduates were chosen for the highly competitive Euro–NATO jet pilot training.

In academics, the squadron never ranked lower than third overall during the year and finished in second place. Three graduates have been selected for the graduate scholarship program, including one to Harvard University.

In athletics, the squadron was not only the wing champ in flickerball, three of its members captained varsity teams. Wolfpack cadets contributed to a national team championship in skiing and were national individual runners-up in boxing and handball.

Cadets also contributed more than 600 hours of community service in programs such as Big Brothers and Sisters, Habitat for Humanity, a local soup kitchen, Special Olympics, Boy Scouts, and blood banks, as well as many church-related events.

Cadet 1st Class Jeremiah O. Klomp, Wolfpack spring commander, who accepted the trophy at the dinner said, "It has been a great year for us in the Wolfpack." The squadron's nickname signifies the unit's association with the famous "Wolfpack" Fighter Wing, whose leader in Southeast Asia was Brig. Gen. Robin Olds.

"What really helped us achieve this level of excellence is the hardworking members of Wolfpack, the commitment to excellence, and the legacy of pride that resides in Wolfpack Five and the entire Academy," stated Klomp. "Our entire class of 'firsties' led the way by their examples and leadership. We didn't ask any of our people to do anything we were first not willing to do. By giving our people ownership of their jobs, their pride showed through and everyone individually and, as a whole, did outstanding in their respective jobs."

He added, "It is very easy to be a leader in an environment where all your followers are hardworking and dedicated to excellence in all that they do."

Brig. Gen. Ruben Cubero, then USAFA dean of faculty, noted that "making teamwork part of a unit's culture is a result of outstanding leadership." He said that Cadets Volkland and Klomp, along with Gustafson and military training advisor SSgt. Jacqueline M. Edwards, "provided the experience and leadership necessary to propel the Wolfpack to the top."

This year's keynote "returning graduate" speaker was Gen. Ralph E. Eberhart, Air Force vice chief of staff, a 1968 USAFA graduate.

Speaking especially to those about to graduate, Eberhart noted that when he was in their place, he wasn't certain whether or not he wanted to make the Air Force a career. That he did he laid in great measure to the fact that "the armed forces are a great team."

He emphasized that the service understands and appreciates the importance of each individual and that it provides a challenging and rewarding career with "the best training in the world." He added, "Even if you don't stay in for a career, it certainly won't be time wasted."

Eberhart said, when noting that the services are hiring only the best, that one of the central characteristics of the best individuals is that they are good at what they do. He encouraged the cadets to "continue to honor excellence—indeed, demand it—in every accepted activity, however humble, and scorn shoddiness, however exalted the activity." ■

AFA/AEF Almanac

Compiled by Frances McKenney, Assistant Managing Editor

Chapters of the Year

YEAR	RECIPIENT(S)
1953	San Francisco Chapter
1954	Santa Monica (Calif.) Area Chapter
1955	San Fernando Valley (Calif.) Chapter
1956	Utah State AFA
1957	H.H. Arnold Chapter (N.Y.)
1958	San Diego Chapter
1959	Cleveland Chapter
1960	San Diego Chapter
1961	Chico (Calif.) Chapter
1962	Fort Worth (Texas) Chapter
1963	Colin P. Kelly Chapter (N.Y.)
1964	Utah State AFA
1965	Idaho State AFA
1966	New York State AFA
1967	Utah State AFA
1968	Utah State AFA
1969	*(no presentation)*
1970	Georgia State AFA
1971	Middle Georgia Chapter
1972	Utah State AFA
1973	Langley (Va.) Chapter
1974	Texas State AFA
1975	Alamo Chapter (Texas) and San Bernardino (Calif.) Area Chapter
1976	Scott Memorial Chapter (Ill.)
1977	Thomas B. McGuire Jr. Chapter (N.J.)
1978	Thomas B. McGuire Jr. Chapter (N.J.)
1979	Brig. Gen. Robert F. Travis Chapter (Calif.)
1980	Central Oklahoma (Gerrity) Chapter
1981	Alamo Chapter (Texas)
1982	Chicagoland–O'Hare Chapter (Ill.)
1983	Charles A. Lindbergh Chapter (Conn.)
1984	Scott Memorial Chapter (Ill.) and Colorado Springs/Lance Sijan Chapter (Colo.)
1985	Cape Canaveral Chapter (Fla.)
1986	Charles A. Lindbergh Chapter (Conn.)
1987	Carl Vinson Memorial Chapter (Ga.)
1988	Gen. David C. Jones Chapter (N.D.)
1989	Thomas B. McGuire Jr. Chapter (N.J.)
1990	Gen. E.W. Rawlings Chapter (Minn.)
1991	Paul Revere Chapter (Mass.)
1992	Central Florida Chapter and Langley (Va.) Chapter
1993	Green Valley Chapter (Ariz.)
1994	Langley (Va.) Chapter
1995	Baton Rouge (La.) Chapter
1996	Montgomery (Ala.) Chapter
1997	Central Florida Chapter
1998	Ark–La–Tex Chapter (La.)

Profiles of AFA Membership

As of June 1998 (Total 154,431)

62%	One-year members
12%	Three-year members
27%	Life Members
21%	Active duty military
46%	Retired military
17%	Former service
6%	Guard and Reserve
6%	Patron
2%	Cadet
2%	Spouse/widow(er)

Of AFA's service members (who account for about 9 percent of USAF total strength):

63% are officers

37% are enlisted

Of AFA's retired military members:

75% are retired officers

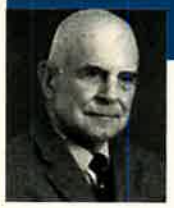
25% are retired enlisted

AFA "Member of the Year" Award Recipients

State names refer to winner's home state at the time of the award.

YEAR	RECIPIENT(S)
1953	Julian B. Rosenthal (N.Y.)
1954	George A. Anderl (Ill.)
1955	Arthur C. Storz (Neb.)
1956	Thos. F. Stack (Calif.)
1957	George D. Hardy (Md.)
1958	Jack B. Gross (Pa.)
1959	Carl J. Long (Pa.)
1960	O. Donald Olson (Colo.)
1961	Robert P. Stewart (Utah)
1962	*(no presentation)*
1963	N.W. DeBerardinis (La.) and Joe L. Shosid (Texas)
1964	Maxwell A. Kriendler (N.Y.)
1965	Milton Caniff (N.Y.)
1966	William W. Spruance (Del.)
1967	Sam E. Keith Jr. (Texas)
1968	Marjorie O. Hunt (Mich.)
1969	*(no presentation)*
1970	Lester C. Curl (Fla.)
1971	Paul W. Gaillard (Neb.)
1972	J. Raymond Bell (N.Y.) and Martin H. Harris (Fla.)
1973	Joe Higgins (Calif.)
1974	Howard T. Markey (D.C.)
1975	Martin M. Ostrow (Calif.)
1976	Victor R. Kregel (Texas)
1977	Edward A. Stearn (Calif.)
1978	William J. Demas (N.J.)
1979	Alexander C. Field Jr. (Ill.)
1980	David C. Noerr (Calif.)
1981	Daniel F. Callahan (Fla.)
1982	Thomas W. Anthony (Md.)
1983	Richard H. Becker (Ill.)
1984	Earl D. Clark Jr. (Kan.)
1985	George H. Chabbott (Del.) and Hugh L. Enyart (Ill.)
1986	John P.E. Kruse (N.J.)
1987	Jack K. Westbrook (Tenn.)
1988	Charles G. Durazo (Va.)
1989	O.R. Crawford (Texas)
1990	Cecil H. Hopper (Ohio)
1991	George M. Douglas (Colo.)
1992	Jack C. Price (Utah)
1993	Lt. Col. James G. Clark (D.C.)
1994	William A. Lafferty (Ariz.)
1995	William N. Webb (Okla.)
1996	Tommy G. Harrison (Fla.)
1997	James M. McCoy (Neb.)
1998	Ivan L. McKinney (La.)

Air Force Association National Presidents



Jimmy Doolittle
1946–47

Thomas G. Lanphier Jr.
1947–48

C.R. Smith
1948–49

Robert S. Johnson
1949–51

Harold C. Stuart
1951–52

Arthur F. Kelly
1952–53

George C. Kenney
1953–54

John R. Alison
1954–55

Gill Robb Wilson
1955–56

John P. Henebry
1956–57

Peter J. Schenk
1957–59

Howard T. Markey
1959–60

Thos. F. Stack
1960–61

Joe Foss
1961–62

John B. Montgomery
1962–63

W. Randolph Lovelace II
1963–64

Jess Larson
1964–67

Robert W. Smart
1967–69

George D. Hardy
1969–71

Martin M. Ostrow
1971–73

Joe L. Shosid
1973–75

George M. Douglas
1975–77

Gerald V. Hasler
1977–79

Victor R. Kregel
1979–81

John G. Brosky
1981–82

David L. Blankenship
1982–84

Martin H. Harris
1984–86

Sam E. Keith Jr.
1986–88

Jack C. Price
1988–90

O.R. Crawford
1990–92

James M. McCoy
1992–94

Gene Smith
1994–96

Doyle E. Larson
1996–98

Air Force Association Chairmen of the Board

Edward P. Curtis
1946–47

Jimmy Doolittle
1947–49

C.R. Smith
1949–50

Carl A. Spaatz
1950–51

Thomas G. Lanphier Jr.
1951–52

Harold C. Stuart
1952–53

Arthur F. Kelly
1953–54

George C. Kenney
1954–55

John R. Alison
1955–56

Gill Robb Wilson
1956–57

John P. Henebry
1957–58

James M. Trail
1958–59

Julian B. Rosenthal
1959–60

Howard T. Markey
1960–61

Thos. F. Stack
1961–62

Joe Foss
1962–63

Jack B. Gross
1963–64

W. Randolph Lovelace II
1964–65

George D. Hardy
1966–67

Jess Larson
1967–71

George D. Hardy
1971–72

Joe L. Shosid
1972–73

Martin M. Ostrow
1973–75

Joe L. Shosid
1975–76

Gerald V. Hasler
1976–77

George M. Douglas
1977–79

Daniel F. Callahan
1979–81

Victor R. Kregel
1981–82

John G. Brosky
1982–84

David L. Blankenship
1984–85

Edward A. Stearn
1985–86

Martin H. Harris
1986–88

Sam E. Keith Jr.
1988–90

Jack C. Price
1990–92

O.R. Crawford
1992–94

James M. McCoy
1994–96

Gene Smith
1996–98

AFA's Regions, States, and Chapters

These figures indicate the number of affiliated members as of June 30, 1998. Listed below the name of each region is the national vice president for that region.

CENTRAL EAST REGION 13,796
R. Donald Anderson

Delaware 799
Delaware Galaxy 570
Diamond State 184
Henlopen Area 45

District of Columbia 953
Nation's Capital 953

Maryland 2,911
Baltimore* 839
Central Maryland 436
College Park Airport 147
Thomas W. Anthony 1,489

Virginia 8,767
Danville 44
Donald W. Steele Sr. Memorial 3,746
Gen. Charles A. Gabriel 1,247
Langley 1,950
Leigh Wade 157
Lynchburg 88
Northern Shenandoah Valley 193
Richmond 485
Roanoke 304
Tidewater 355
William A. Jones III 198

West Virginia 366
Chuck Yeager 366

FAR WEST REGION 24,304
Arthur F. Trost

Arizona 4,822
Barry Goldwater 184
Cochise 118
Frank Luke 1,155
Phoenix Sky Harbor 1,284
Prescott 166
Richard S. Reid 225
Tucson 1,690

California 15,901
Antelope Valley 653
Bakersfield 104
Bob Hope 1,277
C. Farinha Gold Rush 1,934
David J. Price/Beale 585
Fresno* 425
Gen. B.A. Schriever Los Angeles 874
General Doolittle Los Angeles Area* 1,909
Brig. Gen. Robert F. Travis 1,382
Golden Gate* 868
High Desert 346
Maj. Gen. Charles I. Bennett Jr. 376
Monterey Bay Area 328
Orange County/Gen. Curtis E. LeMay 1,071
Palm Springs 392
Pasadena Area 448
Robert H. Goddard 913
San Diego 1,064
Tennessee Ernie Ford 952

Guam 197
Guam–Arc Light 197

Hawaii 1,154
Hawaii* 1,117
Maui 37

Nevada 2,230
Dale O. Smith 485
Thunderbird 1,745

GREAT LAKES REGION 15,618
Anton D. Brees

Illinois 4,033
Chicagoland–O'Hare 1,077
Greater Rockford 100
Land of Lincoln 447
Lee Cordell Memorial 439
Quad Cities 284
Scott Memorial 1,686

Indiana 1,725
Central Indiana 465
Columbus–Bakalar 45
Falls Cities 55
Fort Wayne 243
Grissom Memorial 185
Gus Grissom 141
Lawrence D. Bell Museum 264
Lester W. Johnston 38
P-47 Memorial 53
Southern Indiana 133
Terre Haute–Wabash Valley 103

Kentucky 802
Gen. Russell E. Dougherty 409
Lexington 265
West Kentucky 128

Michigan 2,389
Battle Creek 238
Huron 140
James H. Straubel 891
Kalamazoo 283
Lake Superior Northland 202
Lloyd R. Leavitt Jr. 154
Mid-Michigan 85
Mount Clemens 315
PE–TO–SE–GA 81

Ohio 5,357
Capt. Eddie Rickenbacker Memorial* 807
Cleveland 414
Frank P. Lahm 567
Greater Cincinnati 135
Steel Valley 322
Wright Memorial* 3,112

Wisconsin 1,312
Badger State 265
Billy Mitchell 670
Madison 377

MIDWEST REGION 6,333
John J. Politi

Iowa 743
Gen. Charles A. Horner 277
Lancer 161
Northeast Iowa 102
Richard D. Kisling 203

Kansas 1,111
Contrails 67
Lt. Erwin R. Bleckley 721
Maj. Gen. Edward R. Fry 323

Missouri 2,222
Central Missouri 460
Harry S. Truman 621
Ozark 254
Spirit of St. Louis 887

Nebraska 2,257
Ak-Sar-Ben 1,972
Lincoln 285

NEW ENGLAND REGION 5,175
Ronald E. Palmer

Connecticut 990
Central Connecticut 118
Charles A. Lindbergh 131
First Connecticut 144
Flying Yankees 144
Gen. Bennie L. Davis 71
Gen. George C. Kenney 72
Igor Sikorsky 121
Northern Connecticut 133
Sgt. Charlton Heston 56

Maine 376
Eastern Maine 206
Maj. Charles J. Loring Jr. 93
Southern Maine 77

Massachusetts 2,473
Boston 199
Laurence G. Hanscom 172
Maj. John S. Southrey* 231
Minuteman 315
Otis 211
Paul Revere 776
Pioneer Valley 212
Taunton 174
Worcester* 183

New Hampshire 835
Amoskeag 297
Pease 538

Rhode Island 259
Metro Rhode Island 230
Newport Blue & Gold 29

Vermont 242
Burlington 242

NORTH CENTRAL REGION 2,792
George E. Masters

Minnesota 1,321
Gen. E.W. Rawlings 1,061
Richard I. Bong 260

North Dakota 830
Gen. David C. Jones 371
Happy Hooligan 158
Red River Valley 301

South Dakota 641
Dacotah 271
Rushmore 370

NORTHEAST REGION 10,141
Dolores F. Vallone

New Jersey 2,961
Adm. Charles E. Rosendahl 143
Aerospace Founders 61
Atlantic City Area 206
Brig. Gen. Frederick W. Castle 199
Hangar One 147
Highpoint 109
Hudson* 80
John Currie Memorial 30
Mercer County 236
Passaic–Bergen* 208
Sal Capriglione 100
Teterboro–Bendix 29
Thomas B. McGuire Jr. 1,005
Tri-County 61
Union Morris 280
Wings 67

New York 3,722
Albany–Hudson Valley* 417
Brooklyn "Key" 248
Chautauqua 83
Colin P. Kelly 311
Forrest L. Vosler 271
Francis S. Gabreski 287
Gen. Daniel "Chappie" James Jr. Memorial 89
Genesee Valley 271
Iron Gate 206
L.D. Bell–Niagara Frontier 427
Lloyd Schloen–Empire 66
Nassau Mitchel 350
Queens 242
Thomas Watson Sr. Memorial 182
Gen. Carl A. "Tooey" Spaatz 272

Pennsylvania 3,458
Altoona 60
Beaver Valley 95
Brandywine 184
Col. Stuart E. Kane Jr. 164
Eagle 77
Erie 98
Greater Pittsburgh* 476
Joe Walker–Mon Valley 106
Lehigh Valley 256
Lt. Col. B.D. "Buzz" Wagner 133
Liberty Bell 662
Mifflin County* 126
Olmsted 364
Pocono Northeast 217
Total Force 171
York–Lancaster 269

NORTHWEST REGION 7,390
I. Fred Rosenfelder

Alaska 1,172
Anchorage 894
Fairbanks Midnight Sun 278

Idaho 795
Boise Valley 499
Magic Valley 110
Snake River Valley 186

Montana 545
Big Sky 430
Treasure State 115

Oregon 1,256
Eugene 315
Klamath Basin 119
Portland* 822

Washington 3,622
Greater Seattle 1,267
Inland Empire 833
Tacoma 1,522

*These chapters were chartered prior to Dec. 31, 1948, and are considered original charter chapters; the Maj. John S. Southrey Chapter of Massachusetts was formerly the Chicopee Chapter.

ROCKY MOUNTAIN REGION 7,532
Mark J. Worrick

Colorado 5,394
Colorado Springs/Lance Sijan ... 3,066
Gen. Robert E. Huyser 159
Long's Peak 303
Mel Harmon 139
Mile High 1,727

Utah 1,661
Northern Utah 657
Salt Lake 478
Ute–Rocky Mountain 526

Wyoming 477
Cheyenne Cowboy 477

SOUTH CENTRAL REGION 9,514
Ivan L. McKinney

Alabama 2,615
Birmingham 411
Gadsden 39
Mobile 310
Montgomery 1,519
Tennessee Valley 336

Arkansas 1,459
David D. Terry Jr. 1,057
Ouachita 132
Razorback 270

Louisiana 2,008
Alexandria 145
Ark–La–Tex 1,139
Maj. Gen. Oris B. Johnson 370
Greater New Orleans Area 354

Mississippi 1,359
Golden Triangle 368
Jackson 199
John C. Stennis 792

Tennessee 2,073
Chattanooga 137
Everett R. Cook 520
Gen. Bruce K. Holloway 584
Maj. Gen. Dan F. Callahan 581
H.H. Arnold Memorial 251

SOUTHEAST REGION 22,425
Jack H. Steed

Florida 12,173
Cape Canaveral 1,445
Central Florida 1,290
Col. H.M. "Bud" West 295
Eglin 1,990
Falcon 358
Florida Gulf Coast 343
Florida Highlands 115
Gainesville 291
Brig. Gen. James R. McCarthy 376
Gen. Nathan F. Twining 510
Gold Coast 413
Hurlburt 488
Indian River 147
Jerry Waterman 983
John C. Meyer 178
John W. DeMilly Jr. 272
Miami 389
Morgan S. Tyler 237
On Wings of Eagles 291
Panama City 761
Peace River 140
Pensacola 123
Southwest Florida 257
St. Augustine 75
West Palm Beach 406

Georgia 4,428
Athens 191
Carl Vinson Memorial 1,904
Chatahoochee Valley 66
Coosa Valley 71
Dobbins 1,270
Savannah 239
South Georgia 390
South Metro 238
Southeast Georgia 59

North Carolina 3,251
Blue Ridge 358
Cape Fear 159
First in Flight 60
Kitty Hawk 84
Piedmont 485
Pope 672
Roanoke Valley 33
Scott Berkeley 690
Tarheel 436
Triad 274

South Carolina 2,573
Charleston 752
Columbia 494
Ladewig–Shine Memorial 250
Strom Thurmond 387
Swamp Fox 690

SOUTHWEST REGION 20,739
Charles G. Thomas

New Mexico 2,266
Albuquerque 1,445
Fran Parker 480
Llano Estacado 341

Oklahoma 3,411
Altus 514
Central Oklahoma (Gerrity) 1,863
Enid 545
Tulsa 489

Texas 15,062
Abilene 529
Aggieland 189
Alamo 5,039
Austin 1,455
Concho 441
Dallas 1,127
Del Rio 193
Denton 357
Fort Worth 2,258
Gen. Charles L. Donnelly Jr. 671
Ghost Squadron 142
Heart of the Hills 188
Lubbock 240
Northeast Texas 489
Panhandle AFA 140
Paso Del Norte 172
Permian Basin 127
San Jacinto 1,305

AFA's Overseas Chapters

CHAPTER	LOCATION
	United States Air Forces in Europe (USAFE)
Dolomiti	Aviano AB, Italy
Lufbery–Campbell	Ramstein AB, Germany
Spangdahlem	Spangdahlem AB, Germany
United Kingdom	Lakenheath, UK
	Pacific Air Forces (PACAF)
Keystone	Kadena AB, Japan
Misawa	Misawa AB, Japan
Tokyo	Tokyo, Japan
	Supreme Headquarters Allied Powers Europe (SHAPE)
Gen. Lauris G. Norstad	Mons, Belgium

AFA's First National Officers and Board of Directors

This panel of officers and directors acted temporarily until a representative group was democratically elected by membership at the first National Convention, in September 1947.

OFFICERS

President Jimmy Doolittle
First Vice President Edward P. Curtis
Second Vice President Meryll Frost
Third Vice President Thomas G. Lanphier Jr.
Secretary Sol A. Rosenblatt
Assistant Secretary Julian B. Rosenthal
Treasurer W. Deering Howe
Executive Director Willis S. Fitch

BOARD OF DIRECTORS

John S. Allard
H.M. Baldridge
William H. Carter
Everett Cook
Burton E. Donaghy
James H. Douglas Jr.
G. Stuart Kenney
Reiland Quinn
Rufus Rand
Earl Sneed
James M. Stewart
Forrest Vosler
Benjamin F. Warmer
Lowell P. Weicker
C.V. Whitney
J.H. Whitney

The Twelve Founders

John S. Allard, Bronxville, N.Y.
Everett R. Cook, Memphis, Tenn.
Edward P. Curtis, Rochester, N.Y.
Jimmy Doolittle, Los Angeles
W. Deering Howe, New York
Rufus Rand, Sarasota, Fla.
Sol Rosenblatt, New York
Julian B. Rosenthal, New York
James M. Stewart, Beverly Hills, Calif.
Lowell P. Weicker, New York
Cornelius Vanderbilt Whitney, New York
John Hay Whitney, New York

H.H. Arnold Award Recipients

Until 1986, AFA's highest Aerospace Award was the H.H. Arnold Award. Named for the World War II leader of the Army Air Forces, it was presented annually in recognition of the most outstanding contributions in the field of aerospace activity. In 1986, the Arnold Award was redesignated AFA's highest honor to a member of the armed forces in the field of National Security. It continues to be presented annually.

YEAR	RECIPIENT(S)
1948	W. Stuart Symington, Secretary of the Air Force
1949	Maj. Gen. William H. Tunner and the men of the Berlin Airlift
1950	Airmen of the United Nations in the Far East
1951	Gen. Curtis E. LeMay and the personnel of Strategic Air Command
1952	Sens. Lyndon B. Johnson and Joseph C. O'Mahoney
1953	Gen. Hoyt S. Vandenberg, former Chief of Staff, USAF
1954	John Foster Dulles, secretary of state
1955	Gen. Nathan F. Twining, Chief of Staff, USAF
1956	Sen. W. Stuart Symington
1957	Edward P. Curtis, special assistant to the President
1958	Maj. Gen. Bernard A. Schriever, commander, Ballistic Missile Division, ARDC
1959	Gen. Thomas S. Power, commander in chief, Strategic Air Command
1960	Gen. Thomas D. White, Chief of Staff, USAF
1961	Lyle S. Garlock, assistant secretary of the Air Force
1962	Dr. A.C. Dickieson and John R. Pierce, Bell Telephone Laboratories
1963	The 363d Tactical Reconnaissance Wing, TAC, and the 4080th Strategic Wing, SAC
1964	Gen. Curtis E. LeMay, Chief of Staff, USAF
1965	The 2d Air Division, PACAF
1966	The 8th, 12th, 355th, 366th, and 388th Tactical Fighter Wings and the 432d and 460th Tactical Reconnaissance Wings
1967	Gen. William W. Momyer, commander, 7th Air Force, PACAF
1968	Col. Frank Borman, USAF; Capt. James Lovell, USN; and Lt. Col. William Anders, USAF, Apollo 8 crew
1969	*(No presentation)*
1970	Apollo 11 team (J.L. Atwood; Lt. Gen. Samuel C. Phillips, USAF; and astronauts Neil Armstrong, Col. Edwin E. Aldrin Jr., USAF, and Col. Michael Collins, USAF)
1971	Dr. John S. Foster Jr., director of defense research and engineering
1972	Air units of the Allied Forces in Southeast Asia (Air Force, Navy, Army, Marine Corps, and the Vietnamese Air Force)
1973	Gen. John D. Ryan, USAF (Ret.), former Chief of Staff, USAF
1974	Gen. George S. Brown, USAF, Chairman, Joint Chiefs of Staff
1975	James R. Schlesinger, Secretary of Defense
1976	Sen. Barry M. Goldwater
1977	Sen. Howard W. Cannon
1978	Gen. Alexander M. Haig Jr., USA, Supreme Allied Commander, Europe
1979	Sen. John C. Stennis
1980	Gen. Richard H. Ellis, USAF, commander in chief, Strategic Air Command
1981	Gen. David C. Jones, USAF, Chairman, Joint Chiefs of Staff
1982	Gen. Lew Allen Jr., USAF (Ret.), former Chief of Staff, USAF
1983	Ronald W. Reagan, President of the United States
1984	The President's Commission on Strategic Forces (the Scowcroft Commission)
1985	Gen. Bernard W. Rogers, USA, Supreme Allied Commander, Europe
1986	Gen. Charles A. Gabriel, USAF (Ret.), former Chief of Staff, USAF
1987	Adm. William J. Crowe Jr., USN, Chairman, Joint Chiefs of Staff
1988	Men and women of the Ground-Launched Cruise Missile team
1989	Gen. Larry D. Welch, Chief of Staff, USAF
1990	Gen. John T. Chain, commander in chief, Strategic Air Command
1991	Lt. Gen. Charles A. Horner, commander, US Central Command Air Forces and 9th Air Force
1992	Gen. Colin L. Powell, USA, Chairman, Joint Chiefs of Staff
1993	Gen. Merrill A. McPeak, Chief of Staff, USAF
1994	Gen. John Michael Loh, commander, Air Combat Command
1995	World War II Army Air Forces veterans
1996	Gen. Ronald R. Fogleman, Chief of Staff, USAF
1997	Men and women of the United States Air Force
1998	Gen. Richard E. Hawley, commander, Air Combat Command

John R. Alison Award Recipients

Established in 1992, the John R. Alison Award is AFA's highest honor for industrial leadership.

1992	Norman R. Augustine, chairman, Martin Marietta Corp.
1993	Daniel M. Tellep, chairman and chief executive officer, Lockheed Corp.
1994	Kent Kresa, chief executive officer, Northrop Grumman Corp.
1995	C. Michael Armstrong, chairman and chief executive officer, Hughes Aircraft
1996	Harry Stonecipher, president and chief executive officer, McDonnell Douglas Corp.
1997	Dennis J. Picard, chairman and chief executive officer, Raytheon Co.
1998	Philip M. Condit, chairman and chief executive officer, Boeing Co.

W. Stuart Symington Award Recipients

Since 1986, AFA's highest honor to a civilian in the field of National Security has been the W. Stuart Symington Award. The award, presented annually, is named for the first Secretary of the Air Force.

YEAR	RECIPIENT
1986	Caspar W. Weinberger, Secretary of Defense
1987	Edward C. Aldridge Jr., Secretary of the Air Force
1988	George P. Schultz, secretary of state
1989	Ronald W. Reagan, former President of the United States
1990	John J. Welch, assistant secretary of the Air Force (acquisition)
1991	George Bush, President of the United States
1992	Donald B. Rice, Secretary of the Air Force
1993	Sen. John McCain (R–Ariz.)
1994	Rep. Ike Skelton (D–Mo.)
1995	Sheila E. Widnall, Secretary of the Air Force
1996	Sen. Ted Stevens (R–Alaska)
1997	William Perry, former Secretary of Defense
1998	Rep. Saxby Chambliss (R–Ga.) and Rep. Norman D. Dicks (D–Wash.)

Gold Life Member Card Recipients

Awarded to members whose AFA record, production, and accomplishment on a national level have been outstanding over a period of years.

Name	Year	Card No.
Gill Robb Wilson	1957	1
Jimmy Doolittle	1959	2
Arthur C. Storz Sr.	1961	3
Julian B. Rosenthal	1962	4
Jack B. Gross	1964	5
George D. Hardy	1965	6
Jess Larson	1967	7
Robert W. Smart	1968	8
Martin M. Ostrow	1973	9
James H. Straubel	1980	10
Martin H. Harris	1988	11
Sam E. Keith Jr.	1990	12
Edward A. Stearn	1992	13
Dorothy L. Flanagan	1994	14
John O. Gray	1996	15
Jack C. Price	1997	16

Aerospace Education Foundation Presidents

John B. Montgomery
1963–64

Dr. Lindley J. Stiles
1964–66

Dr. B. Frank Brown
1966–67

Dr. Leon M. Lessinger
1967–68

Dr. L.V. Rasmussen
1968–71

Dr. Leon M. Lessinger
1971–73

Dr. Wayne O. Reed
1973–74

Dr. William L. Ramsey
1975–81

Dr. Don C. Garrison
1981–84

George D. Hardy
1984–86

Eleanor P. Wynne
1986–87

James M. Keck
1988–89

Gerald V. Hasler
1989–94

Thomas J. McKee
1994–97

Walter E. Scott
1997–98

Aerospace Education Foundation Chairmen of the Board

Dr. W. Randolph Lovelace II
1963–64

Gen. Laurence S. Kuter, USAF (Ret.)
1964–66

Dr. Walter J. Hesse
1966–69

J. Gilbert Nettleton Jr.
1969–73

George D. Hardy
1973–75

Sen. Barry M. Goldwater
1975–86

George D. Hardy
1986–89

James M. Keck
1989–94

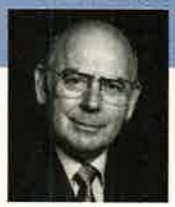
Walter E. Scott
1994–97

Thomas J. McKee
1997–98

AFA Executive Directors

Willis S. Fitch
1946–47

James H. Straubel
1948–80



Russell E. Dougherty
1980–86

David L. Gray
1986–87

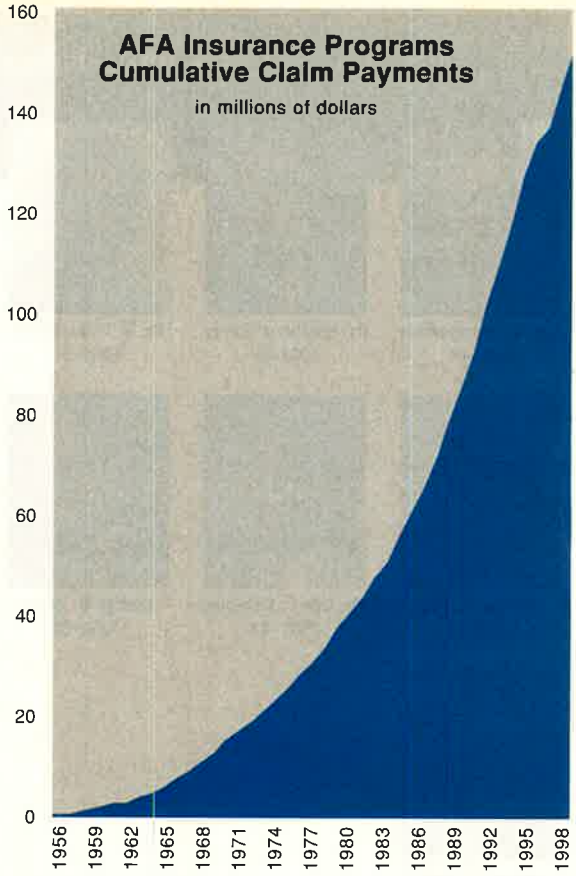
John O. Gray
1987–88

Charles L. Donnelly Jr.
1988–89

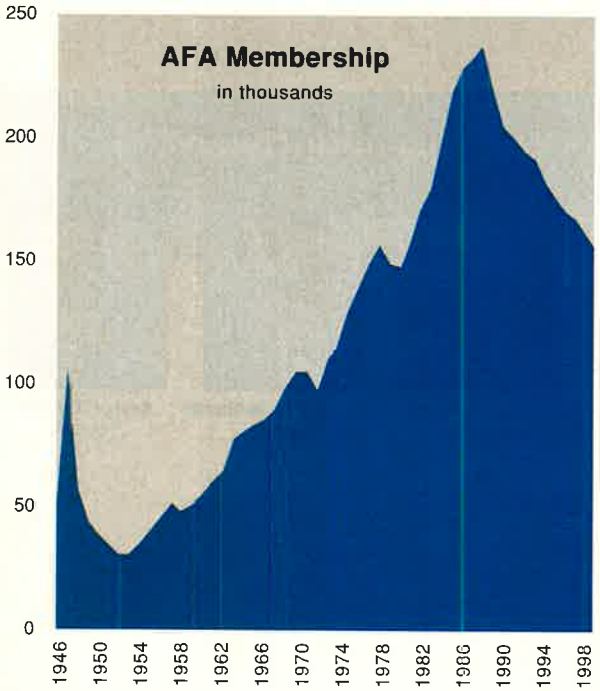
John O. Gray
1989–90

Monroe W. Hatch Jr.
1990–95

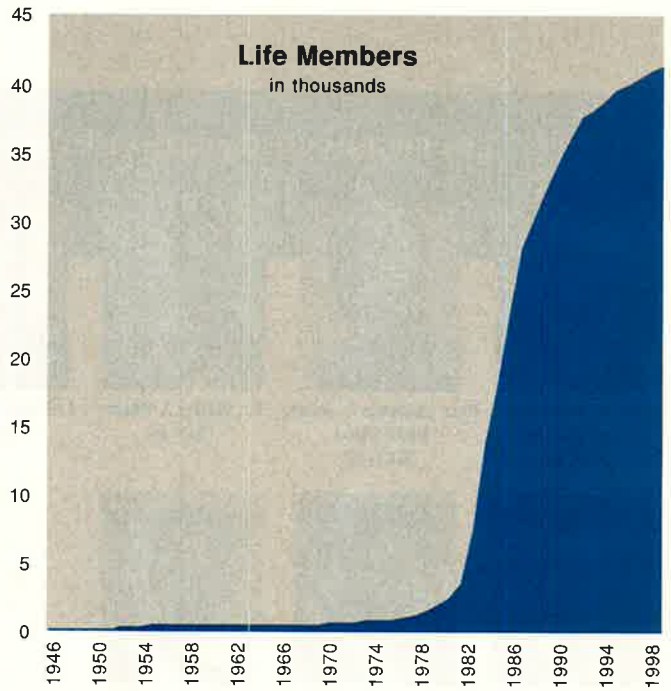
John A. Shaud
1995–



AFA insurance programs have grown steadily from modest beginnings in the 1950s. Through June 1998, cumulative claim payments totaled $151,847,817.



Strong growth in the 1970s and 1980s reflected the remarkable success of the Base Drive membership program. As of June 30, 1998, AFA membership is 154,431.



Life membership in AFA became increasingly popular in the 1980s. As of June 1998, Life Members account for 26.8 percent of total membership.

AFA State Contacts

Following each state name are the names of the communities in which AFA chapters are located. Information regarding these chapters or any of AFA's activities within the state may be obtained from the appropriate contact.

ALABAMA (Birmingham, Gadsden, Huntsville, Mobile, Montgomery): **Roy A. Boudreaux,** P.O. Box 1190, Montgomery, AL 36101-1190 (phone 334-241-2739).

ALASKA (Anchorage, Fairbanks): **Steven R. Lundgren,** P.O. Box 71230, Fairbanks, AK 99707 (phone 907-459-3291).

ARIZONA (Green Valley, Phoenix, Prescott, Sedona, Sierra Vista, Sun City, Tucson): **Raymond D. Chuvala,** 5039E N. Regency Cir., Tucson, AZ 85711-3000 (phone 520-747-2738).

ARKANSAS (Fayetteville, Hot Springs, Little Rock): **John L. Burrow,** 352 Rollston Ave. #1, Fayetteville, AR 72701 (phone 501-751-0251).

CALIFORNIA (Apple Valley, Bakersfield, Edwards AFB, Fairfield, Fresno, Los Angeles, Merced, Monterey, Orange County, Palm Springs, Pasadena, Riverside, Sacramento, San Diego, San Francisco, Sunnyvale, Vandenberg AFB, Yuba City): **Paul A. Maye,** 1225 Craig Dr., Lompoc, CA 93436 (phone 805-733-5102).

COLORADO (Colorado Springs, Denver, Fort Collins, Grand Junction, Pueblo): **Howard R. Vasina,** 1670 N. Newport Rd., Ste. 400, Colorado Springs, CO 80916-2700 (phone 719-591-1011).

CONNECTICUT (Brookfield, East Hartford, Middletown, Storrs, Stratford, Torrington, Waterbury, Westport, Windsor Locks): **Harry C. Levine,** 14 Ardmore Rd., West Hartford, CT 06119 (phone 860-292-2456).

DELAWARE (Dover, New Castle County, Rehoboth Beach): **Stephanie M. Wright,** 5 Essex Dr., Bear, DE 19701-1602 (phone 302-834-1369).

DISTRICT OF COLUMBIA (Washington): **Rosemary Pacenta,** 1501 Lee Hwy., Arlington, VA 22209-1198 (phone 703-247-5820).

FLORIDA (Avon Park, Broward County, Cape Coral, Daytona Beach, Fort Walton Beach, Gainesville, Homestead, Hurlburt Field, Jacksonville, Leesburg, Miami, New Port Richey, Orlando, Palm Harbor, Panama City, Patrick AFB, Port Charlotte, St. Augustine, Sarasota, Spring Hill, Tallahassee, Tampa, Vero Beach, West Palm Beach, Winter Haven): **Robert E. Patterson,** 95 Country Club Rd., Shalimar, FL 32579-1610 (phone 850-651-4830).

GEORGIA (Atlanta, Peachtree City, Savannah, Valdosta, Warner Robins): **Edward I. Wexler,** 8 E. Back St., Savannah, GA 31419-3343 (phone 912-966-8252).

GUAM (Agana): **Thomas M. Churan,** P.O. Box 12861, Tamuning, GU 96931 (phone 671-653-0525).

HAWAII (Honolulu, Maui): **Norman R. Baker,** 1284 Auwaiku St., Kailua, HI 96734-4103 (phone 808-545-4394).

IDAHO (Boise, Mountain Home, Twin Falls): **Chester A. Walborn,** P.O. Box 729, Mountain Home, ID 83647-1940 (phone 208-587-9757).

ILLINOIS (Addison, Belleville, Chicago, Moline, Rockford, Springfield–Decatur): **John D. Bailey,** 6339 Cotswold Ln., Cherry Valley, IL 61016-9379 (phone 815-226-6932).

INDIANA (Bloomington, Columbus, Evansville, Fort Wayne, Grissom ARB, Indianapolis, Lafayette, Marion, Mentone, New Albany, Terre Haute): **James E. Fultz,** 3915 Baytree Ln., Bloomington, IN 47401-9754 (phone 812-333-8920).

IOWA (Des Moines, Marion, Sioux City, Waterloo): **Louis M. Rapier,** 2963 29th Ave., Marion, IA 52302-1367 (phone 319-373-1036).

KANSAS (Garden City, Topeka, Wichita): **Jean M. Clifford,** 2070 Milford Ln., Garden City, KS 67846 (phone 316-275-4317).

KENTUCKY (Lexington, Louisville, Paducah): **Bradley C. Young,** 636 Grabruck St., Danville, KY 40422-1764 (phone 606-748-4655).

LOUISIANA (Baton Rouge, New Orleans, Shreveport): **Michael F. Cammarosano,** 4500 Sherwood Commons Blvd., Apt. 302, Baton Rouge, LA 70816 (phone 504-925-4911).

MAINE (Bangor, Caribou, North Berwick): **Peter M. Hurd,** P.O. Box 1005, Houlton, ME 04730-1005 (phone 207-532-2823).

MARYLAND (Andrews AFB, Baltimore, College Park, Rockville): **Erwin B. Nase,** 6116 40th Ave., Hyattsville, MD 20782-3012 (phone 301-345-8664).

MASSACHUSETTS (Bedford, Boston, East Longmeadow, Falmouth, Hanscom AFB, Taunton, Westfield, Worcester): **Francis F. Carmichael Jr.,** 14 Carmichael Way, West Wareham, MA 02576-1486 (phone 508-295-9167).

MICHIGAN (Alpena, Battle Creek, East Lansing, Kalamazoo, Marquette, Mount Clemens, Oscoda, Traverse City, Southfield): **James W. Rau,** 466 Marywood Dr., Alpena, MI 49707-1121 (phone 517-354-2175).

MINNESOTA (Duluth, Minneapolis–St. Paul): **Coleman Rader Jr.,** 6481 Glacier Ln. N., Maple Grove, MN 55311-4154 (phone 612-943-1519).

MISSISSIPPI (Biloxi, Columbus, Jackson): **Billy M. Boyd,** 107 N. Rosebud Ln., Starkville, MS 39759 (phone 601-434-2644).

MISSOURI (Richards–Gebaur ARS, St. Louis, Springfield, Whiteman AFB): **Graham Burnley,** 112 Elk Run Dr., Eureka, MO 63025-1211 (phone 314-938-6113).

MONTANA (Bozeman, Great Falls): **John M. Wallace,** 1700 W. Koch St., Ste. 10, Bozeman, MT 59715 (phone 406-587-8998).

NEBRASKA (Lincoln, Omaha): **Robert M. Williams,** 6014 Country Club Oak Pl., Omaha, NE 68152-2009 (phone 402-572-7655).

NEVADA (Las Vegas, Reno): **Albert S. "Sid" Dodd,** 1921 Dresden Ct., Henderson, NV 89014-3790 (phone 702-295-4953).

NEW HAMPSHIRE (Manchester, Portsmouth): **Baldwin M. Domingo,** 5 Birch Dr., Dover, NH 03820-4057 (phone 603-742-0422).

NEW JERSEY (Andover, Atlantic City, Camden, Chatham, Forked River, Ft. Monmouth, Gladstone, Jersey City, McGuire AFB, Newark, Old Bridge, Toms River,Trenton, Wallington, West Orange): **F.J. "Cy" LaManna,** 770 Berdan Ave., Wayne, NJ 07470-2027 (phone 973-423-0030).

NEW MEXICO (Alamogordo, Albuquerque, Clovis): **Dennis E. Mills,** 3016 Cheyenne Dr., Clovis, NM 88101-3204 (phone 505-762-4417).

NEW YORK (Albany, Binghamton, Brooklyn, Buffalo, Rome, Jamestown, Nassau County, New York, Queens, Rochester, Staten Island, Syracuse, Westhampton Beach, White Plains): **Bonnie B. Callahan,** 6131 Meadowlakes Dr., East Amherst, NY 14051-2007 (phone 716-741-2846).

NORTH CAROLINA (Asheville, Charlotte, Fayetteville, Goldsboro, Kitty Hawk, Raleigh, Wilmington): **Bill M. Dyer,** 1607 Cambridge Dr., Kinston, NC 28504-2001 (phone 919-527-0425).

NORTH DAKOTA (Fargo, Grand Forks, Minot): **Ronald L. Garcia,** 1600 University Ave. W., Minot, ND 58703-1908 (phone 701-858-3856).

OHIO (Cincinnati, Cleveland, Columbus, Dayton, Mansfield, Youngstown): **William "Ron" Goerges,** 4201 W. Enon Rd., Fairborn, OH 45324-9412 (phone 937-429-6070, ext. 102).

OKLAHOMA (Altus, Enid, Oklahoma City, Tulsa): **William P. Bowden,** P.O. Box 620083, Oklahoma City, OK 73162-0083 (phone 405-722-6279).

OREGON (Eugene, Klamath Falls, Portland): **John Lee,** P.O. Box 3759, Salem, OR 97302 (phone 503-581-3682).

PENNSYLVANIA (Allentown, Altoona, Beaver Falls, Coraopolis, Drexel Hill, Erie, Harrisburg, Johnstown, Lewistown, Philadelphia, Pittsburgh, Scranton, Shiremanstown, State College, Washington, Willow Grove, York): **Eugene B. Goldenberg,** 2345 Griffith St., Philadelphia, PA 19152-3311 (phone 215-332-4241).

RHODE ISLAND (Newport, Warwick): **Eugene M. D'Andrea,** P.O. Box 8674, Warwick, RI 02888 (phone 401-461-4559).

SOUTH CAROLINA (Charleston, Clemson, Columbia, Myrtle Beach, Sumter): **Stanley V. Hood,** P.O. Box 6346, Columbia, SC 29260-6346 (phone 803-787-2743).

SOUTH DAKOTA (Rapid City, Sioux Falls): **Charles A. Nelson,** 1517 S. Minnesota Ave., Sioux Falls, SD 57105-1717 (phone 605-336-1988).

TENNESSEE (Chattanooga, Knoxville, Memphis, Nashville, Tullahoma): **Glenn Fuller,** 6440 Strathspey Dr., Memphis, TN 38119-7751 (phone 901-682-1905).

TEXAS (Abilene, Amarillo, Austin, Big Spring, College Station, Commerce, Dallas, Del Rio, Denton, El Paso, Fort Worth, Harlingen, Houston, Kerrville, Lubbock, San Angelo, San Antonio, Wichita Falls): **Henry C. Hill,** P.O. Box 10356, College Station, TX 77842-0356 (phone 409-821-0201).

UTAH (Clearfield, Ogden, Salt Lake City): **Boyd Anderson,** 1120 Canyon Rd., #15, Ogden, UT 84404-5964 (phone 801-621-2639).

VERMONT (Burlington): **Erwin R. Waibel,** 1 Twin Brook Ct., South Burlington, VT 05403-7102 (phone 802-660-5298).

VIRGINIA (Alexandria, Charlottesville, Danville, Langley AFB, Lynchburg, McLean, Norfolk, Petersburg, Richmond, Roanoke, Winchester): **George D. Golden,** 36 W. Riverpoint Dr., Hampton, VA 23669-1072 (phone 757-850-4228).

WASHINGTON (Seattle, Spokane, Tacoma): **Richard A. Seiber,** 5323 97th Ave. Court W., Tacoma, WA 98467-1105 (phone 253-564-3757).

WEST VIRGINIA (Charleston): **Samuel Rich,** P. O. Box 444, White Sulphur Springs, WV 24986 (phone 304-536-4131).

WISCONSIN (Madison, Milwaukee, General Mitchell IAP/ARS): **Gilbert M. Kwiatkowski,** 8260 W. Sheridan Ave., Milwaukee, WI 53218-3548 (phone 414-463-1849).

WYOMING (Cheyenne): **Irene G. Johnigan,** 503 Notre Dame Ct., Cheyenne, WY 82009 (phone 307-773-2137).

AFA/AEF National Report

By Frances McKenney, Assistant Managing Editor

AFA Founder Celebrates 90th Birthday

Happy birthday, Julian Rosenthal!

The Fourth of July marked the 90th birthday of Julian B. Rosenthal, the last surviving member of the Air Force Association's group of 12 founders.

Called "the epitome of an AFA statesman" in former Executive Director John O. Gray's history of AFA, Rosenthal was among the first nine members of the association.

A World War II Army Air Corps enlisted man, Rosenthal got involved in AFA almost by chance, at a time when two other "founding fathers," Edward P. Curtis and Rosenthal's law partner in New York City, Sol Rosenblatt, were organizing the group. In *Crusade for Airpower,* former AFA Executive Director James H. Straubel writes, "At this first organization meeting [Oct. 12, 1945], Sol Rosenblatt announced that Julian Rosenthal, a member of his law firm (and an Air Force veteran) would be available to the Association approximately 50 percent of his time for a period of three months and for some 25 percent of his time over the next two or three years."

It was the beginning of Rosenthal's enthusiastic, 100 percent involvement in AFA for more than 50 years. The very next month, November 1945, Jimmy Doolittle—another AFA founder and its first National President—tasked him with drafting AFA's first constitution. Rosenthal also incorporated AFA that month in New York state and later drafted the rules and procedures for AFA's National Convention.

A native of New York City, with degrees from Columbia University and Fordham University Law School, Rosenthal has served AFA over the years as chairman of the board from 1959 to 1960 and as national secretary for 12 years.

He was named AFA's first "Member of the Year" in 1953 and in 1962 received the AFA Gold Life Member Card. Today Rosenthal is a national director emeritus and keenly follows AFA affairs.

In his honor several chapters in North Carolina, where Rosenthal is a member of the **Tarheel (N.C.) Chapter,** donated $90—one dollar for each year—to the Aerospace Education Foundation.

USAF photo by A1C C. E. Lewis

President Doyle Larson received a briefing on B-2 operations at the 509th Bomb Wing, Whiteman AFB, Mo., in July. Here, pilot Maj. Ricky Rodgers (left), of the 394th Combat Training Squadron, assists him in a cockpit simulator. At a luncheon during this visit, Larson spoke to an AFA audience about the association's policy positions and encouraged the group to make its views known to their congressional representatives.

Air Force Ball of Mid-America

A whirlwind weekend in St. Louis in June combined the 16th Air Force Ball of Mid-America, the Missouri State Convention, and a symposium on airlift.

The Air Force Association Briefing Symposium opened with comments by Lt. Gen. Walter S. Hogle Jr., who was at the time Air Mobility Command's director of plans and programs, and Stuart Symington Jr., son of the first Secretary of the Air Force. Brig. Gen. Duncan J. McNabb, commander of the Tanker Airlift Control Center at Scott AFB, Ill., spoke on AMC operations and Phoenix Scorpion, the build up of US forces in Southwest Asia. Several AMC staff officers also delivered briefings on topics including security issues, aeromedical evacuation, and equipment modernization.

About 120 people attended the symposium, organized by the **Scott Memorial (Ill.) Chapter.**

The **Spirit of St. Louis Chapter** and W. Graham Burnley, Missouri state president, hosted the Missouri State Convention, where the luncheon featured AEF President Walter E. Scott as guest speaker on the topic of the Berlin Airlift.

During awards presentations, Rene M. Chinn-Lang, former president of the **Central Missouri Chapter,** received the Missouri AFA Member of the Year award. She is now a member of the **John C. Stennis (Miss.) Chapter.** Rodney G. Horton of the **Harry S. Truman Chapter** received the Missouri Chapter of the Year award for the best continuous program.

That evening the Ball of Mid-America opened with the posting of the colors by the Scott AFB Elite Guard. The US Air Force Band of Mid-America Shades of Blue Jazz Ensemble, also based at Scott, and a local combo provided music for the evening.

Presentation of AEF awards highlighted the ball. Burnley received a Jimmy Doolittle Fellowship, and CMSgt. Joseph R. Harrison, from AMC's Logistics Airlift Aircraft Maintenance Division, received an Ira C. Eaker Fellowship. The fellowships represent a donation, in their names, of $1,000 from the Ball of Mid-America to AEF.

With Fay J. "Jack" Pledger Jr. of the Scott Memorial (Ill.) Chapter serving as chairman, the Scott Chapter, Spirit of St. Louis Chapter, and the state AFA organized the ball as a benefit for AEF, the Air Force Aid Society, and the James S. McDonnell USO at Lambert–St. Louis IAP.

AFA co-hosted a Capitol Hill reception in July highlighting USAF's Airborne Laser. In the top photo, Gen. Michael Ryan, Air Force Chief of Staff, exchanges views with Rep. Saxby Chambliss (R–Ga.), of the House National Security Committee. Here, HNSC chairman, Rep. Floyd Spence (R–S.C.) gets program specifics from Col. Michael Booen, director of the ABL System Program Office, Kirtland AFB, N.M. More than 300 guests viewed the exhibits provided by Team ABL—Boeing, TRW, and Lockheed Martin.

Conventions: In the "Magnolia State"

The **Golden Triangle Chapter** hosted the Mississippi State Convention in June at Columbus AFB, Miss., with AFA Chairman of the Board Gene Smith as keynote speaker for the evening banquet. In his remarks he commended convention delegates and their chapter members for volunteering time and talents to the association.

Special guests at the dinner included Ivan L. McKinney, national vice president (South Central Region), and Col. John J. Catton Jr., the 14th Flying Training Wing commander at Columbus and a chapter member.

Re-elected for a second year were the current state officers: Billy M. Boyd, president; Ronald J. Vaughan, vice president; Teresa Miley, secretary; and Eugene W. Davenport, treasurer. All are from the Golden Triangle Chapter.

Earlier in the year, the chapter participated in the Columbus AFB Appreciation Dinner, where retired Gen. Ronald R. Fogleman, former USAF Chief of Staff, and Mississippi Governor Kirk Fordice were the main speakers. Chapter President Lt. Col. Michael A. Counihan presented a 1998 Aerospace Education Foundation Spouse Scholarship for $1,000 to Penny Boese. She is a graduate

Backed by donations from Community Partners, the John W. DeMilly Jr. (Fla.) Chapter raised funds by selling coffee 'n doughnuts and other goodies at a balloon race. Cal Morton, chapter vice president for finance, organized the effort, and John Breslin, chapter president, and Tom Gammon, aerospace education VP, helped him man the refreshments trailer. Meanwhile, chapter member Thomas Oatmeyer and wife, Suzanne (both shown here), soared aloft in one of the many entries in the charity event.

student at Mississippi State University. AFJROTC cadet Michael Provencher of Columbus High School received a $250 scholarship.

In May chapter representatives attended a unique graduation ceremony—for sixth-graders.

The students, from B.L. Moor Attendance Center in Crawford, Miss., had completed two months of "pilot training," so to mark the occasion Gen. Lloyd W. "Fig" Newton, commander of Air Education and Training Command, pinned wings on the 27 youngsters at a formal graduation ceremony held at the Columbus AFB Officers Club.

The pilot training was developed by teacher Sheila Williams as a way to motivate students, encourage them to develop goals, expose them to more career choices, and broaden their view of the world. During the course students dressed in flight suits, did daily physical training, marched, and saluted. They studied aerodynamics, aviation terms, flight principles, navigation, military history and courtesy, and first aid, among a host of related topics. With volunteer mentors from Columbus AFB they also learned about specific aircraft.

At the graduation, Miley, who is also her chapter's vice president for aerospace education, presented Williams with an AEF Educator Grant. Williams has been selected as the state's Teacher of the Year and was honored at the state convention.

In the "Razorback State"

Arriving directly from a high-level USAF meeting in San Antonio, Gen. Lloyd Newton made it to the Arkansas State Convention in June in time to deliver the awards banquet's keynote address. His remarks focused on Little Rock AFB and its role in AETC.

Newton and AEF President Scott were honored guests at the two-day convention, hosted by the **David D. Terry Jr. Chapter** in Jacksonville.

During awards presentations, the chapter was recognized as the recipient of the 1997 national Outstanding Visions of Exploration Chapter Award, and chapter member Jerry Reichenbach was named the Arkansas AFA Person of the Year. An AFA Medal of Merit went to Marleen E. Eddlemon of the Terry Chapter, and Paul W. Bixby, **Razorback Chapter** president, received the Arkansas State President's Special Award.

Other awards recognized AFJROTC and Civil Air Patrol cadets, 1997–98 Eagle Grant recipients, Teacher of the Year Sandra Dawn Sanders from Pinewood Elementary School in Jacksonville, and the Outstanding Arkansas ANG Enlisted Person of the Year, SrA. Donmonick Z.T. O'Gwinn from the 189th Mission Support Flight (ANG), Little Rock AFB.

The Razorback Chapter's John Logan Burrow was elected state president, with Reichenbach as vice presi-

dent, Bixby as treasurer, and William A. Kehler of the Terry Chapter as recording secretary.

In the "Buckeye State"

W. Ron Goerges, current state president, called a visit to the Motts Military Museum the highlight of the Ohio State Convention. The convention was held in Columbus in June and was hosted by the **Capt. Eddie Rickenbacker Memorial Chapter.**

Museum founder Warren Motts, an Army National Guard veteran, was guest speaker for the convention's awards dinner. He described the goals of his educational organization and its central purpose of honoring military service members.

Located in Groveport, Ohio, the museum opened in 1988. Displays include uniforms and artifacts from the Civil War—such as a living mask of Abraham Lincoln—to the Persian Gulf War, represented by items like an Iraqi Republican Guard helmet and a Hershey chocolate bar made specifically not to melt in the sun.

The museum is in the process of moving to a four-acre site with a facility funded and constructed entirely by volunteers. Convention-goers visited the new building, where the rolling stock includes jeeps, a World War II landing craft used in the Philippines, and a Huey helicopter from the Vietnam War.

At the convention itself, the **Steel Valley Chapter** took home the Chapter of the Year award, and member Fred Kubli Jr. was selected as Ohio Person of the Year.

New state officers are Joseph R. "Ray" Lesniok Jr. of the **Cleveland Chapter,** president; Kenneth R. Wheeler and Charles B. Spencer of the **Wright Memorial Chapter,** vice president and treasurer, respectively; and Sharon M. Johnson, from the Steel Valley Chapter, secretary.

In the "Sagebrush State"

Arizona and Nevada joined forces for their fifth combined convention in June. AFA Nevada hosted the event in Laughlin, Nev.

The **Richard S. Reid (Ariz.) Chapter** was named Chapter of the Year. William A. Lafferty, a national director and a Reid Chapter member, was honored for his role in flying one of the first missions of the Berlin Airlift. His experience was described in the June 1998 issue of *Air Force* Magazine.

During Arizona's business sessions, Angelo Di Giovanni of the Reid Chapter, was elected state president. Arthur W. Gigax and Donita F. Plaumann, both from the **Phoenix Sky Harbor Chapter,** were elected vice president and secretary, respectively. **Tucson Chapter's** Carl E. Beck was re-elected treasurer.

Nevada's state officers continue on to the second year of their two-year terms. They are Albert S. "Sid" Dodd III, president; Kathleen Clemence, vice president North; Joel "Tom" Hall, vice president South; Juan B. Sotomayor, treasurer; and George A. "Pete" Peterson, secretary. All are **Thunderbird Chapter** members, except for Clemence, who is from the **Dale O. Smith Chapter.**

National Secretary William D. Croom Jr. was the honored guest at the joint convention, which current Arizona State President Raymond D. Chuvala said would take place at the same time, same place next year, with Arizona serving as host.

Renamed for "Tooey"

The Westchester Falcon (N.Y.) Chapter was renamed the **Gen. Carl A. "Tooey" Spaatz Chapter** at a June meeting at the US Military Academy West Point, where he graduated in 1914.

The day also marked the 107th anniversary of Spaatz's birth in Boyertown, Pa.

One of Spaatz's daughters, Rebecca Spaatz Nagel, and grand-

daughter DeDe Laver were special guests at the champagne brunch and renaming ceremony, held at the West Point Club. Nagel spoke about growing up as the daughter of the first USAF Chief of Staff, revealing Spaatz's personal side: his guitar playing and his decision to become a flier after seeing Glenn H. Curtiss race along the Hudson River, from Albany to New York City, in 1910.

The renaming ceremony for the chapter began with presentation of a flag that had flown over the US Capitol on June 16 and the Pledge of Allegiance led by two AFJROTC cadets from Newburgh (N.Y.) Free Academy. Letters of congratulations from USAF Chief of Staff Gen. Michael E. Ryan and Rep. Benjamin A. Gilman (R–N.Y.) were read, and John Morrissey spoke about a project to name a mountain in Alaska for POW/MIAs. The first guests to make reservations for the event, as well as Spaatz's daughter and granddaughter, received ball caps decorated with the new chapter name.

James E. Callahan, national director, presented the new charter to Karl Miller, chapter president. Also present was Bonnie B. Callahan, New York state president.

Miller said that among the World War II memorabilia displayed for the gathering were models of the ME-262s—reminders of Spaatz's role as commander of US Strategic Air Forces in Europe and also in the Pacific.

We Remember: *Memphis Belle*

The **Everett R. Cook (Tenn.) Chapter** helped the Memphis Belle Memorial Association of Memphis carry out "We Remember–Airshow '98."

Featuring vintage and contemporary military and civilian aircraft, the two-day event centered on *Memphis Belle,* one of the most famous aircraft of World War II. Among the first B-17s to complete 25 missions over Nazi occupied territory, *Memphis Belle* returned to the US to help raise morale and funds for the war effort. The bomber has been the subject of two popular movies of the same name.

Five of the surviving crew members attended the air show: Robert K. Morgan, pilot; James A. Verinis, copilot; Harold P. Loch, third top turret gunner and engineer; Robert Hanson, radio operator; and Casimer A. "Tony" Nastal, right waist gunner.

Memphis Belle is currently the focus of an effort to secure a more permanent, climate-controlled facility for it, necessary because of its location at a riverfront park pavilion.

To help in this endeavor, Joseph C. Bryant, Cook Chapter vice president, and Glenn Fuller, Tennessee state president, presented $500 at the air show to John D. "David" White. He is a Memphis Belle Memorial Association board member and a Cook Chapter member.

Another featured guest at the air show was Tuskegee Airman Luke Weathers, who retired from the Air Force Reserve as a lieutenant colonel. He returned to his hometown of Memphis for the show to recount his World War II experiences as a P-51 Mustang pilot.

Chapter members also helped with administrative tasks at the air show, including parking, admissions, and concessions—all to support the *Memphis Belle* fund-raising efforts. The association has a home page at www.memphisbelle.com.

Directly to the Airman

Sixty-seven airmen at Elmendorf AFB, Alaska, recently received $50 each through tuition assistance from the **Anchorage Chapter.**

Carl W. Bradford Jr., past state president, said the chapter distributed $3,350 to help the airmen pay for tuition for the spring 1998 semester. It is the third time the chapter has raised money to help local airmen meet their college expenses.

Bradford explained that the chapter raises the funds through contributions from members, private individuals, the base's officers spouse group, and the Anchorage Armed Services YMCA. He then places a notice in the base newspaper and also asks the 11th Air Force senior enlisted advisor to e-mail everyone on base to let them know the tuition assistance is available.

Airmen who qualify for the aid must be enrolled in at least one college course and make a grade of B or better.

Although the Air Force picks up most of the cost of college tuition, Bradford said the local college charges $225 for a three-credit course, and USAF doesn't cover the cost of books. People taking more than one class are especially grateful for the chapter's help, he said.

Bradford noted that the program "gets the benefit right down to the airman, which is what we want to do."

Tops

The American Legion and the Veterans of Foreign Wars were among those presenting awards. But according to Chapter President Thomas C. Craft, the audience at the dinner dance for the AFJROTC unit at Anchor Bay High School in New Baltimore, Mich., was told that the AFA Award from the **Mount Clemens (Mich.) Chapter** was the highest level honor to be given that evening.

Craft presented the award to Matthew Badaczewski, a graduating senior, at the annual event, held at the All-Ranks Club at Selfridge ANGB. Chapter members Louis D. Werder and Steven E. Wratchford are the Aerospace Science Instructors for the ROTC unit and organized the May gathering for their students.

In June the chapter held its Salute to Veterans and Educators Annual Golf Outing and buffet dinner, an event that has taken place for at least the last 15 years, said Craft.

The chapter mailed flyers to area schools and military groups, generating a turnout of 42 folks—an even mix of military veterans and teachers—at a golf course in Sterling Heights, Mich.

It was just a "fun day," building goodwill for the chapter, said Craft, who arranged the event.

F-117 Insights

At the **Gen. Nathan F. Twining (Fla.) Chapter's** annual awards night in May, Maj. William Berg, an F-117 pilot assigned to US Central Com-

mand, MacDill AFB, Fla., spoke about the development of stealth technology and flying the Nighthawk.

The topic appealed to all members of the audience, including a group of young Civil Air Patrol cadets, explained Henry L. Marois Jr., chapter president. The chapter gathering that evening featured announcement of CAP cadet Christian Collamore as Outstanding Civil Air Patrol Cadet of the Year.

The awards night also included presentation of the chapter's Pinellas County Teacher of the Year award to Earnest Johnson. He is a fifth-grade teacher at Belleair Elementary School in Clearwater, Fla., and was among the first teachers in the area to use the Visions of Exploration program of *USA Today*–AEF in his classroom. Irwin H. Sommerfeld, chapter vice president for aerospace education, made the presentation.

In a letter to the chapter, Johnson pointed out that Visions activities "enabled the students to focus on ideas, issues, and trends that provided them with knowledge that would enhance their awareness and foster understanding of important news and events."

Joseph H. Higgins (1925–1998)

TV personality Joe Higgins, AFA's Man of the Year in 1973, died June 15 in Los Angeles. He was 72.

Higgins was also a past president of the General Doolittle Los Angeles Area Chapter and was known as the Air Force's and AFA's "Toastmaster General." He was more widely known for Dodge sports car commercials in the 1970s in which he portrayed a southern small-town sheriff who drawled, "Boy, you in a heap a trouble."

In his AFA persona, Higgins served as master of ceremonies for conventions and symposiums and appeared as the "safety sheriff" at many national and chapter events. He also sometimes showed up as "Air Commodore Height–Hobson," entertaining audiences with his parody of British officiousness.

Higgins was born in Logansport, Ind. He attended the University of Dayton in Ohio before World War II. He moved to Hollywood in the early 1950s and among many television and movie roles played the blacksmith in Chuck Connors' series "The Rifleman."

In a 1969 newspaper interview, he explained that he auditioned for the Dodge TV ad wearing a pair of Air Force summer suntans, a straw Texas Ranger hat, amber colored shooting sunglasses, and a cigar. He beat 27 actors for the part.

More Chapter News

■ The **Enid (Okla.) Chapter** presented four Community College of the Air Force graduates with $100 savings bonds at a recent CCAF graduation ceremony at Vance AFB's Officers Club. TSgt. Brian E. Wilson, SSgts. Michael B. Akins and Ricky W. Herring, and SrA. Terrence T. Kehoe had also earlier received $250 Eagle Grant scholarships through AEF.

■ In what he calls "hands across the state assistance," John E. Schmidt Jr., past president of the **Col. H.M.**

AFA Conventions

Sept. 12, **Delaware State Convention,** Dover, Del.; Sept. 14–16, **AFA National Convention and Aerospace Technology Exposition,** Washington; Oct. 3, **Utah State Convention,** Salt Lake City.

"Bud" West (Fla.) Chapter, attended the awards banquet for the AFJROTC unit at Bainbridge High School in Bainbridge, Ga. He joined the school's Senior Aerospace Science Instructor, retired Col. P. Gary Breedlove of the **South Georgia Chapter,** in presenting an AFA Outstanding Cadet Medal to Shalonda J. Snell, the new corps cadet commander who will begin her senior year this fall. Schmidt said the Florida chapter initiated such efforts at crossing state lines this year to support the AFJROTC units located near the state's capital. Bainbridge is about 30 miles north of Tallahassee.

■ The **Lloyd Schloen–Empire (N.Y.) Chapter** hosted a Flag Day performance in June by the USAF Band of Liberty's Jazz Combo. They performed a concert of old standards at the Long Island State Veterans Home in Stony Brook, N.Y., for more than 100 veterans and guests. William Birnbach, chapter president, organized the program, including the presentation of a flag that had flown over the US Capitol and the donation of an *Air Force* Magazine subscription to the nursing home's library. The USAF Band of Liberty is based at Hanscom AFB, Mass.

Have AFA/AEF News?

Contributions to "AFA/AEF National Report" should be sent to *Air Force* Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Phone: (703) 247-5828. Fax: (703) 247-5855. E-mail: fmckenney@afa.org. ■

Unit Reunions

1st Tactical Depot Sq, 1st TSS, and 9th AFDS. Oct. 13–15, 1998, at the Sheraton Anaheim Hotel in Anaheim, CA. **Contact:** Fred I. Chanatry, 3709 Big Sky Dr. NE, Albuquerque, NM 87111 (505-292-7475), or Bob Alterman, 1319 Riviera Ave., Banning, CA 92220 (909-769-0886).

13th BS Grim Reapers (Korea and Vietnam). Sept. 16–20, 1998, in San Diego. **Contact:** Walter T. Campbell, 110 Silk St., Brewer, ME 04412-1858 (207-989-4937).

19th Air Refueling Sq (SAC). Oct. 11–14, 1998, in Orlando, FL. **Contact:** Jack Crawford, 1571 N. Ridge Lake Cir., Longwood, FL 32750-4555 (407-767-0722).

22d BG, Fifth AF (Southwest Pacific, WWII). Sept. 16–19, 1998, at the Holiday Inn in Bossier City, LA. **Contact:** Chris R. Kilgus, 5019 Swan Lake Rd., Bossier City, LA 71111-6412 (318-746-4872).

23d Fighter–Bomber Sq, 36th Gp (Bitburg, Germany, mid-1950s). Sept. 9–11, 1998, at the Sheraton Colorado Springs Hotel in Colorado Springs, CO. **Contact:** Jack Monson, 2146 Purcell Rd., Fabius, NY 13063 (315-677-9757 or fax 315-677-7876).

40th BS, 6th BW (H). Oct. 9–11, 1998, in Roswell, NM. **Contact:** Len Kunko, 1601 S. Kentucky Ave., Roswell, NM 88201 (505-622-7546) (LKUNKO98@prodigy.net).

77th and 404th BS (WWII). May 5–9, 1999, at the Travelodge Suites NW in San Antonio. **Contact:** James H. Sample, 608 N. Colbert, Sherman, TX 75090 (903-893-0180).

Unit Reunions

Mail unit reunion notices well in advance of the event to "Unit Reunions," *Air Force* Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Please designate the unit holding the reunion, time, location, and a contact for more information.

84th BS, 47th BW (1950–62, B-45s and B-66s). Oct. 14–18, 1998, at the Holiday Inn Hotel & Conference Center in Hampton, VA. **Contact:** Charles R. Palmer, 511 Wellington Ave., Newark, OH 43055-6440 (740-345-3229).

322d Troop Carrier Sq, Fourteenth AF (China, 1942–45). Sept. 8, 1998, at the Rio Rio Cantina in San Antonio. **Contact:** Walter Springall, PO Box 8048, Horseshoe Bay, TX 78657 (830-598-5795 or fax 830-598-2412).

468th BG (VH). Oct. 17–19, 1998, at the Holiday Inn in Longboat Key, FL. **Contact:** J.L. Pattillo, 1143 Glenview Rd., Santa Barbara, CA 93108 (805-969-2796).

501st Tactical Control Gp (all units, Germany). Sept. 24–27, 1998, at the Marriott Hotel Dayton in Dayton, OH. **Contact:** Joe Livernash, 12672 Senda Acantilada, San Diego, CA 92128 (619-485-9020).

512th MAW (October 1973). Oct. 13–14, 1998, at Dover AFB, DE. **Contact:** Ron Love, 8 Ringed Neck Ln., Wyoming, DE 19934 (302-697-7393).

Childress AAF Aviation Cadet Reunion (increment July 2, 1944). Sept. 7–9, 1998, in Branson, MO. **Contact:** Charles Silliman (417-739-1870).

EB-66s. Oct. 23–25, 1998, at the Golden Nugget Hotel & Casino in Las Vegas. **Contact:** Jim Milam, 3600 Willomet Ct., Bedford, TX 76021 (817-545-3554) (jimmilam@aol.com).

Pilot Class 54-H. April 28, 2000, in Las Vegas. **Contact:** John T. Taylor, 15807 El Camino Real, Houston, TX 77062-4416 (JTT54H@aol.com).

Seeking members of **AF OCS Class 60-B** for a reunion. **Contact:** Bruce R. Pottorff, (410-451-6373) (CaptnBruce@MSN.com), or Garland Benfield (210-681-3982 or fax 210-523-0197).

Seeking former **"Red Pants" SOS** members for a 50th reunion in 2000. **Contact:** 34 SS/SOS, 125 Chennault, Maxwell AFB, AL 35112-6430 (334-953-2231 or fax 334-953-3580) (sos50yrs@max1.au.af.mil). ■

Bulletin Board

Seeking information on **Col. James E. Smothers,** who was a pilot in Japan, Korea, Fairchild AFB, WA, 1956–62, and who was last stationed at Dyess AFB, TX, with SAC until 1968. **Contact:** Nena Smothers, 222 Bear Paw Rd., Newport, WA 99156.

Seeking contact with **Capt. Tom Tapper,** who was an instructor at the RAF Fighter Combat School in West Reyhnam, Norfolk, UK. **Contact:** Sumit Chakravarty (sumitc@microsoft.com).

Seeking contact with members of **Eighth AF** or **817th Engineer Battalion,** Stansted Airport, UK, 1943, or who knew **Joyce Martin** of Bishop's Startford, UK. **Contact:** Linda Tan, 2C Bracken Ln., Oaklands, Welwyn, Hertfordshire, UK AL6 0RB.

Seeking **patches** from the 16th Tac Recon Sq, Tan Son Nhut AB, Vietnam, 11th TRS, Udorn RTAB, Thailand, and Phase Tester in North Vietnam. **Contact:** Stephen G. Sullivan, 20 Shady Hill Rd., Newton, MA 02161 (617-969-4984).

Seeking information from anyone who was entertained by country–western singer **Elton Britt** during WWII and Korea. **Contact:** Joe Macchia, Box 1091, Arizona City, AZ 85223.

Seeking contact with members of **Aviation Cadet Class 42-D. Contact:** William W. Fink, 319 Cedar Ln., Seabrook, TX 77586 (281-326-2133) (ctpl@earthlink.net).

Seeking members of the **91st Strat Recon Sq,** Yokota, Japan, 1952–53, who have knowledge about Project Charlie and the development of the high altitude night photography pod. **Contact:** Robert R. Ott, 1523 1st St., Paonia, CO 81428.

Seeking contact with **Maj. Robert A. Cruikshank,** last assigned to Bangkok, Thailand, and **CWO James R. Clemmer** of North Carolina. **Contact:** Van Swicegood, 348 Shady Knoll Ln., Mocksville, NC 27028 (336-492-7376) (vbowen@ols.net).

Seeking members of the **Red River Valley Fighter Pilots Assn** who may have lost contact with the organization due to the recent move of the national office. **Contact:** Red River Valley Fighter Pilots Assn., PO Box 1551, North Fork, CA 93643 (209-877-5000) (AFBridger@aol.com).

Seeking anyone associated with the **Mitchel Players** at Mitchel Field, NY, 1957–61. **Contact:** Gene Alfaro, 5804 Hampton Forest Way, Fairfax, VA 22030 (703-266-6532) (galfa@aol.com).

Seeking former members of the **67th Security Police Sq,** Bergstrom AFB, TX, 1976–79. **Contact:** Fred Theriot, 1007 Boston Ave., Nederland, TX 77627 (Fred57@msn.com).

Seeking **Stanley M. Colflesh and Alexander M. Mitchell** of Aircraft Observer Class 55-02. **Contact:** Roger A. Knopf, 6116 Ridgeview Dr., Muskegon, MI 49441-6146 (616-798-4123).

Seeking **WWII veterans** with pictures of US bases in UK. **Contact:** Robert Bonsall, 10 Thornwood Ct., Carlisle Rd., Buxton, Derbyshire, UK SK17 6XZ.

Seeking members of the **685th Air Warning Co,** Tilting, Fogo Island, Newfoundland, Canada, during WWII. **Contact:** Len McGrath, 5470 Sand Lake Dr., Melbourne, FL 32934 (407-752-7237) (fax: 407-253-8643).

Seeking photos of **Stearman PT, A-20, A-26, P-80, P-86, and F-15** aircraft. **Contact:** Jack E. Daitz, 11045 N. 77th St., Scottsdale, AZ 85260-5565.

Seeking anyone who knew **Maj. Gen. Glenn O. Barcus** when he was a captain stationed at

If you need information on an individual, unit, or aircraft, or want to collect, donate, or trade USAF–related items, write to "Bulletin Board," *Air Force* Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Items submitted by AFA members have first priority; others will run on a space-available basis. If an item has not run within six months, the sender should resubmit an updated version. Letters must be signed. Items or services for sale, or otherwise intended to bring in money, and photographs will not be used or returned.

Langley AFB, VA, in the late 1930s. **Contact:** Wayne Layman, 14 Belle Crest Dr., Belleville, IL 62221-5513 (618-233-6878).

Seeking contact with **1st Lt. Peter C. Pulrang,** who was a copilot with the 856th BS, 492d BG (H), Eighth AF, and who was the sole survivor of a B-24 crash, March 31, 1945, Kirkland Mainland, Orkney Islands, Scotland. **Contact:** Louis Allessio, 113 Shannon Ln., Westfield, MA 01085 (martyall@msn.com).

Seeking copies of ***Air Force* Magazine** from 1976. **Contact:** Gary A. Henle, 316 S. Paseo Pena Apt. C, Green Valley, AZ 85614.

Seeking information on and **patches** and photos of the **7405th SS, 7406th SS, and 7499th SG.** **Contact:** Ian Warner, 267 Brookside, Burbage, Hinckley, Leicestershire, UK LE10 2TJ.

Seeking contact with **Lt. "Jim" Marshall,** who was a copilot on a B-25J at Ascension island April–October 1944, doing anti-sub and air–sea rescue. **Contact:** Patrick H. McCarthy, 5417 State Rt. 104, Oswego, NY 13126.

Seeking contact with former AF artists, photographers, or historians who served at **Kingsley Field,** OR, with the 408th FG. **Contact:** Elmer Ross, PO Box 807, Everett, WA 98206-0807 (425-252-3056).

Seeking **Thomas Stanley Ford** from Choudrant, LA, who graduated from flight school Class 43-K, went to B-17 training in Roswell, NM, and then to Salt Lake City, UT. He was the best man at Hubert Donohue's wedding. **Contact:** Hubert Donohue, Donohue Rd., Dayton, WA 99328 (509-382-4082) (hfd@bmi.net).

Seeking **Robert W. Fausel** or anyone who knows about an incident that occurred in May 1939 near Chungking, China, involving a Curtiss–Wright CW-21 vs. JAAF–piloted Savoia–Marchetti bombers. **Contact:** Brooks Whelan, Box 512, S. Orleans, MA 02662-0512 (508-240-3442).

Seeking 1967–68 era **Rolling Thunder** SAC **patch,** beret, and medallion. **Contact:** Jeffrey Brown, 6830 Luddow St., Apt. 408, Upper Darby, PA 19082.

Seeking a USAF F-4 crew that might have observed Royal Australian Air Force pilot **Garry Cooper** trying to escape from the enemy, while carrying a US Army brigade commander named **Hill** of 2d Brigade, 9th Infantry, in Vietnam, Aug. 18, 1968. **Contact:** Colin Benson, 19 Mengel St., Mackay, Queensland 4740, Australia (valiant@acslink.aone.net.au).

Seeking contact with or information on Stalag Luft 1 POWs **Eugene Anderson, Donald Carr, Eugene Rhodes Johnson, Samuel S. Lawler, James J. McGrew, Farmer E. Rains, Frank Sims, and G.E. Zebrowski. Contact:** Peter Joseph, 20839 Lancaster St., Harper Woods, MI 48225 (313-886-2559).

Seeking photos of **Piper Cub, PT-19, and BT-13** aircraft on the ground or in the air. **Contact:** Lionel Bertheaud, 109 Mark Twain Dr. #11, River Ridge, LA 70123 (504-738-5606).

Seeking contact with members of the **436th and 512th MAW** who participated in Operation Nickel Grass in October 1973. **Contact:** Ron Love, 8 Ringed Neck Ln., Wyoming, DE 19934 (302-697-7393).

Seeking information on or contact with anyone who served with the **1603d ABG,** Wheelus Field, Libya, in 1954–55, or with **HQ TUSLOG Det. 9,** Diyarbakir, Turkey, 1955. **Contact:** Bud Trill, 1171 MacDonnell Dr., Palm Harbor, FL 34684-2345 (727-786-2482) (Bud-Dee@juno.com).

Seeking information on or contact with **Lt. Col. Michael Reavis,** of Alabama, who was an F-15 pilot in the 49th TFW at Holloman AFB, NM, an F-15 advisor to the Royal Saudi AF in 1986, and whose last known assignment was at Hickam AFB, HI, in 1992. **Contact:** Gary Sanders, 3618 N. Knollwood Cir., Tucson, AZ 85750 (520-721-2430 or 520-746-5226) (Gsanders@aol.com). ■

Pieces of History

Photography by Paul Kennedy

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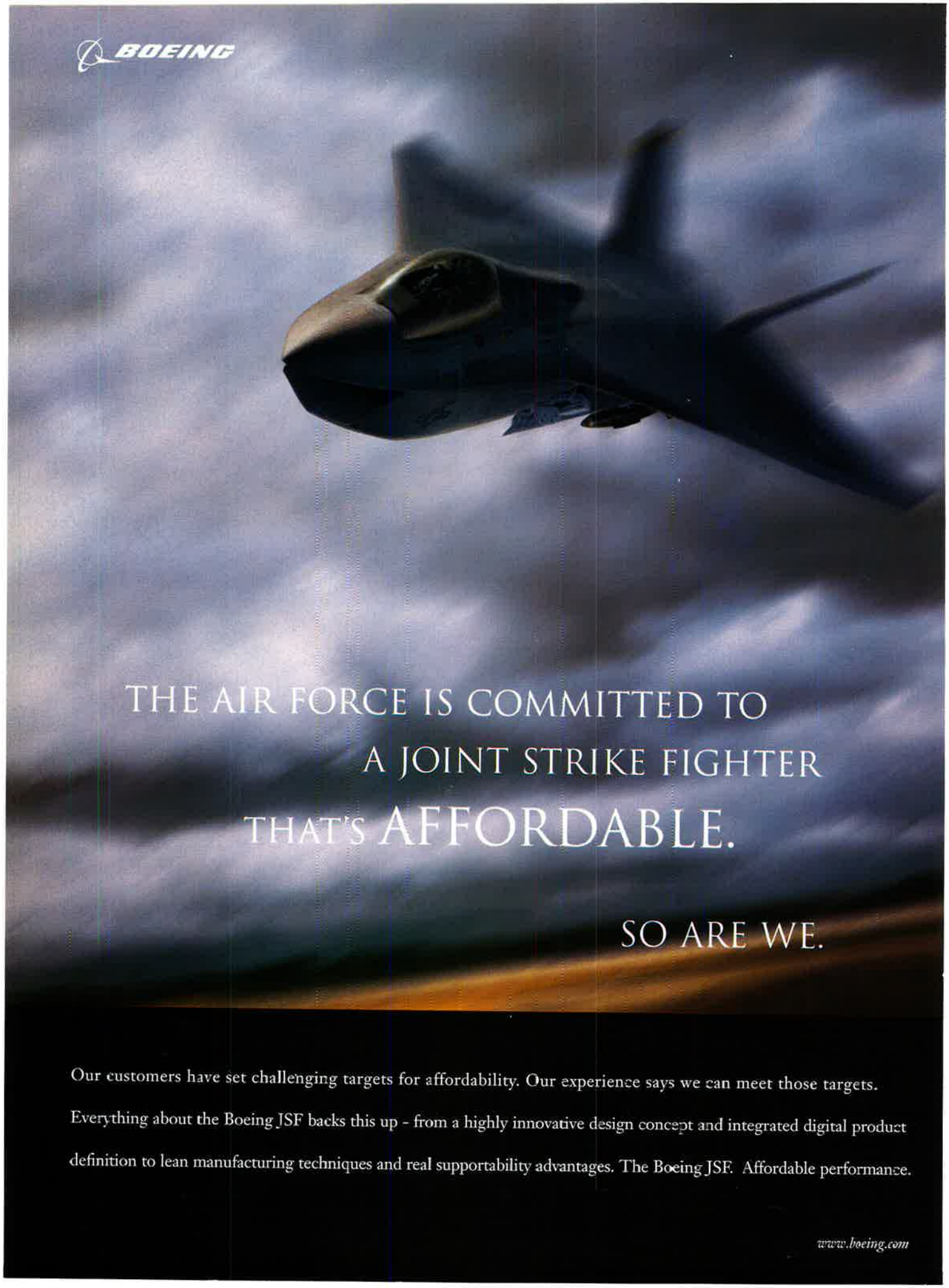
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