JUNE 1996/$3

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June 1996, Vol. 79, No. 6

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

About the cover: At the USAF Weapons School, Nellis AFB, Nev., F-16 instructor Capt. Scott Bishop teaches students how to be leaders in the field and in the classroom. See "Weapons School," p. 42. Staff photo by Guy Aceto.

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LOCKHEED MARTIN

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Editorial

By John T. Correll, Editor in Chief

Backing Up on Strategy

A PROPOSAL gathering steam in Washington calls for the United States to abandon the "two-MRC" defense strategy and its standard that the armed forces be prepared to fight and win two major regional conflicts, nearly simultaneously.

That strategy had been opposed all along by hard-core defense cutters. They say US military power is excessive, that two conflicts occurring at the same time is wildly improbable, and that the services should be geared for limited actions like those in Haiti and Bosnia-Hercegovina rather than theater conflicts on the scale of the Persian Gulf War.

Now, conservatives who reached their positions by a practical route also are inclined to change the strategy. They believe it is foolish to cling to a plan the nation seems unwilling to support. Sen. John McCain (R-Ariz.) says a force to implement the present strategy "exceeds available funding by hundreds of billions of dollars" over the next few years and there is "little realistic prospect of significant, sustained increases." He would therefore peg the strategy to "a single MRC, possibly together with one or more lesser threats" instead of counting on forces and capabilities "that will never materialize."

The two-MRC strategy grew out of the notorious "Bottom-Up Review" in 1993. Recollections of what happened during that strange interlude, however, are receding into myth. In making its case against the current strategy, the Progressive Policy Institute, the research arm of the Democratic Leadership Council, says the Bottom-Up Review "was a useful initial device for trimming the Cold War force structure in a planned and consensual manner."

What actually took place was this. Two months after coming to office, the Clinton Administration—on the basis of faulty assumptions—made whopping cuts to the defense budget without any real analysis to determine feasibility or impact. The Bottom-Up Review was an exercise to devise a strategy and a force structure to fit a budget level that had been set already.

Partway through the process, the Administration floated a concept called "Win-Hold-Win," based on a capability to fight one regional conflict and conduct a holding action elsewhere. After several weeks of withering criticism and ridicule, Win-Hold-Win was withdrawn and the two-MRC strategy was put forward in June 1993.

The manipulation of numbers continued. Bottom-Up Review calculations, for example, prescribed twenty-four Air Force fighter wings for a two-MRC strategy and twenty wings for Win-Hold-Win. When the two-MRC force was announced in October 1993, though, it had twenty fighter wings. Within the year, the projected total of 184 heavy bombers was marked down to 100. That was a Win-Hold-Win force, no matter what label was pasted on it.

There's a movement to drop the two-conflict strategy in favor of a standard similar to Win-Hold-Win.

To make matters even worse, the emaciated defense budget would not cover such a force. It still won't. (An interesting sidelight is that John Hillen of the Heritage Foundation says that his proposal for a 1.5-MRC strategy would take substantially *more* forces and funding than are found in the present posture.)

There is no requirement that strategy be expressed in some specific number of conflicts. From 1961 to 1968, conventional force planning used a 2.5-war standard—simultaneous response to a Soviet/Warsaw Pact invasion in Europe, an attack by the Chinese in Asia, and a "lesser contingency" elsewhere. The lesser contingency, or "half war," was Vietnam. From 1982 to 1993, national defense strategy was not based on any explicit number of conflicts.

The two-MRC concept works reasonably well as a means for sizing the force and estimating resources required. Response to regional crisis is central to the strategy, but there are other missions, ranging from strategic deterrence to peacekeeping and counterproliferation. The two-MRC force must cover these missions, too, and also provide a margin against the unexpected. For that matter, it should not take a great deal of imagination for anyone who reads the newspapers to think of two places—or more—where significant trouble could erupt.

Retreat from the two-MRC standard would inevitably be taken to mean that the armed forces can be reduced even further. The reality is that current forces and budgets are not sufficient to carry out the present strategy. We might be obliged to cut more if the nation could not afford anything better, but in 1995 defense outlays were just 3.7 percent of the Gross Domestic Product. They will account for 2.7 percent of the GDP in 2002. The two-MRC strategy is unaffordable only if we want it to be unaffordable.

In Korea, Vietnam, and the Gulf War, US estimates of forces required were consistently low. Operation Desert Storm took a third more fighter forces than anticipated by Pentagon war plans. Any way you slice it, the right standard for sizing the force is appreciably more than one MRC. If it's not two, it's very close.

The arguments for changing the strategy are essentially economic, not military. The two-MRC standard was the least that the Administration could get by with in 1993. For the past three years, it has struggled to make a strategy based on that standard line up with insufficient funds. It won't work. It's time to recognize the budgeting for what it is—a mistake—and correct the problem in the only way that makes sense. ■

Letters

Lighter Than Gray

I am confused and distressed by "The Gray Threat" *[February 1996, p. 64]*. It is not clear to me what the purpose of the study was or what your objective was in publishing the article.

The Air Force Association's strong support of the F-22 is obvious and appropriate and does not need to embrace the scare tactics of a study devoid of meaningful and relevant facts drawn from ambiguous analyses. The analyses used in the study are empirical and employ parameters that are, at best, notional and are patently inappropriate as a basis for meaningful conclusions or decisions.

The statement "these European aircraft will be highly competitive with existing US fighters and future variants" is absurd. These European fighters (the not fully operational EF-2000, Rafale, and Gripen) incorporate technologies that were applied to the F-16 and F/A-18 twenty years ago. These "competitive" aircraft are simply catch-up fighters—technologically obsolescent by today's standards. They may be equal in some areas to earlier models but definitely are not superior to later models or to potential improvements and variants of current US fighters.

Inputs to the study were not only notional, some were inaccurate. F-16Cs flying today have engines capable of achieving more than 29,000 pounds of thrust—giving them a thrust-to-weight ratio of one-to-one, and the F-15E has only 58,200 pounds of thrust *[see "Misplaced Thrust," May 1996 "Letters," p. 5]*.

None of the parameters used in Figure 1 is a meaningful indicator of combat maneuvering capability—one of the measures of combat effectiveness. Wing loading is not a true indicator of lift and neglects drag at lift. Thrust loading also neglects drag effects and is measured under static sea-level conditions at a specific location—not representative of installed n-flight thrust. Angle of attack has meaning only if it can be controlled. . . .

The F-22 does not need any "honked up," contrived basis to justify its worth. Its worth is totally consistent with the tenet that we field our military forces with weapons that afford maximum essential effectiveness while putting their crews at minimum risk within responsible fiscal realities. Our air combat fighters, whether in the active forces or under development, are outclassed in only one area: an all-aspect air-to-air missile, such as the Russian AA-11/12. . . .

Harry J. Hillaker
Fort Worth, Tex.

■ *Mr. Hillaker, who retired from General Dynamics in 1985, was instrumental in the design of the F-16.*—THE EDITORS

What Happened to Powers?

Some errors in the letter by Col. L. Fletcher Prouty, USAF (Ret.) *["U-2 Shootdowns," April 1996 "Letters," p. 5]*, should be corrected. Most important, President Dwight D. Eisenhower *did* authorize Francis Gary Powers's overflight.

Plesetsk, the most important target of the mission, was so far north that lighting conditions were favorable only from April to September. Confirmation was urgently needed for information that had recently been received on possible installation of ICBMs there that could reach the continental United States. If the area were not photographed before the May 16, 1960, summit conference, the summit and the President's planned visit to the USSR would have delayed the flight beyond the season of good conditions.

Do you have a comment about a current issue? Write to "Letters," *Air Force* Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Letters should be concise, timely, and preferably typed. We cannot acknowledge receipt of letters. We reserve the right to condense letters as necessary. Unsigned letters are not acceptable. Photographs cannot be used or returned.—THE EDITORS

The President well knew the risks of losing a U-2 just before the summit and imposed an April 25 cutoff date. He extended it to May 1 because of bad weather in the target region. Weather delayed the flight to the last authorized day, but it was flown with Presidential authority and knowledge. President Eisenhower acknowledged as much to Premier Nikita S. Khrushchev at Paris, admitting that he had authorized the aerial espionage as "a distasteful but vital necessity."

Colonel Prouty apparently bases his comments only on CIA Director Allen W. Dulles's testimony to Congress, given just a few weeks after the event. It is probable that Dulles was attempting to protect the remaining secrets of a project that had explosively become public knowledge. Also, the US did not then have full information about the U-2 loss.

The truth emerged years later, after Powers was returned to US control and debriefed and other information was collated and declassified. The conjectured "mechanical malfunction" of Dulles's testimony was a preliminary interpretation of intercepted Soviet communications reflecting the confusion of their air defense system. They did not know at first that they had destroyed the U-2, and several surface-to-air missile (SAM) sites continued to fire, killing one of their own fighter pilots.

The SAM did not hit Powers's U-2 but exploded below and behind it. The U-2 was a fragile aircraft. Strength and weight had been sacrificed for range and altitude. The shock wave broke the right stabilizer. The plane flipped over, tearing off its wings. Because of the violent tumbling, Powers was unable to trigger the destruct mechanism and was barely able to escape.

Errors once committed to print are stubborn. I hope this letter will help to set the record straight: The CIA did not run a rogue operation, as Colonel Prouty implies, and Powers's U-2 was not brought down by a malfunction, but by an SA-2.

These facts came from *Operation Overflight*, by Francis Gary Powers

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Letters

with Curt Gentry, and *Dark Eagles,* by Curtis Peebles.

Maj. Edwin Frobisher, USAF (Ret.)
Lafayette, Colo.

As an Air Force U-2 pilot from 1963 to 1972, I have found the recent accounts regarding the "article known as the U-2," as many of us referred to that great airplane, highly interesting.

I found Colonel Prouty's letter in the April issue informative. I'm sure he was in a position to know details not available to some of us pilots. However, I question his statement that Powers's U-2 had not been shot down. Maybe, as Colonel Prouty wrote, "everyone in the Air Force" knows this, but it was not common knowledge in the 4028th Strategic Reconnaissance Weather Squadron, the only squadron flying the U-2 in the early 1960s.

Allen Dulles's statement quoted by Colonel Prouty was made before he or any other Americans had been able to talk with Powers. It reflects optimism based on best guesses and highest hopes. Statements about the invulnerability of the U-2 were instrumental in inducing President Eisenhower to approve such flights.

According to *Mayday, the U-2 Affair,* by Michael Beschloss, "the CIA and Joint Chiefs of Staff had 'assured' [President Eisenhower] that 'it would be impossible, if things should go wrong, for the Soviets to come in possession of the equipment intact—or, unfortunately, of a live pilot.' . . . The President had been advised that, in a crash, the U-2 would 'virtually disintegrate.' "

With all due respect to Colonel Prouty, I do not believe that we can discount the possibility that Frank Powers's U-2 was brought down by a Soviet SA-2 SAM, probably fired in salvo, perhaps from multiple launchers. This was how our squadron mate, Maj. Rudolf Anderson, Jr., was killed over Cuba in October 1962. Other U-2s were subsequently destroyed by SAMs over hostile territory.

It is possible that with the access provided by the breakup of the Soviet Union that the Soviet side of this story has been revealed. If so, it would be interesting to know how they think Powers's U-2 was downed.

Lt. Col. Ward G. Graham, USAF (Ret.)
Manns Choice, Pa.

Far from "clarifying" the circumstances surrounding the shootdown of Francis Gary Powers's U-2 on May 1, 1960, Colonel Prouty's letter seeks to perpetuate a long-discredited myth.

It is beyond all reasonable doubt that Frank Powers was shot down from his cruising altitude above 70,000 feet, when a Soviet SA-2 SAM, which had been fired at his U-2, exploded nearby and its debris penetrated the aircraft's thin-skinned tail and wings, rendering it uncontrollable.

To accept this explanation, you don't have to rely on Powers's autobiographical account, published in 1970, perfectly credible though it is. You don't have to rely on the CIA's Board of Inquiry in 1962 after Powers returned to the US. This board took note of the various speculative stories that circulated just after the shootdown before concluding that "the information on which [they] were based was erroneous or was susceptible to varying interpretations." Instead, just ask the Russians.

The Western intelligence community was given an accurate, uncensored Soviet version of the event as early as August 1960, when KGB Col. Oleg Penkovsky first made contact. He confirmed that an SA-2 had downed the U-2, but in their confusion Soviet air defenses had fired multiple missiles, one of which shot down one of their own MiG-19s.

The true story was finally revealed to the public on April 29, 1990, when the Soviet armed forces newspaper, *Red Star,* published an article commemorating the shootdown. Since then, further articles have been published in Russian newspapers and magazines, and participants from the Soviet air defense system have given interviews. These have amplified the details and are entirely consistent with Powers's account.

Maybe none of this will convince Colonel Prouty. He prefers to quote selectively from a preliminary assessment of the incident, given by CIA Director Dulles before any of the real facts were known. That assessment was based on communications intelligence intercepts of the Soviet air defense system. Because the Soviets themselves were confused at the time, it's hardly surprising that the illicit eavesdroppers in the communications intelligence posts could not unravel fact from fiction. In hindsight, Dulles was badly advised and should not have indulged in such idle speculation.

Incidentally, Colonel Prouty's assertion that the flight was "definitely against Presidential orders" because of the forthcoming Paris summit is

utter nonsense. Eisenhower's Staff Secretary, Gen. Andrew Goodpaster, wrote a memorandum for the record on April 25, 1960, noting that "after checking with the President" he had informed Richard Bissell of the CIA that "one additional operation may be undertaken," with the proviso that "no operation is to be carried out after May 1."

Chris Pocock
Uxbridge, UK

Two Views of the March Issue

I was dismayed by the March 1996 issue of *Air Force* Magazine. Once a fine publication serving the diverse needs of active and retired service personnel and those citizens who wish to stay informed on the issues of the Air Force, it has lost much stature through a change in literary style.

The March 1996 issue is composed largely of articles that could be considered filler. Forty-one of ninety-six pages were devoted to photo essays, the "Gallery of Russian Aerospace Weapons" (largely unchanged from year to year), and arts and charts pages. Serious issues in procurement, operations, personnel, and policy deserve better coverage than the magazine currently offers.

As a vehicle to assist the legislative process and garner public support, the current magazine is a mere shadow of the one that was published just ten years ago. . . .

Mark S. Bilas
Poland, Ohio

I just finished reading the March 1996 issue of *Air Force* Magazine, and, without a doubt, it is the most thought-provoking issue I have read as a member in more than thirty years! I spent hours going over four articles in particular: "New World Vistas," "Uncertainty on the Personnel Front," "Veterans," and the "DoD Senior Leadership" photochart.

With the changes occurring each year, the DoD Senior Leadership photochart is extremely useful for those of us not working regularly in the Washington, D. C., area. We need you to keep us informed. Your photochart does the job very well.

"Uncertainty on the Personnel Front" was illuminating. The impact of these realities, combined with the future technologies that are to be fielded (as discussed in "New World Vistas"), need to be reconciled. . . .

"New World Vistas" is the roadmap for the future of the Air Force. It is the vision needed by the leadership of the Air Force and industry as they lay the groundwork for future air warfare technology development.

AFA ought to advocate these initiatives in other feature articles, one of which might be to take the original "Toward New Horizons" document by Theodore von Kármán and map the future technologies predicted there in light of when they actually occurred. It might be very revealing. Compared to the technologies described in "New World Vistas," the "New Horizons" technologies seemed just as far out. . . . This seems to be a fertile area for charting the course of the future Air Force.

Finally, the statistical compilation on "Veterans" was sobering and especially thought-provoking. . . .

Col. Carl A. Forbrich, Jr.,
USAF (Ret.)
Rancho Palos Verdes, Calif.

Why Settle for Less?

Maj. Phil Ruhlman's comments in the April issue *["Look to the Future," April 1996 "Letters," p. 5]* are scary. They raise the specter of a "kinder, gentler, more politically correct" Air Force that settles for less than optimal combat capability. Yes, budgets are smaller, but much has been sacrificed in our ability to accomplish our job. Why should we settle for less than the best aircraft for any given job? In football, you don't send in the second string until the game is in the bag; why should the US military settle for anything less than maximum combat capability?

We have retired the F-4G without a true replacement. The High-Speed Antiradiation Missile Targeting System (HTS) is an interim gap filler, lacking the true "Wild Weasel" capability. While the F-16 may be more cost-effective in a number of categories, such as parts, reliability, maintainability, and number of crew, the F-16 with HTS will never replace the F-4G completely. That lost capability relates directly to the ability of other aircraft to operate and survive in a radar SAM threat environment. We cannot afford to give this mission to a less capable aircraft. That is part of the reason for the interest in the EA-6B for USAF—more combat capability.

In these times of tight budgets, maybe we should analyze our priorities and assess where the money can best be spent. Every mission has specific requirements to best accomplish it. The F-16 is currently king of the multirole fighters but lacks the wherewithal for many of these mission requirements. For each of the missions the F-16 is currently assigned, another aircraft is better able to perform it:

Interdiction: The F-15E carries

more payload, has a longer unrefueled range, and has two crewmen to share the work load. The same could be said of the F-111. Any joint force commander should prefer these airframes over an F-16 that carries only two Mk. 84s and requires tanker support to get to the target.

Counterair: The F-15C has a better radar, longer on-station time, longer-range missiles, and trains exclusively for this critical role.

Suppression of Enemy Air Defenses: The F-4G avionics systems are superior to HTS. The addition of an electronic warfare officer increases threat-assessment capabilities.

Close Air Support: The A-10 carries a much greater weapons load, has a longer on-station time, and has more practice at this mission. The Army surely doesn't want aircraft without experience hastily dropping ordnance close to them. While slow, the A-10 can effectively engage targets outside most threat ranges. . . .

I cannot accept the fact that in the next shooting war I'll be putting my neck on the line with less than the best support. To do my job—putting bombs on target—I need the best support possible, not just the "tools on hand." It comes down to money. Is it worth it to keep pilots from being shot down, captured, or killed? That will be a high price to pay.

Capt. Dale B. Larkin,
USAF
Tucson, Ariz.

On the Beech

The capsule summary on the Beech Mk. II on p. 38 of "Training Together" *[March 1996, p. 34]* is inaccurate. The $7 billion (budgeted) is for the system (including the Groundbased Training System), not just the aircraft (and is more realistically $4 billion). The "advances" (presumably over the T-37/T-34) you listed should have included anthropometrics, training effectiveness, and reduced operating costs and maintenance man-hours per flying hour.

Bill Douglas
International Planning &
Analysis Center
Arlington, Va.

A Scrounged F-51

I was surprised and pleased to see a color photograph of F-51D #FF-800 *["The Air War in Korea"]* on p. 68 of the April issue. The troops of the 18th Field Maintenance Squadron, under the leadership of Maj. Milt Tarr and Master Sergeant Shand, assembled this aircraft. It was rebuilt using scrap parts from the battle-damaged F-51s wrecked at Chinhae, South Korea.

The enlisted troops presented it to me on my birthday because, unlike the fighter squadron commanders, I did not have an F-51 with my name on it (hence the "Major Bill" on the canopy).

The black drop tanks were specially rigged to spray DDT over the air base—an added mission to fighter-bomber strikes on North Korea and ferrying scrounged aircraft parts from other air bases.

FF-800 was pristine, an outstanding example of unsung work by skilled, dedicated, ingenious USAF enlisted personnel. Thanks—now I have a color picture!

Col. Bill E. Myers,
USAF (Ret.)
Aurora, Colo.

Perkins in the Balkans

"The Air Force in the Balkans" *[March 1996, p. 26]* contained an error.

On p. 31, bottom left photograph, the individual shown is SSgt. Douglas Perkins, a C-130 loadmaster with the 50th Airlift Squadron deployed out of Little Rock AFB, Ark. The 50th AS flies the C-130H-3, the newest C-130 in the active-duty force. The 50th was deployed to Ramstein AB, Germany, from December 1995 to March 1996.

CMSgt. Rich Klindt, USAF
314th Operations Group
Little Rock AFB, Ark.

Reaching 100,000

The photo caption on p. 12 of the March issue *["Aerospace World"]* states that the 145th Airlift Wing, Charlotte/Douglas IAP, N. C., may have been the first operational unit to reach 100,000 consecutive accident-free flying hours in a C-130 Hercules.

On January 25, 1994, the 165th Airlift Wing, Savannah IAP, Ga., reached the milestone of 100,000 accident-free flying hours. As of mid-March, we had exceeded 107,000 accident-free flying hours.

Lt. Col. Ronald N. Speir,
Georgia ANG
Savannah IAP, Ga.

Memories of Whiteman

"With the First B-2 Squadron" *[April 1996, p. 36]* brought back fond memories of my tour at Whiteman AFB, Mo., from January 1, 1959, to mid-November 1960. . . .

Although I have not seen Whiteman AFB from the air, your picture of the town of Knob Noster and Knob Noster State Park was vivid—they look like they did when I was a member of the Whiteman team. I can just picture the B-47s and the KC-97s taking off.

Thank you for the memories.

Richard J. Russo
Casselberry, Fla.

Refreshing Heroism

With all the "Yankee go home" feelings being expressed on Okinawa and in Japan, specifically surrounding the rape of the young girl on Okinawa, it was refreshing to read "Everyday Heroes" *[February 1996 "Aerospace World," p. 15]*, which described how Capt. Timothy Finnegan saved a toddler on Okinawa and how SSgts. Gary Duclo and Neri LaMadrid rescued a six-year-old in Japan.

MSgt. Donald D. Stockton,
USAF (Ret.)
Hanover, Md.

Knowing Tuzla From Taszar

Members of the staff of the Air Traffic and Airfield Services Division at Hq. Air Combat Command read "RED HORSE of the Balkans" *[April 1996, p. 30]* with great interest. ACC has deployed air traffic controllers, airfield managers, and equipment to the region to support air operations there. Jim Hunter, ACC's Air Traffic Control and Landing Systems (ATCALS) manager, immediately noted an error in one of the photos that accompanied the article.

The top photo on p. 34 does not depict air operations in Tuzla, Bosnia-Hercegovina, as captioned, but rather Taszar, Hungary. The ATCALS pictured, or rather *not* pictured, gave away the location. The mobile radar system in the photo is ANG's AN/MPN-14K mobile radar approach control (RAPCON) deployed in Taszar. In Tuzla, the 3d Combat Communications Group (ACC) furnished an AN/TPN-19 mobile RAPCON to provide air traffic control radar services.

Maj. William A. Malec,
USAF
Langley AFB, Va.

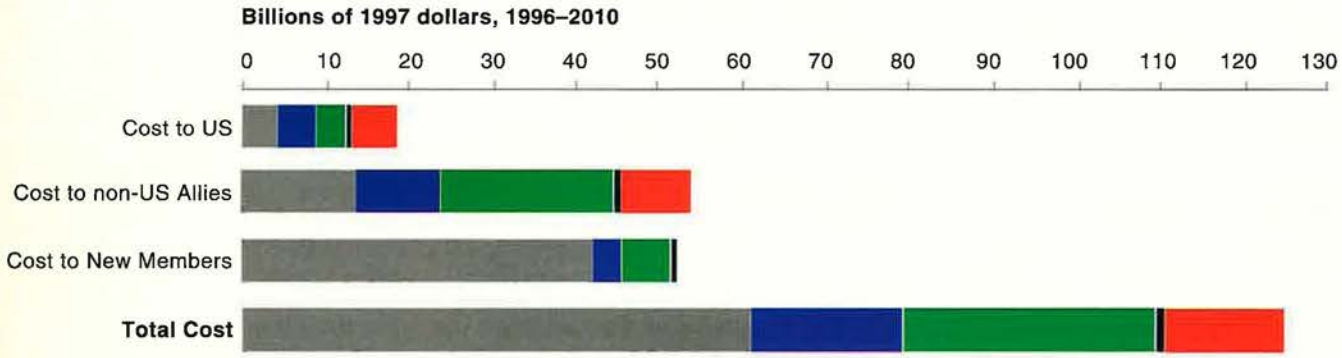
Errata

In the April 1996 "Letters," retired Army Brig. Gen. Neal M. Gertz's branch of service was incorrectly stated, and, contrary to what was printed in "Valor: A CAP for the Sub Threat," Germany and Italy did not declare war on the US until December 11, 1941. We regret the errors.

The Chart Page

By Tamar A. Mehuron, Associate Editor

For NATO, the Expense of Expansion



Five Options for the Eastern Flank
(Billions of 1997 dollars, 1996–2010)

	Defense Options	Cost to US	Cost to non-US Allies	Cost to New Members	Total Cost
1	Enhance local defense; facilitate NATO reinforcement	$4.8	$13.8	$42.0	$60.6
2	Project NATO airpower eastward to defend new allies	4.6	10.3	3.6	18.6
3	Project power eastward with Germany-based ground forces	3.6	20.3	6.2	30.1
4	Preposition NATO stocks on territory of new allies	0.3	0.9	0.1	1.2
5	Forward-deploy limited NATO forces in new NATO area	5.5	8.7	0	14.2
	Cumulative implementation costs	**$18.9**	**$54.0**	**$51.8**	**$124.7**

A recent Congressional Budget Office study examined the fiscal consequences of extending full NATO membership to four likely new Alliance entrants—Poland, Hungary, Slovakia, and the Czech Republic. CBO's study looked at five defense options and estimated their costs over the period 1996–2010.

Under Option I, each new NATO member would be made ready to handle a limited border incursion, possibly with NATO reinforcement.

The next four options address, in escalating terms, the requirements for defense against a resurgent Russia. Option II adds temporarily deployed NATO airpower to the local forces. Option III calls for deployment of NATO ground troops on a temporary basis. Option IV entails permanent prepositioning of equipment near air bases for use by fast-deploying NATO forces. Option V envisions the permanent stationing of Allied forces in the new NATO states.

Source: Congressional Budget Office, "The Costs of Expanding the NATO Alliance," March 1996. Costs for options after the first option are incremental. Numbers may not sum to totals because of rounding.

Capitol Hill

By Brian Green, Congressional Editor

Sam Johnson's Perspective

The former Air Force fighter pilot says the military structure is both fat and lean—but not necessarily in the right places.

REP. Sam Johnson, retired USAF fighter pilot, former prisoner of war, and currently Republican Congressman from north Dallas, Tex., is what many consider a rarity on Capitol Hill—a man who wants to do the right things for the right reasons. In a recent interview, he acknowledged, "I've probably got less fear of the system than most guys I see around here."

Toughness and the values learned in Air Force service permeate the views of Mr. Johnson, a veteran of the Korean and Vietnam wars who retired at the grade of colonel in 1979. After his F-4 was shot down April 16, 1966, he spent almost seven years in North Vietnamese prison camps, during which time he fiercely resisted Communist torture and other efforts to break his will and force him to betray his country. He never did write a "confession."

Mr. Johnson voiced concern that the military is facing major weapon modernization problems. The difficulty, he concluded, has been aggravated by poor leadership in the Administration and Congress, where a lack of military experience prevents informed judgment. "That's the problem you've got up here in Congress," he noted. "The interest level is pretty low, unless they've been in the military before. It's hard to emphasize the fact that our weapon systems are getting old. You've got to start replacing them with new equipment. It's a tough nut."

This lack of interest, Mr. Johnson argued, leads to poorly focused modernization projects. He noted Navy budget successes in Congress and attributed them to the wide distribution of Navy ports and other facilities—and jobs—around the nation. "Those things have an effect because there are guys . . . who don't care about whether the military is strong or weak," he said. "They're just interested in putting dollars into their states. . . . That's the wrong reason to vote for something."

As a result, said the Congressman, "our military structure is fat *and* lean. . . . There are places it ought to be strong and it isn't, and there are places you don't need it, and it's strong." The Texas lawmaker said Congress inappropriately "second-guessed" the Defense Department and the services when it added unrequested money for the B-2 bomber and *Seawolf*-class submarine.

In Mr. Johnson's view, the Administration is not helping matters and lacks a coherent plan to modernize military systems. He described today's Pentagon leadership as "pretty weak" but saved his heaviest criticism for President Clinton.

"The President has no idea what he's doing," charged Mr. Johnson, and has "no background to draw upon to base a military decision, whether it's procurement or operational."

He went on, "These decisions, . . . whether it's more B-2s or submarines, are totally political, because of where they're built. The decision [to recognize Vietnam] is business. . . . You've got a guy who responds to political and business things rather than . . . right and wrong."

Weak Pentagon leadership, Mr. Johnson claimed, has badly damaged the Navy. "I think we still have need for carriers," he said, "but the Navy's messed up its airplane procurement something awful."

He explained, "All they've got left is the [advanced] F/A-18 now coming on board and that's a lightweight airplane that can't go very far and can't carry very much. They're trying to make an air-superiority fighter as well as an attack bomber out of it."

Mr. Johnson charged that such an approach amounts to a repeat of "the McNamara concept," meaning the penchant of former Secretary of Defense Robert S. McNamara to try to get "one airplane to do everything."

The Texas Republican is a strong supporter of the F-22 fighter, USAF's next-generation air-superiority fighter. "It's a great airplane," he stated, noting that by the time it is deployed in significant numbers, the F-15 (USAF's current air-superiority fighter) will have been around for more than thirty years.

Representative Johnson worries about the institutions that pass down the military values he holds in such high regard. He expressed dismay over recent problems at the US Naval Academy in Annapolis, Md.—problems that allegedly included car theft, robbery, sexual assault, and drug violations. "It's amazing to me that . . . those things occur and keep occurring," he said.

He speculated that some of the problems at Annapolis may stem from civilian instructors who lack military experience.

Mr. Johnson also expressed support for some sort of mandatory military service, although he concedes that his is a minority view. "Military service in particular, but other service to the country, too, gives a sense of discipline you can't get anywhere else," he argued.

He attributed recent controversy at the Smithsonian Institution's National Air and Space Museum to a lack of informed perspective on the military among its leaders and employees. Mr. Johnson played a key role in resolving the controversy over the museum's proposed display of the *Enola Gay,* the B-29 that dropped the atomic bomb on Hiroshima. The exhibit, as originally prepared, impugned US motives and portrayed the Japanese as victims. He led the charge in Congress to pressure the museum to put on a balanced presentation.

Mr. Johnson noted that Smithsonian Secretary I. Michael Heyman has a military background and has improved the atmosphere at NASM. "I think the *Enola Gay* display turned out pretty well in a revised form," he said. Museum leaders, said Mr. Johnson—now a member of the Smithsonian Board of Regents—have learned a valuable lesson. "I hope they don't forget," he said. "We aim not to let them." ■

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Washington Watch

By John A. Tirpak, Senior Editor

The Aging of the Fleet

The average age of USAF aircraft is rising steadily. With careful management, service leaders believe, they can operate the oldest fleet ever safely and effectively.

EVEN if Congress funds all the new airplanes now on the books, the Air Force will continue to see a steady increase in the average age of its flying machines for decades to come. Keeping old warbirds not only safe to fly but also effective for combat is among the top challenges facing USAF on the eve of the twenty-first century.

According to Defense Secretary William J. Perry's 1996 Annual Report to the President and Congress, the average age of USAF fighter and attack airplanes is now ten years. That compares favorably with the service's 1980s goal of maintaining a fighter and attack airplane average age of twelve years.

However, that low figure stems from the retirement of such 1960s- and 1970s-vintage airframes as F-4Gs and F-111s. From now until 2005, the bulk of the USAF fighter fleet will be composed of F-15s and F-16s built in the 1980s, and only a handful of new models will be bought to offset attrition. The twelve-year standard, moreover, has been discarded.

Only when the F-22 begins entering the fleet in significant numbers—anticipated for 2005—will the fighter/attack inventory break a nine-year rise and level off at an average age of just under twenty years per airplane. The average won't start down again until 2010—and only if the Joint Strike Fighter program begins delivering airplanes on time that year.

Dealing with old airplanes is nothing new for the Air Force. USAF's B-52Hs and C-135s both average about thirty-four years of service. The C-141 Starlifter fleet is not far behind, with nearly thirty years of duty, and the C-130 fleet averages almost a quarter-century. The Air Force calculates that the active inventory average age per airplane is 17.8 years; the Air National Guard average is 15.9. The figure for the Air Force Reserve is 19.3. This overall average is climbing steadily.

"We have never tried to manage a fleet this old," noted Dr. Eugene E. Covert of the Massachusetts Institute of Technology. Dr. Covert chaired an Air Force Scientific Advisory Board (SAB) review of the issue last year, a study that yielded a classified report titled "Life Extension and Mission Enhancement for Air Force Aircraft."

Many Air Force airplanes are serving "long past their design life," Dr. Covert said, but he sees "no reason to believe there's a crisis" in fleet safety or capability because of airframe age alone.

"Commercial aircraft are flying with 60,000-plus hours and [with more than] 45,000 takeoffs and landings," he pointed out. Such aircraft require increased attention and spare parts, he acknowledged, but he added, "If it weren't safe or cost-effective to fly airplanes that long, it wouldn't be profitable, and [the commercial carriers] wouldn't be doing it."

By comparison, he said, the Air Force flies similar airplanes "about a thousand hours a year" each, meaning that "they have a lot of life left in them."

Metal fatigue is the number one issue facing the commercial carriers, while corrosion—from long exposure to the elements—is the chief nemesis of Air Force "heavies," Dr. Covert said.

Though he could not discuss the findings of the SAB study in detail, he summed them up by saying "as long as you stay on top of it," the additional care needed by older aircraft "is manageable." But, Dr. Covert added, the SAB also determined that "the problem is not as well understood as it ought to be, and we probably better find some more money to deal with it."

Dr. Covert offered the C-141 airlifter as an example of the United States not managing an aging military airplane well. The venerable Starlifter was left to languish without careful attention to developing "age spots" in the late 1970s and early 1980s, mainly because the Air Force assumed that C-17s would soon be joining the inventory in large quantities and that the C-141 would soon be phased out.

Delays in the C-17 forced the C-141s to continue operating under a punishing load—including a stressful year building up to and carrying out the 1990–91 Gulf War—and led to huge numbers being grounded for stress fatigue, cracks, and corrosion.

The problem was "caught," Dr. Covert said, because Gen. Ronald R. Fogleman—then head of Air Mobility Command (AMC), now Air Force Chief of Staff—"directed [that] the appropriate resources [be applied] to deal with it." The C-141, Dr. Covert noted, is "by and large in better shape now than it was in the last fifteen years."

General Fogleman described the C-141 as a "textbook case" of "what happens when you don't pay attention to airplanes as they age."

Getting It Right

The B-52 is an example of where the Air Force got it right, Dr. Covert said.

The leaders of Strategic Air Command "did a great job managing the B-52," he said. "They took care of the engines, and when the time came, reskinned the wings." If the Air Force continues to take an active, aggressive approach, "it shouldn't be a problem" to keep the B-52s in service up to their currently planned retirement in the 2030s, when the bombers will be more than seventy years old, he said.

Despite their chronological age, B-52s and KC-135s spent much of their careers until now "sitting alert" and not accumulating tens of thousands of stressful flying hours, making them technically "younger" than some more recent types. But a change in their

use could accelerate the aging process, Dr. Covert said.

Airframe-life specialists are also determining, however, that airplanes that "just sit . . . often corrode more than airplanes you fly all the time," according to James L. Rudd, who leads the Aging Aircraft Customer-Focused Integrated Product Team (CFIPT) for Air Force Materiel Command (AFMC) at Wright Laboratory, Wright-Patterson AFB, Ohio. Especially if left in a warm, humid, and salty environment—Andersen AFB, Guam, or Hurlburt Field, Fla., for example—airplanes can corrode much faster than those in other locales.

General Fogleman said he believes that the aging aircraft issue is getting the attention it deserves at the highest levels of the service.

"I think we're more prepared today—and will be in the future—to handle the issue of aging airplanes than we were in the past," the General said. "There's a higher level of understanding and knowledge about the dynamics" of how airplanes are stressed under various conditions and what it takes—technically and financially—to keep them airworthy.

However, General Fogleman added, " 'Aging aircraft' is a term that people want to associate with big airplanes" because the "thirty-plus-years airframes have gotten a lot of attention. . . . The fact of the matter is, in the era that we're living in, 'aging aircraft' takes on a new significance when you've got to look at keeping fighters in the inventory twenty-five to thirty years."

The small numbers and rapidly increasing age of the fighter/attack force are unprecedented in USAF's history, and General Fogleman said the Air Force leadership is keenly aware that fighters endure much more stressful operating conditions than large airplanes, which don't do heavy maneuvering.

"We're very cognizant" of the unique circumstances facing the fighter/attack inventory, he said, adding that budget constraints rule out fixing the problem by simply buying new airframes.

"We've got to . . . keep our fighter force alive . . . through the year 2010," said General Fogleman. To do it, the Air Force has "put in place . . . monitoring programs, maintenance data collection programs, . . . things that we didn't have twenty to twenty-five years ago," he continued. "We've put a lot of effort into this."

The monitoring programs collect information about where airplanes tend to be stressed and whether the fatigue is something tolerable or must be addressed by a strengthener or fix of some kind. But it is understood that fighters cannot be kept "like new" indefinitely.

"Little by little, all the airplanes develop problems as they age," Mr. Rudd said. "We've had five review teams this year," teams that make in-depth, multidisciplinary, multidepartment studies of specific airplanes that are starting to show their age or are becoming "more and more expensive" to maintain properly.

The Air Force is aware that budget constraints rule out fixing the problem by simply buying new airframes.

"Unique" problems, he added, were found in each airplane type reviewed this year—including the KC-135, C-141, B-1B, F-16, and C-130.

The CFIPT works with the various major commands and AFMC's Air Logistics Centers (ALCs) to "find out what the customers need from us, . . . so we're pushing in the right directions" to provide technologies that can help keep the airplanes flying, Mr. Rudd said.

In addition to the strain of dogfight maneuvers, fighters and bombers experience other stresses not shared with transports or station-keeping airplanes, he noted.

"There are severe dynamic loads on twin-tail fighters, there's the oscillation of stores hanging on weapon stations, and there's the acoustic stress of the air blowing over an open weapons bay," he said. Some of these are "just beginning to be understood."

In the case of the F-16, use has been "far more severe" than originally expected and rougher than the airplane was designed for, Mr. Rudd noted. Alternating between dogfighting and low-level ground-attack missions has caused tremendous stress on key components.

"The load paths are putting more loads into certain areas" that weren't expected to endure such high strain, he said. The fuselage bulkheads are cracking under the fatigue of repeated high-G loading.

AFMC's Aeronautical Systems Center (ASC), also based at Wright-Patterson AFB, is working on various fixes, "including doublers, patches, . . . all the way to redesign of the bulkhead," Mr. Rudd noted.

But he also said that no airplane can be built to take all the stresses being inflicted on today's fleet.

"You don't want to design an airplane so it never has a problem," he said. The weight of building break-proof structures would mean "you'd never get it off the ground."

Performance vs. Durability

USAF, he said, has a "damage-tolerance design philosophy," which trades off performance for durability and vice versa to get the best balance of combat airplane possible. This philosophy depends on designing structures to last "only as long as they need to," which translates to a design life. The F-16 was designed to hold up under heavy stress for 8,000 hours and is now being asked to make it to 12,000.

The F-16 is also one of the first airplanes to make widespread use of composites, and there is still a lot to learn about how composites hold up under long use, Mr. Rudd said.

Though many are made of nonmetallic materials, "composites can actually corrode" if the graphite fibers in them are in contact with corroding metal, he noted. The big challenge with composites is detecting "low-velocity impact damage . . . where some guy drops a toolbox" on a composite part, causing delamination deep inside the structure without any betraying surface faults.

Composites also see use as patches on metals and on other composites, and their useful life expectancy is still "a hard thing to predict," Mr. Rudd admitted. "The analysis techniques for composites are not as far along" as in metals research, he said.

It is difficult to quantify just how much money is being spent on technologies that will keep aging aircraft aloft, Mr. Rudd acknowledged. The funding is scattered among Defense Department, FAA, and NASA projects. In DoD, the money is distributed among the basic, exploratory, and advanced development accounts and under the Air Force Office of Scientific Research.

The departments share the labor and their findings, so the lessons learned can be distributed throughout the commercial and military aviation communities.


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For instance, Mr. Rudd said, the FAA is in charge of investigating fuselage fatigue, while USAF has responsibility for wings.

"What we do is try to transition the technology from the labs to the ALCs," Mr. Rudd said. His shop coordinates new applicable technologies then tries to turn them into low-cost processes, techniques, or equipment that can directly search for problem areas or fix them.

"Corrosion is the hardest problem," he said, because it remains impossible to predict. A "significant amount" of funding is being applied to developing models or predictive methods that can indicate when and where corrosion will occur.

Other innovations are taking place in radiographic procedures, in which parts are X-rayed, and in acoustic testing, which can locate stress zones or cracks.

Research thrusts center on structural integrity, avionics and propulsion, subsystems, and nondestructive evaluation and inspection (NDEI).

NDEI holds promise for both cost-effectiveness and safety because the technologies created will make it "unnecessary to do some disassembly that is too expensive and time-consuming to do very frequently," Mr. Rudd noted. A nondestructive procedure pays off by reducing the time required for an overhaul—getting the airplane back in service faster—and increasing the number of times an inspection can be performed, which increases the odds of finding serious problems in their infancy.

In the "subsystems" category, technical orders are being revised to require inspections of parts that were never inspected before because, when the airplane was built, it was assumed the airplane would wear out before the part did.

"Look at the design assumptions," said Anthony J. Wall, director of Engineering in ASC's Aircraft Program Support Office. "If you had a fuel pump that had a design life of 50,000 hours, and the airplane had a design life of 25,000 hours, then no one has looked at it before. And we are starting to . . . go through the original blueprints looking for those kinds of things. . . . I think we catch most of them."

Though "there's a good paper trail" at ASC that can help identify such parts and subsystems, "it's not a consistent one," and the records might be scattered among the ALC and the manufacturers. "In some cases, the factory is out of business," Mr. Wall noted.

To better monitor structural integrity, Wright Laboratory is developing sensors to detect corrosion, stress fatigue, or cracks and alert maintenance crews who otherwise might not catch a problem until a more thorough periodic inspection.

It's important not to lose sight of when it's necessary to stop patching up an old warplane and move on to a new system.

The CFIPT also is working on a family of predictive models that will enable AMC to do a "life assessment" on the KC-135 in 2000 to see how much longer the old tankers can remain in service, Mr. Rudd noted.

"We will hand them an analysis tool," which may be applicable to other airplanes as well, he said. The Stratotanker suffers mostly from corrosion stress and crevice corrosion, which can only be "ground out and patched so many times," he pointed out. AMC wants to keep the KC-135 in service until about 2040.

Replacing Old Parts

Not all of the aging aircraft initiatives focus on patching or reinforcing. Some parts simply have to be replaced, such as old, worn-out, or obsolescent items, including those using transistors or primitive computers. There are also initiatives under way—such as developing a battery that can go twenty years without maintenance—to reduce maintenance needs so that man-hours can be spent on critical repairs instead of avoidable routine. Labor-intensive systems, such as hydraulic actuators, can be replaced with highly reliable electric models. The time and money these initiatives could save can defray the expense of repairing or rehabilitating structural components, such that maintaining an old aircraft need not become prohibitively expensive.

In the case of old engines, technologies are being explored that can reduce or eliminate high-cycle fatigue. The use of a fuel called JP-8 +100, which burns at 100° hotter than regular JP-8, can cut down the amount of residue left in an engine, reducing failures and maintenance. Corrosion-resistant bearings are being developed that can provide similar benefits.

Mr. Rudd says there is no "bow wave" of structural or obsolescence problems facing the Air Force's aging fleet in the outyears.

"I don't think we'll have any major surprises coming down the road," he said. "To be honest, I think we're getting a pretty good handle on it."

General Fogleman said that while maintaining "legacy" systems is important, it's also important not to lose sight of what capabilities are truly required and when it's necessary to stop patching up an old warplane and move on to a new system.

"Quite frankly," said the General, "I'm not so sure that we're not spending more money on [modifications] than we ought to be. We may have to be more ruthless about cutting off upgrades to certain systems sooner. . . . I can only continue to upgrade something so long. And I ought to cut my losses at some point."

For the next five years, he said, "I think we're going to whip anything that's out there with what we have, basically," and the Air Force can afford to forgo some improvements in order to apply the funds to needed modernization.

Why, he asked, should the Air Force "pump $4 million a copy, say, into upgrading F-15Cs and Ds if, in fact, I'm going to replace them starting in 2005 to 2010?" While "everybody would like to have an upgrade," he said, "I really need to go look at that, look at that hard. . . . If I can't afford the next airplane because I'm spending too much money [on the existing one], then I'm being very shortsighted."

Nevertheless, a lot of today's inventory is going to be around for a long time, General Fogleman acknowledged, and he believes that the tools are in place to keep them capable.

"What was a big problem in the past," such as on the C-141, "will be a manageable problem in the future. At least, that's what we're betting the future on, anyway." ■

Aerospace World

By Suzann Chapman, Associate Editor

USAF Rejects F-22 Slip

Gen. Ronald R. Fogleman, Air Force Chief of Staff, warned Congress that a proposed delay in F-22 fighter production would cause a dramatic cost increase and that the Air Force opposes it.

He was reacting to legislation introduced by Sen. Dale Bumpers. The Arkansas Democrat, citing a Navy intelligence report that the nonstealthy F/A-18E/F Super Hornet will be uncontested until 2015, proposed to delay F-22 production by five years. He said this would offer low risk and would save $6 billion.

However, General Fogleman told the Senate Appropriations Defense Subcommittee April 17 that such a slip would actually add between $8 billion and $10 billion to the cost of the fighter program. He said that nine-tenths of the money initially saved by slipping the F-22 would be eaten up by extending the service lives of aging F-15 fighters.

The General added, "It becomes a self-fulfilling prophecy that the aircraft becomes too expensive to buy."

Secretary of the Air Force Sheila E. Widnall pointed out that the Navy's new F/A-18E/F uses existing technology, while the F-22 would represent a major leap forward. General Fogleman offered to provide an Air Force intelligence review supporting their views.

Far from agreeing with Senator Bumpers, Subcommittee Chairman Sen. Ted Stevens (R-Alaska) said Congress would accelerate the F-22's initial operational capability if possible.

CT-43 Crash Claims Six Airmen

Six Air Force members were killed April 3 when their CT-43 passenger jet, which was carrying Commerce Secretary Ronald H. Brown, crashed into a rocky hillside near Cilipi Airport at Dubrovnik, Croatia.

The crash claimed thirty-five lives—the Air Force members, Secretary Brown, and twenty-eight others, including Commerce Department officials, American business leaders, and two Croatians. Secretary Brown and his group were on their way to a meeting in Dubrovnik to discuss ways to rebuild the region's economy and infrastructure.

The aircrew members all were assigned to the 76th Airlift Squadron, 86th Airlift Wing, Ramstein AB, Germany. They were: Capt. Ashley J. Davis, aircraft commander, Baton Rouge, La.; Capt. Timothy W. Schafer, copilot, Costa Mesa, Calif.; TSgt. Shelly E. Kelly, steward, Zanesville, Ohio; TSgt. Cheryl A. Turnage, steward, Lakehurst, N. J.; SSgt. Robert Farrington, in-flight passenger services specialist, Brierfield, Ala.; and SSgt. Gerald V. Aldrich, flight mechanic, Louisville, Ky.

The Air Force, the National Transportation Safety Board, and the FAA are investigating the accident. It was the first crash of a USAF T-43 since the aircraft entered the Air Force inventory in 1974. *[See "Flying Safety: The Real Story," p. 56.]*

Photo by Paul Kennedy

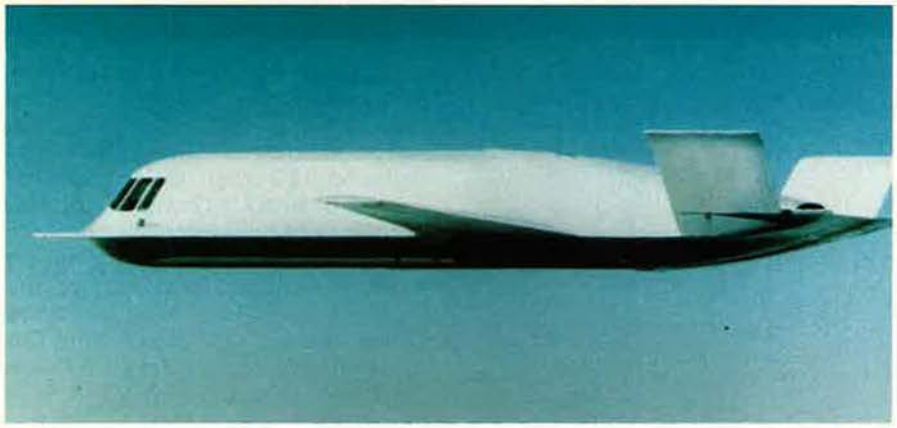
These master sergeant (left) and airman (right) stripes demonstrate the startling contrast between the brighter, more prominent new versions and the subdued-looking older versions. The wear date for the new stripes is October 1, 1997.

The Rush for Bolder Stripes

Air Force enlisted members in increasing numbers have opted for the new larger and brighter chevrons—prompting USAF to accelerate the date for mandatory wear of the new stripes. All enlisted troops must be wearing the new chevrons by October 1, 1997, two years earlier than originally planned.

According to Air Force personnel officials, sale and distribution of the old-style chevrons dropped significantly after November 1994, when the Air Force reversed its policy prohibiting wear of new stripes on the old service dress uniform. Until then, new chevrons could be worn only on the new uniform, which is still not mandatory until October 1, 1999.

The new stripes were unveiled in December 1991 by Gen. Merrill A.



17 that he believes the GAO analysis has several flaws.

For instance, said General Viccellio, GAO did not take into account the increase in production overhead at the remaining depots if they received additional work loads and had probably underestimated the cost to relocate the work.

Tests Validate F-22 Components

F-22 program officials believe Pratt & Whitney engineers have solved the flutter and high stresses observed in the F119 engine's hollow fan blades during early testing.

McPeak, then Chief of Staff, along with a proposed new streamlined service dress uniform. Besides its adoption of the bolder enlisted chevrons, the new look sported sleeve braid rank for officers.

The officer sleeve rank has not survived. The current Chief of Staff, Gen. Ronald R. Fogleman, reversed the policy on officer rank because of a lack of acceptability, but he kept the new and apparently popular enlisted chevrons.

In addition to having a brighter look, the new chevrons feature a return to central stars for all enlisted ranks. They also have stripes above and below the star to distinguish the top three enlisted ranks—master sergeant, senior master sergeant, and chief master sergeant.

Outsourcing Plan Takes Heat

Deputy Defense Secretary John P. White on April 4 announced details of the new Pentagon outsourcing initiative, citing the potential to save billions of dollars. However, the General Accounting Office, a Congressional watchdog agency, quickly cast doubt on the numbers, and many Congressmen cried "foul."

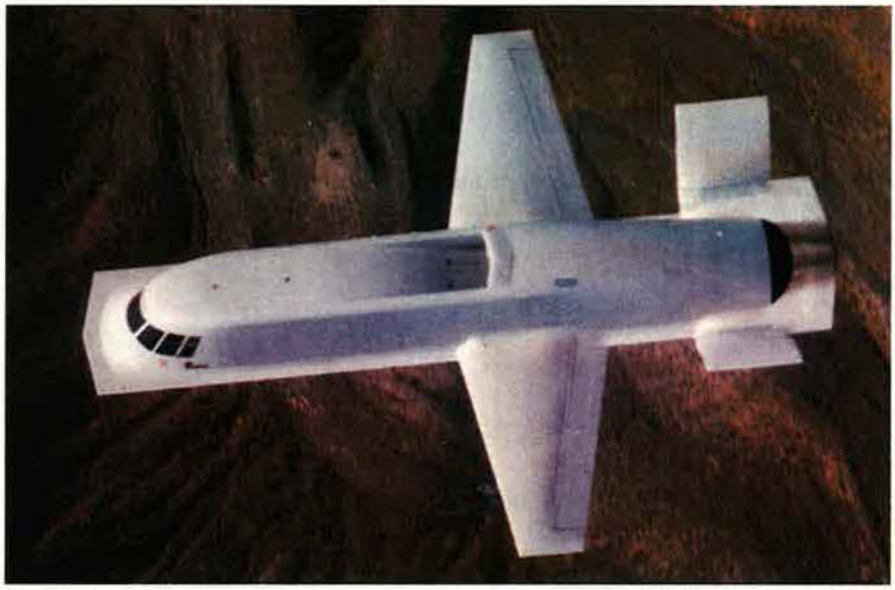
Outsourcing—the transfer of a function previously handled in-house by DoD workers to an outside provider—has already reduced annual operating costs by thirty-one percent, according to a DoD report, "Improving the Combat Edge Through Outsourcing." The report states that, from 1978 to 1994, the services have saved about $1.5 billion annually.

Mr. White said that, based on the record thus far, savings from new outsourcing opportunities could run into the billions. He emphasized, however, that the services had not completed their analyses.

GAO reported to Congress that DoD's policy "signals a clear intent to shift work loads to the private sector" and could, if not effectively managed, cause further underutilization of remaining government depots. DoD projects about a fifty-fifty split between the public and private sectors. GAO's analysis predicts a thirty-seven–sixty-three split favoring private contractors.

GAO and some Congressmen also took exception to the Clinton Administration plan to privatize-in-place the functions of USAF depots in Sacramento, Calif., and San Antonio, Tex. The GAO analysis indicated that the plan will prove more costly than closing the military installations as directed by the 1995 Base Realignment and Closure actions and transferring the work loads to other government depots.

Gen. Henry Viccellio, Jr., commander of Air Force Materiel Command, told the Senate Armed Services Readiness Subcommittee April



Tacit Blue, forerunner to today's stealth technology, shed its "supersecret" tag April 30, as the Air Force unveiled the $165 million program under contract to then–Northrop Corp. from 1978 to 1985. The single aircraft constructed (a second airframe shell served as backup) made 135 flights, beginning in February 1982. It had a 48.2-foot wingspan, was 55.8 feet long, and weighed 30,000 pounds. It is now on display at the US Air Force Museum in Dayton, Ohio.

Although hollow fan blades are used in some new commercial airliners, the early tests cast doubt on their applicability to fighter aircraft.

Use of the hollow fan blades reduces the weight of the F119 by seventy pounds, thus dropping 140 pounds from the F-22's overall weight.

According to Aeronautical Systems Center (ASC) program officials at Wright-Patterson AFB, Ohio, Pratt & Whitney engineers used a sophisticated computer-modeling technique to determine that the problems were caused by airflow disturbance over the fan blades' inlet guide vanes, which channel air into the engine's first stage. They then tested a taped inlet guide vane in Wright Laboratory's joint technology demonstrator engine. It eliminated the airflow disturbance.

The engineers developed a more permanent, flight-capable, mechani-

Lockheed photo by Denny Lombard

The Tier III Minus DarkStar unmanned aerial vehicle completed a successful, twenty-minute first flight March 29, then crashed on its second flight April 22. (See "DarkStar: First Flight and First Crash," below).

cal seal based on one used in some Pratt & Whitney commercial engines. That seal was tested successfully on the F119 at USAF's Arnold Engineering Development Center, Arnold AFB, Tenn.

"We now have every confidence that F119 hollow fan blades will perform to design expectations," said Capt. Charles Sherwin, ASC's F119 Compression System project manager.

New Composite Process for F-22

The Boeing Co. recently credited the team of Dow Chemical Co. and United Technologies Corp. with successfully using a new process, which will save an average of $250,000 per aircraft, to create the first set of complex parts for the F-22 wing.

Dow-UT used the Advanced Resin Transfer Molding process on the initial set of forty-four wing parts, called sine wave spars. The process, using carbonfibers to reinforce epoxy and other resins, provides greater quality, increased production rates, and an ability to manufacture more complex parts than in the past, according to a Boeing news release.

A Boeing official said that the projected savings from the Dow-UT process were compared with the cost for hand lay-up of composites for an anticipated buy of 438 F-22 aircraft.

DarkStar: First Flight and First Crash

The Tier III Minus DarkStar unmanned aerial vehicle made its first successful flight March 29. Then, on its second flight, April 22, the UAV crashed on takeoff at Edwards AFB, Calif.

Manufactured by Lockheed Martin Skunk Works and Boeing Defense and Space Group, the UAV on March 29 reached an altitude of about 5,000 feet and completed programmed, basic flight maneuvers, said Maj. Mark Mattoon, flight test director. He said the flight was flawless.

Software and hardware problems had delayed the program for some time.

The stealthy UAV was destroyed in the April 22 crash. It was under the control of NASA's Dryden Flight Research Facility at Edwards.

The Advanced Research Projects Agency manages DarkStar for the Defense Airborne Reconnaissance Office, but the Air Force's Joint Endurance UAV System Program Office at Wright-Patterson AFB, Ohio, is to take over the program on completion of the flight tests in September 1997.

DarkStar, which has a short, disk-shaped body and a sixty-nine-foot wingspan, is expected to complement the Tier II Plus aircraft, which also provides tactical reconnaissance data.

Congress Wants More C-17 Savings

Debate continues on the Air Force's proposed seven-year C-17 purchase plan. USAF's agreement with McDonnell Douglas would provide a five percent savings of about $900 million. However, the typical five-year plan traditionally has provided about a ten percent savings.

The top Air Force civilian and military leaders defended the seven-year proposal in Congressional testimony April 17. USAF Secretary Widnall called the plan a "sound business decision."

However, McDonnell Douglas had made a second proposal for a six-year purchase plan that would save

Photo by Dave Faylinger

Army Secretary Togo D. West, Jr., Navy Secretary John H. Dalton, and Air Force Secretary Sheila E. Widnall (left to right, standing) experienced "battle management" up close in March as they flew aboard a USAF E-3 Airborne Warning and Control System aircraft in the finale to a joint planning conference.

an additional $330 million. When queried on that plan, Air Force Chief of Staff General Fogleman said the service is not sure it could meet the necessary funding time line.

At issue is more than $400 million for Fiscal 1998 that the General said might not be available. "Whereas within the seven-year multiyear [plan], all the funds required are currently within the top line," he said.

First C-17 Arrives at Altus

General Fogleman delivered the first C-17 Globemaster III to be based at Altus AFB, Okla., to the 97th Air Mobility Wing March 23. The base, which will receive nine of the new airlifters over the next two years, will conduct all C-17 training for the Air Force.

At the arrival ceremony, General Fogleman said the C-17 "is the most sophisticated, most capable air mobility asset that we've ever developed."

He added, "It has already proven itself under combat conditions and was one of the keys in moving our troops successfully into Bosnia [-Hercegovina]."

C-17 training currently conducted at Charleston AFB, S. C., will transfer to Altus as additional aircraft arrive. USAF officials expect to teach all initial C-17 aircrew courses at Altus by January 1, 1997, after the base receives its fourth C-17.

An eighty-person team from McDonnell Douglas, the C-17's prime contractor, has provided aircrew academic and simulator training at Altus since August 1994. Another fourteen McDonnell Douglas employees moved to Altus to assist with aircraft maintenance.

Pave Lows Ride on C-17s

Two C-17s logged another first for USAF's newest airlifter April 18 when they transported MH-53J Pave Low helicopters for the first time.

Each C-17 carried one Air Force Special Operations Command helicopter to RAF Mildenhall, UK, from Sierra Leone in Africa, where they had been used to help evacuate American personnel from Monrovia, Liberia.

AFSOC members at Hurlburt Field, Fla., developed a spreader bar to pull the helicopters into the C-17 cargo bay, where the Pave Lows had only inches to spare. TSgt. Edward Meza, from Mildenhall's 21st Special Operations Squadron, said that a tow bar on the helicopter's nose landing gear makes it maneuverable.

It took eight people about an hour to load and another hour to unload the helicopters—stopping at times to deflate or inflate the main and nose struts. The team used a winch on the airlifter to pull the helicopters aboard and provide restraint during offloading.

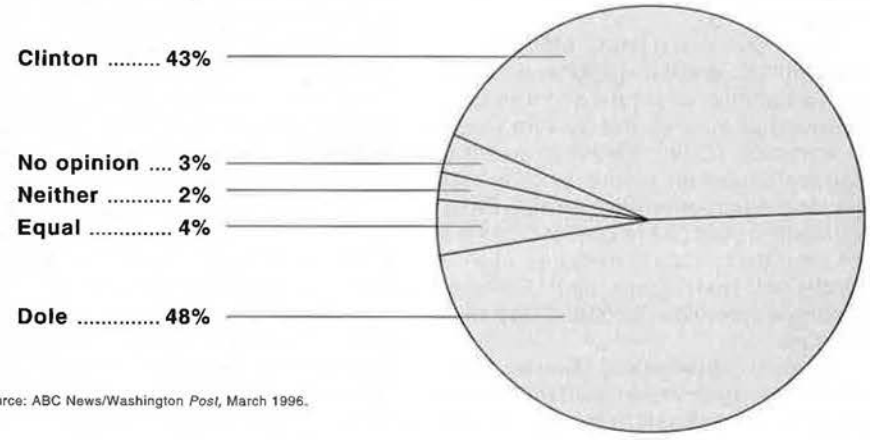
TSgt. Jennifer Rainey, a C-17 loadmaster with Air Mobility Command's 14th Airlift Squadron, Charleston AFB, S. C., said winching cargo into an airplane always poses a challenge, but the job went smoothly.

Defense in the Polls

Here's a sampling of public opinion on national security issues, compiled by the Roper Center for Public Opinion Research.

Maintaining Military Strength

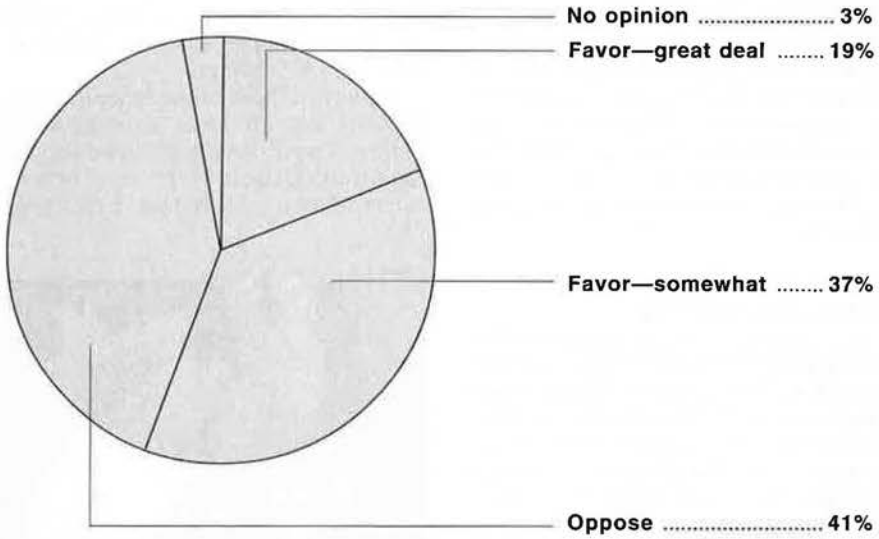
Whom do you trust to do a better job in maintaining military strength: President Bill Clinton or Sen. Bob Dole?



Source: ABC News/Washington *Post*, March 1996.

Cut Defense to Balance Budget?

To balance the federal budget in seven years, would you favor or oppose cutting spending on defense? If you favor cutting defense spending, would you cut it a great deal or only somewhat?



Source: ABC News/Washington *Post*, January 1996.

Leadership Lapse Cited in AWACS Crash

Four officers with the 3d Wing at Elmendorf AFB, Alaska, received disciplinary action April 11 for their failure to reduce bird hazards before last year's E-3B Airborne Warning and Control System aircraft crash, which killed all twenty-four crew members. Administrative action has also begun against at least one other of-

ficer, according to Elmendorf AFB officials.

An accident investigation board found that a flock of Canada geese caused the E-3 crash September 22, 1995. *[See "Geese Caused AWACS Disaster," March 1996 "Aerospace World," p. 10.]*

The four disciplined officers included Col. Wayne Heskew, who received a letter of reprimand and was relieved of duty as the 3d Wing vice commander. Colonel Heskew was the former chairman of the base's bird hazard reduction working group. Base officials would not reveal the names of the other officers because of Privacy Act restrictions, but Colonel Heskew's position necessitated disclosure.

Lt. Gen. Lawrence E. Boese, 11th Air Force commander, had initiated a criminal investigation based on the accident board's findings. Based on an Air Force Office of Special Investigations report, he decided not to take action against air control tower workers. AFOSI had found that they were meeting the basic requirements set by pertinent directives.

General Boese said the AFOSI investigation showed that "3d Wing people were taking steps to react to geese they saw on the airfield" at the time of the accident. However, he added that the officers responsible for implementing the wing's bird-avoidance program did not take "adequate steps to detect and deter geese from appearing on or near the airfield."

A-10 Crash: Degraded Instrument Lighting

According to an investigation, the October 10, 1995, crash of an A-10 in Alaska's Fort Greeley Reservation area was most likely caused by insufficient instrument lighting while the pilot was using night vision goggles (NVGs). The pilot, Capt. Troy Dunn of the 354th Fighter Wing, Eielson AFB, Alaska, ejected safely.

The accident report stated that the instrument lighting had degraded beyond acceptable levels before Captain Dunn's night mission. When he began using the NVGs and unexpectedly entered clouds, he could not make the transition to instrument flight. He ejected at about 2,000 feet.

The aircraft had been equipped with partially modified instrument lighting to permit use of NVGs, which make images more visible by concentrating existing light. Regular instrument lighting must be lowered to prevent interference with NVGs.

C-130J Takes Wing

The latest transport edition in the long-running Lockheed Martin C-130 Hercules series made its maiden flight April 5 from Dobbins ARB, Ga.

The first C-130J, which was ordered by the United Kingdom, and four others must undergo a year-long flight evaluation program for the new transport aircraft to receive FAA certification, said Aeronautical Systems Center officials at Wright-Patterson AFB, Ohio. The first USAF C-130J will take its initial flight this month.

The evaluation program will also confirm the aircraft's improvements, such as thirty-five percent greater range, forty-two percent higher cruising ceiling, fifty-nine percent decrease in time-to-climb, twenty-one percent increase in maximum speed, and forty-one percent decrease in takeoff run, stated a Lockheed Martin program official.

USAF Gains First Production Joint STARS

Northrop Grumman on March 22 turned over to the Air Force the first production model of the E-8 Joint Surveillance and Target Attack Radar System aircraft. The new E-8C is not scheduled to enter operational service until later this year, according to USAF officials.

However, three preproduction Joint STARS aircraft have already seen action. Two E-8As were used during Operation Desert Storm, and one of those E-8As and a test E-8C provided support during the Operation Joint Endeavor deployment to Bosnia.

The two Joint Endeavor aircraft returned to the United States from Rhein-Main AB, Germany, March 29. They flew every assigned sortie—ninety-five missions covering more than 1,000 flying hours since December 27, 1995, according to Northrop Grumman officials.

In testimony before Congress in March, USAF Chief of Staff Gen. Ronald R. Fogleman placed two additional Joint STARS at the head of the service's wish list if Congress makes more funds available in Fiscal 1997 than the Administration has requested.

USAF Checks Extremist Activity

Reacting to recent concerns about possible extremist group activity within the armed forces, USAF officials directed commanders and the Air Force Office of Special Investigations (AFOSI) to look for any suspected or actual cases of such activity during the past two years. The Air Force has monitored the human relations climate on its bases since 1976, according to service officials.

"We don't have a significant problem with extremist group activity," said Dennis M. Collins, Air Force deputy for Equal Opportunity, though he added that this type of activity is happening around Air Force installations.

The AFOSI examination of criminal activity revealed three cases that might

USAF photo by SSgt. John Raynes

SSgt. Barry Lefavour, 66th Security Police Squadron, Hanscom AFB, Mass., demonstrates a handheld thermal imager that Hanscom's Electronic Systems Center officials say "sees" human silhouettes by detecting heat. USAF plans to purchase initially 230 units for Security Police forces.

be related to extremist groups. Commanders reported fifteen possible cases based on social actions office records. Mr. Collins said that most actions were not directed against one particular group but toward several ethnic, racial, and religious groups.

During the two-year period covered by the investigation, officials found that several disciplinary actions had been taken. In one instance, an active-duty member received an Article 15 for making racial comments. In another, a civilian employee was fired for deliberate, racially motivated actions against a co-worker. Two active-duty members received letters of reprimand—one for writing racially disparaging messages on another person's message board, the other for handing out supremacist group information. Two other cases are still under investigation.

Air Force Secretary Widnall said in an April 4 statement that she was not surprised by the low number of cases. "We are not, however, blinded by past successes" in combating extremist activity.

USAF photo by A1C Cherie Taff

Col. Gary North (left), 35th Operations Group commander, Misawa AB, Japan, became one of five USAF pilots to reach 3,000 flying hours in the F-16. He received a plaque from Brig. Gen. Paul V. Hester, 35th Fighter Wing commander, April 19 on completion of his historic flight.

DoD Releases Proliferation Report

In a conscious effort to emulate the "Soviet Military Power" booklet it released annually in the 1980s, the Pentagon has produced a new document focused on today's key threat—the spread of nuclear, biological, and chemical weapons and the means for delivering them.

The sixty-three-page report, called "Proliferation: Threat and Response," was released by Defense Secretary William J. Perry April 11.

Although the greatest potential threats—Iraq, Iran, North Korea, and Libya—have been discussed publicly, Secretary Perry noted that the report "gives clarity and definition" to a difficult subject and provides comprehensive information to the public.

Ashton B. Carter, assistant secretary of defense for International Security Policy, briefly discussed the department's response to proliferation, including some defensive measures should prevention and deterrence fail.

The services are procuring new chemical and biological protection suits for troops and new chemical-weapons detectors with a much lower false-alarm rate than the 1970s-vintage units used in Desert Storm. He also noted that a "number of efforts" to attack and destroy hardened or buried targets were under way and that the Army would field the latest Patriot missile, PAC-3, in 1999.

However, Mr. Carter stated that, in his opinion, the "biological warfare problem is an underestimated one." He said that, as this report illustrates, "we're doing a lot, but it also illustrates we need to do a lot more."

Parallel Use for GPS

Vice President Al Gore announced March 29 at a White House briefing that access to the Air Force's Global Positioning System (GPS) will be given to the private sector "on terms that protect our national security."

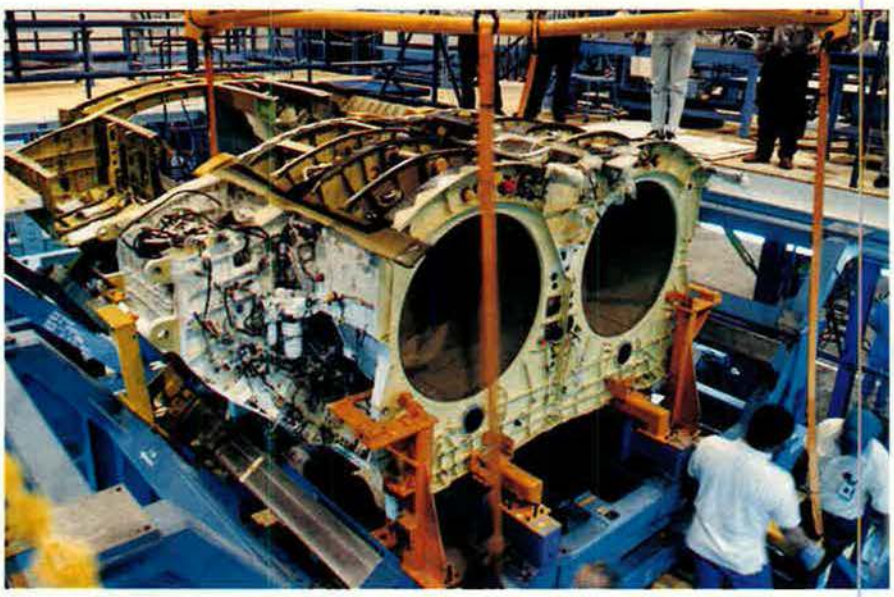
Following months of controversy and discussion about unlimited use of GPS, the Administration decided to stop degrading the GPS signal in

Internet Addresses

Scores of Internet sites are created daily, especially on the World Wide Web. The Air Force Association launched its Web home page in September 1995. Like many others, it's a work in progress.

The Internet and its superhighway, the Web, are now routinely discussed in the news media. Some, however, are just starting to check out this new world. Here are some defense and defense-related sites as starting points. *Air Force* Magazine will provide others on a regular basis.

Site	World Wide Web Address
Air Force Association	http://www.afa.org/
Defense Department	http://www.dtic.dla.mil/defenselink/
US Air Force	http://www.dtic.dla.mil/airforcelink/
US Navy	http://www.navy.mil/
US Army	http://www.army.mil/
US Marine Corps	http://www.usmc.mil/
US Coast Guard	http://www.dot.gov/dotinfo/uscg/
Air Force Reserve	http://www.afres.af.mil/
Air National Guard	http://www.ang.af.mil/
Civil Air Patrol	http://www.cap.gov/
Navy Reserve	http://www.navy.mil/navresfor/
Air Force Personnel Center	http://www.afpc.af.mil/
Veterans Affairs	http://www.va.gov/
NATO	gopher://gopher.nato.int/
United Nations	http://www.un.org/



Lockheed Martin announced March 26 the successful construction of the F-22 midfuselage, using a modular approach for greater efficiency. Almost all systems pass through the new stealthy fighter's midfuselage, including hydraulic, electrical, environmental control, and auxiliary power systems.

about four to ten years to permit free use of a more accurate signal by the public. Although they said details are classified, DoD officials did disclose that advances in signal processing should give the US military and its allies the edge while allowing commercial users to receive signals that can pinpoint locations to within one meter.

US military officials have been concerned that GPS is vulnerable to potential adversaries. The Pentagon is also working on new ways to deny an enemy the use of GPS signals during a conflict. A March 12 notice in *Commerce Business Daily* stated that the Air Force is looking for a contractor to design, develop, implement, and support an integrated Navigation Warfare program.

Vice President Gore and Transportation Secretary Federico F. Peña stressed at the briefing that the Administration's policy would expand the GPS market into an $8 billion industry by the end of the century. Secretary Peña also said that the policy would ensure that GPS signals would be available to everyone worldwide.

Commissary Shoppers Save More

In its 1996 Market Basket Price Comparison Study, the Defense Commissary Agency (DeCA) found that shoppers in US-based commissaries save an average of 29.7 percent over private-sector supermarket prices.

"That's 6.3 percent more than the 23.4 percent savings" in the 1992 study, Army Maj. Gen. Richard E. Beale, Jr., DeCA director, told a House National Security Committee subcommittee March 27. "This means that the typical E-4 with [more than] four years of service, with a family of four who does all their grocery shopping at the commissary, saves $1,581 per year."

The DeCA chief attributed the increase in savings to streamlining that the agency has undertaken since its creation in 1991. He said that DeCA's operating costs will have dropped from a high of $1.3 billion to $939 million by the end of Fiscal 1997.

General Beale also believes that by becoming a Performance-Based Organization, the agency will have increased opportunities for operational flexibility, be able to maintain high customer satisfaction, and reduce its dependence on appropriated funds.

Earlier this year, the House Budget Committee asked the Congressional Budget Office (CBO) to conduct a comprehensive review of nonappropriated fund organizations, such as exchanges, and resale activities, such as commissaries, and compare them with commercial alternatives. The CBO review, due in December, will include a cost model for commissaries to compare their costs directly with those at commercial supermarkets.

USAF photo by SSgt. Russell Petcoff

When a twenty-million-gallon oil spill in February brought more than 400 ducks and waterfowl to the Norfolk Wildlife Hospital in East Winch, UK, RAF Mildenhall pitched in with donations of supplies and manpower. Base personnel collected almost a ton of towels and blankets for the Royal Society for the Prevention of Cruelty to Animals facility, and volunteers from RAF Mildenhall's 100th Transportation Squadron trucked the items to the hospital.

Photo by Stacy Mitchell, Applied Physics Laboratory

Shown here in final processing at Vandenberg AFB, Calif., before launch on April 24, the Midcourse Space Experiment (MSX) spacecraft is expected to detect, track, and discriminate ballistic missile flight characteristics during the "midcourse" phase between burnout and missile reentry. Built by Johns Hopkins University for the Ballistic Missile Defense Organization, the $325 million MSX, with a design life of four years, may also provide data on global atmospheric change, astronomy, and space debris.

For its 1996 study, DeCA contracted with Wirthlin Worldwide, McLean, Va., who also conducted the 1992 review. Wirthlin compared prices of about 600 items from a random sample of thirty US-based commissaries and commercial grocery stores near them. It also studied overseas commissaries, including one in Alaska and one in Hawaii, but had no data from foreign civilian grocers for comparison.

News Notes

■ Lightning killed A1C John Vincent and injured ten other aircraft maintainers April 18 at Hurlburt Field, Fla., while they were learning how to change a tire on a C-130. According to a USAF release, the airmen had just returned to the field following the lifting of a lightning advisory when the incident occurred. Before issuing an "all clear," base weather personnel had waited 1.5 hours, rather than the customary thirty minutes, during which no additional lightning struck.

■ Capt. Douglas J. Cligrow, of the 178th Fighter Wing, Ohio ANG, ejected safely before his F-16 crashed into a heavily wooded area at Camp Grayling, Mich., March 19. He was on a routine bombing training exercise.

■ Capt. Michael Fontaine ejected safely before his F-15C crashed on takeoff from Nellis AFB, Nev., March 21. The pilot, from the 1st Fighter Wing, Langley AFB, Va., was participating in training exercises in Nevada.

■ Lt. Gen. (Gen. selectee) Walter Kross, current director of the Joint Staff, was nominated April 5 to replace retiring Gen. Robert L. Rutherford as commander in chief of US Transportation Command and Air Mobility Command commander.

■ The Centralized Software Support Activity for the Electronic Systems Center's Joint Tactical Information Distribution System reached initial operational capability in early March. When the organization, located at Robins AFB, Ga., reaches full operational capability in November, it will provide support for common JTIDS software to US and foreign military services, as well as support for software unique to USAF, Army, and Marine Corps forces.

■ The US Air Force Museum, Wright-Patterson AFB, Ohio, will host the Great War Aeroplane Association's World War I Fly-In July 20–21. Authentic World War I aircraft, as well as replicas and reproductions, will perform formation and precision flying.

■ A Delta II successfully boosted the twenty-fifth Global Positioning System satellite into orbit March 27 from Cape Canaveral AS, Fla. USAF launched the first GPS satellite in 1989 and completed the constellation of twenty-four with a March 1994 launch. The latest GPS will eventually replace one of the earlier satellites, which have an estimated life span of about seven years.

■ The third attempt to launch a Pegasus XL booster was successful. On March 8, a Pegasus XL, dropped from beneath a modified L-1011 aircraft at Vandenberg AFB, Calif., launched two experimental payloads into space. A June 1994 rocket failure was caused by miscalculation in an on-board guidance computer, and one in June 1995 was blamed on human error during assembly.

■ USAF selected 1,546 of 21,139 eligibles for promotion to senior master sergeant, for a 7.31 percent selection, compared with 7.24 percent for 1995 and 4.62 percent for 1994. The average selectee has 5.5 years in grade and 18.77 years in service.

■ The Fiscal 1996 defense authorization bill contains a provision that will provide hazardous-duty incentive pay for E-3 Airborne Warning and Control System aircraft enlisted aircrew using not only grade but also time and experience, similar to the system used for AWACS officers. Under the new rules, USAF officials said the maximum compensation for enlisted AWACS weapons controllers increased from $200 to $300 per month.

■ Earlier this year, the Civil Air Patrol unveiled aerial video imagery—its new tool to aid in search and rescue, disaster assessment, and the drug war. The new technology will multiply "tenfold" CAP's value to local, state, and federal emergency officials, stated CAP National Commander Brig. Gen. Richard L. Anderson.

■ Col. Ronald M. Sega, an Air Force Reservist with Air Force Space Command, flew aboard the space shuttle *Atlantis,* serving as the intravehicular crew member to coordinate a six-hour spacewalk while *Atlantis* docked at the Russian space station Mir. This was the second shuttle flight for Colonel Sega, a professor in the University of Colorado's electrical and computer engineering department.

■ The German Air Force activated its only US-based Tactical Training Center May 1 at Holloman AFB, N. M. The center will oversee two German aircrew training squadrons, one for F-4s and one for Tornados. The German government is paying

Senior Staff Changes

RETIREMENTS: B/G John J. **Allen,** B/G Leonard F. **Kwiatkowski,** B/G James M. **Richards** III.

PROMOTIONS: To be **General:** Walter **Kross.**
To be **Lieutenant General:** Carl E. **Franklin,** Ronald T. **Kadish.**
To be **Brigadier General:** William E. **Stevens.**
To be **AFRES Major General:** Wallace W. **Whaley.**

CHANGES: M/G Kurt B. Anderson, from Cmdr., USAF Recruiting Service, and Dir., Recruiting, Hq. AETC, Randolph AFB, Tex., to Cmdr., Jt. Task Force Southwest Asia, ACC, Riyadh, Saudi Arabia, replacing M/G (L/G selectee) Carl E. Franklin . . . **Col. (B/G selectee) Walter E. L. Buchanan III,** from Dep. for Current Plans, J-33, Office of the Dep. Dir., Ops., Jt. Staff, Washington, D. C., to Cmdr., USAF Recruiting Service, and Dir., Recruiting, Hq. AETC, Randolph AFB, Tex., replacing M/G Kurt B. Anderson . . . **L/G Ralph E. Eberhart,** from DCS/P&O, Hq. USAF, Washington, D. C., to Cmdr., US Forces Japan, USPACOM, and Cmdr., 5th AF, PACAF, and Cmdr., US Air Forces Japan, and Cmdr., West Pacific North Air Defense Region, Yokota AB, Japan, replacing L/G Richard B. Myers . . . **M/G (L/G selectee) Carl E. Franklin,** from Cmdr., Jt. Task Force Southwest Asia, ACC, Riyadh, Saudi Arabia, to Cmdr., 9th AF, ACC, and Cmdr., USCENTAF, USCENTCOM, Shaw AFB, S. C., replacing L/G John P. Jumper.

Col. (B/G selectee) Charles L. Johnson II, from Dir., C-141 SPO, Warner Robins ALC, AFMC, Robins AFB, Ga., to Program Dir., C-17 SPO, AFPEO, Ass't Sec'y of the Air Force for Acquisition, Wright-Patterson AFB, Ohio, replacing M/G (L/G selectee) Ronald T. Kadish . . . **L/G John P. Jumper,** from Cmdr., 9th AF, ACC, and Cmdr., USCENTAF, USCENTCOM, Shaw AFB, S. C., to DCS/P&O, Hq. USAF, Washington, D. C., replacing L/G Ralph E. Eberhart . . . **M/G (L/G selectee) Ronald T. Kadish,** from Program Dir., C-17 SPO, AFPEO, Ass't Sec'y of the Air Force for Acquisition, Wright-Patterson AFB, Ohio, to Cmdr., ESC, AFMC, Hanscom AFB, Mass., replacing retiring L/G Charles E. Franklin . . . **L/G (Gen. selectee) Walter Kross,** from Dir., Jt. Staff, Washington, D. C., to CINC, Hq. USTRANSCOM, and Cmdr., Hq. AMC, Scott AFB, Ill., replacing retiring Gen. Robert L. Rutherford.

B/G (M/G selectee) John F. Miller, Jr., from Cmdr., 57th Wing, ACC, Nellis AFB, Nev., to C/S, Hq. Allied Air Forces Northern Europe, NATO, Stavanger, Norway, replacing M/G John L. Borling . . . **Col. (B/G selectee) T. Michael Moseley,** from Chief, Office of General Officer Matters, Hq. USAF, Washington, D. C., to Cmdr., 57th Wing, ACC, Nellis AFB, Nev., replacing B/G (M/G selectee) John F. Miller, Jr. . . . **L/G Richard B. Myers,** from Cmdr., US Forces Japan, USPACOM, and Cmdr., 5th AF, PACAF, and Cmdr., US Air Forces Japan, and Cmdr., West Pacific North Air Defense Region, Yokota AB, Japan, to Ass't to Chairman of the JCS, Washington, D. C.

SENIOR EXECUTIVE SERVICE CHANGES: Alfred A. Buckles, to Dep. Dir., C⁴I Sys., Offutt AFB, Neb. . . . **Walker L. Evey,** to Spec. Asst., Contracting, Washington, D. C. . . . **Kenneth E. Gregory,** to Ass't Auditor, Acquisition & Log., AFAA, Wright-Patterson AFB, Ohio, replacing retired L. Roger Stapleton. ■

for the relocation of twelve Tornado aircraft to Holloman, support activities, and about $42 million in construction.

■ March AFB, Calif., which began flying operations in 1918 as March Field, became March ARB on March 23, as part of the 1993 Base Realignment and Closure actions. The base exchange and commissary will continue to operate on a for-profit basis to serve about 60,000 military retirees in the area.

■ MacDill AFB, Fla., will transfer from Air Combat Command to Air Mobility Command on October 1. AMC's 43d Air Refueling Group, with its twelve KC-135 tankers, will relocate from Malmstrom AFB, Mont., to MacDill this fall.

■ USAF winners for the 1995 Gerrit D. Foster, Jr., Outstanding Military Personnel Flight Achievement Award were ACC's 49th Mission Support Squadron, Holloman AFB, N. M., for large bases, and AMC's 436th MSS, Dover AFB, Del., for small bases.

■ Gen. Joseph W. Ashy, commander in chief of NORAD and US Space Command and commander of Air Force Space Command, won the 1995 Gen. Thomas D. White USAF Space Trophy, sponsored by the National Geographic Society.

■ Among USAF's 1995 safety award winners was Capt. Bart D. Klein, 55th Air Refueling Squadron, Altus AFB, Okla. He won the Koren Kolligian, Jr., Trophy for saving a KC-135 and its crew by successfully landing the aircraft though the entire left main landing gear had been ripped from the plane.

■ The Air Force and Lockheed Martin team that designed, built, and launched the Milstar satellite communication system received the 1996 Nelson P. Jackson Aerospace Award from the National Space Club.

USAF photo by MSgt. Rick Corral

Lt. Col. Henry B. Garther, 1st Helicopter Squadron commander, got a champagne shower to celebrate the unit's achievement of the longest-running safety record in DoD history—175,000 accident-free flying hours over thirty-nine years—on March 28. Defense Secretary William Perry told the Andrews AFB, Md., unit that it demonstrated the "essence of readiness."

Obituaries

Charles Alfred Anderson, the African American aviation pioneer who directed the Army Air Corps Primary Training Program at Tuskegee Institute, Ala., during World War II, died April 13 at age eighty-nine. Known as "Chief Anderson," he was head of Tuskegee's Civilian Pilot Training Program in 1940. That year, he piloted an aircraft transporting First Lady Eleanor Roosevelt, who helped convince President Franklin D. Roosevelt to support training black pilots at Tuskegee. Mr. Anderson earned his pilot license in 1929, began training black civilian pilots in 1933, introduced ground school aviation training in Washington, D. C., black high schools in 1937, and started a civilian pilot training program at Howard University, also in Washington, in 1938.

Charles W. Corddry, long-time defense and national security affairs correspondent for the Baltimore *Sun*, died of cancer March 31 at age seventy-six. Though a perforated eardrum kept him out of the service, he was known for his appreciation of the men and women in uniform and was respected by Pentagon officials for tough but fair and knowledgeable coverage. Mr. Corddry started his reporting career with United Press wire service in World War II then joined the *Sun* during the Vietnam War, in 1967. He won many awards, including the Air Force Association's Gill Robb Wilson award for "consistently excellent reporting and analysis" of defense issues.

Retired **Maj. Gen. Henry L. Hogan III,** one of the founding fathers of the US Air Force Academy, died April 13 at age seventy-six. A West Point graduate, he served as a B-17 pilot with the 483d Bomb Group and flew fifty-one missions over Germany and Romania. After his retirement in 1972, he was active in the Air Force Association and The Retired Officers Association and served as his West Point class president from the time he was elected as a cadet throughout his life. ■

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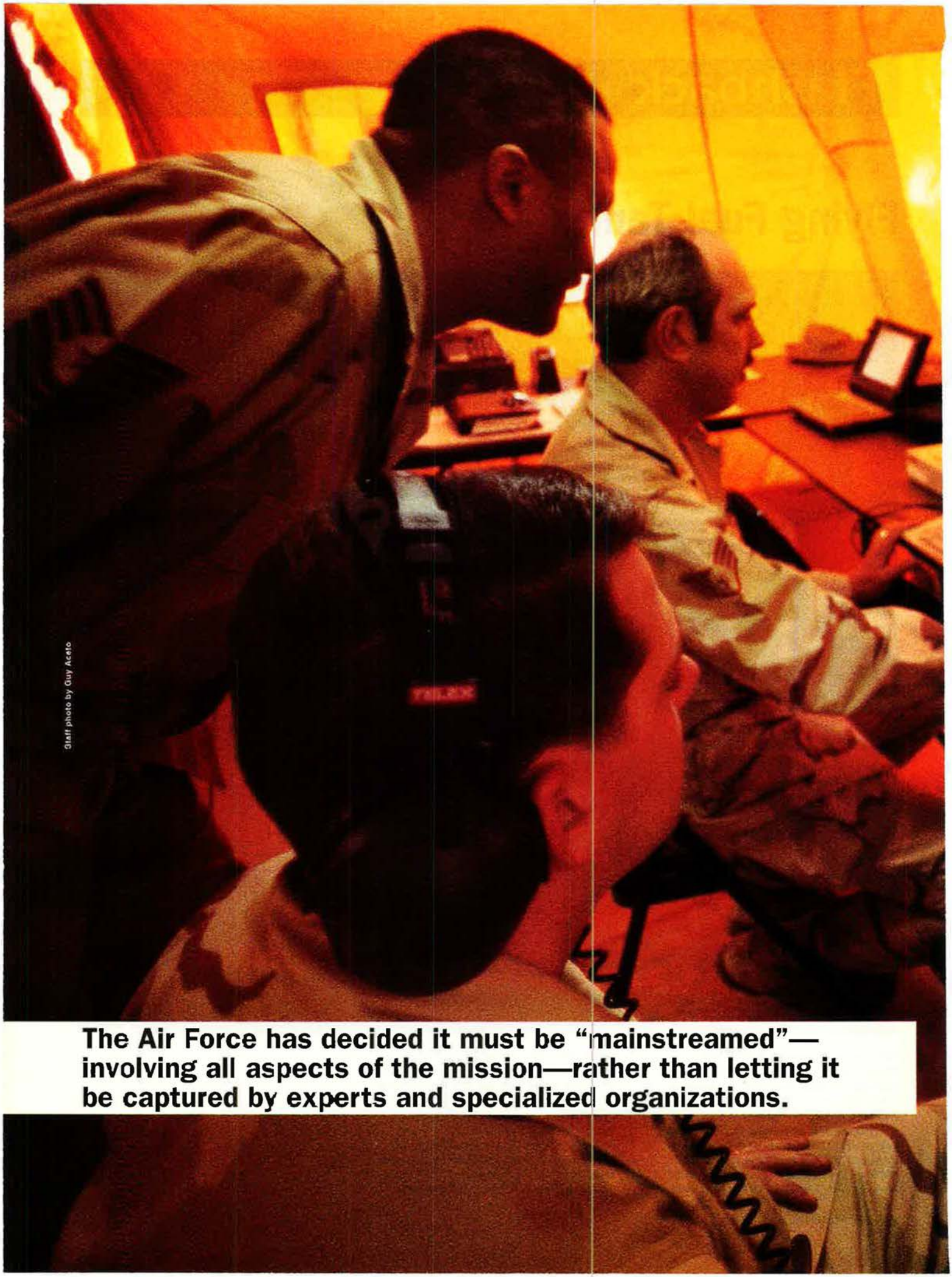
Flying Fuel Tank

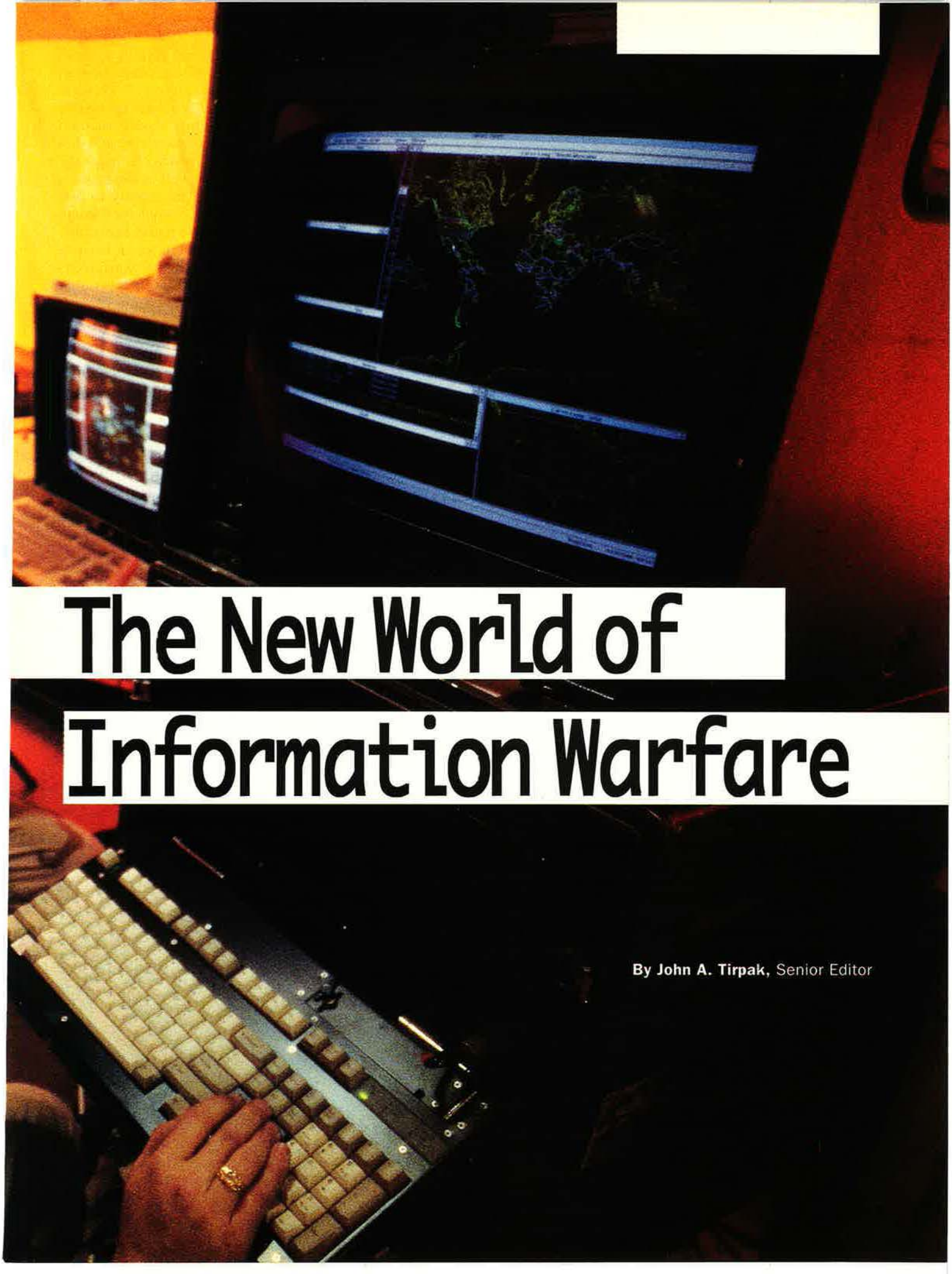
Photo courtesy Jeffrey Ethell

The crusade to win World War II produced many impressive advances and more than one unconventional idea. The Cornelius Aircraft Corp. of Dayton, Ohio, designed a novel way to extend the range of bombers and cargo aircraft—a piloted fuel glider, designated XFG-1. This extra, 764-gallon fuel "tank," with a fifty-four-foot, forward-swept wingspan and no horizontal tail surface, was designed to be towed behind a powered ship, feeding it fuel. When the glider was empty, it would detach and return to base. Only two XFG-1s were ever built. The first crashed in a spin-recovery test. The second proved that the aircraft would have needed a spin-recovery parachute, so it was never accepted into production.



Staff photo by Guy Aceto

The Air Force has decided it must be "mainstreamed"—involving all aspects of the mission—rather than letting it be captured by experts and specialized organizations.



The New World of Information Warfare

By John A. Tirpak, Senior Editor

Staff photo by Guy Aceto

Above and previous pages: Technicians from the 609th Intelligence Squadron, Shaw AFB, S. C., participate in the annual Green Flag exercise, which integrates some elements of information warfare into its scenarios.

IN THE opening round of the Persian Gulf War in 1991, Air Force pilots in F-117s squeezed triggers and released 2,000-pound iron bombs on Iraqi telephone exchanges, power stations, command-and-control nodes, and other vital information and communication links.

In the future—possibly soon—such an attack might be conducted far from the target, with a computer terminal replacing the airplane, "logic bombs" replacing the ordnance, and the "enter" key replacing the trigger.

These real-world and hypothetical strikes both are examples of information warfare (IW), which is rapidly assuming a central place in modern military thinking and planning. It involves much that is new as well as much that is familiar.

With tight limits on the assets available for any given mission, the armed services are depending as never before on information systems to make sure forces are employed when and where they will have the most telling effect. With this dependence, however, comes a vulnerability that an opponent could exploit. IW works both ways.

To the Air Force, IW is "any action to deny, exploit, corrupt, or destroy the enemy's information and its functions; protecting ourselves against those actions; and exploiting our own military information functions," said Maj. Gen. Robert E. Linhard, director of Plans in the office of the Air Force deputy chief of staff for Plans and Operations, quoting from "Cornerstones of Information Warfare," published by USAF last fall.

Two years ago, Gen. Merrill A. McPeak, then the Air Force Chief of Staff, charged General Linhard and others with formulating a doctrine for IW. When they presented their findings, General McPeak told General Linhard, "You don't have it right, yet."

"Though we absolutely correctly reflected the thinking of the time, our concept was too evolutionary from the traditional notions of command and control, reconnaissance, electronic combat, etc.," General Linhard said. "We had to take a broader view" that would account for the synergy of acquiring and disseminating information from a variety of sources as well as the ruinous effect of forcing the enemy to distrust his own data or not have enough of it to make good battle decisions.

With further reflection, it became apparent that, just as "air warfare" is not a mission unto itself but rather an element of everything the Air Force does, so, too, is "information warfare" fundamental to all aspects of the mission. And, just as there is no "air warfare" or "space warfare" department in the Air Force—because every function contributes to it—there will be no "information warfare" command, General Linhard said. "We decided . . . whatever this buzzword means, it must be mainstreamed rather than captured by some expert group."

As a whole, IW—or more specifically information dominance—has now been designated the fifth pillar of the Air Force's core competencies, along with control of the air, control of space, global mobility, and the ability to project power precisely.

"We consciously chose not to have an information warfare 'czar,' " General Linhard said, because doing so would contradict the notion that IW must be integral to all mission areas. "We believe we're thinking about it

USAF photo by SSgt. Louis Briscese

Information warfare works both ways. Not only will USAF try to disrupt the enemy's flow of information, it also will seek to ensure that such data as Global Positioning System transmissions (above) arrive uninterrupted to its own troops.

correctly, now," the General added. "We're all 'information warriors.' "

Rather than let IW become too esoteric, the General said, the Air Force will develop doctrine for it as it applies to theater operations, "to look for a 'counterinformation' mission . . . rather than an IW doctrine." Such an approach "works for us pretty well." There are "other people working on strategic information warfare," he added.

General Linhard also hastened to note that USAF is not attempting to co-opt the IW mission, pointing out that both the Navy and Army are pursuing IW in their own ways. The combination of all the approaches strengthens the resilience of US systems and "enhances joint operations," he said.

There will be no line item in USAF's budget for "information warfare," but assets that tighten the link between sensor and shooter, such as the E-8 Joint STARS, receive ample funding and are inextricably intertwined with IW.

Two Categories

"Cornerstones" broke IW down into intellectually and operationally manageable chunks while stressing the synergy among them. There are two broad categories—"attack and defend information" and "exploit information."

- Attacking and defending information consists of psychological operations, military deception, security measures, physical destruction, information attack, and electronic warfare. These aspects could include destroying command-and-control links with ordnance, undermining enemy troop confidence in their leadership through TV broadcasts, sending computer "viruses" into an enemy logic system to cause it to fail at a critical moment, and jamming enemy radars.
- "Exploiting information" simply means gathering all that is knowable and turning it into military decisions faster than the adversary can, or "acting within your opponent's decision loop," General Linhard explained. "Information operations" fall into this category and include such missions as command and control, combat identification, intelligence, generation of weather data, and surveillance, he noted.

"There isn't a line item for 'information warfare' in our budget," General Linhard pointed out, "and there hasn't been a big uptick in what we're spending on it, because so much of it is the same thing we've been doing all along," such as collecting intelligence and waging psychological warfare. The main boosts in funding have gone to systems that tighten the link between the sensor and shooter, such as the E-8 Joint Surveillance and Target Attack Radar System aircraft, he said.

The Air Force is, however, keenly aware that the systems and capabilities of the information age are evolving at blinding speed, with computer power doubling every eighteen months or less, and ever-more-powerful hardware becoming available to potential "bad actors" for a low entry cost.

At a recent IW symposium in Washington, D. C., sponsored by the Armed Forces Communications and Electronics Association, Vice Adm. John M. McConnell, USN (Ret.), former head of the National Security Agency, said that he has conducted experiments to see how vulnerable some of the nation's supposedly "secure" computer systems are, and he has found that some could be cracked "with $10,000 worth of equipment, a half-dozen college students, some pizzas, and beer."

Among the potential targets of terrorist groups or enemy states might be the nation's power grid, the public telephone switching system, the stock markets, the Federal Reserve, the Internal Revenue Service, "strategic" companies, the research-and-development structure, or the air traffic control system.

Of these information- and computer-dependent networks, the air traffic control system is least vulnerable, Admiral McConnell said, "because that system is so old and arcane."

Asked if the national banking system could truly be "crashed," Admiral McConnell said that, with enough hardware and expertise, "I think it's doable."

Given the vulnerability of such "strategic" targets, it is likely that less prominent databases and e-mail systems, such as logistics-trafficking systems or personnel files, could also be compromised. Because the likelihood of such attacks is rising, the Air Force has moved to keep ahead of the threat.

Anticipating the Possibilities

The Air Force Information Warfare Center has been set up at Kelly AFB, Tex., charged with anticipating IW offensive and defensive possibilities, creating such IW exercises as Blue Flag, and integrating IW into other exercises. It is also developing the concept of the "air ops center," which would collate the wealth of information coming into a theater command post from a multitude of sensors and networks and translate it into a coherent picture of the battlespace for the commander in chief, General Linhard said.

Last fall, the 609th Information Warfare Squadron was established at Shaw AFB, S. C. It was chartered

Photo by Randy Jolly

Because modern fighters rely so heavily on computers, they may be vulnerable to attempts to cripple their electronics with electromagnetic pulses or high-power microwaves. USAF's information warriors are seeking ways to protect them.

to be a deployable counter-IW capability that will move with 9th Air Force units, protecting the information systems set up at expeditionary sites while advising the theater commander of the threats and opportunities facing him in an IW context.

"We're here for protection of 9th Air Force assets against computer intrusions . . . and to affect the enemy," said 609th IWS Commander Lt. Col. Walter E. "Dusty" Rhoads.

The 609th should be operational late this summer, and Colonel Rhoads expects that within two years the unit will have 100 persons—about forty officers and sixty enlisted, with perhaps two civilian specialists—who are skilled at "watching the fence" of a computer system, detecting or stopping intrusions, finding out who the intruders are, and preventing them from causing damage. It is a capability that already can "protect three or four bases," with fewer than a dozen people, and "if it provides a benefit, . . . we may set up additional units" like the 609th at other numbered air forces, he said.

Among the armed services, "we're the first dedicated unit" for this type of mission, Colonel Rhoads noted.

Though the prospect of unwanted intrusions might seem reason enough to create stringent barriers against use of Air Force networks, "we don't want to put up a brick wall," Colonel Rhoads said. To do so would hand potential enemies a "win" by slowing down the system and reducing the efficiency of USAF personnel who must move data quickly.

"The biggest threat . . . is the openness of the US system," he continued. "The whole Air Force needs to be educated about IW," and the service is "getting the word out to tighten things up."

For now, the unit "has no doctrine in place; . . . [but] several drafts are in the works," the Colonel said. The mission is so new, "we're making it up as we go along . . . and creating the blueprint for those who will follow."

The unit is developing a visual presentation to show a commander a penetration of the base network in progress—"kind of like an air defense picture," Colonel Rhoads explained. The systems envisaged will help determine which information tools the intruder is using and what damage he might be able to inflict.

Finding personnel to staff this new operation is challenging, the Colonel said, because USAF has no Air Force Specialty Codes for information warriors. For now, he is recruiting from the communications, computer service, and intelligence fields.

When called on to deploy, the 609th would take with it "computers, software and monitoring tools, fire walls, and routers," said Deputy Commander Maj. Andrew K. Weaver. "Almost all of it is commercially available," he added. "The military is using almost everything off the shelf," because the hardware and software are changing so rapidly that a military-developed system would probably always be outdated, compared with an opponent's system.

In addition to performing a kind of "electronic Security Police" function, the 609th will probe friendly systems for flaws or vulnerabilities that an enemy could exploit and help to "set up barricades . . . that they would have to go around," Major Weaver said.

Colonel Rhoads declined to discuss the 609th's capabilities for offensive IW operations but acknowledged that anything an opponent might try to do to disrupt or disable a US system could be met with a comparable response.

Nothing Is Invulnerable

Offensive and defensive IW operations are becoming increasingly important for contractors as well, because the effectiveness of the systems they provide to the Air Force inevitably hinges on the integrity of the data the systems process.

"Everything we do is aimed at insuring our product lines in tactical air," said Charles A. Anderson, vice president for Information Warfare Programs at Lockheed Martin Tactical Aircraft Systems in Fort Worth, Tex.

Mr. Anderson said his organization, recently set up to mirror the mission areas outlined in "Cornerstones," is developing the means to make certain that USAF F-16s and F-22s won't be vulnerable to IW attacks, either in the hangar or in flight.

"Suppose you were able to get into the database of a ground or airborne system and change it," Mr. Anderson said. The result could be a plane's sensors "recognizing" a friendly aircraft as an enemy or switching the target coordinates for a standoff missile. Such IW attacks could happen in the middle of a dogfight, sending missiles after phantom targets or disabling their ability to fuze. An aircraft's electronic fly-by-wire system might be crippled by electromagnetic pulses or high-power microwaves.

"We would be remiss in believing our systems are invulnerable" to such threats, Mr. Anderson said. "Nobody knows how much of this is feasible," but the company does not want to wait until it happens to start working on countermeasures.

Lockheed Martin is also working on all other aspects of IW, from sensors and processors to jammers and knowledge systems that will push collated, reliable information into the cockpit in real time.

It is important to his organization that it look at IW "not just with regard to the vulnerability of a single system but the . . . vulnerability of a total integrated system," Mr. Anderson said.

One of General Linhard's biggest concerns is that the acquisition system is running too slowly to keep up with the threats engendered by IW.

"Part of the struggle that all the services are going through," he said, "is that cycle time for a generation of computers is months, while the cycle time for our acquisition system is much longer. We must find a way to integrate the state of the art in a timely fashion."

Admiral McConnell went a step further and said, "The half-life of technology used to be months. Now it's weeks, if not days."

Enemies will constantly be watching the US for signs that it is "behind the power curve" in some area—a place where an enemy can "find a niche . . . and attack you asymmetrically," General Linhard said.

"We need to have a flexible and intelligent capability to recognize what the state of the art is," he added.

All of the information available to the US—by tapping into an adversary's communications, imagery from satellites and unmanned aerial vehicles, and electronic reconnaissance—and the ability to convert that data into a form useful for decision-making gives the US the "coercive power of information," General Linhard said.

The US is entering an age when it can enjoy "virtual presence" around the world, able to react to any action within hours by means of a stellar network of sensors and information systems coupled with aircraft and standoff weapons only hours away from any point on the globe.

Lockheed photo by Eric Schulzinger

Information now flows directly from satellites into the cockpit, which is one component of the information dominance that the US hopes to maintain over its potential enemies.

Any potential adversary will "know that we know" whatever may be going on in a given area, he said.

Mr. Anderson said he shares the concerns that the Army's Gen. J. H. Binford Peay III, commander in chief of US Central Command, expressed in recent testimony before Congress, that the US might be putting too much emphasis on IW.

"You have to be careful about moving too fast toward total dependence on IW at the expense of the pointy end of the spear," Mr. Anderson said.

Staying Ahead

Admiral McConnell observed that the US is "two, three, or four years ahead of the rest of the world" in thinking about IW and debating its ramifications, particularly as they increasingly encroach on "personal liberty, law enforcement, and national security." But the US must stay ahead, he said, because "we have orders of magnitude more to lose than the rest of the world" to IW attack.

For now, counterinformation operations are not going to replace the F-117, or any other combat aircraft, as in the hypothetical "cyber-strike" against an enemy's command-and-control nodes and power grid. Colonel Rhoads believes such a scenario might be "ten to fifteen years away" at the earliest, though he cautioned that technology might bring such a capability sooner. ■

Unmanned aerial vehicles help give the US virtual presence, feeding data to decision-makers who can react to any action, anywhere, within hours, giving the US "coercive power of information," according to Maj. Gen. Robert Linhard.

To fix it using traditional solutions would cost billions, so the Department of Defense will try something new.

The Housing Problem

By Suzann Chapman, Associate Editor

MILITARY housing has been called a disgrace—neglected and wholly inadequate for the needs of today's troops. Housing conditions are so bad, says the Defense Department, that they could undermine readiness and retention.

The problem is vast. The services argue that, if they are required to use standard construction procedures and conform with existing federal laws, they will never remedy the situation. Defense officials warn it would take forty years and $20 billion simply to correct deficiencies in 387,768 family housing units. Similar problems afflict bachelor housing. Revitalizing 612,000 dorm spaces will take just as long and cost $9 billion.

With such pressures crowding in on all sides, the Defense Department and military services have shifted course and embarked on a new get-well plan, one that relies heavily on the private sector. The effort stems from a pilot program that the Pentagon proposed last year and Congress enacted as the Military Housing Privatization Initiative in the Fiscal 1996 defense budget.

In the Pentagon's view, the new law paves the way for not only a surge of privately financed and privately built houses but also housing built using current construction standards. If the US sticks with this effort, said Pentagon officials, it could reverse the decline in military housing and produce an acceptable situation in as few as ten years.

Years of Underfunding

The services have built housing over many years under various programs. Among the better known were the Lanham Act project of the World War II era and the Wherry and Capehart Housing Programs during the 1950s and 1960s *[see box p. 38]*. These houses were built according to the standards of the day. Even the more recent housing units—some 11,000 built under 1984 legislation known as Section 801—reflect earlier standards and legislation, which actually restricted room size.

Moreover, funding for housing upkeep and improvements has not kept pace with traditional home-maintenance requirements.

The average age of military family housing is thirty-three years. About twenty-five percent of those houses are more than forty years old.

Though USAF has been noted for having the best military housing, half of its houses still were classified as "unsuitable." Some 100 Lanham Act houses built in the 1940s, like this one at McChord AFB, Wash., are scheduled to be replaced in Fiscal 1996 and 1997.

Photo by Bill Chan

The majority were built before the advent of the All-Volunteer Force in 1973, when the force was largely unmarried, but times have changed.

In 1955, only forty-two percent of the force was married. Today, married military men and women constitute sixty-one percent of the force. Moreover, out of the nearly 400,000 houses they occupy, the Pentagon considers nearly half to be unsuitable.

In several Congressional hearings last year, Joshua Gotbaum, then assistant secretary of defense for Economic Security, testified that houses "are too small, their layouts and amenities reflect the standards of the 1950s instead of the 1990s, and many are just plain dilapidated and falling down."

Even those that have been renovated, added Mr. Gotbaum, have not been brought up to today's standards.

A DoD Task Force on Quality of Life recently took a comprehensive look at the housing problem *[see "Task Force Links Readiness, Quality of Life," December 1995 "Aerospace World," p. 15]*. The panel found that the armed services had failed to ensure adequate funding for maintenance, repair, and replacement, turning once-new homes "into poorly maintained, low-quality housing by the mid-1980s." The task force also noted that the then-modern housing lacked both the amenities and the size considered standard in the private sector today.

Pentagon officials attribute the poor condition of housing to the existence of higher priorities, which drained funds into other areas, and to rigid housing procedures, which made it difficult to get the most out of what money was available. DoD officials note that the problem did not appear overnight.

"When faced with trade-offs between force levels, modernization, and readiness [and] housing investment, [family and bachelor] housing has frequently come in second," stated Mr. Gotbaum. He stressed that housing's "rigid management practices" and "inflexible specifications and standards" have contributed to higher costs and an unwillingness of industry to work with government.

"Best" Is Far From Good

The DoD task force credited the Air Force with having the "best housing," despite USAF's listing of more than half its family housing as "unsuitable" and some as "substandard." In the view of USAF's top civil engineer, Maj. Gen. Eugene A. Lupia, the Air Force traditionally has placed a "great deal of emphasis on family housing" and even more so in the last ten years. While praising this progress, he also warned, "We have a long way to go."

Within USAF, the "unsuitable" label can be applied to 60,000 family-housing dwellings, or fifty-four percent of its inventory of 114,000 single-family and townhouse-style homes. These are units that do not measure up to contemporary standards and that need major renovation.

General Lupia described the term "major renovation" as replacement of a kitchen, a house's entire electrical system, and heating and ventilation mechanical systems—fixes that would cost about $100,000 per house. The service has tried to cover these major overhauls and new construction over the last ten years with annual investments of about $250 million. At that rate, said the General, it would take twenty-four years to complete the process.

A Short History of Military Housing

(From the DoD Task Force on Quality of Life, Final Report, October 1995)

In the nineteenth century, the military focus was on providing housing for its officers rather than for enlisted men, who were considered to be "single." Officers either lived on post or received a housing allowance. Enlisted men lived in tents, aboard ship, in cantonments at forts, or in temporary wooden barracks.

Initially, the only members provided quarters on post were the commanding officer and a few senior officers and top-ranking enlisted men. The post quartermaster normally rented housing for other officers at no expense to them. Apart from the most senior enlisted men, the few permitted to marry had to find housing for themselves.

As many small frontier forts closed toward the end of the century, the Army consolidated its forces at larger posts and began to construct more permanent housing. By 1939, following a military housing construction program authorized by Congress, the armed forces had built about 25,000 family housing quarters, enough for less than ten percent of the troops.

During World War II, the Army and Navy built additional houses, although most were rental units or temporary construction, under the Lanham Act and other emergency legislation. (Some 100 Lanham Act houses still in use today at McChord AFB, Wash., are scheduled for replacement in Fiscal 1996 and 1997.)

After the war, construction slowed, with the services building a few new temporary houses and making existing temporary houses somewhat more permanent. However, the larger standing force required more housing, prompting Congress to authorize the Wherry Program in 1949.

Under the Wherry Program, the first use of private financing for military housing construction, the government guaranteed rent for houses constructed on government-owned land or near military installations. Military members or civilian residents rented the finished houses. Between 1949 and 1954, more than 83,000 Wherry homes were built.

As the Wherry Program took off, President Harry S. Truman also created the Defense Housing Commission in 1950 to study the issue of housing military families. The commission established the Armed Forces Housing Agency, which lasted only three years but laid the foundation for the Defense Housing Act, passed in 1954. Under this first major use of appropriated funds for housing construction, the services built 18,000 homes.

The following year, Congress authorized another housing project, the Capehart Program. Running from 1955 to 1962, this program produced more than 115,000 houses, built on government land by private contractors under mortgages insured by the Federal Housing Administration. Once the houses were completed, the sponsoring military agency assumed responsibility for operating and maintaining them and paying the twenty-five-year mortgages. Residents of Capehart housing forfeited their Basic Allowance for Quarters.

In the 1950s, the composition of the services began to change, with the number of married members increasing from thirty-five percent to forty-five percent. By 1960, the housing inventory had reached 300,000.

In 1962, Secretary of Defense Robert S. McNamara centralized housing management and funding for all the services at the Pentagon. He also advocated an increased use of appropriated funds over private financing for construction. Although the Vietnam War diverted resources from housing, the services built about 8,000 houses per year during the 1960s and early 1970s. By the end of the 1970s, only 1,000 per year were built.

A change in 1982 placed responsibility for housing programs back with the individual services. Three third-party financing authorities developed in the 1980s had varying success.

Under Section 801 (Title 10, section 2836), essentially a build-to-lease program, the services signed a twenty-year lease/purchase agreement with a private developer who then built houses to military specifications. The services built about 11,000 houses, including more than 4,000 for the Air Force, using Section 801.

Section 802 (Title 10, section 2837), a housing rental-guarantee program, obligated the services to guarantee ninety-seven percent occupancy or subsidize payments under a twenty-five-year agreement with a private developer. Military members had first priority to rent the houses and would pay the developer directly. However, the rents were based on local Basic Allowance for Quarters/Variable Housing Allowance (BAQ/VHA) levels, which, at fifteen percent below the median national housing costs, produced little interest from private developers. The Marine Corps used Section 802 to build 276 houses.

With real estate out-leasing (Title 10, section 2667), the services could lease government land to private developers to build houses with terms up to ninety-nine years. There would be no rental guarantee; the developer would assume all risk. Rents again would be based on local BAQ/VHA levels but adjusted for inflation in later years. Individual service members would retain their housing allowances and enter into a lease with the developer. Only one project of 220 houses built for the Army has been successful using this provision.

Today, the services control a total of 387,768 family housing units, including townhouses and single-family houses.

Congress raised the funding for housing in Fiscal 1995 to about $300 million, which, if maintained for the long term, would reduce the renovation cycle to twenty years. The Air Force and the other services are looking for a way to cut the cycle more dramatically. Each service emphasized to Congress the impact that housing has on military members.

"The living environments we provide our people contribute major dividends to the Air Force through increased productivity and retention of highly trained personnel who feel the Air Force cares enough about them to provide them good facilities for their homes," Rodney A. Coleman, assistant secretary of the Air Force for Manpower, Reserve Affairs, Installations, and Environment told Congress last year. He added that the Air Force's housing improvement program has been "extremely successful"—improving more than 18,000 homes since 1988. (The number is now about 23,000, according to USAF housing officials.)

Currently, the Air Force is renovating or replacing about 10,000 houses, using traditional military construction funding from Fiscal 1992–95 appropriations. Apart from these major renovation and construction projects, the service expects to spend about $3,800 per house in Fiscal 1996—up from $3,600 in Fiscal 1995—for annual maintenance. That equates to about $435 million over the entire stock of 114,000 houses.

"That's probably . . . in the ballpark of what most homeowners spend on their house over the year," said General Lupia.

However, a continuing problem is that the service has a backlog of maintenance work estimated to cost more than $900 million. The increase of $200 per house will slow the rate of escalation in the buildup of the backlog, but it will not eliminate it.

Some USAF housing is worse than merely "unsuitable." About 800 houses in the inventory are deemed "substandard." Air Force officials maintain that the dwellings are safe for habitation; however, they are in such poor condition that the families who live in them retain some of their housing allowance in compensation.

The Air Force is making headway on this problem. Compared with today's figure of 800 problem units, the figure twenty years ago was 6,700. General Lupia said that the 800 will be replaced by 1997.

Staff photo by Guy Aceto

Air Force officials have called the dorm that houses the USAF Honor Guard at Bolling AFB, D. C., a "hovel." It is so bad that the service recently had contractors recondition it enough to make it livable until it can be replaced.

Why the Waiting List?

The young, single, enlisted troop has no choice in housing. If a dormitory space is available, he or she must take it. However, many married troops place their names on long waiting lists—39,000 for USAF—for the few on-base houses available, regardless of condition. Given the dilapidated state of much military housing stock, why do so many military families want to live there?

One of the primary reasons is that the housing allowance provided by Congress has not kept pace with the off-base cost of housing. On average, about twenty-two percent of a service member's housing expenses comes out of pocket. When Congress changed the Basic Allowance for Quarters in 1985 and introduced the Variable Housing Allowance, it established a baseline of fifteen percent for that out-of-pocket expense. However, even with a 5.2 percent increase in the housing allowance approved in the Fiscal 1996 budget, the out-of-pocket expense will drop only to about nineteen percent, according to General Lupia. In view of the goal of fifteen percent, he noted that the "out-of-pocket costs are still pretty high." Some lawmakers are working on legislation to further increase the housing allowance.

Cost is not the only factor attracting the troops to base housing. Last year's big USAF Quality-Of-Life survey showed that Air Force members considered security a big factor in deciding whether to live on or off base. With more frequent deployments, troops want to know that their family members are safe. Living in a community where neighbors are also military, as well as having a nearby hospital and commissary, are assets that rate especially high for young families with a single automobile. Indeed, General Lupia said that a much higher percentage of the family housing—roughly thirty percent more—goes to the enlisted force than to officers.

"We're far more concerned about [the financial impact on] our young enlisted people than [on] our officers," said the General. "We expect [officers] to take that money out of their pocket and go live downtown rather than [expect] a young enlisted person to do that."

Each year, every Air Force base reviews its housing situation, determining who is on the waiting list, how long they have waited, and the current distribution of houses by grade. Then, base authorities redistribute houses to different grades as

Photo by Bill Chan

USAF has renovated about 23,000 family homes since 1988. These 1960s-era townhouses, home to enlisted members and their families at McChord, were among the housing units renovated in 1995.

Historic Quarters Add To Funding Problems

The DoD Task Force on Quality of Life found that the historic-quarters housing maintained by the military "disproportionately drains overburdened housing accounts."

The 2,675 military houses listed on the National Historic Register (NHR) must be maintained in full compliance with the National Historic Preservation Act of 1966.

In Fiscal 1996, DoD plans to spend almost $63 million on historic quarters, about $23,000 per unit. As shown below, the Army will spend the most, about $58,000 per unit.

Historic preservation boards regulate work done on historic houses. Stringent restrictions on changing the appearance of the houses usually add to the cost of upgrades, stated the task force report.

The task force recommended that DoD and the services review their inventories of historic quarters and initiate action to remove all but the most significant from the NHR.

Planned Fiscal 1996 Spending for Historic Houses

Service	Number of Units	Maintenance, Repair Costs	Average Cost Per Unit
Army	786	$45,400,000	$57,761
Navy	378	11,300,000	29,894
Air Force	1,511	5,900,000	3,905
Total DoD	**2,675**	**62,600,000**	**23,402**

Source: DoD Task Force on Quality of Life; FY 1996 DoD Budget Submission

needed. The larger portion goes to lower grades for both enlisted and officer families.

Mr. Coleman also emphasized the higher priority for young enlisted members. He said that eighty-four percent of the Fiscal 1996 budget request for capital improvements replaces or improves homes for enlisted families.

Though it is DoD policy to rely on local communities for family housing—providing government housing only when the local area cannot meet the demand—private-sector housing may not be the best solution in many cases. According to Mr. Gotbaum, one family in eight lives in unsuitable off-base housing.

"Hardships occur when rents are excessive or a family can only afford to live in isolated, sometimes unsafe neighborhoods," Mr. Gotbaum testified. "Problems are made worse when the family only has one car or perhaps none."

Mr. Gotbaum also said that some duty locations lack "good, safe, affordable housing" within a reasonable distance, a factor that has forced some families to be "involuntarily separated," meaning that the military member transfers to the duty location but his or her family members do not.

Changing the Rules

Defense Secretary William J. Perry decided that taking thirty or forty years to fix the housing problem was "entirely inadequate." He asked for a solution that would produce results in ten years or less.

Defense Department officials concluded that the answer lay in attracting private capital. While the use of private financing is not new, a DoD Housing Finance "Tiger Team" came up with a pilot program it hoped would introduce a new flexibility to broaden and combine previous legislation. The panel's members also proposed using commercial building practices and standards.

"In real estate, one size does not fit all," Mr. Gotbaum told a Congressional committee, adding that solutions that work in one location can fail dismally at another. The Pentagon wanted to provide the services the ability to tailor an approach to best suit a particular location.

Financial practices have changed since the construction of the Wherry and Capehart housing. Even the Section 801 legislation that produced some 11,000 houses is no longer an option since the Office of Management and Budget introduced "budget scoring" in the 1990 Budget Enforcement Act.

Under the scoring rule, DoD would have to fund an entire twenty-year lease in one year for any new houses built under Section 801. According to Mr. Gotbaum, the new approach would not eliminate OMB's scoring rule but would develop mortgage or loan guarantees that could be scored at less than 100 percent.

A key selling point in the Pentagon's push for the pilot housing program was the need to use commercial building processes to produce houses faster and cheaper. Statutory limitations on square footage have forced the services to build smaller houses that cost more and take longer to construct than comparable private-sector houses.

The average DoD house with three bedrooms has a net living area of about 1,200 square feet, compared with a similar private-sector house's area of about 2,100 square feet, yet costs more to build. General Lupia explained that, in some cases, a builder will have to spend more to build a nonstandard small house than to build a larger one using off-the-shelf materials precut at the factory, standard practice for private home builders.

The Air Force has already met with representatives from private-sector banks and architectural, engineering, and construction firms, as well as officials from the National Association of Home Builders and various government lending agencies. General Lupia also created a facilities privatization office and met with housing personnel from every major command.

The General contended that a great deal of interest has been shown by entrepreneurs, especially now that DoD demonstrates a willingness to eliminate costly regulations and specifications. "We have a great deal of confidence that the privatization thing is going to work," he said.

DoD also created a special joint office, the Housing Revitalization Support Office, last year. The HRSO

and the services are evaluating potential sites for private-sector housing proposals.

"Our target is to have about eight to ten projects with up to 2,000 family housing units awarded within the next year," Deputy Assistant Secretary of Defense Robert E. Bayer stated before a House National Security subcommittee March 7. He said they would serve as prototype sites to test the new legislative authorities.

Mr. Bayer added that DoD estimates it will take twenty-one months from site identification until families can move into the new or renovated housing. He called this a "vast improvement" over the standard military construction process, which normally takes about thirty-six to forty-eight months.

The Single Life

The good news for single enlisted members is that DoD has approved the so-called "one plus one" housing standard, beginning in Fiscal 1996 *[see "One Plus One Approved," February 1996 "Aerospace World," p. 15].* This means that a single enlisted person eventually will have a private sleeping room and share a bath and kitchenette with one other person. This stands in contrast to the previous "two plus two" standard, which placed two persons in each room with four sharing a bath. The bad news is that it will take a long time to provide such privacy for dormitory residents.

Senior military leaders evidently have recognized that the lack of privacy in personal housing arrangements is a major irritant for the new breed of soldier, sailor, airman, and Marine. It was a reality that first became readily apparent in the Air Force's 1995 Quality-of-Life survey.

General Lupia said, "When eighty-eight percent of your people are telling you . . . 'If you want me to reenlist, I'd like a little privacy,' you ought to be listening."

DoD-wide surveys produced similar results, showing that today's single enlisted member wants more than just a bunk and a common, or "gang," latrine. Taken together, the services require some 450,000 junior enlisted members to live in barracks, and at least one-fourth of those still live in facilities with gang latrines that are deemed substandard, based on the two plus two standard adopted in 1983.

One of those substandard dormitories houses the US Air Force Honor Guard at Bolling AFB, D. C. Mr. Coleman described it as "a hovel" and reported that it is being replaced. He told Congress that the Bolling facility "looks bad, is bad, smells bad; the water's bad, the heat's bad, everything is bad." And there are other facilities in similar condition, he said.

Some of the worst Air Force housing units are the 152 gang-latrine facilities still home to 7,000 permanent-party airmen. In all, the service has 875 dormitory buildings providing shelter for approximately 70,000 enlisted members.

Since 1983, USAF has managed to move eighty percent of its permanent-party dormitory residents into facilities meeting the two plus two standard or better. The service expected to have every airman living in that configuration by 2000. Now, according to General Lupia, the goal is still to eliminate the gang latrine by the turn of the century but at the same time begin to implement the new, one plus one standard.

"Let's say, nominally, by about 2010 the Air Force [will be] at the eighty to ninety percent conversion to one plus one," he said.

However, officials must decide whether it is practical—structurally or financially—to renovate buildings that have already been reconfigured multiple times. General Lupia explained that the service doesn't plan to take every two plus two dormitory and convert it to one plus one. It's not that easy.

He said the average dormitory has a nominal useful service life of twenty years. The facilities "take a pretty good beating" from their eighteen-, nineteen-, and twenty-year-old occupants. Some of the buildings converted to the two plus two configuration will be at the twenty-year point within four years.

Nonetheless, the Air Force is stepping out with the new housing standard. The Fiscal 1996 budget request included about $132 million for twenty-four dormitory projects that would apply the new private sleeping room standard.

On top of what service officials called the largest dormitory funding request since 1989, Congress added $46 million for construction and $100 million for maintenance and repair of existing dormitories.

The Air Force doesn't plan to stop there. Having launched its changeover to the one plus one standard, the service now wants to pursue "Vision 2020." This latest goal, which surfaced about two years ago, according to General Lupia, calls for the Air Force to provide each permanent-party airman a private sleeping room, kitchenette, and bath by 2020. ■

Staff photo by Guy Aceto

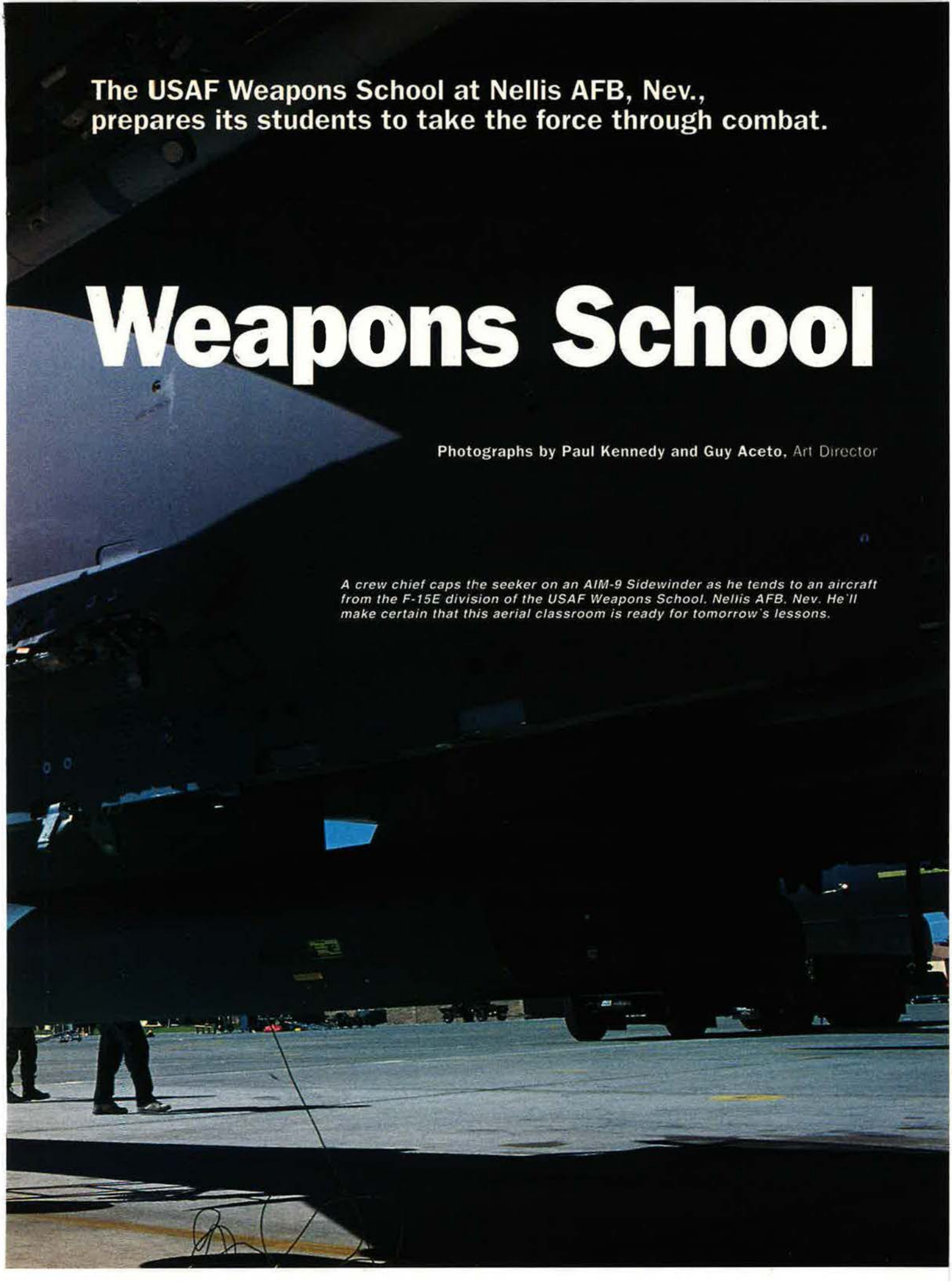
Cramped living arrangements, such as this two-to-a-room unit at Bolling AFB, will not encourage today's airman to reenlist, according to USAF's Quality-of-Life survey. This dorm is one of 152 gang-latrine facilities slated to be gone by 2000.

Staff photo by Guy Acelo

The USAF Weapons School at Nellis AFB, Nev., prepares its students to take the force through combat.

Weapons School

Photographs by Paul Kennedy and Guy Aceto, Art Director



A crew chief caps the seeker on an AIM-9 Sidewinder as he tends to an aircraft from the F-15E division of the USAF Weapons School, Nellis AFB, Nev. He'll make certain that this aerial classroom is ready for tomorrow's lessons.

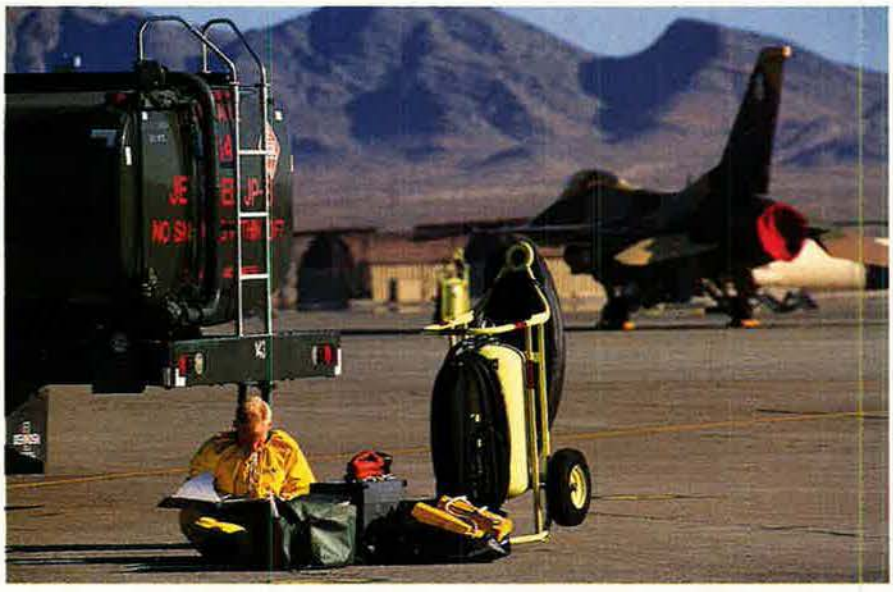
Staff photo by Guy Aceto

With its bull's-eye and cross hair design, a "Target Arm" patch like the one at left identifies a superior weapons officer with in-depth technical expertise, an excellent instructor, and an expert in combat employment—a graduate of the USAF Weapons School. Those wearing patches like this one (earned before 1992, when the word "Fighter" was dropped) have completed five and a half months of flying and classroom study covering fighters, bombers, command and control, intelligence, or search and rescue and have trained to become the primary instructors and tacticians of their units, serving their commanders as technical advisors.

Students for this "graduate school" are handpicked, experienced, instructor-qualified flyers. A student in the F-15C division, for example, usually has five years in the Eagle, with 300 hours of instructor pilot time. At Nellis, the officer completes thirty-four sorties and 236 hours of classroom instruction. Real-world operations tempo might preclude a comprehensive postflight briefing, but here such debriefs are long and exacting, with every aspect of performance carefully critiqued.

Staff photo by Guy Aceto

Photo by Paul Kennedy



An office is where you keep your paperwork. This crew chief checks his in the shadow of a refueling truck. Crew chiefs and support personnel at Nellis are some of the best in the Air Force. With so many different types of aircraft flying such varied sorties, maintenance must be top-notch.

Staff photo by Guy Aceto

The USAF Weapons School has kept pace with changes in the Air Force. It was opened in 1949 as an F-80, F-84, and F-86 gunnery school, later training its graduates for the Korean War. With the addition of the F-4, F-111, F-15, A-10, and F-16 aircraft in the 1970s, the school moved away from its gunnery focus. Instruction for radar controllers and intelligence officers began in the 1980s. "Fighter" dropped from the school's name when, in 1992, most of Strategic Air Command and Tactical Air Command merged to become Air Combat Command, and the B-1 and B-52 divisions joined the Nellis school.

The Weapons School consists of seven flying divisions—for the A-10, B-1, B-52, F-15C, F-15E, F-16, and HH-60—and the intelligence and command-and-control operations divisions. One of the latest additions to the school's curriculum is combat search and rescue. Eight trainees per year, flying the HH-60H, will prepare for this vital role. Top, one of the school's helicopters lands back at base. Above right, a crew unpacks after the day's sorties.

Photo by Paul Kennedy

Staff photo by Guy Aceto

Photo by Paul Kennedy

The Weapons School covers so many disciplines that there is not always enough space under one roof for them all. The addition of the HH-60 meant moving the F-15E division into what had been the school's lounge area (above), where plaques from previous classes still hang on the wall. The benefits of housing the divisions together outweigh the inconveniences, however. "This is the classic example of the synergistic effect," said Lt. Col. Jeffrey W. Leeper, F-15C division commander, "because through the six months that the students are here, they get academics in all of the different areas that some of them may not have even known about before, and they live together with people from different disciplines." He added, "As the course goes on, we integrate the other students and instructors, all work together, and come up with the better way to do it."

Nellis graduates two classes per year, in June and December. The largest class, for F-16s, graduates twelve students per cycle. The F-15E class is one of the smallest, with three pilots and three weapon systems officers per class. Above right, an F-15E blocks in after a morning sortie.

Staff photos by Guy Aceto

The intelligence division supports each flying division through mission planning and evaluation of threats and targets. "Intel needs to know just about everything there is to know from an academic standpoint," said Lt. Col. James D. Cantwell, former deputy commandant. Students in the intelligence division receive the heaviest load of academic instruction—406 hours. At right, on a portable unit identical to equipment at their home squadrons, 1st Lts. Mike Stevenson, A. J. Ajello, and Daniel Simpson check information on an upcoming sortie.

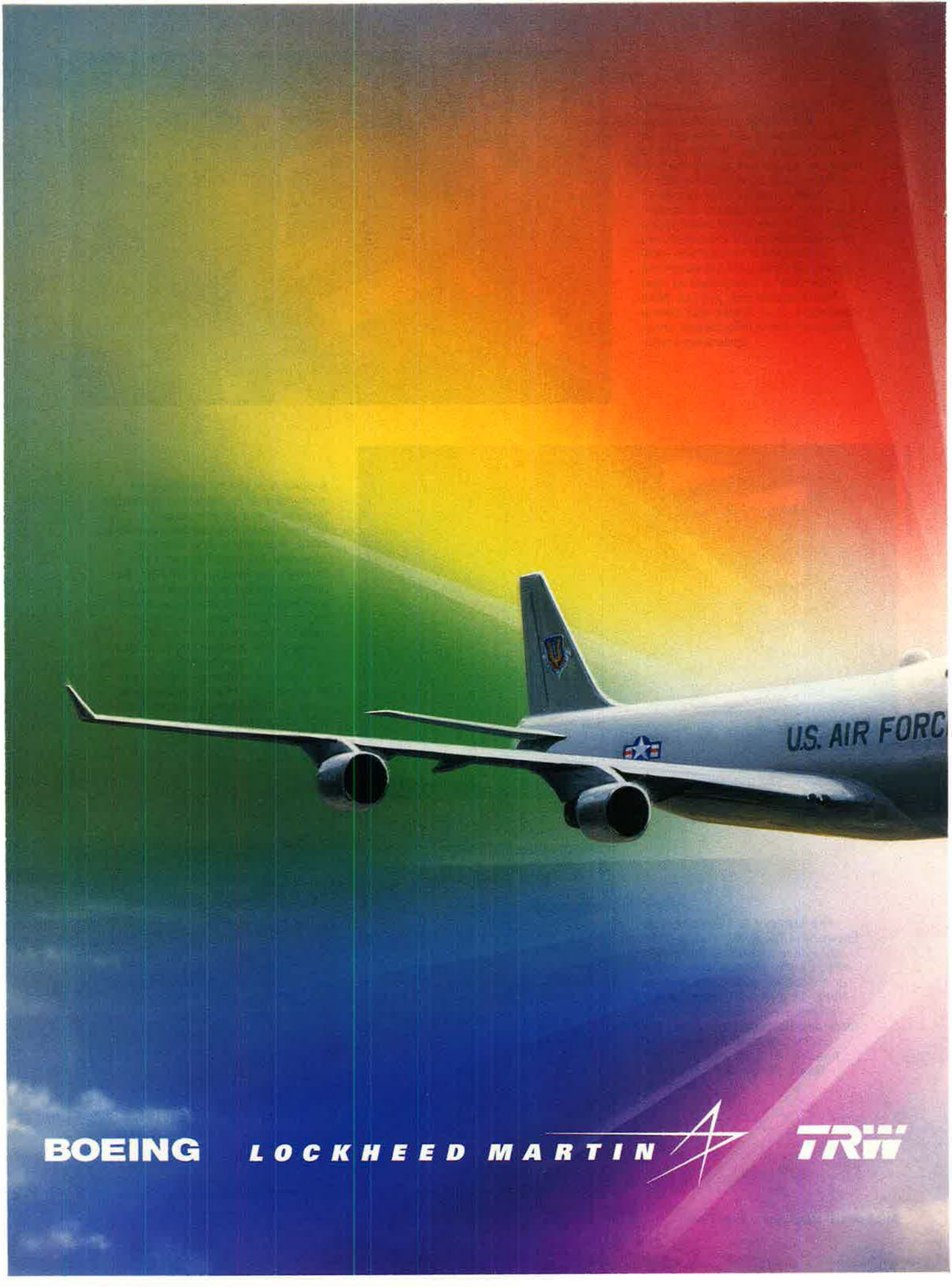
Photo by Paul Kennedy

Photo by Paul Kennedy

A portion of the information the students use is classified. Behind this vault door is the school's library, containing records dating to 1949, including actual combat accounts from the Korean War through the Persian Gulf War. As befits a graduate-level course, students present briefings, write a paper for publication, and must pass numerous written exams. Some of the work is stored in this vault, to be used by future students as research material. This wealth of information is also available to combat units through state-of-the-art distribution systems.

The school's B-1 division is at Ellsworth AFB, S. D., and its B-52 division is located at Barksdale AFB, La. For the final two weeks of school, all divisions gather at Nellis for a mission-employment phase—a composite force-on-force operation that serves as the culmination of five months of training. At right, one of the 2d Bomb Wing's B-52Hs awaits its crew.

Staff photo by Guy Aceto


U.S. AIR FORC
BOEING
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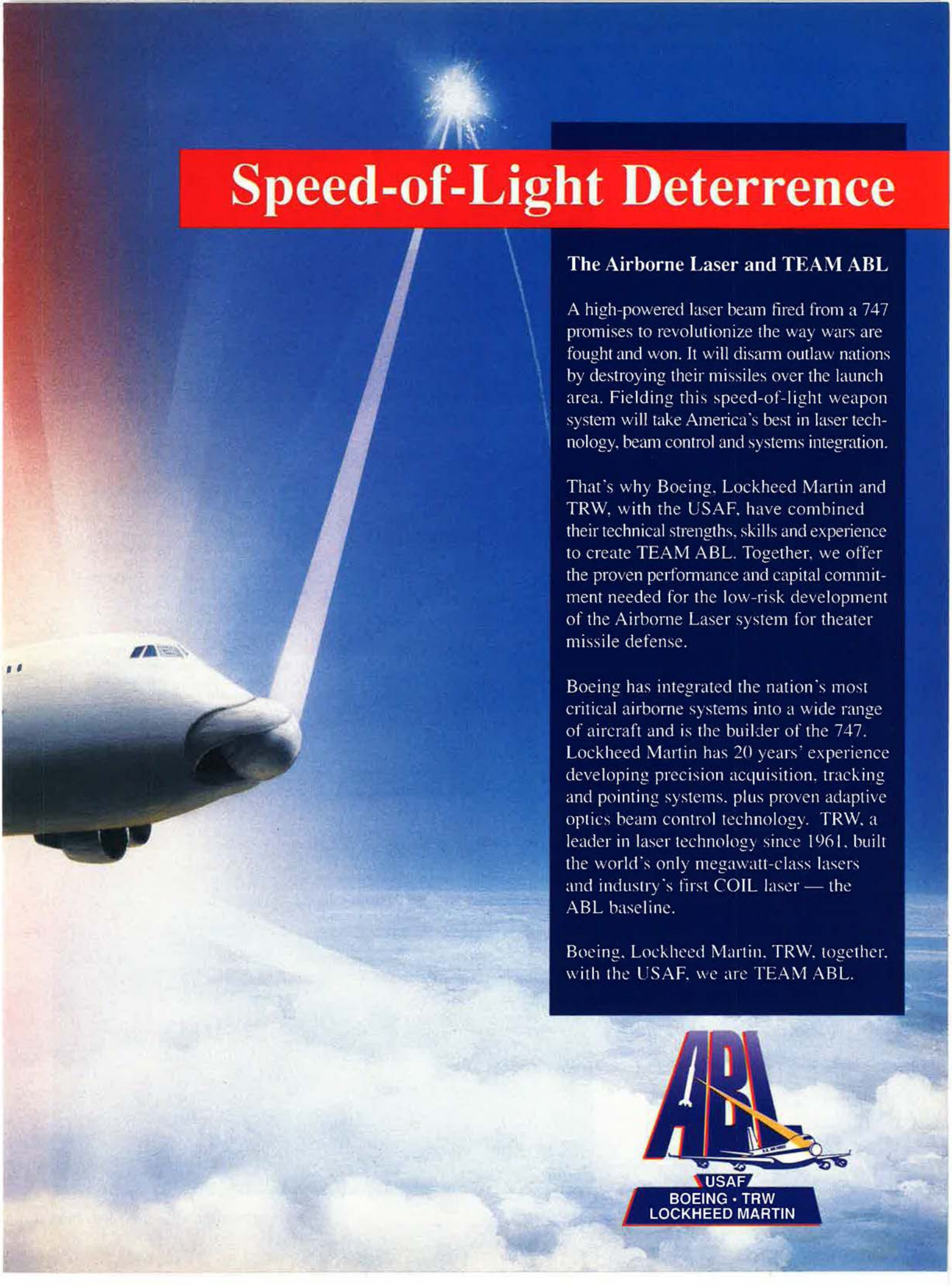


Speed-of-Light Deterrence

The Airborne Laser and TEAM ABL

A high-powered laser beam fired from a 747 promises to revolutionize the way wars are fought and won. It will disarm outlaw nations by destroying their missiles over the launch area. Fielding this speed-of-light weapon system will take America's best in laser technology, beam control and systems integration.

That's why Boeing, Lockheed Martin and TRW, with the USAF, have combined their technical strengths, skills and experience to create TEAM ABL. Together, we offer the proven performance and capital commitment needed for the low-risk development of the Airborne Laser system for theater missile defense.

Boeing has integrated the nation's most critical airborne systems into a wide range of aircraft and is the builder of the 747. Lockheed Martin has 20 years' experience developing precision acquisition, tracking and pointing systems, plus proven adaptive optics beam control technology. TRW, a leader in laser technology since 1961, built the world's only megawatt-class lasers and industry's first COIL laser — the ABL baseline.

Boeing, Lockheed Martin, TRW, together, with the USAF, we are TEAM ABL.

ABL

USAF

BOEING · TRW

LOCKHEED MARTIN

Before beginning "class" over the training ranges, students and instructors rub elbows one more time in life support. The training area is "a huge expanse of airspace," said Colonel Cantwell, "and we've got a lot of good, technical targets out there in the desert that we can employ against, [using] lots of live weapons."

Photo by Paul Kennedy

Photo by Paul Kennedy

The large range area at Nellis allows the safe use of many types of live bombs, rockets, and missiles, which adds realism to the training. At left and below, A-10s wait in the live ordnance loading area before launching for the range. Live Mk. 84s and Sidewinders are used against targets. Rounding up large numbers of adversaries to train against presents difficulties. USAF's increased operations tempo means most flyers have had their fill of TDY. The school has staff whose primary responsibility is arranging adversary support, and each division has points of contact charged with ensuring the right number and type of adversaries for the school's different phases.

The A-10, F-15E, F-16, B-1, B-52, and intelligence divisions place heavy emphasis on air-to-ground training. They use a building-block approach, starting with box patterns on the conventional range, surface attack tactics, nuclear weapons, and Joint Air Attack Team (for the A-10), then working up to live weapons employment on tactical targets.

Staff photo by Guy Aceto

Staff photos by Guy Aceto

The instructors take their jobs seriously, interested not in publicity but in their students, who often go on to become the Air Force's senior leaders. Above, F-16 instructor Capt. Scott Bishop waits his turn to teach class out on one of the Nellis ranges. Instructors also go to combat units to fly, teach, and learn how the school curriculum should be adjusted to keep pace with real-world demands. Operation Desert Storm, for example, demonstrated the value of the Weapons School graduate to combat planners but also pinpointed a need for more emphasis on precision guided munitions and night employment instruction.

Role models and experts on the elements of today's integrated force, those who are called "Target Arm" bring special expertise to warfighting commanders and improve the readiness of the combat air forces. ■

The military buildup continues and could produce a nuclear weapon around the turn of the century.

Iran's Regional Powerhouse

By Bill Gertz

IRAN has embarked on a major modernization and buildup of its military force, one that includes selective purchases of new advanced weapons and an ominous nuclear weapons program.

US officials contend that the Shiite Muslim regime will be in a position to construct a crude but workable nuclear device at the turn of the century. The development of a "Persian bomb" is Iran's top priority, and Tehran receives technology and aid from both Russia and China, according to Pentagon officials.

"We're talking about something the size of a boxcar," explained one Defense Department expert, "but with the Iranians, a truck or a merchant ship can be a weapon-delivery system."

In the field of conventional power, Iranian military planners are taking steps to bolster their naval forces, in particular with purchases of Chinese advanced cruise missiles. Moreover, Tehran has purchased new and upgraded surface warships, including five new "Houdong" Chinese fast-attack craft delivered in March to the port at Bandar Abbas.

The ships and cruise missiles, along with other recent deployments of missiles on tiny islands in the Strait of Hormuz, form the outline of a developing challenge to US interests in the region.

The objective of the naval buildup, said one American military official who tracks it, is "to develop the capability to choke us off, at least temporarily, at the Strait of Hormuz, or if they can't choke us off, at least make it very difficult for us to get in." Many of the oil-producing sheikdoms in the Persian Gulf region rely on American military protection to resist Iranian pressure and influence.

Ninety percent of Japan's oil and sixty percent of Europe's oil pass through the strategic region.

High-Quality Warplanes

The Iranian Air Force is relatively small but has improved its arsenal of warplanes with Soviet-made MiG-29 "Fulcrums" and Su-24 "Fencers" as its primary combat aircraft. With a newly installed in-flight refueling capability, Iran's MiG-29s have been given greater range. The Fencers, Iran's main strike aircraft, could be used to deliver nuclear weapons if Iran ever acquires one of appropriate size and weight.

With such modern fighters as the MiG-29 (opposite), Iran is beginning to pose a new threat in the dangerous Persian Gulf region. Now outfitted with in-flight refueling capability, the MiG-29s can project Iranian power around the Gulf.

Photo © Hans Halberstadt / Arms Communications

Iran also is now building its own Soviet-designed Scud B and Scud C missiles, weapons having ranges of about 300 kilometers and 500 kilometers, respectively. In addition to possessing some 200 to 300 Scuds, Iran also has expressed interest in purchasing No Dong medium-range ballistic missiles from North Korea, once the No Dong is ready for sale.

"With the Scud Bs and Cs, they can bring every capital in the [Gulf Cooperation Council] within range," one Pentagon official said. "They can bring debarkation ports within range, and, if they do not already have a chemical warhead, they will probably have one very soon."

Iran's ballistic missile manufacturing program lacks the capability to produce some parts that are essential for the total production of some types of systems. Iran hopes to eventually have complete manufacturing capabilities for its Scuds. Iran also produces short-range missiles similar to the Soviet FROG-7.

Iran's military buildup has been tempered somewhat by its economic woes, which include a US embargo, a cash shortage because of low oil prices worldwide, rapid population growth, and an external debt estimated at $35 billion. The latter problem has made it difficult for Tehran to gain the international credit needed to finance weapons procurement. In 1996 and 1997, Iran is expected to spend roughly $3.4 billion on weapons.

Iran's plan for its conventional forces evidently calls for creating units that are more maneuverable and have more advanced weapons for Tehran's specific purposes—war against forward-deployed US forces, Iraq, or other Persian Gulf nations.

"I think they see their most immediate threat as a conflict with us," said the Pentagon official.

Priorities

The DoD official added, "Iran's priorities [are related to] weapons of mass destruction—their nuclear program, their chemical program, which is pretty well advanced, their biological program, and their missile program, which also is pretty well advanced."

The current military buildup began in 1989, not long after the conclusion of the 1980–88 war with Iraq. Iran, with a Gross Domestic Product of only about $80 billion in 1990, spent $3.1 billion on its military that same year. The next year, the defense budget rose to $3.8 billion.

Washington officials and nongovernment analysts report that Tehran has been active on the arms procurement front. During the period 1989–95, Iran acquired 184 new battle tanks, eighty infantry fighting vehicles, 106 artillery pieces, fifty-seven combat aircraft, and twelve warships. The purchases have expanded its current arsenal to about 1,200 tanks, 1,000 armored personnel carriers, 2,000 artillery pieces, 265 aircraft, and twenty-eight warships.

With a population of about 64 million, Iran maintains an armed force totaling about 513,000 active troops—including its most elite force, the 120,000-strong Revolutionary Guard Corps. Another 350,000 are reservists. Most of the Guards are ground forces.

Nuclear arms. According to Defense Department officials and specialists outside government, Iran seeks nuclear arms to become a regional power and counter the threats posed by the surrounding nuclear and nuclear-threshold states: Israel, Russia, Pakistan, and India.

"The nuclear route may be the only way for Iran to become a regional power without destroying its economy," said Michael Eisenstadt, senior fellow and specialist on the Iranian military for the Washington Institute for Near East Policy. "While building a bomb could cost billions, rebuilding its conventional military would cost tens of billions."

Iran's procurement activities represent clear evidence of a drive to build nuclear arms. The acquisitions include:

- Research reactors from Argentina, India, China, and Russia.
- Argentine reprocessing technology for separating plutonium from used reactor fuel.
- Nuclear powerplants from Russia and China.
- Gas centrifuge components from Switzerland, Germany, and Russia.

On at least one occasion since the disintegration of the Soviet Union, Iran approached the government of a successor state (Kazakhstan) and sought—unsuccessfully—to make a direct purchase of enriched uranium suitable for bomb-making.

The nuclear program "is still in the research and development phase," a Pentagon official said, "but they have a vast acquisition network, and they are getting what they need. Expense is no object. It is a high-priority program."

Chemical and biological weapons. Iran's chemical weapons program is believed to be the largest in the Middle East and includes the production of several types of blistering, choking, and nerve agents. Mr. Eisenstadt believes the Iranians have produced 2,000 tons of chemical agents to date and can produce several hundred tons of agent a year.

Iran produces bomb and artillery shells with chemical agents and probably has deployed missile warheads with deadly poisons.

Meanwhile, Iran's deadly biological weapons include such agents as anthrax and botulinum toxins *[see "Horror Weapons," January 1996, p. 44].*

"Tehran's biological warfare program provides Iran with a true mass-destruction capability for which the United States . . . currently lacks an effective counter," Mr. Eisenstadt said.

Air forces. The Iranian Air Force, with 30,000 personnel, has an aircraft inventory that includes not only Soviet-designed systems but also Chinese F-4s, F-5s, F-7s, and US-made F-14s. The US systems, though aging and difficult to repair, are still a key part of the forces.

Reports have indicated that the Iranians are negotiating to buy Su-27 Flankers from Russia. The Iranians already have twenty-five MiG-29s. They can be refueled by a fleet of KC-707 and KC-747 tankers, bought long ago by the Shah's government.

Before the Shah's downfall, Iran's armed forces had a decidedly Western accent, as these F-14 Tomcats demonstrate. They also have British and French weapons, which are difficult to support in the face of a continuing arms embargo.

These fighters plus some twelve Su-24 Fencers provide Iran's principal air projection capabilities. The Su-24s have extended range, making them capable of reaching targets throughout the Persian Gulf region, according to the Pentagon.

Air defense. Efforts to increase Iran's air defense capability also have been stepped up. Its tradition of aircraft-to-aircraft air defense, largely the result of the US-trained air force that developed before the 1978–79 revolution, is giving way to a ground-based air defense.

The Iranians have been unable to build a nationwide, integrated air defense network. As a result, the Iranian military relies on point defense of key locations using surface-to-air missile (SAM) batteries.

The Iranians have small numbers of Chinese model SA-2s and Russian SA-5 and SA-6 SAMs. Iran reportedly may purchase the highly capable SA-10 missile system that the Russians have been aggressively marketing as the S-300.

Key SAM-defended areas include Tehran and centers involved in development or production of weapons of mass destruction—nuclear research, chemical weapons production and manufacturing, and biological arms work. One key facility defended with the antiaircraft weapons is the nuclear complex at Bashir. Air defense forces include about 18,000 military personnel.

Surface naval forces. The Iranian naval buildup has been closely watched by US Central Command, whose area of operations includes the Persian Gulf. Vice Adm. John S. Redd, commander of US Navy forces in the region, highlighted the threat posed by Iran's newly acquired Chinese C-802 sea-launched antiship cruise missiles in January.

Admiral Redd said he believes the test firing of C-802s in January showed that Iran has increased its ability to threaten shipping throughout the region. He called the C-802 a "new dimension" to the Iranian threat.

C-802s can travel up to seventy-five miles and carry a warhead weighing about 150 to 165 kilograms. The actual number of C-802s bought by the Iranians is not known.

Iran has acquired another effective antiship missile: the Ukrainian-produced "Sunburn," a hypersonic weapon.

Moreover, the Admiral reported, five Chinese Houdong patrol boats were delivered to Iran in mid-March. The vessels represent a qualitative increase in Iran's naval capabilities. The Iranian Navy has "five more platforms that can be mounted with cruise missiles," he said.

"It used to be we just had to worry about landbased cruise missiles," the Admiral continued. "Now they have the potential to have [cruise missiles] throughout the Gulf, mounted on ships."

Admiral Redd said deployments of Iranian surface-to-surface missiles, like the C-802, and surface-to-air weapons have tripled since September 1994. Many are located in areas that can threaten shipping or US carrier-based aircraft.

"What we have seen over that period is a slow and steady increase in capabilities of the Iranian military, particularly in the naval and maritime capabilities," he said. The new missiles are "obviously something we pay attention to" because of the presence of US aircraft carriers in the region.

The new cruise missiles, the Admiral noted, are not the most advanced. But, he added, "a cruise missile is a cruise missile, and you've got to stop it or knock it down. We take it all seriously."

Central Command is not alarmed by the Iranian buildup. "We can handle the threat," Admiral Redd said. However, he emphasized that the US military presence in the region is aimed at keeping stability. "We're not here to threaten anybody," he noted. "We're here to ensure freedom of navigation and to make sure there's a free flow of oil . . . to ensure stability and security."

Iran's ten French Combatant II ships at one time were armed with French-made Exocets and US Harpoons, but no Harpoon firings have been detected since the 1980s. Two of the Combatant IIs, however, were modified by Chinese weapons technicians last year to fire C-802s.

Iran's ten new Houdong missile boats are equipped to fire C-802s.

Submarines. Iranian naval power was greatly expanded by deployment of two Soviet-designed *Kilo*-class diesel submarines that Tehran bought from Russia. The submarines are in operation and will be joined by another *Kilo*-class boat this year.

Iran has upped the naval stakes considerably with the purchase of three* Kilo*-class submarines from Russia. Though virtually useless in the shallow waters of the Persian Gulf, they should be effective in the Gulf of Oman and elsewhere.

The *Kilos* are armed with high-technology, wake-homing torpedoes, which, according to the Pentagon, are effective against all types of ships.

Because its waters are so shallow, the Persian Gulf is a poor location for submarine operations; the US Navy, for example, would have little difficulty spotting them, tracking them, and destroying them. The *Kilos* operate mostly in the blue water of the Gulf of Oman. Currently stationed at Bandar Abbas, they eventually will be based at Chah Bahar.

"We think they'll get another *Kilo* submarine this year, and that should be the end of it for a while," a Pentagon official said. "They need to absorb that, and [*Kilos* are] very expensive."

Sea mines. From China, Iran is acquiring new underwater mines. These can be deployed from a submarine and can cause havoc in shipping lanes, whether target vessels are commercial or military. These new Chinese mines would upgrade Iran's World War II–era mines, weapons it currently manufactures.

US officers said that the Chinese advanced mines include special mines that lie on the bottom in the mud and are propelled upward after sensing a ship passing above. The mines are difficult to detect and are deadly.

Ground forces. Iranian ground-force development has been relatively modest. Still, Iran has purchased in the past several years Soviet-designed T-72 tanks outfitted with antitank guided missiles in addition to the main guns. "It's a capable system," said a Defense Department analyst.

The ground forces—divided between the elite, well-equipped Revolutionary Guard divisions and the less-capable regular divisions—are currently armed with M48s, British-built Chieftains, and other types of tanks left over from the Shah's days.

A key to future planning is developing the capability to produce T-72s indigenously, as the Iranians see self-sufficiency in weapons and parts as a key goal. T-72s will probably become standard for the ground troops.

Most of the ground troops are deployed along the Iraqi border, and Iran views Baghdad as the principal regional threat. The Iranians believe their ground forces, combined with nuclear, biological, and chemical weapons, and missiles, are the primary means of carrying out another war with Iraq, or with US forces, if it should ever come to blows in the Gulf. ■

Bill Gertz covers national security affairs for the Washington Times. *His most recent* Air Force *Magazine article, "RED HORSE of the Balkans," appeared in the April 1996 issue.*

Official investigations confirm what USAF safety officials knew all along. Flying safety has improved steadily for many years.

Flying Safety: The Real Story

By James Kitfield

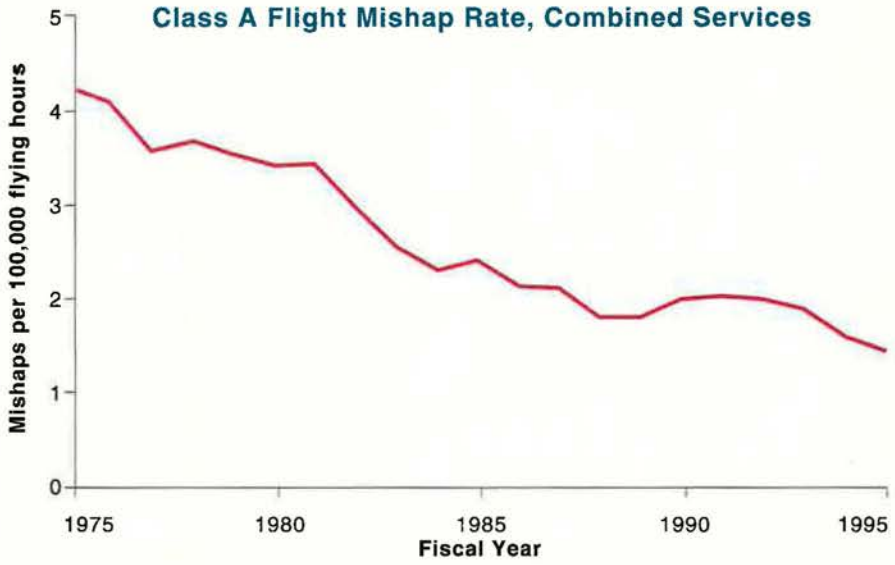
THREE major air disasters in 1994 set warning lights flashing throughout the Air Force about safety procedures. First, an F-16 crashed into two transports at Pope AFB, N. C., destroying the fighter and one transport and killing twenty-three service members. Next came the accidental shootdown by two F-15s of two US Army UH-60 Black Hawk helicopters over Iraq, killing twenty-six personnel. Finally, a B-52 performing unauthorized maneuvers crashed near Fairchild AFB, Wash., killing four.

At that time, few members of the public would have guessed that the Air Force safety record was not deteriorating.

These tragedies by themselves would have been enough to trigger a review of USAF procedures, but Alan Diehl, a former safety official at Air Force Safety Center, Kirtland AFB, N. M., added to the urgency by writing a scathing letter to the Defense Secretary and members of Congress. In it, he charged that a lack of independence and expertise on Safety Investigation Boards (SIBs) had compromised as many as thirty crash probes.

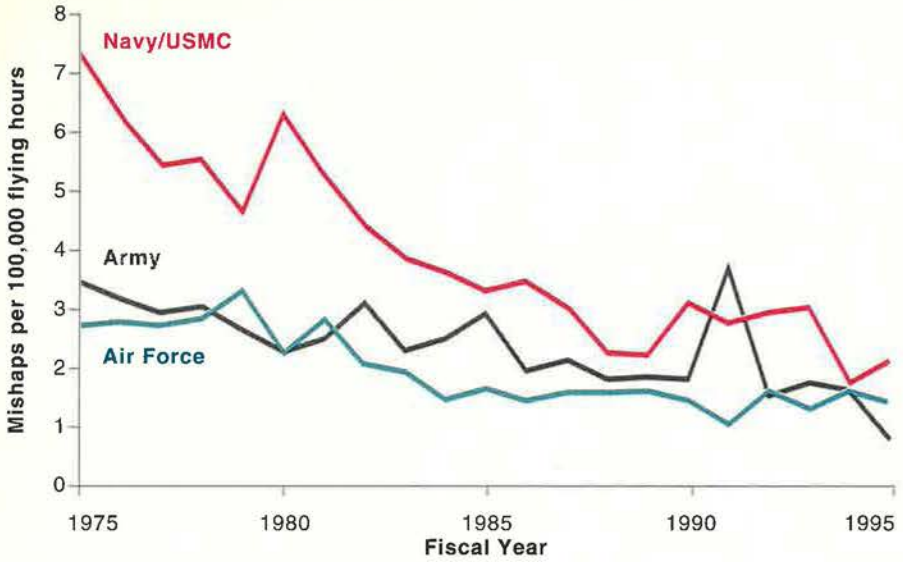
Nowhere did those warning lights flash more intensely than at Kirtland AFB, where Air Force Safety Center officials chart accident trends in an effort to prevent mishaps. "That letter and those three high-profile accidents attracted a lot of negative press, and I had a lot of my own concerns," said Brig. Gen. Orin L. Godsey, the Air Force chief of Safety.

These events touched off a series



DoD's Class A mishap rate, calculated as the number of accidents per 100,000 flying hours, declined from about 4.3 in FY 1975 to 1.5 in FY 1995.

Class A Flight Mishap Rate, by Service



Each of the services has also experienced an overall downward trend in its mishap rate since FY 1975.

of high-level investigations by an Air Force Blue Ribbon Panel on Aviation Safety, the General Accounting Office, and the Pentagon Inspector General. General Godsey said that the work of the Blue Ribbon Panel was important "to get at the truth behind the accidents." However, he added, "I was trying to put out the positive message that our overall accident record was still good. I was just never effective at cutting through the negative spin."

The Reality

Then, in February 1996, GAO released a report titled "Military Aircraft Safety: Significant Improvements Since 1975." GAO investigators confirmed what USAF safety officials knew all along—that Air Force safety had been improving for many years.

From Fiscal 1975 through 1995 the annual number of Class A mishaps (those involving a fatality, loss of aircraft, or damage worth $1 million or more) for all services decreased from 309 to seventy-six. Air Force Class A mishaps dropped from ninety-nine to thirty-two. The mishap rate—or the number of Class A mishaps per 100,000 flying hours—dropped from about 4.3 to 1.5 for the military as a whole and from 2.8 to 1.44 for the Air Force.

"I think everyone was a little surprised at those findings, and that may be a result of the so-called 'CNN effect,' where we pay more attention to these accidents because they now attract more national news," said William E. Beusse, assistant director for GAO's Military Operations and Capabilities group.

GAO noted that each of the services has taken steps to reduce aviation mishaps, including tracking mishap-investigation recommendations and disseminating safety information in manuals, newsletters, and videos. As noted in the GAO report, the Air Force has also recently instituted a number of reforms to enhance the independence of its investigations.

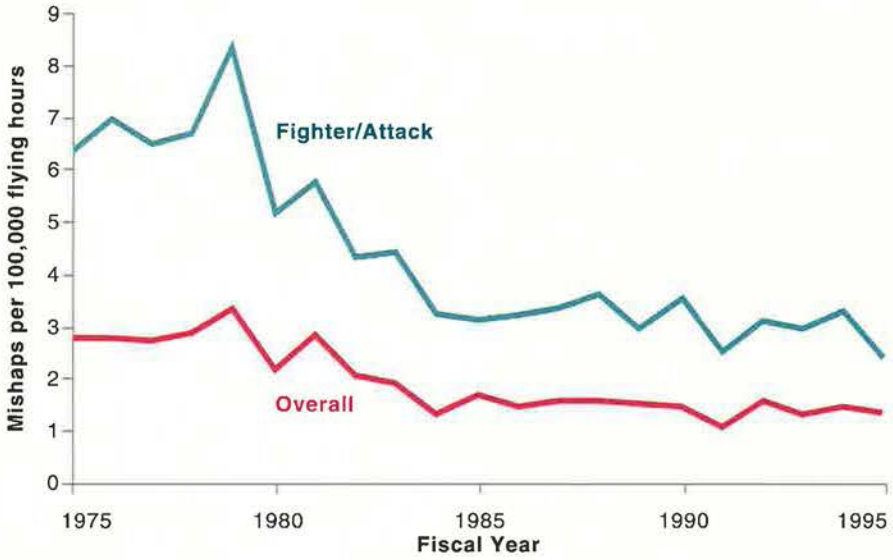
The Blue Ribbon Panel, which released its report in September, tracked similar improvements in safety since 1975. It found, for instance, that Class A mishaps for fighter/attack aircraft have fallen by 61.5 percent over the past two decades, while aircraft losses and fatalities have been reduced by 51.7 percent and 62.7 percent, respectively.

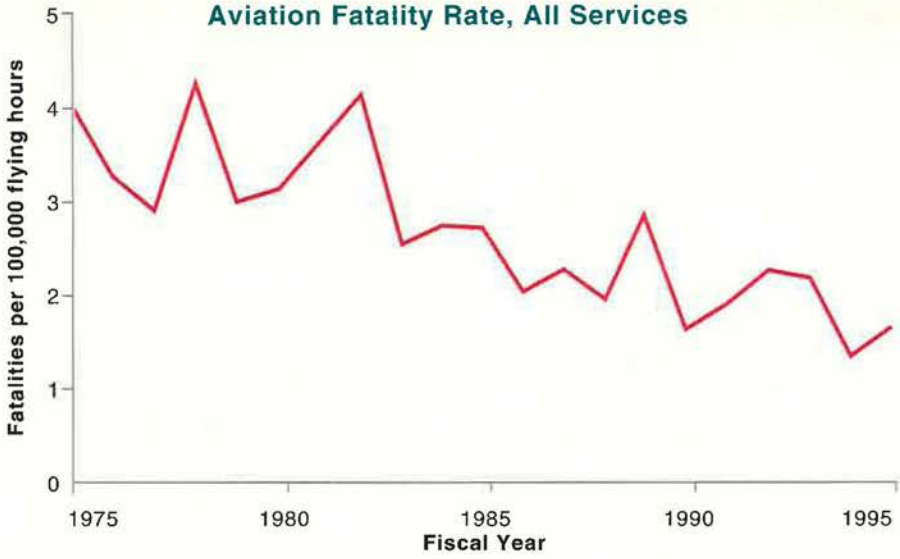
The panel also noted a perception—even among those involved—that SIBs lacked full independence.

"Notwithstanding [an] overall positive perception regarding the mishap-investigation process, there are too many service members who believe that SIB results are occasionally driven by factors outside of the [SIB] process," the panel's report stated, citing information from a questionnaire developed by the Air Force Military Personnel Center (now the Air Force Personnel Center, after merging with the Air Force Civilian Personnel Management Center). "The fact that a significant portion of those holding these views have had SIB experience is an important consideration in developing recommendations."

Previously, a commander of a numbered air force had the authority to convene an SIB, choosing members from within the numbered air force. Once the SIB investigation was completed, the commander could make changes to the language of the report before it was formally released.

Class A Flight Mishap Rate, USAF Only





The number of DoD aviation fatalities per 100,000 flying hours fell from about four in FY 1975 to 1.7 in FY 1995.

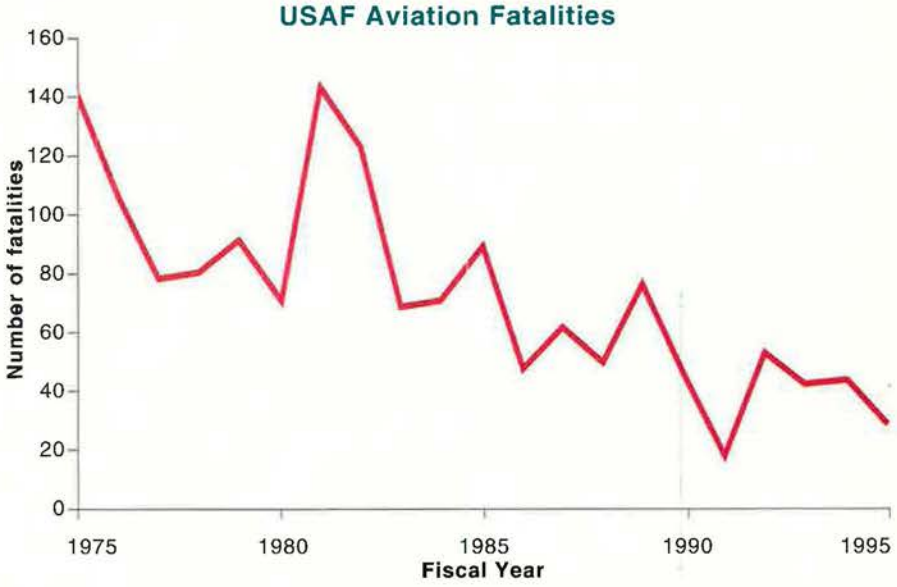
"I think the Air Force realized that no matter how well-intentioned commanders were, it just didn't look right . . . that they could change the language of an accident investigation report and no record would exist of the original," said GAO's Mr. Beusse. "People should be able to make up their own minds on the legitimacy of the changes."

The panel concluded that, in order to remove the perceived conflict of interest, the authority to convene an SIB should rest solely with the commander of the major command (Majcom) involved. The panel also recommended that the SIB report precisely reflect the results of the investigation.

Three Options

"So," said General Godsey, "once a Majcom commander is briefed on the SIB report, he has three options: He can concur, concur with his own comments added, or . . . tell the board to go back and reinvestigate if he thinks they missed something. What he can't do is change the report, and the purpose of that was to remove even the perception in anyone's mind of bias or a cover-up."

Even after an SIB report clears the Majcom, it is subjected to a thirty-day review by the Air Force Safety Center. During that review, the di-



Even before the Army accepted its first aircraft, the service suffered its first fatality when 1st Lt. Thomas E. Selfridge was killed in a crash of the Wright Flyer during tests at Fort Myer, Va., with Orville Wright at the controls on September 17, 1908.

USAF photo by Manuel Ruiz

When a Class A flight mishap occurs, USAF safety mechanisms, including the Air Force Safety Center, Kirtland AFB, N. M., swing into action. The Air Force recently revamped its Safety Investigation Board procedures to combat even the appearance of conflict of interest.

rector can reopen an investigation. "That's actually happened twice during my tenure, because I've received letters during my review that alleged that pertinent information had been missed," said General Godsey.

The Air Force has also adopted a number of the panel's recommendations aimed at improving the expertise on SIBs. An Air Force Safety Center representative who sits on all Class A investigation boards, for instance, was elevated to the status of a voting member. The Air Force also declared that, after October 1, 1995, all SIB leaders would have to take and pass a board president's course. The center has expanded the number of courses designed to train board members to ensure that Majcoms will have adequate expertise on staff.

"That's a positive development for two reasons," said General Godsey. "First, we all agreed that someone shouldn't be on an investigation board unless he was adequately trained, but often there just weren't sufficient courses available." He continued, "Because the people sent to these courses are also the same ones responsible for instituting safety programs for the wings and squadrons, we get a prevention benefit as well."

The Blue Ribbon Panel specifically rejected suggestions, however, that the Air Force create a totally independent accident investigation organization modeled after the National Transportation Safety Board. While the Federal Aviation Administration regulates commercial and general aviation, accident reports are conducted only by independent NTSB investigators.

Panel members concluded that such adversarial "second guessing" of the chain of command could harm combat readiness.

"We want the Majcom commander to 'buy in' to the safety program, and that's much more likely to happen if he can appoint his own team," said General Godsey. "He also has the same goal of zero mishaps or fatalities; so to imply that this four-star general would want to cover up the cause of an accident is really insulting to his integrity."

Looking Deeper

With board members more thoroughly trained in accident-investigation techniques, Air Force officials hope SIB reports will also get at the possible underlying causes for a disaster. Too often, they say, sterile SIB reports focus on the most obvious causes without digging further into possible unseen contributors.

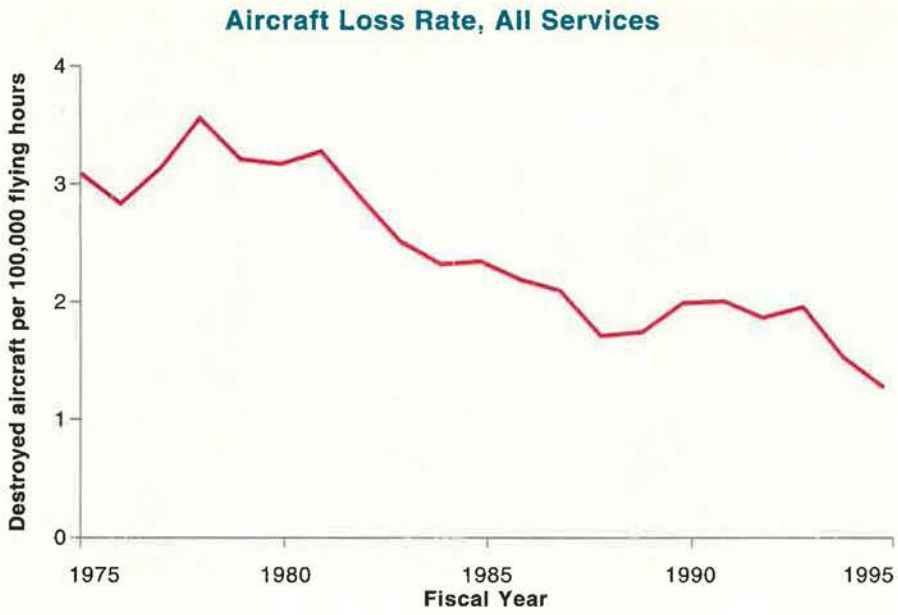
For example, when an E-3B Sentry Airborne Warning and Control System aircraft crashed near Elmendorf AFB, Alaska, last year *[see "Leadership Lapse Cited in AWACS Crash," "Aerospace World," p. 21],* the ingestion of geese by the aircraft's engines was cited as the primary cause of the accident. "But what led so many geese to be flying near one of our airfields?" asked General Godsey. "Those are the kinds of indirect causes of accidents that we want to highlight in our reports."

In another incident last year, an Air Force helicopter crashed into a cable during night vision flying in Korea. The direct cause of the accident was obvious, but Safety Center officials dug a little further to unearth fundamental "human factors" problems.

"We found that the unit had only recently transitioned to that type of helicopter, and the fact that they were being pushed very hard in training to get them combat-ready in a hurry was clearly a contributing factor," said General Godsey. "So, in the past, there has been a tendency to want to blame the machine rather than the man. Yet, in a lot of our mishaps, the man has been just as responsible as the machine."

GAO's analysis of data reported by all services showed that human error contributed to seventy-three percent of Class A flight mishaps in Fiscal Years 1994 and 1995. In Air Force mishaps, human error was a factor seventy-one percent of the time. For the Army, the figure was seventy-six percent. According to the Naval Safety Center, human error was a factor in eighty percent of the Navy and Marine Corps Class A mishaps for Fiscal Years 1990 through 1994.

"The fact that nearly three-fourths of accidents have a human error factor doesn't necessarily mean that the human caused the problem," said GAO's Mr. Beusse. "Often, some other problem occurs, but at some



Since FY 1975, the annual rate of destroyed aircraft per 100,000 flying hours has dropped from 3.1 to 1.3.

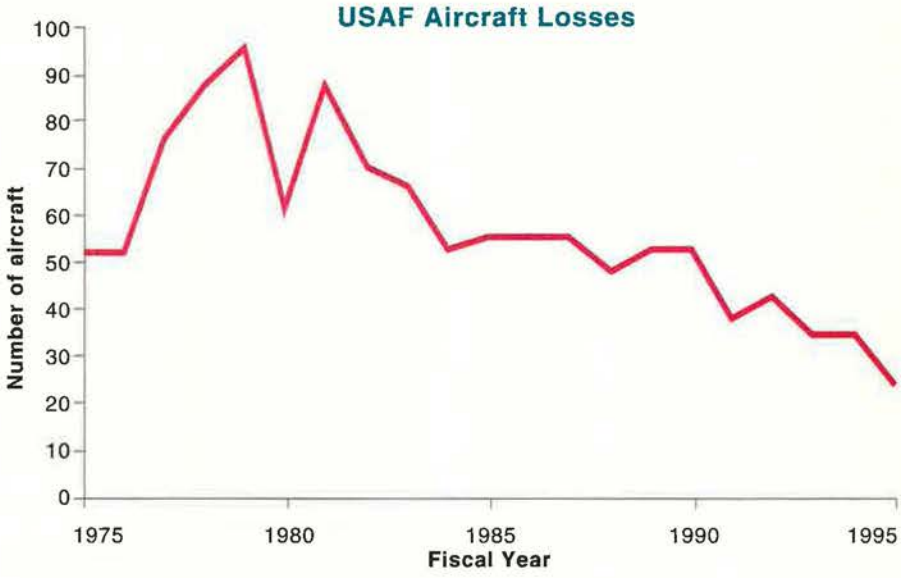
point the human could have or should have intervened to change the course of events—and that someone is not always the pilot. It could be anyone from the air traffic controller to the maintenance crew."

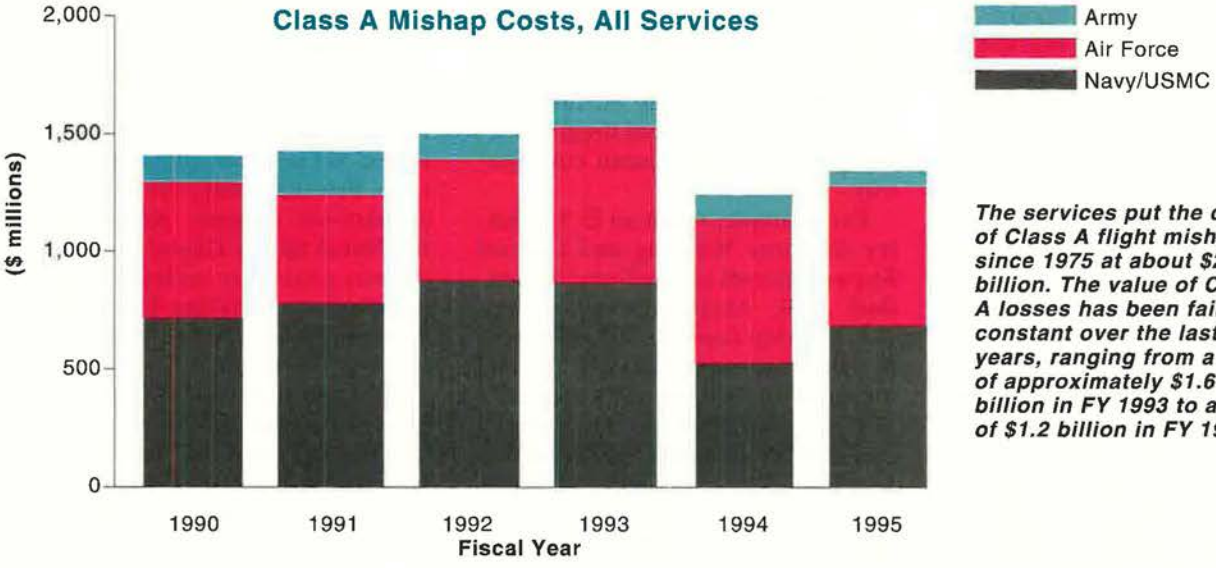
That point was tragically highlighted in May 1995, when an F-15 pilot was killed shortly after takeoff from Spangdahlem AB, Germany. Two Spangdahlem mechanics are standing trial for negligent homicide as well as four counts of dereliction of duty. According to Air Force officials, one mechanic failed to install two flight-control rods properly, rendering the fighter uncontrollable. The other mechanic allegedly failed to catch the mistake in a required inspection. *[See "F-15 Mechanics Stand Trial," May 1996 "Aerospace World," p. 30.]*

Human Factors

To avoid such human errors, all of the services have implemented human factors programs designed to manage and reduce aviation risk. The whole field of human factors got a big boost from the space program, when psychologists for NASA studied ways to improve safety in flight operations.

In 1993, the Air Force established a Crew Resource Management Steer-





The services put the cost of Class A flight mishaps since 1975 at about $21 billion. The value of Class A losses has been fairly constant over the last six years, ranging from a high of approximately $1.6 billion in FY 1993 to a low of $1.2 billion in FY 1994.

ing Group. The next year, CRM training programs were required for all Air Force crew members. According to the Blue Ribbon report, however, implementation of the CRM programs was held up by staff reductions resulting from the military drawdown of the 1990s.

"Not all of the Air Force community adopted CRM as they should have, and the Air Force has recently made the director of Operations and Plans the CRM advocate," said General Godsey, who notes that the Air Combat Command recently let a contract to introduce CRM into the fighter arena.

The CRM program, he said, can improve interaction and communication in any crew environment, from multimember bomber crews to single-member fighter crews to a two-member maintenance team changing a tire on the flight line. "We look at human factors as the next pearl that, when polished, will help us reduce our mishaps," he said.

The Air Force and Navy both are also interested in an Operational Risk Management program instituted by the Army. After suffering a disproportionate number of OH-58 helicopter accidents at night, the Army developed a series of flight profiles for predicting whether a mission was low, medium, or high risk. The number of accidents dropped off once a system was developed to assess the risk prior to each OH-58 mission and offer guidance for reducing the risk to acceptable levels. The Army plans to expand use of the risk-management system to include not only other aircraft but also ground vehicles.

"What we want to do is formalize risk management into our education and training programs," said General Godsey, "so from the time someone comes into the Air Force, they are indoctrinated into a risk-management culture. Of course, as the Air Force moves from peacetime to contingency operations to wartime, you'll see the amount of risk people are willing to take rise."

Getting airmen to consider risk carefully, however, is far different from asking them to avoid it. That would go against the grain, experts say, of an organization that has to respect, and in some cases revere, the reasoned risk-taker.

"You want to allow pilots to train hard enough to get a good feel for what their aircraft can do, while at the same time keeping them from getting so close to the edge during training that they significantly increase the danger of a crash, with its attendant loss of life and very expensive equipment," said Mr. Beusse. "In a sense, risk management is an attempt to protect pilots from themselves. These tend to be very motivated, dedicated people. Sometimes they have so much confidence in the aircraft and their own abilities that they push that envelope a little too far." ■

Crash Kills Thirty-Five, Including Commerce Secretary

In the military's most recent high-profile air accident, a USAF CT-43A passenger jet crashed on April 3 at Dubrovnik, Croatia, killing Commerce Secretary Ronald H. Brown and thirty-four others. The cause of the crash was not readily apparent and raised concerns that the lack of "black boxes" on the military jet would hamper the investigation.

Although the weather was poor and the airport had only a rudimentary radio beacon, DoD officials stated that the flight was within commercial passenger aircraft restrictions. Extensive review of the wreckage by military and civilian investigators has already ruled out rudder and other major equipment failures, according to senior USAF officials. DoD expects to issue a more complete report this month.

The accident prompted Defense Secretary William Perry on April 9 to order each service to install cockpit voice and flight-data recorders, as well as Global Positioning System equipment for precise navigation, as soon as possible on all military aircraft that carry passengers. He also directed the service secretaries to report to him on passenger-manifesting procedures because of the initial confusion over the number and identity of persons aboard the CT-43.

The aircraft, a military version of the Boeing 737-200, crashed into Saint John's Hill, a 2,300-foot peak about 1.8 miles northwest of Dubrovnik's Cilipi Airport. The transport had been flying in what some officials termed the worst storm in a decade, but the aircraft commander, Capt. Ashley J. Davis, and the copilot, Capt. Timothy W. Schafer, both had substantial experience with the aircraft. They were making an instrument approach using the airport's single radio beacon.

The CT-43 was on the correct approach path as it started a twelve-mile-long descent to the airport, according to radar data collected by one NATO aircraft, and it was communicating with the airport tower when contact suddenly was lost. USAF Lt. Gen. Howell M. Estes III, Pentagon Operations chief, said the crew made no calls indicating there was a problem.

Several commercial aircraft had landed at the airport shortly before the USAF jet made its approach. However, the Washington *Post* reported that Croatian Airlines had diverted some of its flights because of the harsh weather.

The CT-43 #1149 was one of two used for passenger transportation, while another fifteen are used for navigation and cargo training. USAF officials said this was the first crash for any of its T-43s in 300,000 flying hours during more than twenty years of service. With only 17,000 flying hours, this particular aircraft was well short of the 30,000 to 50,000 flying-hour average for other T-43s of that age. General Estes noted that this CT-43, operated by the 86th Airlift Wing, Ramstein AB, Germany, had undergone an extensive maintenance overhaul in June 1995.

The aircraft entered operation in 1973, the year before USAF began its policy of equipping its aircraft with cockpit voice and flight data recorders. USAF officials stated that the aircraft was used for training until 1988 and was not retrofitted with black boxes because of the expense. At a briefing April 9, a senior USAF official also said that the T-43s were the only passenger aircraft without such recorders.

Although black boxes are standard today on commercial airliners, the National Transportation Safety Board (NTSB) has not been able to resolve two recent commercial 737 crashes. More than 2,700 Boeing 737s are in service, making it one of the world's most widely used airliners. It has also been one of the safest. The unresolved crashes, however, have caused the NTSB to focus more closely on any 737 crash. The senior Air Force official said that although the lack of recorders would "complicate" the CT-43 investigation, with today's technology the service will "be able to replicate almost the entire realm" of the flight and the lack of black boxes "will not preclude us from finding out what happened in the mishap."

The NTSB and Federal Aviation Administration are working with the Air Force Accident Investigation Board, headed by Brig. Gen. (Maj. Gen. selectee) Charles H. Coolidge, Jr., 22d Air Refueling Wing commander, McConnell AFB, Kan.

—Suzann Chapman

James Kitfield is a defense correspondent for National Journal *in Washington, D. C. His most recent article for* Air Force *Magazine, "Counterproliferation," appeared in the October 1995 issue.*

Valor

By John L. Frisbee, Contributing Editor

Beating Four Aces

Lt. Henry Brown pulled off one of the most amazing bluffs of the war.

LT. HENRY Brown was on his second tour in fighters, based at Steeple Morden, UK, with the 355th Fighter Group. On the morning of April 11, 1944, in his *Hun Hunter From Texas,* he was number four in the 354th Fighter Squadron's Blue Flight, escorting bombers to their target on the outskirts of Berlin.

After the bombers unloaded and headed for home, the 355th turned its escort duty over to another group and prepared to strafe targets of opportunity, the most dangerous of fighter tactics. The four squadrons fanned out, each to find its own targets. Blue Leader picked the Luftwaffe airfield at Strausberg to the east of Berlin. The four P-51s went down in a screaming 400-mph dive, their props cutting weeds as they came in over the field.

On the first pass, Lieutenant Brown burned a Ju-52, then riddled a Ju-88 bomber on his second pass. Spotting an FW-190 fighter taking off, he performed a chandelle to the left, pulling up behind the German fighter and shooting it down just as he ran out of ammunition. While Brown was busy reducing the Luftwaffe's inventory, the other three members of his flight had formed up and were on their way home.

Climbing to 15,000 feet, Lieutenant Brown saw four fighters in the distance, heading west. Maybe they were members of his group. As he closed on them, he discovered that they were Bf-109s—difficult to tell from P-51s at a distance. In perfect firing position but out of ammunition, he reduced power and slid into their blind spot at six o'clock low. Why had they not seen him? Then he spotted two Mustangs ahead and below. The -109s were so intent on hunting the Mustangs that they had not seen him.

Brown called a warning to the Mustangs, which broke sharply to the left with the -109s now almost in firing range. He told the Mustang pilots he would try to disrupt the enemy formation. At that moment, the Luftwaffe pilots picked up on Brown as he closed on their tails, not knowing he was out of ammunition. Henry Brown didn't pause to calculate his chance of survival. He saw what needed to be done, and he did it.

There followed a twenty-minute engagement in which Brown outturned his four adversaries, who held all the aces, forcing them one by one to roll out of a Lufbery circle and dive for the ground. While Lieutenant Brown hovered constantly on the verge of a high-G blackout, the two Mustangs he had saved disappeared to the west, leaving him alone in an unfriendly sky.

Having won the Lufbery fight against incalculable odds, Henry Brown throttled back and turned for home. In that moment of relaxation, one of the -109s climbed back up and got on his tail. Suddenly, *Hun Hunter* was taking hits. Fortunately, the Luftwaffe pilot overshot, giving Brown time to split-S to the treetops. His sigh of relief was short-lived. There were holes in his left wing, but more serious, his compass had been shot out. With no friendly aircraft around, he could only guess at the correct heading for England.

Brown called in the blind, giving his approximate position and asking someone to tell him the sun position on his canopy for a rough heading to the UK. At length, a voice came back, telling him to put the sun on the second screw from the top of his left canopy railing. Correcting his course, he realized he soon was going to be above solid-to-broken clouds. No more ground checks. At last, through a small break in the clouds, he saw the coast of Holland.

A call to Air-Sea Rescue got him a rough heading to Steeple Morden. From there, he got a home steer from Steeple Morden tower. Six hours and fifteen minutes after takeoff, Henry Brown touched down at home plate. He found out later that the two Mustang pilots he had saved, and who apparently had deserted him, also had been out of ammunition.

Lt. Henry Brown and his P-51,* Hun Hunter From Texas, *achieved 14.2 victories over the Luftwaffe.

For a day marked by superior skill and unsurpassed valor, Henry Brown was awarded the Distinguished Service Cross to go with his Silver Star, multiple Distinguished Flying Crosses and Air Medals, and a Purple Heart. He tallied eleven more air-to-air victories, ending the war with 14.2, plus more than fourteen planes destroyed on the ground. What his score might have been had he not been downed by flak while strafing an airfield on October 3, 1944, is only conjecture.

On the day he bellied in, his squadron operations officer, Maj. Chuck Lenfest, landed to rescue him, but Lenfest's P-51 became stuck in soft ground. Lt. Alvin White also landed in an attempted rescue. The downed men were escaping and did not see him. White was able to take off and returned home alone. Brown and Lenfest ended the war as guests of the Luftwaffe.

Henry Brown remained in the Air Force, serving among other assignments as test pilot, combat pilot in Vietnam, wing commander, and deputy director of Operations, 7th Air Force. He retired as a colonel in 1974, one of the most decorated Air Force officers, and now lives in Sumter, S. C. ■

The Pentagon seeks a transfer of funds from Medicare to avoid forcing older retirees out of the military medical system.

Military Hospitals and Medicare

By Suzann Chapman, Associate Editor

For years, military recruiters spoke of a solemn agreement that the services had with their members—the promise of lifetime medical care. They said the government would provide free (or nearly free) care to every military retiree and his dependents, even after he took off the uniform.

Recruiters pointed to this benefit as a key reason for serving a full twenty-year career.

Unfortunately for retirees and their dependents, fulfillment of the promise is in doubt. With the cost of health care soaring and base closures shutting the doors of military medical centers, some officials and analysts have begun claiming that the promise never was an absolute pledge in perpetuity. Recruiters, they maintain, exceeded their authority, making promises that are not binding.

Even so, no one has seriously challenged the retiree claim that military recruiters did in fact make such promises, that they continued to do so until at least 1993, and that many people based career and retirement decisions on these pledges. Nor has the government explained why it for decades made so little effort to correct such a significant and high-visibility "mistake" on the part of the recruiters.

For the Pentagon, these factors add up to big trouble. If the pledge is shown to be just another empty Washington promise, the government will face charges that it has broken faith with its own troops. Pentagon officials worry that the dispute could undermine today's force. They say current members will draw the appropriate conclusion about government promises and be less likely to pursue a full military career.

The Defense Department's present position is that it has a moral obligation to provide health care to military retirees. That is why DoD, when it presented a health-care reform plan

Military Health-Service System Beneficiaries

	FY '90	FY '91	FY '92	FY '93	FY '94	FY '95	FY '96	FY '97
Active-duty members	2,284,795	2,243,030	2,108,908	1,977,440	1,834,176	1,707,444	1,645,964	1,612,865
Active-duty dependents	2,922,790	2,938,121	2,860,956	2,778,638	2,593,968	2,427,207	2,337,301	2,297,275
Retirees	1,142,263	1,147,606	1,157,010	1,159,920	1,147,655	1,151,949	1,131,243	1,119,029
Retiree dependents	1,837,384	1,822,469	1,841,477	1,866,099	1,869,583	1,928,296	1,917,181	1,885,354
Medicare-eligible beneficiaries	894,297	947,200	993,830	1,035,768	1,086,360	1,144,145	1,213,194	1,273,440
Total	**9,081,529**	**9,098,426**	**8,962,181**	**8,817,865**	**8,531,742**	**8,359,041**	**8,244,883**	**8,187,963**

"Active-duty" figures include members of the four armed services, the Coast Guard, commissioned corps of the National Oceanic and Atmospheric Administration, and eligible Public Health Service employees. "Retirees" and "Retiree dependents" refer to CHAMPUS-eligible retirees and dependents. "Medicare-eligible beneficiaries" refers to both retirees and their dependents. Fiscal 1996 and 1997 are projections.

Source: DoD

to Congress in 1994, included a financing proposal called "Medicare Subvention." Under this plan—in which Medicare would reimburse DoD for care provided to older retirees—the Pentagon could keep open the option to make good on the promise to retirees without worrying that the services will go broke.

The post–Cold War drawdown of the 1990s, with its severe reductions in uniformed personnel and bases, has sharply undercut the once almost unlimited ability of the military health-service system (MHSS) to accommodate its beneficiaries, whether active-duty dependents or retired persons. By 1997, the MHSS will have closed fifty-eight hospitals—thirty-five percent of the entire system that existed in Fiscal 1988.

The Space-Available Crunch

The problem is especially difficult for retirees. Military treatment facilities have always handled retirees on a space-available basis, but the shrinking military system has made it increasingly difficult to find available space. The older retirees have to seek coverage either under Medicare or through civilian health insurance, which many do not want to do.

With the introduction of the All-Volunteer Force in 1973, the number of military careerists—and future retirees—began to increase, meaning that, even though the active-duty pool has shrunk following the end of the Cold War, the retiree population only began to drop slightly last fiscal year. (See chart, p. 63.)

Inevitably, the number of military retirees and dependents eligible for Medicare—those who have reached age sixty-five—is growing. These military retirees are no longer considered eligible for coverage under the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS).

Adding to the dilemma facing this older group of retirees has been DoD's introduction of Tricare—a managed-care health program. Current rules state that Medicare-eligible beneficiaries may not enroll in the program's health-management option, known as Tricare Prime, because it combines the MHSS with a network of civilian providers. *[See "Sizing Up Tricare," August 1995, p. 64.]*

Even before the inauguration of Tricare, military retirees and their family members age sixty-five or older were no longer eligible for CHAMPUS. However, in the past, the MHSS normally has been able to provide free or very low-cost space-available health care to its Medicare-eligible beneficiaries, but that option is disappearing.

"With continuing reductions in military medical facilities and end strength, our 'space available' will decline," Dr. Stephen C. Joseph, assistant secretary of defense for Health Affairs, told Congress last year. "As this occurs, there is little doubt that our Medicare-eligible patients will be forced to seek care from civilian providers under the Medicare system."

Today, nearly 600,000 retired military personnel and dependents who are at least sixty-five years old receive some of their medical care at military treatment facilities. The Pentagon estimates that about 380,000 used MTFs exclusively in 1995.

DoD puts the annual cost of treating Medicare-eligible beneficiaries at $1.4 billion. As DoD's budgets tighten, it will be increasingly difficult to absorb this expense. In fact, defense officials state that the cost to care for all Medicare-eligible military beneficiaries who might want to participate in Tricare Prime is more than the department can afford.

Saving the Government Money

Dr. Joseph emphasized that if those Medicare-eligible beneficiaries are forced out of the military system, the cost to the government might well increase. The Pentagon reported in a 1994 study that MTFs can provide health care far less expensively—by some ten to twenty-four percent—than can CHAMPUS through civilian providers.

A 1990 General Accounting Office study also concluded that the military could save money by treating patients in MTFs rather than with CHAMPUS providers.

The Pentagon's top health official offered two additional reasons why MTFs should continue treating the Medicare-eligible beneficiaries. Not only is DoD morally obligated to do so, said Dr. Joseph, but military health professionals also need older patients as subjects. Their wide range of health conditions provides training for medical readiness skills and helps maintain clinical proficiency.

Air Force leaders are taking this moral obligation seriously. However, they stated that care for Medicare-eligible beneficiaries will become more and more constrained until changes are made in the law. USAF's top doctor, Lt. Gen. (Dr.) Edgar R. Anderson, Jr., wrote a special article in the Air Force retiree newsletter to reassure retirees and family members sixty-five and older that the Air Force remains "committed to providing your care."

Along with the services, veterans' groups have vigorously petitioned Congress to implement Medicare Subvention.

The Air Force Association stated its support for Medicare Subvention formally in a 1995 issue paper. AFA members believe the proposal will provide "seamless health-care coverage for military retirees regardless of age" and maintain the guarantee of "military health care for life."

Two bills now before the House of Representatives outline plans for the federal Health Care Financing Agency (HCFA) to reimburse the Defense Department for the treatment that MTFs provide to Medicare-eligible beneficiaries.

Rep. Joel Hefley (R-Colo.) introduced one bill on January 19, 1995, maintaining that this is a "reform that is long overdue." As of May 1, 1996, the Hefley bill had 253 cosponsors (109 Democrats, 142 Republicans, and two Independents).

The second bill, introduced by Rep. Randy "Duke" Cunningham (R-Calif.) on February 8, 1995, seeks to expand the new financing provision to treatment in veterans' medical facilities as well as MTFs. It has six cosponsors (three Democrats and three Republicans).

Currently, no comparable bills have been introduced in the Senate. However, Sen. Phil Gramm (R-Tex.) introduced a bill on December 20, 1995, that would establish a demonstration project for Medicare Subvention. Three more demonstration project bills were proposed on March 21. Sen. Bob Dole (R-Kan.) introduced another bill in the Senate. Representatives Hefley and J. C. Watts (R-Okla.) presented bills in the House.

The Pentagon has already been working with the HCFA to outline a

demonstration project, which DoD hopes to implement in the fall.

Increased Costs?

There is some concern that Medicare Subvention would increase costs to the HCFA. However, the Military Coalition, an alliance of veterans' and military groups (including AFA), points out that DoD has been effectively subsidizing the Medicare trust fund over the years by treating military Medicare-eligible beneficiaries. Those same beneficiaries paid payroll taxes to the fund during their years of government employment.

The coalition contended in Congressional testimony last year that Medicare costs will increase as the drawdown and Tricare implementation push more Medicare-eligible military beneficiaries into the private sector. "Subvention would not cause Medicare cost growth; it would help ease it by giving Medicare an option to secure DoD care at lower cost," the coalition argued.

Representative Hefley says he believes his Medicare Subvention legislation is "cost neutral."

"Medicare is simply paying DoD just as [it] would pay any approved provider," he wrote in a "Dear Colleague" letter to other members of Congress. He also emphasized studies that have shown military care to cost less and added, "This means that Medicare would be paying less money to DoD than it would in the private sector."

The Retired Officers Association (TROA) estimates that, by 2000, the number of Medicare-eligible military beneficiaries will grow to 1.6 million. If these new beneficiaries rely on Medicare as their sole source of care, said TROA, it would increase Medicare's cost by $7.7 billion. TROA further states that Medicare Subvention could help reduce this cost increase by $361 million.

However, the Congressional Budget Office said that Medicare Subvention as outlined in some 1995 proposals could increase the overall deficit. The CBO stated that, as long as there are fixed caps on discretionary spending, any savings in DoD's budget from Medicare Subvention can be spent on other defense or nondefense discretionary programs. Thus, enacting Medicare Subvention alone would increase the deficit by the amount of the Medicare payment. In 1995, Congress asked the CBO to study other options, such as using the Federal Employees Health Benefits Program (FEHBP), for military health care.

The FEHBP Option

In its July 1995 report, "Restructuring Military Medical Care," the CBO suggested that the military should downsize its medical establishment to its wartime requirement—thereby generating "substantial" savings.

Using the Pentagon's own study of wartime medical requirements, the CBO said, DoD could cut the number of direct-care facilities from 120 to eleven. Those eleven facilities and a similarly downsized medical force could cover wartime requirements and about thirty-three percent of the peacetime care for active-duty beneficiaries, said the CBO.

For the remaining sixty-seven percent of active-duty personnel, the services would need to seek peacetime health care from the civilian sector. The report proposed that, to handle the non-active-duty beneficiaries, the government should shut down CHAMPUS and shift coverage of this group to the FEHBP.

The CBO's analysis concluded that the health care provided in military medical facilities in peacetime bears little relation to battlefield medicine and that the services do not need peacetime health care to train effectively for wartime.

In Congressional testimony, Neil M. Singer, the CBO's deputy assistant director, National Security Division, stated, "Only deep reductions in the direct-care system, accompanied by elimination of CHAMPUS, can generate enough savings to offset the cost of providing health care to military beneficiaries under FEHBP." He added, "At the same time, our analysis indicates that for an FEHBP approach to achieve savings, many military beneficiaries would have to pay a larger share of the cost of health care than they do today."

However, the CBO also noted that it did not include the cost of downsizing the military health-care system in its report but said it would take from five to ten years to realize any savings.

A Defense Department review of the FEHBP option was due out soon. However, in September 1995 Congressional testimony, Dr. Joseph flatly denied the viability of the CBO approach. He said, "Wholesale conversion of military health care to FEHBP . . . would be disastrous to readiness and unacceptably expensive for our beneficiaries."

He criticized not only the cost to beneficiaries but also the report's failure to consider the need to maintain professional medical skills.

The FEHBP option, unlike CHAMPUS and Tricare, would provide coverage for Medicare-eligible military beneficiaries. However, Dr. Joseph noted that the cost would be greater. "The FEHBP is significantly more expensive than Tricare, and the strongest statements from our military retirees regarding their health care are about costs," he said.

He emphasized that, in using data from the Pentagon wartime medical requirements report (known as the "733 Study"), the CBO failed to mention a major point of that study—the MHSS provides the most cost-effective health care. In fact, the study found that reducing the medical force to a wartime-only size would be more expensive.

The Military Coalition also disagreed with the CBO analysis. Its representatives told Congress last year that the coalition would not support FEHBP as an alternative if it were offered as a replacement for CHAMPUS. The threat of increased cost was the central issue.

Nonetheless two bills are now in Congress that would permit military retirees and their dependents to enroll in FEHBP. Rep. James P. Moran, Jr. (D-Va.), introduced his bill on March 5, and Sen. John W. Warner (R-Va.) presented his FEHBP option bill March 28. Rep. Ed Pastor (D-Ariz.) also had introduced a bill September 29 to permit a demonstration project for the FEHBP option.

DoD expects to have its new Tricare program up and running in all twelve regions during Fiscal 1997. If no Medicare Subvention provision or other option exists, Medicare-eligible military retirees who choose to use MTFs, some twenty-three percent, may lose their spaces in the military health-care line.

In its Medicare Subvention position paper, the Air Force Association noted that military retirees are the only group of retired government employees who lose their health-care coverage at age sixty-five. ■

He launched his crusade for airpower almost eighty years ago. His ideas live on in the armed forces of today.

The Spirit of Billy Mitchell

By Walter J. Boyne

IN TODAY's cynical world, the very act of remembering a hero poses many problems. Invoking Billy Mitchell's name raises questions of relevance, accuracy, and purpose. Can a man who began his crusade for airpower nearly eighty years ago, whose finest hour came seventy years ago, and who died in relative obscurity sixty years ago, have more than symbolic meaning for us today? Is the symbol really accurate? Did Mitchell actually predict the future? And, most fundamental, given the passage of time and events and considering the technological, economic, social, and political revolutions that have transpired since his heyday, can anything Mitchell did or said be useful for today's United States Air Force?

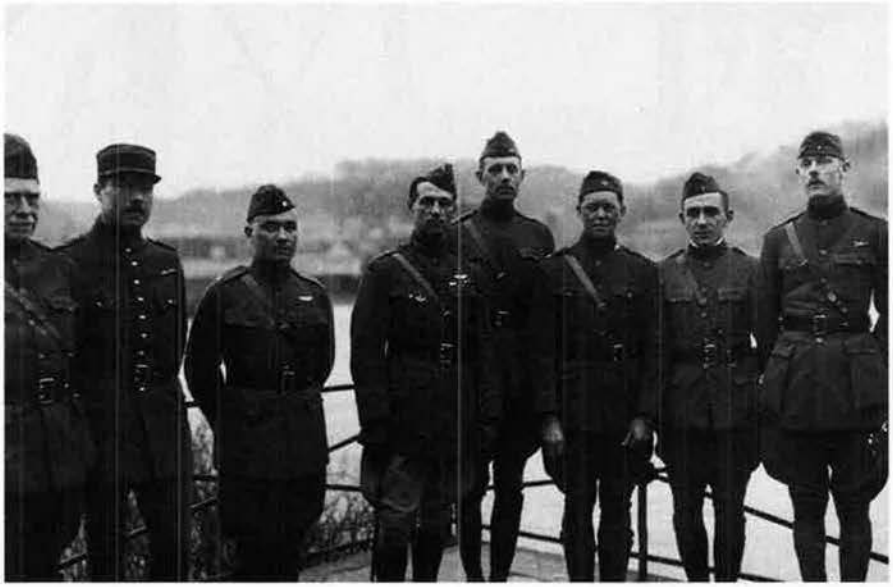
The answer to all of these questions is a resounding "yes," for he molded what would become the US Air Force in a thousand ways that have been increasingly overlooked and need to be remembered. Today, USAF is riding the fourth section of a multistage rocket that Billy Mitchell launched by the sheer force of his personality and the breadth of his vision.

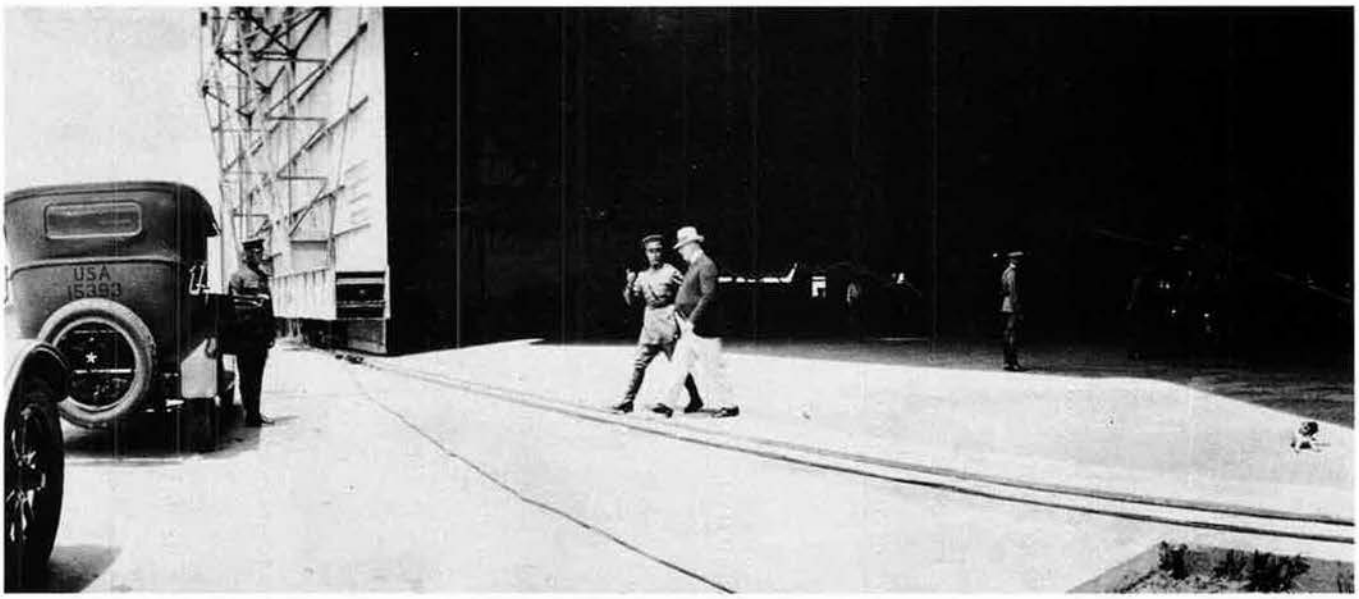
At the height of his fame, when he was tilting with the War Department and the Navy Department with equal enthusiasm, the term "Mitchellism" was coined by the press to symbolize the concept that airpower was now the dominant military factor and that sea and land forces were becoming subordinate. In the intervening years, the correctness of his thinking, the accuracy of his predictions, the risks he took, the sacrifices he so willingly made of his health and his career, and, by far the most important, the influence he had on his successors have conferred a new, higher, and entirely contemporary meaning on "Mitchellism."

Billy Mitchell's name conjures up different and mostly stereotyped images. For those with an interest in airpower, it brings to mind the visionary who sank battleships and paid the price for defying the War Department. Unfortunately, for far too many, the name Billy Mitchell is associated only with a grainy black-and-white movie showing Gary Cooper fighting a court-martial.

Brig. Gen. William L. Mitchell deserves better than this. So great was his impact on the Army Air Ser-

Billy Mitchell, the spiritual father of the Air Force, led the fight for airpower after World War I and was court-martialed for his aggressive advocacy of the cause.





General Mitchell (center, with walking stick) poses with his staff in Koblenz, Germany, on January 15, 1919. His experiences during World War I crystallized his belief in airpower. Below, he walks through a Langley Field, Va., hangar with Secretary of the Navy Edwin Denby.

vice and its successor organizations that the effect is still being felt. During Mitchell's meteoric military career, he charted new paths, set new standards, and influenced key leaders for decades to come. Mitchell was twenty years ahead of his time when he put forth his detailed vision of a hazardous future. More important, he knew that airpower was the answer to overcoming the danger. His impassioned campaign to tell his story had a quadruple-barreled impact on the modern Air Force, past, present, and future.

Mitchell and the Past

Billy Mitchell was born into privileged circumstances in Nice, France, on December 29, 1879. His father, John L. Mitchell, became a US senator and would quietly smooth the way for his impetuous son's early military career. Commissioned as a second lieutenant at age eighteen, Billy Mitchell immediately got on the fast track by demonstrating his leadership and organizational skills in the Philippines and Alaska. Without a contracting officer's warrant, he managed to spend $50,000 of US government money to build a telegraph line across Alaska—on an authorized budget of $5,000. The overrun must not have hurt Mitchell; he came back a captain at age twenty-three, the youngest in the Army.

At thirty-two, Mitchell became the youngest officer ever appointed to the Army General Staff. While in Washington, he felt the first attraction to aviation, seeing in it the future for his country and, not incidentally, for himself. Paying for his own flying lessons, he learned to fly in four Sunday sessions at the Curtiss Flying School, Newport News, Va., in 1915.

There have been disputes over his ability as a flyer—for example, Maj. Gen. Benjamin D. Foulois always contended that Mitchell was not a "regular" Army flyer because he had not been through an Army flying school. (This was a somewhat ironic point for Foulois to make, given that he had taught himself to fly by corresponding with the Wright brothers.) On the other hand, one of the great pioneer test pilots, the record-setting

MB-2 bombers fly in formation over Atlantic coastal waters in exercises intended to demonstrate the prowess of airplanes against battleships. Though fragile by today's standards, the MB-2s could carry more than a ton of ordnance.

Lt. Lester J. Maitland, stated unequivocally that Mitchell "could fly anything with wings and fly it well."

Mitchell's flying catapulted him to prominence, and he became deputy chief of the Signal Corps Aviation Section in 1916, with the rank of major. This was his ticket to the top. He wangled his way to France as a military observer in March 1917. When the US declared war on Imperial Germany the next month, he soon established himself as the premier US aviation officer in France. He was promoted to lieutenant colonel in May and to colonel in August 1917 and received a rating as a Junior Military Aviator without the normal testing process.

Fluent in French, unlike most of his colleagues, Billy Mitchell became what today would be called a master networker—cementing ties, obtaining resources, making friends, and pledging help that he could only hope to deliver. Hugh "Boom" Trenchard, commander of the Royal Flying Corps (later, first Marshal of the Royal Air Force), became his mentor. He could not have chosen better.

Mitchell drew many ideas from Trenchard, especially the fundamental conclusion that airpower was primarily an instrument for offensive, not defensive, employment. Mitchell embraced Trenchard's concepts on supremacy in the air and demonstrated them as chief of the Air Service, 1st Brigade, and by the time of the Saint-Mihiel offensive of September 1918 was chief of the Air Service, 1st Army, American Expeditionary Forces.

Mitchell commanded 1,476 aircraft and twenty balloons, assembled from 101 American, British, French, and Italian squadrons, in the greatest air offensive of the war. The battle of Saint-Mihiel was itself a bit of an anticlimax, as the Germans were in the process of evacuating the salient, but the air battle went as Mitchell had planned.

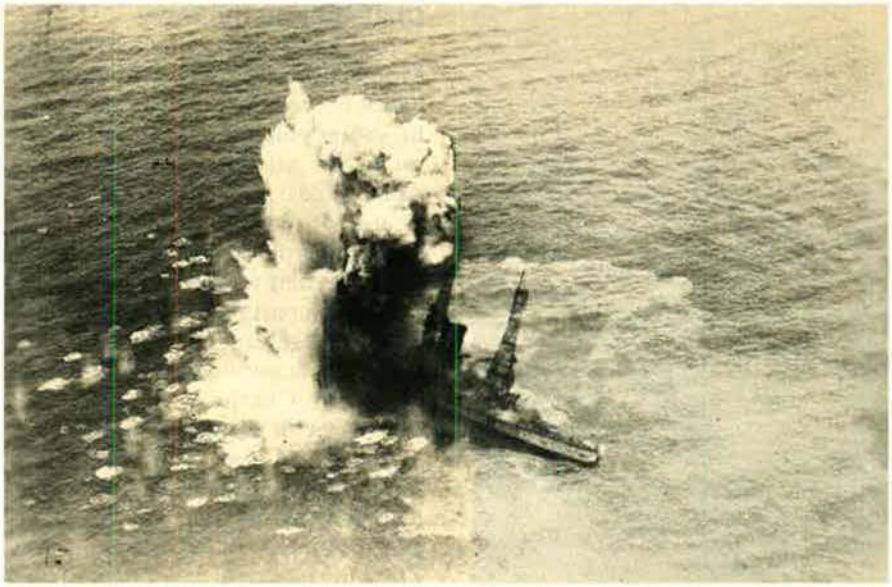
Challenge to the Navy

In the convulsive downsizing that followed World War I, Mitchell, who had achieved the grade of temporary brigadier general (a grade he would retain for all but ten months until April 1925), was one of the few officers not reduced in rank, much to the distress of longtime rival Foulois, who reverted to being a major. Yet the War Department regarded Mitchell as a loose cannon and placed him under the supervision of a nonflyer, Maj. Gen. Charles T. Menoher, the new Director of the Air Service.

It was at this point that Billy Mitchell set out on the path that would lead him to his greatest heights—and ultimately to his court-martial. Knowing he would never prevail over the stolid, conservative Army leaders of the time, Mitchell went public. He soon became a national figure as a witness at Congressional hearings. He expanded his audience with speeches and articles on his new ideas about airpower. Already in hot water with the Army, he next collided with the deep-water Navy by saying that airplanes could sink battleships.

The Navy's leadership ignored, ridiculed, or attacked Mitchell, depending on the issue, but he finally backed them into a corner with an open challenge while testifying before the House subcommittee on aviation. Mitchell announced that "1,000 bombardment airplanes can be built

Mitchell (arm raised) speaks with Gen. of the Armies John J. Pershing during an inspection of an MB-2. Mitchell's initial challenges to the Navy were met with ridicule, but he eventually got the chance to prove the might of airpower.



To the Navy's dismay, the MB-2s and Handley Pages sank target after target in the demonstration off the Virginia Capes. The Navy benefited, however, because the demonstration prompted the service to push for aircraft carriers.

German battleship, and she went down, to the horror of the assembled Navy brass. To add insult to injury, the seventh ship of Mitchell's formation, a Handley Page, dropped its 2,000 pounder into the foam and bubbles rising from the sunken ship.

Mitchell was vindicated, but it was the Navy itself that would benefit most from the tests, as they turned immediately to embrace the concept of aircraft carriers, which would dominate the naval war in the Pacific only twenty years later. Oddly enough, Mitchell's greatest contributions to the Air Service and its successor organizations, contributions that echo today, were made in a far less spectacular fashion.

Impact on R&D

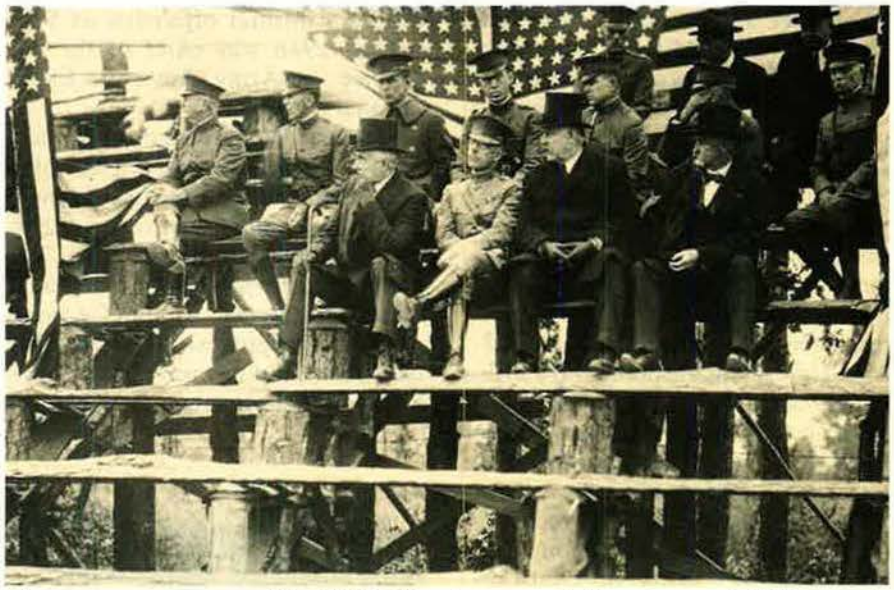
Despite the postwar collapse of the Air Service budget, Mitchell saw

and operated for about the price of one battleship." He declared that his airplanes could sink a battleship, and he invited the economy-minded Congress to see for itself. In his Congressional testimony, as in everything Mitchell did, lay the subliminal message that there should be an independent Air Force, equal with the Army and the Navy.

The Navy grudgingly agreed to a demonstration, providing as the targets some captured Imperial German Navy ships, including a submarine, a destroyer, a cruiser, and the toughest ship of all, the many-compartmented battleship *Ostfriesland*—thought by many to be unsinkable. The Navy also provided strict rules of engagement, designed to minimize Mitchell's chance of success.

Mitchell created the First Provisional Air Brigade at Langley Field, Va., equipping it with some 150 bombers and pursuit airplanes and almost 1,000 personnel—a considerable portion of the Air Service. The heavy bombs he knew he needed were not available. With typical foresight and tenacity, Mitchell induced the ordnance division to produce 2,000-pound bombs, based on a sketch he and two ordnance men drew during an afternoon's conversation.

The tests off the Virginia Capes in the fall of 1921 were carefully regulated, with many observers stationed nearby to make sure that the rules were followed. The Navy set up some procedures to hamper Mitchell's efforts, including limiting the size and number of bombs that could be dropped on any single sortie.



The controversy caused by Mitchell's advocacy of airpower went all the way to the top. President Warren G. Harding (center, with cane) and his staff viewed bombing tests from a hastily constructed viewing stand at Langley Field, Va.

At the crucial moment, when it appeared the *Ostfriesland* might indeed be too tough a nut to crack, Mitchell violated the rules by sending in his twin-engine Martin bombers to drop six of the big bombs instead of the three they were allowed. A hit and several near misses split the seams of the tough old

to it that the maximum possible funds were given to McCook Field, Ohio, the ancestor not only of Wright-Patterson AFB, Ohio, but also Edwards AFB, Calif., Arnold Engineering Development Center, Arnold AFB, Tenn., and every other base where research and development work is done. Mitchell served as both whip and inspiration to the engineers he assigned to bring forth faster fighters and bigger bombers.

Mitchell knew that flying had to be sold to the public before it could be

sold to Congress and that record-setting would advance aviation technology, even as it gained public attention. He was wholeheartedly behind the great headline-making flights of the era, from the 1923 nonstop transcontinental flight in the Fokker T-2—Mitchell did not hesitate to buy from foreign sources when it suited his needs—to the 175-day trip around the world of the Douglas World Cruisers in 1924. On October 18, 1922, in his first flight in the beautiful little Curtiss R-6 biplane, Mitchell himself set a world absolute speed record of 222.97 mph.

Appearances to the contrary, Mitchell could not be everywhere and do everything even as he was leading the fight for an independent Air Force. He deliberately created a climate in the Air Service that was passed on to its successor services, one in which technology was recognized as the ore from which a war-winning air force could be refined. Most important, he inspired devotion in the airmen who would follow in his footsteps and keep research and development at the top of the priority list. His best choice, and a very loyal friend, was a young officer named Henry H. Arnold.

Mitchell's own career had run its course by the mid-1920s. Controversial testimony before Congressional committees, combined with intemperate speeches and articles calling for an independent Air Force, made him *persona non grata* with both the Navy and War Departments. Demoted to colonel and exiled to a minor post in San Antonio, Tex., he continued to lash out. When the Navy dirigible *Shenandoah* was torn apart in a severe squall over Byesville, Ohio, Mitchell released a 6,000-word statement to the press. The September 5, 1925, statement attacked the War Department and the Navy Department for incompetence and for seeking publicity at the cost of tolerating dangerous flights. He also predicted his own court-martial.

General Mitchell predicted his own court-martial. His aggressive promotion of airpower brought it about. At the trial, his military supporters lined up to speak on his behalf despite the risk of damage to their careers.

The Morrow Board

In a preemptive move designed to moderate anything Mitchell might say at his court-martial, President Calvin Coolidge set up a board under Dwight W. Morrow "for the purpose of making a study of the best means of developing and applying aircraft in national defense." Mitchell's testimony before the board was measured and brilliant, laying out with clarity the specter of the Pacific war that would come only sixteen years later. He predicted the rise of Japanese strength and later foretold its Sunday-morning attack on Pearl Harbor and the Philippines. He made the argument, accurate until 1944, that aircraft carriers could not operate against landbased aviation. He saw war as global and imminent, and he knew that airpower was the only way to master the situation.

And it was President Coolidge himself who ordered Mitchell's court-martial under charges of insubordination under the 96th Article of War ("conduct of a nature to bring discredit on the military service"). The trial lasted seven weeks, most of which was devoted to a discussion of Mitchell's concept of airpower. The verdict of guilty was a foregone conclusion, and Mitchell was sentenced to be suspended from rank, command, and duty, with a forfeiture of all pay and allowances for five years. President Coolidge, in an uncharacteristic fit of generosity, later reduced this to forfeiture of half his pay and allowances.

Billy Mitchell refused the offer and resigned on February 1, 1926. All through the court-martial proceedings, Mitchell had the staunch support of "Hap" Arnold and such officers as Carl Spaatz, Herbert Dargue, Robert Olds, William Gillmore, Horace Hickam, and others. Each put his career on the line for Mitchell even though they knew he would be convicted. After the trial, Arnold was exiled to become commanding officer of the 16th Observation Squadron, Fort Riley, Kan. The assignment was intended to be the end of his career.

Mitchell continued to campaign in speeches and articles. "Hap" Arnold, for his part, soldiered on, his leadership qualities inevitably propelling him to the top, regardless of residual resentment about his unflagging support for Mitchell.

More important than Arnold's loyalty, however, was his comprehension of Mitchell's fascination with technology. Early in his tour as Army Air Corps Chief, Arnold began soliciting the ideas and the company of the top scientists in the country.

Eventually, he enlisted the assistance of such stellar names as Theodore von Kármán, Hugh L. Dryden, Frank Wattendorf, Hsue-shen Tsien, Vladimir K. Zworykin, and many others for the Scientific Advisory Group, later transformed into the Scientific Advisory Board. These men and others created first "Where We Stand" and then "Toward New Horizons," studies that addressed state-of-the-art technology and put forth a blueprint for the development of the postwar Air Force.

It is important to note that neither Mitchell nor Arnold had the scien-

tific competence to write such reports; they had, instead, the far more vital ability to see that the reports were needed, recognize who could produce them, and sympathetically enlist their support. The officers Arnold picked to work with the scientists were equally well chosen, among them such men as James H. Doolittle, Donald L. Putt, and Laurence C. Craigie. They knew the importance of science and of scientists.

Again in the spirit of Billy Mitchell, Arnold picked promising young officers who understood the requirements of technology and saw that they were given a track to top positions. Doing so cost him friends. Comrades who had served with him, and who were now passed over, resented his choices. But Arnold knew he was not running a popularity contest; he was building an independent Air Force.

The constructive culture created by Mitchell and Arnold made it possible for R&D positions to be established for such men as Bernard A. Schriever and his successors. From that foundation grew the intricate structure of developments leading first to a fleet of ICBMs and then to the exploitation of space technology. The subsequent development of satellites that harvest intelligence on an unprecedented scale can be attributed directly to the encouraging climate given research and development by Mitchell, Arnold, and their spiritual successors.

Mitchell's supporters included entertainer, political satirist, and aviation enthusiast Will Rogers (below, left) and Capt. Eddie Rickenbacker (right), Medal of Honor recipient and top US ace of World War I. Rickenbacker called Mitchell's guilty verdict "a crime against posterity."

The Future Air Force

Mitchell and Arnold successfully established the service that, as the Army Air Forces, would be vital in winning World War II. It is less well understood that they achieved this through an unprecedented appreciation for technology and a willingness to gamble on the brains of men they respected.

Neither Mitchell nor Arnold would have claimed to have been scientists, and both would have admitted readily that they did not understand the engineering underlying the equipment the scientists promised to deliver. However, both understood that the greatest scientists in the world cannot contribute to national defense unless they are invited to do so and are then given an environment in which they can comfortably function.

When von Kármán told Arnold that he was not certain he could conform to the customs of the Pentagon, Arnold quickly told him not to worry—he would see that the Pentagon conformed to von Kármán. That was Mitchellism at its finest! ■

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Gallery of US Navy, Marine Corps, and Army Aircraft

By Paul Jackson

US Navy and Marine Corps

Attack Aircraft

A-6E Intruder *(Ted Carlson)*

A-6E Intruder

Respected as a potent medium attack aircraft, the A-6E is nevertheless close to the end of a service career shortened by high maintenance costs and funding reductions. The final USMC A-6Es were withdrawn in April 1993, and the last two Navy squadrons will have gone by FY 1998. Constant upgrading over more than two decades has given the current A-6E the AN/AAS-33 TRAM (target recognition and attack multisensor) package, including a precision aimed chin turret housing a FLIR and laser, improved inertial navigation, and upgraded communications. Since 1981, newly built and converted A-6Es have been able to carry up to four Harpoon antiship missiles or HARMs (High-Speed Antiradiation Missiles). Grumman produced 240 aircraft by converting A-6As, followed by 205 new airframes.

Cancellations of an improved A-6F, and of its proposed A-12 successor, led instead to plans to refit 294 A-6Es with new Boeing-built carbon-reinforced aluminum/titanium wings. Only 174 were modified before the Intruder was given notice to quit the Navy, and a SWIP (systems and weapons integration program) for 230 A-6Es was abandoned.

Contractor: Northrop Grumman Corporation.

Power Plant: two Pratt & Whitney J52-P-408 turbojets, each 9,300 lb thrust; to be replaced by P-409s, each 12,000 lb.

Accommodation: pilot and bombardier/navigator side by side.

Dimensions: span (wings spread) 53 ft 0 in, (folded) 25 ft 4 in, length 54 ft 9 in, height 16 ft 2 in.

Weights: empty 26,746 lb, max gross (catapult launch) 58,600 lb, (field takeoff) 60,400 lb.

Performance: max speed (clean, sea level) 644 mph, service ceiling 42,400 ft, T-O run on land 3,890 ft, landing run 1,710 ft, range with max military load 1,011 miles.

Armament: five attachment points for up to 18,000 lb of external stores, a typical load being 28 bombs of 500 lb plus two AIM-9 Sidewinder AAMs for self-defense. Alternatively, Harpoon and HARM missiles.

AV-8B Harrier II Plus *(Paul Jackson)*

AV/TAV-8B Harrier II and II Plus

A year ago, the Marine Corps received the last of 262 **AV-8Bs** and 24 two-seat **TAV-8B** trainers and in January took delivery of the first of 73 earlier aircraft rebuilt to the latest standard—although there are moves to have the remanufacturing process terminated in favor of further new production. The USMC has been enthusiastic about the Harrier's unique STOVL qualities since first-generation AV-8As entered service in 1971; the current AV-8B is a far more capable machine with a longer-span wing of graphite composites, redesigned front fuselage (also of composites) with a roomier cockpit, 50 percent more internal fuel and provision for in-flight refueling, a Hughes ARBS (angle rate bombing set) for greater bombing accuracy, greatly upgraded avionics and weapons capability, and other smaller changes. The first operational squadron, VMA-331, was commissioned at MCAS Cherry Point, N. C., on January 30, 1985, while the first TAV-8B tandem-seat dual-control trainer, which has a taller vertical tail, first flew on October 21, 1986; the first class trained on it by VMAT-203 at Cherry Point graduated in 1988.

The Marines received 167 baseline AV-8Bs before production switched to the **night attack** version. A prototype first flew on June 26, 1987, and deliveries of this model began on September 15, 1989. Lacking a separate designation, the night version is characterized by an over-nose bulge housing a GEC-Marconi FLIR that can present clear night pictures on color HDDs and a wide-angle HUD; the pilot wears NVGs, and the cockpit also contains a digital moving-map display. Four squadrons, VMA-211, -214, -311, and -513, all at Yuma, Ariz., are night-capable, sharing the 67 aircraft built. From December 1990 (182d AV and 16th TAV), all Harrier IIs have had the more powerful Dash 408 version of the Pegasus vectored-thrust engine. Capability further increased in July 1993 when VMA-223 at Cherry Point accepted the first AV-8B **Harrier II Plus.** This has the Dash 408 engine and night attack avionics of its immediate predecessor but adds a Hughes AN/APG-65 multimode pulse Doppler radar in a 17-in-longer fuselage; other features include bigger LERX (leading-edge root extensions) and improved ECM. The 28 new-build "Plus" aircraft are shared, six each by VMA-223 and collocated VMA-231 and -542, with numbers made up to 18 per squadron by baseline AV-8Bs. Empty weight is increased to 14,860 lb, but max gross weight remains unchanged. Remanufacturing of the 73 older aircraft involves new fuselages and costs almost as much as a new Harrier. *(Data for AV-8B Plus.)*

Contractors: McDonnell Douglas Corporation; British Aerospace plc.

Power Plant: one Rolls-Royce F402-RR-408 (Pegasus 11-61) vectored-thrust turbofan, 23,800 lb thrust.

Accommodation: pilot only.

Dimensions: span 30 ft 4 in, length 47 ft 9 in (TAV-8B, 50 ft 3 in), height 11 ft 7¾ in.

Weights: empty 14,860 lb, max gross 31,000 lb.

Performance: max speed at sea level 661 mph, STOL T-O run 1,427 ft, operational radius with seven Snakeye bombs and two 300 gal tanks 684 miles, deck-launched intercept radius 722 miles.

Armament: one 25-mm GE GAU-12/U five-barrel gun with 300 rds; six wing pylons stressed to 2,000 lb each (inboard), 1,000 lb (center), and 630 lb (outboard) for very wide range of weapons, pods, dispensers, sensors, or tanks, to normal maximum load of 13,235 lb.

Fighters

F-14A/B Tomcat and F-14D/D(R) Super Tomcat

Insufficient funds are available for more Super Tomcats, but the Navy is continuing with a more modest program to improve this swingwing air-superiority fighter by upgrading the power plant of the baseline F-14A. Winner of the US Navy's VFX competition for a new all-weather multirole fighter for fleet air defense, interdiction, and strike, the **F-14A** was flown on December 21, 1970, and deliveries of production aircraft started in May 1972. Initial operational capability (IOC) was achieved in July 1974 and fleet deployment, with VF-1 and VF-2 in USS *Enterprise,* two months later. When production of the F-14A ended in April 1987, a total of 545 of this version had been built. Attrition, conversion, and force reductions have taken their toll, leaving the A model in service with two Atlantic Fleet front-line squadrons (plus one mixed training unit), four on the Pacific seaboard (but due to move to NAS Oceana, Va., by next year) and one unit of the Reserve. In 1980–81, to provide an interim reconnaissance capability pending the arrival of a purpose-built aircraft for this role, 49 F-14As (sometimes referred to unofficially as RF-14As) were equipped to carry an underbelly TARPS (Tactical Air Reconnaissance Pod System).

Navy plans to upgrade the Tomcat have involved both improved performance engines and replacement of most major items of the F-14A's analog avionics suite with digital avionics. The improved engine, replacing the TF-30 and giving not only higher flight performance but also dramatically better reliability and "carefree" piloting, is the F110-GE-400. With the F110 installed, the F-14A becomes an **F-14B,** the prototype conversion of which was flown on September 29, 1986. Grumman subsequently delivered 38 new-built F-14Bs, ending in May 1990, and is also producing kits to convert about 50 existing F-14As to B standard. These aircraft serve VF-102, -103, and -143. A second important improvement made to F-14As was to add new

F-14D Super Tomcat *(Ted Carlson)*

computer software to permit attack on surface targets with free-fall bombs. The modified aircraft are unofficially known as "Bombcats."

The **F-14D Super Tomcat** combines the F110 engine with largely new digital avionics and weapons. The radar is the Hughes AN/APG-71 with monopulse angle tracking, digital scan control, target identification and raid assessment, and improved ECCM. This is compatible with AIM-54C Phoenix and AIM-120A AMRAAM (though AMRAAM integration is at present deferred). Trials early in 1996 proved three new medium PRF modes for the radar. Other F-14D features include a twin IRST/TV sensor pod, digital INS, new computer and stores management, Naval Advanced-Concept Ejection Seats, and NVG-compatible multifunction cockpit displays. The planned major production program was canceled, but 37 new aircraft (final delivery May 1992) and 18 **F-14D(R)** rebuilds (final delivery November 1993) were produced. Training with VF-124 began in October 1990, and users are VF-2, -11, and -31. All three Tomcat versions in current service (80 F-14As, 80 F-14Bs, and 51 F-14Ds) are earmarked for installation of a digital flight-control system to prevent flat spins and improve carrier approach qualities. F-14As, which are to remain in the active inventory until 2004, will be modified first. *(Data for F-14D.)*

Contractor: Northrop Grumman Corporation.

Power Plant: two General Electric F110-GE-400 turbofans; each with 27,000 lb thrust with max augmentation.

Accommodation: pilot and naval flight officer in tandem.

Dimensions: span 64 ft 1½ in (38 ft 2½ in swept), length 62 ft 8 in, height 16 ft 0 in.

Weights: empty 41,780 lb, gross 64,093–74,349 lb.

Performance: max speed (low level) 912 mph, (at altitude) 1,544 mph, service ceiling above 53,000 ft, max range (with external fuel) 2,000 miles.

Armament: four Sparrow or Phoenix air-to-air missiles semirecessed under fuselage. Pylon under each inboard (fixed) wing section for additional Phoenix/Sparrows, and/or Sidewinders, or various combinations of missiles, including HARM, and up to 14,500 lb of bombs. One M61A1 20-mm gun in forward fuselage (port side).

F/A-18A/B/C/D/E/F Hornet

Chosen in May 1985 to replace the A-7 Corsair and F-4 Phantom, the Hornet bears the name of McDonnell Douglas, although its origin is in the Northrop YF-17 lightweight fighter. Fitted with new radar, much greater fuel capacity, and carrier equipment, the new NACF (navy air combat fighter) made its maiden flight on November 18, 1978. Following 11 prototypes, deliveries of a "pilot production" batch of 12 F/A-18s began in May 1980. First recipient was the USMC's VMFA-314 squadron at MCAS El Toro, Calif., which achieved IOC in early 1983. The Navy's first Hornet development squadron, VFA-125 at NAS Lemoore, Calif., began flying the F/A-18 from November 1980, and the first seagoing squadron deployment of Hornets was with VFA-25 and VFA-113, in USS *Constellation,* in February 1985. Two years later, the Hornet replaced A-4 Skyhawks with the Navy's Blue Angels demonstration team. In April 1986, two USN squadrons (VFA-131 and -132) and two from the USMC (VMFA-314 and -323), operating from USS *Coral Sea,* took part in the first combat deployment of Hornets when they attacked targets in Libya.

Early production models were the **F/A-18A** (single-seat) and **F/A-18B** (two-seat), of which, excluding prototypes, 370 and 40, respectively, were produced by

F/A-18C Hornet

F/A-18D *(Ted Carlson)*

1987. Navy F/A-18s, replacing F-4 Phantoms in the fleet escort fighter/interdictor roles, initially carried a primary armament of Sparrow air-to-air missiles, while those of the USMC, intended as A-7 attack aircraft replacements, have a FLIR and laser tracker equipment instead of Sparrows. Four Naval Reserve and four Marine Corps Reserve squadrons continue to fly the A/B model, but the type has almost been replaced in the regular Marines (three squadrons at MCAS Beaufort, S. C.) and serves the USN only for training and trials.

Procurement was completed this year of the next generation of Hornet, the **F/A-18C** and two-seat **F/A-18D.** Deliveries began in the fall of 1987, and exactly 600 have been funded (compared with 758 planned). The first 137 Cs and 31 Ds were baseline versions with provision for up to six AIM-120 AMRAAMs and four IIR (imaging-infrared) AGM-65 Maverick missiles. In addition, the C/D has upgraded computers, stores management and self-test facilities, and a flight incident recorder.

All Cs and Ds delivered from November 1989 have **night attack** capability, which includes a Hughes AN/AAR-50 Thermal Imaging Navigation Set (TINS), new Kaiser HUD, GEC Avionics night vision goggles, Smiths digital moving map, and (in an external pod) a Loral AN/AAS-38B NITE HAWK targeting FLIR. Aircraft delivered after May 1994 have a Hughes AN/APG-73 radar, an upgraded version of APG-65 in earlier Hornets. The F/A-18D is employed only as a combat trainer by Navy squadrons, but six Marine squadrons, VMF(AW)-121, -225, and -242 at NAS Miramar, Calif., and VMF(AW)-224, -332, and -533 at MCAS Beaufort, S. C., operate subtly different aircraft with rear cockpits modified to have color screens and sidestick weapons controllers for an NFO (naval flight officer). Some of these combat-rated two-seaters also have provision for electro-optical sensors, as described in the entry for **F/A-18D(RC).** Currently, 22 Navy and seven Marine front-line squadrons fly F/A-18Cs, 18 of them night-capable. Forthcoming improvements include the Hazeltine AN/APX-111 Combined Interrogator Transponder (1997), Litton Embedded GPS/INS and improved NITE HAWK (1998). Despite its cancellation, the AN/ALQ-165 Airborne Self-Protection Jammer was installed in Hornets overflying the former Yugoslavia during 1995.

Foremost among the Navy's new aircraft programs is the Super Hornet—otherwise, the single-seat **F/A-18E** and two-seat **F/A-18F.** Similarly shaped to its progenitor, the Super Hornet is lengthened by 2 ft 10 in and has wings that are increased in span and thickness to provide 100 sq ft more area. Control surfaces are given greater size and authority to maintain F/A-18C agility, despite which the F/A-18E/F has an additional two weapons pylons, 3,600 lb more internal fuel, and the ability to land at weights up to 10,000 lb greater than its predecessor, significantly improving "bring back" weapons load. With General Electric F414 engines appreciably more powerful than the Hornet's original F404s, the "Super" also boasts a 10-knot *reduction* in approach speed. The larger, rectangular "caret" air intakes provide increased airflow and are less radar-reflective. Further "affordable stealth" features include sawtoothed doors and panels, realigned joints and edges, and angled antennas. Retaining APG-73 radar, the E/F nevertheless has improved cockpit displays and an integrated defense countermeasures suite.

The first of seven development Super Hornets flew on November 29, 1995, and was delivered to the Naval Air Warfare Center at NAS Patuxent River, Md., on February 15, 1996, to launch a three-year, 2,000-sortie development program that will see 30 weapons configurations cleared before the first squadron forms in 2001. Plans call for 1,000 Super Hornets to be procured at a cost of $49 billion. *(Data for F/A-18E/F.)*

Contractor: McDonnell Douglas Corporation.

Power Plant: two General Electric F414-GE-400 turbofans; each approx. 22,000 lb thrust with max augmentation.

Accommodation: E, pilot only; F, pilot plus naval flight officer.

Dimensions: span over missiles 44 ft 8½ in (folded, 30 ft 7¼ in), length 60 ft 1¼ in, height 16 ft 0 in.

Weights: empty 30,564 lb, gross 66,000 lb.

Performance: max speed more than Mach 1.8, combat ceiling 50,000 ft, combat radius (attack) 450 miles.

Armament: 11 external weapons stations for up to 17,750 lb including entire range of Navy offensive and defensive ordnance; M61A1 20-mm gun above nose.

P-3C Orion *(Paul Jackson)*

Patrol and Antisubmarine Aircraft

P-3C Orion

Diminution of the Russian submarine threat has allowed a reduction of one-third in the number of squadrons flying the USN's standard shore-based maritime patrol and ASW platform, the P-3 Orion. One regular and one Reserve squadron have disbanded this year, leaving the Navy with 12 patrol squadrons of P-3Cs, plus eight with the Reserve. The first two generations of Orions have been retired from patrol duties. First flown on September 18, 1968, the P-3C retained the T56-14 engine of the P-3B but introduced "A-NEW" advanced integrated avionics, built around a Univac AN/ASQ-114 digital computer. This system did away with routine log-keeping by the crew, permitting cen-

tralized retrieval, display, and transmission of all incoming tactical data. The first P-3C squadron became operational in July 1970. USN deliveries (totaling 267) ended in April 1990.

A succession of avionics and other upgrades has kept the P-3C in the forefront of submarine detection during its 20-year career. After 118 baseline P-3Cs, the first upgrade, begun in the early 1970s, was Update I, which from January 1975 introduced Omega navigation, more sensitive acoustic processing, AN/ASA-66 tactical displays for the two sonar operators, more versatile CMS-2 computer language, and a sevenfold increase (to 393K) in computer memory to the next 31 Orions. In 1977, Update II added to the next 45 P-3Cs an AN/AAS-36 FLIR system, AN/ARS-3 sonobuoy reference system, and Harpoon missile capability. Update II.5, in 1981, introduced new nav/com equipment for 36 more aircraft. Update III, which received the go-ahead in 1978, embodied a major upgrade of ASW avionics; it was installed by Lockheed in the last 36 new-build Navy Orions delivered from May 1984 and retrofitted to earlier in-service P-3Cs from 1987 (making them Update IIIRs). Main ingredients of Update III are a new IBM Proteus acoustic processor, a new sonobuoy receiver to replace the earlier AN/AQA-7 DIFAR (directional acoustic frequency analysis and recording), an improved APU, and a modified environmental control system to improve avionics cooling and crew comfort. It is planned to retain a fleet of 246 Update IIIs, comprising 35 production aircraft; 100 current IIIRs; 86 baseline, I, and II aircraft earmarked for upgrade; and 25 Reserve aircraft that will be modified in FY 2001. The Navy is also showing interest in the proposed Orion 2000, which incorporates engines, propeller, and avionics and systems improvements from the C-130J Hercules. *(Data for P-3C Update III.)*

Contractor: Lockheed Martin Corporation.

Power Plant: four Allison T56-A-14 turboprops; each 4,910 ehp.

Accommodation: normal crew of 10, including five in tactical compartment in main cabin.

Dimensions: span 99 ft 8 in, length 116 ft 10 in, height 33 ft 8½ in.

Weights: empty 61,491 lb, max expendable load 20,000 lb, normal gross 135,000 lb.

Performance: econ cruising speed at 25,000 ft at 110,000 lb gross weight 378 mph, patrol speed at 1,500 ft at same weight 237 mph, service ceiling 28,300 ft, T-O run 4,240 ft, landing field length 2,770 ft, mission radius (3 hr on station at 1,500 ft) 1,550 miles.

Armament: one 2,000-lb or three 1,000-lb mines, or up to eight depth bombs or torpedoes, or depth bomb/torpedo combinations (including nuclear depth bombs) in internal weapons bay. Ten underwing pylons for torpedoes, mines, rockets, or other stores. Some P-3Cs equipped to carry AGM-84 Harpoon antiship missiles.

S-3B Viking

All five Atlantic Fleet Viking squadrons, plus the six assigned to the Pacific Fleet, are now reequipped with S-3B versions, converted from some of the original 187 S-3As built between 1972 and 1978. Replacing Grumman S-2 Trackers in the carrier-based ASW role, initial deliveries were made to VS-41 at NAS North Island, Calif., in February 1974, and the Viking's first operational deployment, with VS-21 in USS *John F. Kennedy*, followed in July 1975. Contracts in 1980 and 1981 initiated a weapon systems improvement program (WSIP) for the S-3A, the main ingredients of which were to upgrade the AN/AYK-10 central air data computer to AYK-10A(V) standard; replace the Sanders AN/OL-82A acoustic processor with an AN/OL-320/AYS, integrating with the IBM AN/UYS-1 processor; replace the Texas Instruments AN/APS-116 radar with an AN/APS-137(V)1 system incorporating inverse synthetic aperture capability; replace the AN/ARR-76 acoustic system communications link with a Hazeltine AN/ARR-78; modify the Goodyear AN/ALE-39 chaff/flare dispensing system; and add provision for the carriage of McDonnell Douglas Harpoon air-to-surface missiles. The first of two FSED S-3Bs flew on September 13, 1984, and 121 of the Navy's 145 S-3s remaining in ASW guise (see also ES-3A and US-3A) have been upgraded to B model. Priority went to the Atlantic Fleet, within which training squadron VS-27 was equipped from December 1987 onward and VS-30 was the first unit to become operational, in October 1988. The final cruise by an S-3A squadron (VS-38 on USS *Ranger*) began in August 1992.

Since October 1993, operating units have been known as Sea Control Squadrons, and it is expected that the eventual deployment will be reduced to three squadrons of eight S-3Bs on each US seaboard, plus 12 based at both Sigonella, Sicily, and Misawa AB, Japan. One S-3B has been modified to "Outlaw Viking" standard with a satellite communications link for real-time intelligence relay, but despite useful service with VS-37 aboard USS *Kitty Hawk*, no more have been converted. A further improvement, flying in prototype form, is Gray Wolf: an S-3B carrying a podded Norden AN/APG-76 synthetic aperture radar that gives "mini–Joint STARS" surveillance and target-finding capability over land. Vikings will remain in service at least until 2015. *(Data for S-3B.)*

S-3B Vikings

Contractor: Lockheed Martin Corporation.

Power Plant: two General Electric TF34-GE-400A/B turbofans; each 9,275 lb st.

Accommodation: crew of four (pilot, copilot, tactical coordinator, and sensor operator).

Dimensions: span 68 ft 8 in, length 53 ft 4 in, height 22 ft 9 in.

Weights: empty 26,650 lb, normal gross for ASW 42,500 lb.

Performance: max cruising speed 426 mph, loiter speed 184 mph, service ceiling more than 35,000 ft, T-O run 2,200 ft, landing run 1,600 ft, combat range more than 2,300 miles.

Armament: internal split weapons bays for bombs, depth bombs, mines, or torpedoes. Two underwing pylons for AGM-84 Harpoon, rocket pods, bombs, mines, flare launchers, or auxiliary fuel tanks.

Reconnaissance and Special-Duty Aircraft

E-2C Hawkeye

Following cancellation of plans to purchase a new design of carrier-based AEW (airborne early warning) aircraft, the Navy has resumed procurement of the Hawkeye, which is now assured of production into the next century. Although a dated airframe design, the Hawkeye fills a unique slot in the spectrum of combat aircraft: infinitely more capable than smaller surveillance platforms, yet a fraction of the price of an E-3 AWACS. Data gathered by the 24-ft-diameter rotodome revolving on a pylon above the fuselage are displayed in the ATDS (airborne tactical data system) compartment in the center fuselage to the Combat Information Center officer, air control officer, and radar operator. At the operating altitude of about 30,000 ft, the radar can see targets up to 300 miles distant within a six million cubic mile envelope. Electronic emitters, such as hostile radars, can be detected over distances up to 600 miles by the Litton AN/ALR-73 PDS (passive detection system). Limitations for carrier stowage require that the rotodome be lowered by a hydraulic jack when aboard ship, reducing overall height to 16 ft 5 in.

E-2C Hawkeyes

E-6A Mercury *(Ted Carlson)*

First flight of the prototype Hawkeye was on October 21, 1960. The E-2A (62 built) had 4,050 shp T56 engines and the APS-96 radar, most being upgraded to E-2B before withdrawal. Radar has been progressively improved via the APS-125, -138, and -139, to the current GE APS-145, with an advanced processing system, including better overland detection. Latest standard **E-2Cs**, known as Group II, also feature new main operator displays, IFF and mission computer, plus JTIDS and uprated engines. This version can automatically track more than 2,000 targets and control more than 20 airborne intercepts. The first E-2C flew in January 1971, and 141 are on firm order, with more expected. The first 100 are Group 0, and 18 more are Group I, but at least 12 of the latter are being upgraded during 1996–97. Seven Atlantic Fleet and six Pacific Fleet squadrons fly E-2Cs, as do three of the Naval Reserve, including VAW-77, which is primarily tasked with antismuggling patrols in the Caribbean.

Contractor: Northrop Grumman Corporation.

Power Plant: two Allison T56-A-427 turboprops; each 5,100 ehp.

Accommodation: two pilots, plus three tactical officers.

Dimensions: span 80 ft 7 in, (folded) 29 ft 4 in, length 57 ft 6¾ in, height (rotodome raised) 18 ft 4 in.

Weights: empty 40,484 lb, max gross 54,426 lb.

Performance: max cruising speed 374 mph, service ceiling 37,000 ft, time on station 200 miles from base 4 hr 24 min, endurance 6 hr 15 min.

E-6A/B Mercury

This appropriately named winged messenger operates in the TACAMO (Take Charge and Move Out) role, providing a survivable airborne communications link between the national command authorities (NCA) and the Navy's fleet of Trident nuclear submarines (SSBNs). It retains, at least initially, the airborne VLF communications system formerly used in the EC-130Q and has a nuclear/EMP-hardened airframe. Derived from the 707-320 airframe, the **E-6A** has wingtip ESM/Satcom pods and CFM turbofans similar to those powering USAF's KC-135Rs. In operational use, the AN/ALR-66(V)4 ESM (electronic support measures) systems in each wingtip pod provide threat information (detection, identification, bearing, and range). Communications can be relayed upward to other airborne command posts, such as the Presidential E-4 or satellites, or downward to VLF ground stations and the SSBN fleet, using two trailing wire antennas (TWAs): one 26,000 ft long (LTWA) reeled out from an underfuselage hatch and a 4,000-ft antenna (STWA) winched out from the tailcone to act as a dipole. To be effective operationally, the LTWA must be kept at least 70 percent vertical; this is achieved by weighting the end with a 90-lb drogue while the E-6A flies in a tight orbit. Prototype flight testing with full on-board avionics started in June 1987, and the first two production E-6As were handed over to VQ-3 in August 1989. Eight serve with VQ-3 and six with VQ-4, both now based at Tinker AFB, Okla., with Strategic Communications Wing One and operating from forward bases at Patuxent River and Travis AFB, Calif. One E-6A has been converted to **E-6B** standard with upgraded avionics, including a satellite communications antenna in a blister radome above the forward fuselage. The remainder of the fleet will be similarly modified to the standard of Airborne National Command Post, with the additional capability to authorize launch of Minuteman and Peacekeeper ICBMs. SCW-1 also has two Boeing 707 training aircraft operated under the designation **TC-18F.**

Contractor: Boeing Defense and Space Group.

Power Plant: four CFM International F108-CF-100 turbofans; each 24,000 lb st.

Accommodation: flight crew of four, plus mission crew of five including an airborne communications officer.

Dimensions: span 148 ft 2 in, length 152 ft 11 in, height 42 ft 5 in.

Weights: empty 172,795 lb, gross 342,000 lb.

Performance: cruising speed at 40,000 ft 523 mph, dash speed 610 mph, patrol altitude 25,000–30,000 ft, T-O distance 5,400 ft, landing distance 2,600 ft, mission range (unrefueled) 7,307 miles.

Armament: none.

EA-6B Prowler

In spite of its age (the first, a converted A-6A, flew on May 25, 1968), the Prowler received a new lease on life when nominated as the sole USN/USAF tactical jamming aircraft, essentially filling the role of the EF-111A Raven. To this end, four joint operating squadrons are being formed with personnel including former EF-111 officers of the Air Force. The first, VAQ-134, commissioned on September 29, 1995, is due to be declared operational in August 1996, followed by VAQ-133, -137, and -142 at six-month intervals. Home-based at NAS Whidbey Island, Wash., joint squadrons and their total of 20 aircraft are carrier-capable but will not normally deploy as part of an air group and are prepared for rapid deployment to forward land bases. The Navy has a force of 127 EA-6Bs remaining from 170 built up to 1991; these also serving wholly naval units (one of which is Reserve) under the commander, Electronic Combat Pacific, at Whidbey (although actively assigned additionally to the Atlantic Fleet).

Designed from the outset for the electronic warfare and active jamming mission, the Prowler is an A-6 with attack capability deleted and the forward fuselage extended by 40 inches to accommodate two additional crew. The main group of receiver antennas is housed in a large fairing on top of the tail to give all-round coverage of hostile emitters. The received information is processed by a powerful AYK-14 central computer. The processing system automatically adjusts the radiated jamming power to match the threat, to make best use of energy, and aims the jamming toward the threat. Jammers are contained in up to five streamlined pods hung on the fuselage and wing pylons. Each pod has two transmitters that are self-powered by a windmill generator on the nose. Today's Prowlers have been through a succession of upgrade programs (EXCAP, ICAP-1, and ICAP-2). The current ICAP-2/Block 86 standard, to which many are fitted, carries AN/ALQ-99F TJS (tactical jamming system) pods able to generate signals in any of seven frequency bands and to jam in any two simultaneously. They have an ALE-39 chaff/flare dispenser in the rear fuselage and internally mounted ALQ-126 ECCM. Another update is the Sanders ALQ-149, a comprehensive system for detecting and jamming hostile communications.

A proposed modification was canceled in 1993, but Northrop Grumman has been contracted to upgrade four Intruders to Block 89A standards, to which configuration the remainder of the fleet will be retrofitted using kits supplied by the manufacturer. Block 89A upgraces concern aircraft systems, navigation, communications, and computers.

Contractor: Northrop Grumman Corporation.
Power Plant: two Pratt & Whitney J52-P-408 turbojets; each 11,200 lb thrust.
Accommodation: crew of four (pilot and three ECM officers) on Martin-Baker GRUEA-7 seats.
Dimensions: span 53 ft 0 in, (folded) 25 ft 10 in, length 59 ft 10 in, height 16 ft 3 in.
Weights: empty 32,162 lb, normal gross 54,461 lb.
Performance (with five pods): max speed at S/L 610 mph, service ceiling 38,000 ft, T-O run 2,670 ft, landing run 2,150 ft, range 1,100 miles.
Armament: up to four AGM-88 HARMs on underwing pylons.

EC-24A

This much-modified DC-8-54F is operated by civilian crews of Chrysler Technologies Airborne Systems for the Fleet Information Warfare Center (which also has two USAF NKC-135A Stratotankers). Though based at Waco, Tex., it ranges throughout the world carrying the Orange Force Commander in all major Fleet exercises. It can be identified by the two large "canoe" radomes under the fuselage covering the steerable antennas of the two broadband ALT-40 radar jammers. Other equipment includes dual AN/ASQ-191 communications transceiver/jammers, two AN/ALE-43 chaff dispensers, dual AN/ALR-75 systems for signal identification, and 12 radio transceivers (six UHF, two VHF, and four HF).

Contractor: Electrospace Systems Inc.
Power Plant: four Pratt & Whitney JT3D-3 turbofans; each 18,000 lb st.
Accommodation (typical): flight crew of three, plus seven systems operators (including mission commander). Capacity also for up to 3,000 lb of cargo and seats for 20 maintenance personnel or additional crew members.
Dimensions: span 142 ft 5 in, length 150 ft 6 in, height 42 ft 4 in.
Weights: gross 315,000 lb.
Performance: max cruising speed at 30,000 ft approx 545 mph, T-O field length 10,560 ft, landing field length 5,620 ft, max unrefueled range approx 5,525 miles, max endurance 11 hr.

EP-3E, P-3B, and NP-3D Orion

A protracted program is now expected to see the last of 12 **EP-3E-II Aries II** conversions from P-3C delivered in January 1997. Replacing a similar number of

EA-6B Prowler *(Guy Aceto)*

EC-24A *(Ted Carlson)*

EP-3E Aries II *(Paul Jackson)*

Aries Is of at least two configurations, they fly elint missions with VQ-1 (NAS Whidbey Island, Wash.) and VQ-2 (NS Rota, Spain). Lacking an MAD "sting," they have a profusion of excrescences, including radomes above and below the fuselage. Equipment includes a Hughes AN/AAR-37 IR receiver, Raytheon AN/ALQ-76 and Magnavox AN/ALQ-108 jammers, a Loral AN/ALQ-78 passive ECM receiver, UTC AN/ALQ-110 radar signal collector, wingtip IBM AN/ALR-76 ESM/RWR pods, and a Sanders AN/ALQ-132 infrared countermeasures system. Elint and other clandestine missions are flown by four greatly modified **P-3B**s of VPU-1 at NAS Brunswick, Me., and VPU-2 at NAS Barbers Point, Hawaii. Painted to resemble regular P-3Cs, they wear spurious unit insignia and serial numbers and have painted-on "sonobuoy tubes." In 1994, a dozen experimental and trial Orions in several configurations were given the blanket designation **NP-3D.** These serve with branches of the Naval Air Warfare Center and Naval Research Laboratory. *(Data for EP-3E-II generally as for P-3C, except as follows.)*

Accommodation: duty and relief flight crew, plus 15 electronic warfare equipment operators.
Weight: gross approx 142,000 lb.

C-2A Greyhound *(Paul Jackson)*

ES-3A Shadow and US-3A Viking

To replace EA-3 versions of the Douglas Skywarrior, Lockheed developed kits to convert S-3A Vikings for the elint role. They retain the AN/ARR-76 electronic support measures system of the S-3A but replace some 3,000 lb of ASW installation with 6,000 lb of new ESM, broadly similar to those of the EP-3E Orion, plus Omega navigation, GPS, and three AN/AYK-14 digital computers. Each ES-3A carries a pilot, EW combat coordinator (right seat), EW operator, and mission specialist, although a fifth crew member can be accommodated, if needed.

The prototype conversion was flown in December 1991. The first of 15 production conversions by NAS Cecil Field, Fla., flew on January 21, 1992, and the last was delivered on September 30, 1993. User units are VQ-5 at Agana, Guam, and VQ-6 at Cecil Field. Once equipped with the 10 E-Systems RS-6BN remotely controlled airborne sensor payloads on order for 1998 IOC, they will form the airborne component of the Battle Group Passive Horizon Extension System, deployed in detachments of two ES-3As to a carrier, to extend the group's threat detection/identification range.

Another conversion program in 1982–83 turned six S-3As into **US-3A** COD (carrier on-board delivery) transports, one via a spell as a KS-3A tanker. They carry their 3,750-lb payload in the weapons bay and in large containers resembling drop tanks attached to the underwing pylons. *(Data generally as for S-3A/B, except performance slightly reduced because of external antenna drag.)*

F/A-18D(RC) Hornet

Following rejection of a dedicated reconnaissance version of the Hornet, the F/A-18D(RC) configuration was developed in which a regular F/A-18D can be converted overnight to fly reconnaissance missions. Lockheed Martin developed the ATARS (Advanced Tactical Airborne Reconnaissance System), contained in an external centerline pod housing a Loral UPD-8 synthetic-aperture side-looking radar supplementing nose-mounted IR and optical sensors, but this was canceled in June 1993. Instead, 31 USMC F/A-18Ds (the first of which was delivered, minus sensors, in February 1992) will receive a partial ATARS fit, comprising some electro-optical overflight sensors and a long-range optical sensor, and with their Hughes AN/APG-73 radar modified to produce high-resolution strip maps. IOC is planned for 1998. *(Data generally as for F/A-18.)*

Tankers and Transports

C-2A Greyhound

Derived from the E-2 Hawkeye, the C-2A has been the Navy's standard COD aircraft since 1964. Pressurized accommodation is provided for up to 28 passengers or 12 litters and medical attendants. The floor is stressed for cargo and can be equipped for the 463L pallet system, bulky loads being winched or driven in via the full-width rear ramp door. Maximum cargo payload for carrier operations is 10,000 lb, but 15,000 lb can be lifted out of airfields.

From 1985, Grumman delivered a second series of 39 improved aircraft, allowing the initial batch of 19 to be withdrawn by 1987. Principal operators are VRC-30 at NAS North Island, Calif., and VRC-40 at Norfolk, Va., but the AEW/COD training squadron, VAW-120 at Norfolk, also operates four.

Contractor: Northrop Grumman Corporation.
Power Plant: two Allison T56-A-425 turboprops; each 4,910 ehp.
Accommodation: crew of pilot, copilot, and loadmaster; payload, see above.
Dimensions: span 80 ft 7 in, length 56 ft 10 in, height 15 ft 10½ in.
Weights: empty 36,346 lb, max gross 57,500 lb.
Performance: max cruising speed 299 mph, T-O run 2,180 ft, landing run 1,428 ft, range with 10,000 lb cargo more than 1,200 miles.

C-9B Skytrain II

From 1973 onward, 17 C-9B—military DC-9s—were built for the Navy as convertible passenger/cargo transports based on the commercial Series 32CF, and a further two went to the Marines at Cherry Point, N. C. They have since been augmented by 10 unconverted DC-9 Series 30 standard transports. The cabin can seat up to 90 passengers, hold 32,500 lb of cargo, or accommodate eight standard military pallets loaded via an 11 ft 4 in x 6 ft 9 in cargo door at the front port side. A typical combi load comprises three pallets and

45 passengers. The fleet is distributed among 10 Naval Reserve units. *(Data for C-9B.)*

Contractor: Douglas Aircraft Company Division of McDonnell Douglas Corporation.

Power Plant: two Pratt & Whitney JT8D-9 turbofans; each 14,500 lb thrust.

Accommodation: flight crew of three, plus two cabin attendants. See above for other details.

Dimensions: span 93 ft 5 in, length 119 ft 3½ in, height 27 ft 6 in.

Weights: empty (passenger) 65,283 lb, (cargo) 59,706 lb, gross 110,000 lb.

Performance: max cruising speed at 25,000 ft 576 mph, service ceiling 37,000 ft, military field length 7,410 ft, landing distance 2,580 ft, range with 10,000 lb payload 2,923 miles.

C-20D/G Gulfstream III

The first two of these executive jets for naval use were **C-20D** Gulfstream IIIs, currently serving Commander Fleet Logistics Support Wing, USN Reserve, NAS Dallas, Tex., on detachment to Andrews AFB, Md. A further five **C-20G** Gulfstream IVs, with freight door and convertible interior for up to 26 passengers, were delivered in 1994 for CFLSW Hawaii detachment (two), VR-48 at Andrews (two), and the Marine Wing Hq. Squadron 1 at Iwakuni, Japan. *(C-20G data as for Army C-20F.)*

C-130T, LC-130F/R, and TC-130G Hercules

After a long and eventful career, the two remaining ski-equipped **LC-130F**s and four similar **LC-130R**s of VXE-6 are to be withdrawn from Antarctic resupply missions (forward-based in New Zealand) after the 1997–98 summer season. However, later versions of the ubiquitous Hercules continue to be delivered to naval squadrons, most recently the **C-130T,** an equivalent to the C-130H with upgraded avionics, including INS and Omega, plus secondary tanker capability. The requirement is for 22, the first two being delivered to VR-54 at NAS New Orleans, La., in August 1991, and others now serving VR-53 at Andrews AFB, Md., VR-55 at NAS Moffett Field, Calif., and VR-62 at South Weymouth, Mass. **TC-130G** is the designation of a surplus EC-130G (TACAMO) Hercules, which supports the Blue Angels demonstration team, its long trailing wire antenna removed to enable cargo to be loaded through the rear ramp door. *(Data generally as for KC-130.)*

CT-39E/G Sabreliner

Only two of the Navy's original 42 T-39D Sabreliners are still in service, but other variants of this small business jet perform useful duties as tactical support transports. The **CT-39E** (seven ordered, of which some are still in service with the Navy and the Marines) corresponds to the commercial Sabreliner 40. A fuselage longer by 3 ft 2 in, with five cabin windows per side (instead of three), characterizes the **CT-39G** (Sabreliner 60), which also features engine thrust reversers. The Navy had 13 of these, of which four are in Marine Corps service and others serve with Commander Fleet Logistics Support Wing at New Orleans, La.

Contractor: Sabreliner Corporation.

Power Plant: two Pratt & Whitney JT12A-8 turbojets; each 3,300 lb thrust.

Accommodation: crew of three; up to nine (-39E) or 10 (-39G) passengers.

Dimensions: span 44 ft 5¼ in, length 43 ft 9 in (-39E), 46 ft 11 in (-39G), height 16 ft 0 in.

Weights: empty 9,845 lb (-39E), 10,486 lb (-39G), gross 18,650 lb (-39E), 19,615 lb (-39G).

Performance: max speed at 21,500 ft (both) 563 mph, service ceiling (both) 45,000 ft, T-O field length (-39E) 4,800 ft, landing field length (-39E) 2,200 ft, range (-39E) 2,118 miles.

KC-130F/R/T Hercules

Six squadrons of the Marine Corps Reserve fly some 80 tanker/transport Hercules, the original **KC-130F** fully equipping the training unit (VMGRT-253) at Cherry Point, N. C., and VMGR-252 at the same base, as well as making up numbers in other squadrons, including VMGR-152 at Futenma, Japan. A C-130B variant, the KC-130F has 4,050 ehp T56-A-7 engines and is fitted with tanks with a capacity of 3,600 gallons of fuel in the main cargo compartment, and with two quickly installable or removable hose-reel units under the outer wings for refueling two aircraft simultaneously. The F version, 46 of which were purchased, can transfer 31,000 lb of fuel at a distance of 1,000 miles from its base. In 1975, VMGR-352 was the first squadron to employ some of the 14 extended-range **KC-130R**s, based on the C-130H. These have more powerful engines (see below) and pylon-mounted external tanks. A few others are with VMGR-152 and -252. The **KC-130T** is similar to the R but has upgraded avionics, including INS, Omega, and Tacan, a solid-state APS-133 color radar, flush antennas, and orthopedically designed crew seats. The 26 procured so far include two **KC-130T-30**s, with the stretched fuselage of the C-130H-30. T versions serve with VMGR-234 at Fort Worth, Tex., and VMGR-452 at Stewart IAP, N. Y., each having one -30. One aircraft of Marine Reserve squadron VMGR-452 underwent special modification for Operation Desert Storm as a comint aircraft codenamed Senior Warrior. *(Data for KC-130R.)*

KC-130T-30 *(Paul Jackson)*

UC-12B *(Paul Jackson)*

Contractor: Lockheed Martin Corporation.

Power Plant: four Allison T56-A-15 turboprops; each 4,508 ehp.

Accommodation: normal crew of four to seven.

Dimensions: span 132 ft 7 in, length 97 ft 9 in, height 38 ft 3 in.

Weights: empty 79,981 lb, gross 109,744–166,301 lb.

Performance: max cruising speed at 30,000 ft 374 mph, max fuel offload 70,000 lb (10,769 gal), or 52,000 lb (8,000 gal) at 1,150 miles from base.

HV/MV/SV-22A Osprey

The Osprey continues to make progress—at times against strong political and military headwinds—toward becoming the first tiltrotor aircraft to see squadron service. A Critical Design Review was passed in December 1994, and four more development aircraft will fly in 1996–97. Main version will be the Marine Corps **MV-22A** assault transport (requirements for 425). Navy plans are for 48 **HV-22A**s for CSAR (combat search and rescue), special warfare, and fleet logistics support, and possibly also an antisubmarine **SV-22A.** Deliveries to the USMC will begin in 1999, and deliveries of HV-22As in 2003. *(Data for MV-22A.)*

Contractors: Bell Helicopter Textron Inc.; Boeing Helicopters.

Power Plant: two Allison T406-AD-400 turboshafts; each 6,150 shp.

Accommodation: flight crew of three; 24 combat troops and two gunners, 12 litters plus medical attendants, or 8,300 lb of internal cargo.

Dimensions: span (excluding nacelles) 46 ft 0 in, fuselage length 57 ft 4 in, height (nacelles vertical) 21 ft 9 in.

Weights: empty 32,760 lb, normal gross 47,500 lb for vertical takeoff, 55,000 lb for forward (short) takeoff. One or two external cargo hooks for single load of 10,000 lb or combined load of 15,000 lb.

Performance: max cruising speed (airplane mode) at optimum altitude 361 mph, service ceiling 26,000 ft, T-O run less than 500 ft, range for amphibious assault 592 miles.

F-5E Tiger II *(Ted Carlson)*

UC-12B/F/M and RC-12F/M

Navy Department procurement of this Super King Air variant began with 66 **UC-12B**s (49 for the USN and 17 for the Marine Corps), deliveries of which were completed by the spring of 1982. Assigned to numerous base flights and similarly tasked communications and light transport units, the UC-12B has PT6A-41 engines, a 4 ft 4 in square cargo door aft of the wing (port side), and high-flotation landing gear. The later **UC-12F** (10 delivered from 1986) corresponds to the civil Model B200C, with PT6A-42s of the same power rating and hydraulic (instead of electric) gear actuation. The **UC-12M** (also 10) is similar, apart from revised instrumentation, lighting, and voice communications. Four additional aircraft have been supplied in Range Surveillance Aircraft (RANSAC) configuration and comprise two **RC-12F**s at Barking Sands, Hawaii, and two **RC-12M**s divided between Point Mugu, Calif., and Roosevelt Roads, P. R. *(Data for UC-12F.)*

Contractor: Raytheon Aircraft Company (Beech).

Power Plant: two Pratt & Whitney Canada PT6A-42 turboprops; each 850 shp.

Accommodation: crew of two plus up to eight passengers or equivalent cargo.

Dimensions: span 54 ft 6 in, length 43 ft 9 in, height 15 ft 0 in.

Weights: empty 8,060 lb, gross 12,500 lb.

Performance: max cruising speed at 25,000 ft 333 mph, service ceiling more than 35,000 ft, range at 27,000 ft at econ cruising speed of 325 mph 2,142 miles.

TP/UP/VP-3A/B Orion

All five **VP-3A**s, three of them converted from former WP-3A weather reconnaissance variants of the Orion, remain in service as Navy VIP transports. There are a similar number (plus many more in storage) **UP-3A**s for more mundane transport duties, converted from retired P-3As by removing the ASW systems and installing seats in the cabin. Standards of furnishings vary. VP-30 at NAS Jacksonville, Fla., the sole Orion training unit, has eight **TP-3A** pilot trainers as well as VP-3As and the usual P-3Cs. Two **UP-3B**s serve alongside the EP-3Es of VQ-1 at NAS Whidbey Island, Wash.

Trainers

F-5E/F Tiger II

The Navy and Marine Corps use Northrop F-5 lightweight fighters for aggressor training and hope to acquire more on the secondhand market by trading some of their withdrawn F-16Ns for Bahrain's eight F-5Es and four tandem-seat F-5Fs. Meanwhile, the original 10 **F-5E**s and three **F-5F**s, acquired in the 1970s, have been augmented by 24 ex-USAF single-seaters. They have been retired from the Top Gun schools but are still active with VMFT-401 at Yuma, Ariz., and the Navy Reserve's VFC-13 at NAS Fallon, Nev. (having transfered this year from regular squadrons VF-45 and VFA-127). *(Data for F-5E.)*

Contractor: Northrop Grumman Corporation.

Power Plant: two General Electric J85-GE-21B turbojets; each 5,000 lb thrust with afterburning.

Dimensions: span 26 ft 8 in (27 ft 11⅞ in over wingtip AAMs), length 47 ft 4¾ in, height 13 ft 4¼ in.

Weights: empty 9,723 lb, gross 24,722 lb.

Performance: max speed at 36,000 ft at 13,350-lb combat weight Mach 1.64, ceiling 51,800 ft, T-O run 2,000–5,700 ft, landing run with brake-chute 2,500 ft.

Accommodation: pilot only, on ejection seat.

EP-3J Orion

This electronic warfare trainer is a P-3B equipped with the AN/USQ-113 communications intrusion and deception system, AN/ALT-40(V) radar jammer, and with external pods housing ALQ-167, ALQ-170, and AST-4/6. Two are assigned to VP-66, a Reserve squadron, at Willow Grove ARS, Pa.

T-2C Buckeye

Reduced training requirements and introduction of the T-45 Goshawk have thinned the numbers of T-2s in Navy service. The T-2C is the sole remaining variant of the first aircraft specifically designed from the start as a Navy basic jet trainer and has been in use since 1969. VT-19 and -23, within Training Wing One at NAS Meridian, Miss., are two of the last three flying training squadrons, and will continue until reequipped with T-45s in 2003. At Pensacola, Fla., VT-4 also trains pilots and VT-86 is responsible for instructing NFOs (see T-39N). About half of the 231 T-2Cs built remain active.

(Data: See December 1995 "World Gallery of Trainers.")

T-34C Mentor

Beech built 352 turboprop versions of the Mentor for the Navy, the great majority of which remain in service, principally with training squadrons VT-2, -3, -6, -10, -27, and -28. Student training began in January 1978 and was modified slightly following the 1994 decision to make VT-3, at NAS Whiting Field, Fla., the first Navy training unit with a joint USN/USAF instructing staff. *(Data: See December 1994 "World Gallery of Trainers.")*

T-38A Talon

More than 1,000 of the 1,189 T-38As built were for USAF. Of 18 originally acquired by the Navy, more than half were later droned as DT-38As, but six remain with the Test Pilots' School at Patuxent River, Md. *(Data: See December 1995 "World Gallery of Trainers.")*

T-39N Sabreliner

Seventeen **T-39N** Sabreliners are operated under short-term civil contract for Undergraduate Naval Flight Officer radar training by VT-86 at NAS Pensacola, Fla. Based on the civil Sabreliner 40, the aircraft are outfitted as flying classrooms. The first was delivered in June 1991. *(Data generally as for CT-39E except as follows.)*

Power Plant: two Pratt & Whitney J60-P-3A turbojets; each 3,000 lb thrust.
Weights: gross 17,760 lb.
Performance: max speed at 20,000 ft 540 mph, service ceiling 42,000 ft, typical range 1,375 miles.

T-44A Pegasus

The Beech King Air was selected in 1976 to fill the Navy's VTAM(X) requirement for a twin-turboprop instrument trainer for pilots of multiengined aircraft. Combining features of the civil C90 and E90 King Airs, its standard commercial avionics were augmented by Tacan, UHF radio, and UHF/DF equipment. Student training began in July 1977, and some 57 of 61 T-44As are still in service with VT-31 at NAS Corpus Christi, Tex. A proposed order for five T-44Bs was allowed to lapse. Under new joint training procedures, VT-31 is receiving some USAF instructors and will eventually train all USAF C-130 Hercules pilots.

Contractor: Raytheon Aircraft Company (Beech).
Power Plant: two Pratt & Whitney Canada PT6A-34B turboprops; each flat rated to 550 shp.
Accommodation: one instructor, two students, and two observers.
Dimensions: span 50 ft 3 in, length 35 ft 6 in, height 14 ft 2½ in.
Weights: empty 6,326 lb, gross 9,650 lb.
Performance: max cruising speed at 12,000 ft 287 mph, service ceiling 27,620 ft, max range 1,456 miles.

T-45A Goshawk

The Goshawk is a navalized version of the British Aerospace Hawk advanced trainer, with new landing gear, a deck hook and catapult launch bar, twin airbrakes, strengthened airframe, customer-specified avionics and cockpit displays, a more powerful version of the Adour engine, and full-span leading-edge slats. Deliveries to VT-21 at NAS Kingsville, Tex., began in June 1992; student training started on January 4, 1994, and the first class ended on October 5 that year after completing the deck-landing phase. Training comprises 132 sorties (175½ hours) in the Goshawk, plus 72 simulator sessions (98 hours). By late 1994, Training Wing Two at NAS Kingsville was forming its second Goshawk squadron, VT-22, the two units being assigned 69 early production aircraft, while another three are used for trials. Introduction of a "glass" cockpit from the 73d Goshawk is planned for this year, and the balance of the currently envisaged 197 T-45As will be upgraded to this "Cockpit 21" standard, with digital avionics, two 5 x 5 in monochrome multifunction displays and Smiths HUD. These aircraft will go to Training Wing One (VT-7 and -19) at Meridian, Miss., but earlier Goshawks will be retrofitted.

Contractors: McDonnell Douglas Corporation; British Aerospace plc.
Power Plant: one Rolls-Royce Turbomeca F405-RR-401 (navalized Adour Mk 871) turbofan; 5,845 lb thrust.
Accommodation: instructor and pupil in tandem.
Dimensions: span 30 ft 9¾ in, length 39 ft 4 in, height 14 ft 0 in.
Weights: empty 9,834 lb, gross 14,081 lb.
Performance: max speed at 8,000 ft 625 mph, service ceiling 40,000 ft, T-O field length 3,610 ft, landing field length 3,310 ft, ferry range (internal fuel) 952 miles.
Armament: two underwing pylons for practice bombs, rocket pods, or drop tanks; provision for centerline stores pod.

T-34C Mentor *(Paul Jackson)*

T-44A Pegasus *(Paul Jackson)*

T-45A Goshawk

TA-4J Skyhawk *(Ted Carlson)*

TA-4J Skyhawk

The last of 281 TA-4Js built will be withdrawn from the advanced training role at VT-7/Training Wing One by October 1997, although they may be survived by a small number employed by VC-8 at Roosevelt Roads, P. R., the Test Pilots' School and Naval Air Warfare Center, China Lake, Calif. (Single-seat A-4Ms were withdrawn when VMA-131 stood down in August 1994, ending a 37-year front-line career.) *(Data for TA-4J except where indicated.)*

Contractor: McDonnell Douglas Corporation (Douglas Aircraft Co.).
Power Plant: one Pratt & Whitney J52-P-6 turbojet; 8,500 lb thrust.
Accommodation: instructor and pupil in tandem.
Dimensions: span 27 ft 6 in, length (excluding probe) 42 ft 7¼ in, height 15 ft 3 in.
Weights (TA-4F): empty 10,602 lb, normal gross 15,783 lb.
Performance (TA-4F): max speed at S/L 675 mph, service ceiling approx 49,000 ft, T-O run 3,380 ft, typical range (clean) 1,350 miles.
Armament: one 20-mm gun in wingroot (not always fitted).

Helicopters

AH-1W SuperCobra

Marine Corps light attack helicopter squadrons have now standardized on the AH-1W SuperCobra, normal complement being 18, plus nine UH-1Ns for support. The ultimate gunship Huey adds Hellfire and Sidearm missiles to the already formidable AH-1 armory of TOW, rockets, and guns, and a requirement exists for a dozen to be armed with Maverick ASMs. Most of the 154 helicopters in the current procurement target are already in service, as are 42 more converted from AH-1Ts by 1992. The last-mentioned equip HMLA-167 and -269 at MCAS New River, N. C.; new-build aircraft have gone to five squadrons (one for training) at Camp Pendleton, Calif., and Reserve squadrons at Camp Pendleton and NAS Atlanta, Ga. Squadrons provide detachments of between four and six Cobras to LPH and newer LHA assault vessels for antiarmor, troop-carrier escort, armed reconnaissance, multiple-weapon fire-support, and target-acquisition missions.

Night capability for the helicopter's M65 TOW sight, consisting of FLIR and a laser-ranger, has been developed jointly by the USMC and Israel. By 1998, all AH-1Ws will have been fitted with this Night Targeting System (NTS) produced by Tamam and Kollsman. Despite abandonment of the proposed Integrated Weapon System in July 1995, SuperCobras are to be retained in service until 2020 as the consequence of a Phase II upgrade (NTS is Phase I), which will include a vibration-reducing, new-technology, four-blade main rotor, 30 percent uprating of transmission, new stub-wings able to carry twice as many antiarmor missiles, "glass" cockpit with multipurpose color displays, new computers, mission data loader, HOTCC flying controls and upgraded self-defense kit. Remanufacture of 180 AH-1Ws will take place between FY 2003 and FY 2011.

Contractor: Bell Helicopter Textron.
Power Plant: two General Electric T700-GE-401 turboshafts; each 1,723 shp (transmission rating 2,032 shp).
Accommodation: pilot and gunner.
Dimensions: rotor diameter 48 ft 0 in, fuselage length 45 ft 6 in, height 14 ft 7 in.
Weights: empty 10,216 lb, gross 14,750 lb.
Performance: max speed at S/L 175 mph, service ceiling more than 14,000 ft, max range 365 miles.
Armament: turreted M197 20-mm gun; up to eight TOW/Hellfire ATMs and two Sidewinder AAMs, or two Sidearm ARMs; or four rocket/gun pods.

CH/HH/UH-46D, CH-46E, and VH-46F Sea Knight

Despite pending replacement by the V-22 Osprey, the H-46 will be around for many more years—perhaps even until 2017, when the Marine Corps expects to have received enough MV-22s to take over entirely in the combat assault role. Meanwhile, the process of rolling H-46 improvement programs is continuing. The latest started in February 1996 with return to service of the first helicopter to receive a dynamic components upgrade (DCU). It is planned that the DCU will be applied to 261 CH/HH-46s operated by the Marines, plus 81 UH/HH-46s used for vertical replenishment (vertrep) and SAR by the Navy. These remain from the 624 H-46s built between 1958 and 1971, but Boeing is proposing a wider-ranging upgrade to keep the Sea Knight flying until 2025. No early CH/HH/UH-46As remain, but unmodified examples of the corresponding **-46D** models, with uprated -10 version of the GE T58 turboshaft, can still be found with four Navy HC squadrons (-6 and -8 on the Atlantic seaboard; -3 and -11 on the Pacific), plus the Navy base flight at Point Mugu and Marine Corps rescue flights at Beaufort, Cherry Point, and Iwakuni. Apart from six **VH-46Fs** for HMX-1, 273 of other D and F model Sea Knights were updated from 1977 as **CH-46Es**, with T58-GE-16 turboshafts delivering one-third more power, crash-resistant crew seats and fuel system, and improved rescue equipment. New glassfiber rotors have also been added to the CH-46E fleet.

Fourteen Marine medium helicopter squadrons operate CH-46Es from Futenma, Japan; New River, N. C.; and MCAS Tustin, Calif., together with two more of the Reserve. Deployments are made regularly on assault carriers, when the Marine Expeditionary Air Unit adopts the identity of the CH-46E squadron around which it is based. Drawn from several units, these squadrons normally comprise 12 CH-46Es, four AH-1Ws, three UH-1Ns and six AV-8Bs, the Navy supplying two more CH-46s for vertrep. The Navy's 72 vertrep-assigned CH-46Ds are scheduled to be partly replaced by 21 UH-60s to be funded in FY 1999–2001, but concern over capacity shortfall in the rapidly aging H-46 fleet prompted a series of practical assessments, beginning in 1995, of chartered civilian helicopters. *(Data for CH-46E.)*

Contractor: Boeing Helicopters.
Power Plant: two General Electric T58-GE-16 turboshafts; each 1,870 shp.
Accommodation: flight crew of two and 17 troops, 15 litters, or 10,000 lb of cargo.
Dimensions: rotor diameter (each) 51 ft 0 in, fuselage length 44 ft 10 in, height 16 ft 8½ in.
Weights: empty 16,000 lb, gross 24,300 lb.
Performance: max speed at S/L 166 mph, service ceiling 9,400 ft, range 173 miles.

CH-53D, RH-53D, and VH-53D Sea Stallion

First examples of the CH-53A Marines heavy assault transport helicopter were delivered in 1966 and successfully employed in Vietnam. The CH-53 uses the dynamic components of the Army's (now withdrawn) CH-54 Tarhe, married to a watertight hull (for emergency sea landings) fitted with clamshell rear doors. Maneuvering of heavy cargo is assisted by hydraulic winches and a floor roller track, with typical loads including pallets, vehicles, and a 105-mm howitzer and carriage. For stowage aboard assault carriers, the CH-53 has a folding tail and main rotors. None of the original A model Sea Stallions remains, the oldest serving version now being the **CH-53D,** with an enlarged cabin for 55 instead of 38 troops and uprated T64-GE-412/413 engines. Deliveries of 126 ended in January 1972, the CH-53D fleet now being concentrated at MCB Hawaii (formerly known as MCAS Kaneohe Bay) in five squadrons, including one for training. Two aircraft were modified to **VH-53D** and serve as VIP transports with HMX-1 at MCCDC Quantico, Va. The USMC also flies the survivors of 30 purpose-built, former minesweeping **RH-53D**s built for the Navy from 1973, these having provision for aerial refueling and two 0.5-in machine guns on flexible mountings. T64-GE-415 power plants of 4,380 shp were retrofitted. Current operators in the transport role are Reserve units, HMH-769 at Alameda, Calif., and -772 at Willow Grove, Pa. *(Data for CH-53D.)*
Contractor: Sikorsky Aircraft Division of United Technologies Corporation.
Power Plant: two General Electric T64-GE-412/413 turboshafts; each 3,695/3,925 shp.
Accommodation: flight crew of three and up to 55 equipped troops or 24 litters.
Dimensions: rotor diameter 72 ft 3 in, fuselage length 67 ft 2¼ in, height 24 ft 10½ in.
Weights: empty 23,485 lb, max gross 42,000 lb.
Performance: max speed at S/L 196 mph, service ceiling 18,000 ft, max range (with reserves) 250 miles.

CH-53E Super Stallion

The Western world's largest and most powerful helicopter is a three-engined Stallion variant with a longer fuselage, revised transmission, and doubled lifting capacity. As a result, its principal Marine Corps role is cargo transport (rather than troop airlift) and recovery of downed aircraft. The Navy employs the helicopter for vertical replenishment of ships at sea and for airlifting unserviceable aircraft incapable of leaving carriers under their own power. Maximum payload is 36,000 lb underslung. Deliveries began in June 1981, and current orders total 172, with three per year planned for FY 1997 and beyond.

Several upgrades are under way, including the HNVS (Helicopter Night Vision System) for low-level night/adverse weather operations. This comprises a Martin Marietta pilot's NVS, Honeywell integrated helmet and display sighting system, and Northrop-developed equipment from the Bell AH-1S surrogate trainer system. Also planned are Omega navigation, composite tail rotor blades, ground proximity warning, improved cargo handling equipment, missile warning, chaff/flare dispensers, and an inerting (nitrogen-based) fuel system. Sidewinder AAMs may be fitted for self-defense. The Navy has a few CH-53Es serving with HC-2 at Norfolk, Va., but the USMC has a more substantial force, comprising HMH-361, -461, -462, -464, -465, and -466, shared between bases at MCAS Tustin, Calif. (four), and MCAS New River, N. C. (two), plus HMT-302 for training. It is intended that the CH-53 (and Army Chinooks) will be replaced in about 20 years by the Joint Transport Rotorcraft.
Contractor: Sikorsky Aircraft Division of United Technologies Corporation.
Power Plant: three General Electric T64-GE-416 turboshafts; each 4,380 shp (transmission rating 31,500 shp).
Accommodation: flight crew of three, up to 55 equipped troops or 24 litters, or 32,000 lb of cargo.
Dimensions: rotor diameter 79 ft 0 in, fuselage length 73 ft 4 in, height 29 ft 5 in.
Weights: empty 33,226 lb, gross 73,500 lb.
Performance: max speed at S/L 196 mph, service ceiling 18,500 ft, max ferry range 1,290 miles.

HH-60H Seahawk

This Seahawk variant (18 ordered, in service from 1990) is generally similar to the SH-60F except for deletion of the ASW suite, addition of extra ECM and warning systems, an NVG-compatible cockpit, and a pair of door-mounted 7.62-mm M60 machine guns. Intended for combat search and rescue and support of covert operations, it can transport eight Navy SEALs or pick up four rescuees. Main operating units are HCS-4 at Norfolk, Va., and HCS-5 at Point Mugu, Calif., both in the Reserve, but the HH-60H is also allocated in pairs to Navy SH-60F squadrons. *(Data similar to SH-60.)*

AH-1W SuperCobra *(Paul Jackson)*

CH-53E Super Stallion *(Paul Jackson)*

SH-3H Sea King *(Paul Jackson)*

MH-53E Sea Dragon

Following successful use of the RH-53D Sea Stallion in the MCM (mine-countermeasures) role, this much more powerful version was first flown September 1, 1983. It is identified by grossly enlarged sponsons carrying nearly 1,000 gallons of additional fuel; improved hydraulic and electrical systems; and minefield, navigational, and AFC systems, including automatic tow couplers and automatic approach to/depart from hover features. Operational equipment towed by the helicopter comprises mechanical, acoustic, and magnetic hydrofoil sweeping gear weighing up to 26,000 lb, while a small number of Kaman Magic Lantern mine detection kits are also available. Deliveries began in June 1986, and about 50 have been received, serving with HM-14 at Norfolk, Va., HM-15 at Alameda, Calif., and, in the transport role, HC-4 at Sigonella, Sicily. MH-53Es have been retrofitted with GPS and will receive an engine upgrade (-419 versions of the T64) next year. They have recently been allocated a floating base in the form of USS *Inchon,* which has been redesignated from LPH-12 to MCS-1 as the first mine countermeasures ship and will regularly deploy eight MH-53Es. *(Data as for CH-53E, except empty weight 36,336 lb.)*

SH-2G Super Seasprite

Considerably reduced in recent years, the Seasprite fleet now comprises only two squadrons of the Navy Reserve, HSL-84 at NAS North Island, Calif., and HSL-94 at Willow Grove ARS, Pa. These share 24 SH-2G variants: six built new and delivered in 1992–94 and 18 rebuilds from SH-2F. Still known by their original role designator as LAMPS I (Light Airborne Multipurpose System 1), G versions have much more powerful engines, composite rotor blades with 10,000 hours life, dual 30-kVA electrics, gas-turbine APU, in-flight refueling, and many other upgrades. Avionics are digital (1553B data bus), with LN-66P radar, ASQ-81(V)2 MAD, ALR-66(V)1 ESM/warning, ASN-150 tactical management, 15 DIFAR/DICASS sonobuoys, ARR-84 sonobuoy receiver, UYS-503 processor, AKT-22(V)6 data link, ARN-146 on-top indicator, ASQ-188 torpedo presetter, ALE-39 chaff/flare dispenser, two torpedoes, eight markers, provision for two pintle-mounted machine guns, and a 4,000-lb cargo hook. In Fleet service, additions include AAQ-16 FLIR, AAR-47 missile warning, ALQ-144 IR jammer, and ARC-184 secure radio. For subsurface mine detection the ML-30 (Magic Lantern) laser sensor was tested in the Gulf War, and prototypes of the ML-90 were delivered in October 1992. Kaman is now offering this system as an SH-2G retrofit.
Contractor: Kaman Aerospace Corporation.
Power Plant: two General Electric T700-GE-401 turboshafts; each 1,723 shp.
Accommodation: pilot, tactical coordinator, and sensor operator.
Dimensions: rotor diameter 44 ft 4 in, fuselage length 40 ft 0 in, height 15 ft 0½ in.
Weights: empty 7,600 lb, gross 13,500 lb.
Performance: max speed 159 mph, service ceiling 23,900 ft, max range (two external tanks) 500 miles.
Armament: two Mk 46/50 torpedoes or AGM-119B Penguin antiship missiles. Optionally, two pintle-mounted 7.62-mm machine guns.

SH-3H Sea King

Jacksonville is the main refuge of the much depleted Sea King force, comprising HS-7, Reservist HS-75, and HS-1 for training. All have the SH-3H, which is capable of antisubmarine and utility roles. Four VIP transport **VH-3A**s and a similar number of unarmed **UH-3H**s are assigned to HC-2 at Norfolk, Va., and a few more of the latter are with base rescue flights. Eleven **VH-3H**s are operated by the USMC executive transport squadron HMX-1 at MCCDC Quantico, Va. *(Data for SH-3H.)*
Contractor: Sikorsky Aircraft Division of United Technologies Corporation.
Power Plant: two General Electric T58-GE-10 turboshafts; each 1,400 shp.
Accommodation: flight crew of two and two systems operators.
Dimensions: rotor diameter 62 ft 0 in, fuselage length 54 ft 9 in, height 16 ft 10 in.
Weights: empty 12,350 lb, gross 21,000 lb.
Performance: max speed 166 mph, service ceiling 14,700 ft, max range 625 miles.

SH-60B/F/R Seahawk

Produced to meet the LAMPS III (Light Airborne Multipurpose System 3) requirement, the initial **SH-60B** Seahawk version has been operationally deployed since 1984. Role equipment includes chin-mounted

pods for ESM equipment, underfuselage Texas Instruments AN/APS-124 search radar, pylons for two torpedoes or additional fuel tanks, Texas Instruments AN/ASQ-81 towed MAD to starboard, a sensor operator's position in the cabin, a 25-round sonobuoy launcher to port, an IBM AN/UYS-1 acoustic processor, folding main rotors, a rescue hoist, folding tailboom, modified undercarriage, deck haul-down equipment, and emergency buoyancy features. Late-build SH-60Bs (delivered from August 1992 to HSL-43) have provision for NFT Penguin antiship missiles, the Mk 50 advanced lightweight torpedo, an upgraded sonobuoy receiver, GPS, and other avionics improvements. Some earlier helicopters will be retrofitted to provide the Navy with a total of 115 Penguin-capable Seahawks.

The USN requirement for 260 SH-60Bs was capped at 186 in 1994. These helicopters are due to form 95 ship's flights—replacing Kaman Seasprites (LAMPS I) in some cases—aboard *Perry*-class frigates, *Kidd*- and *Spruance*-class destroyers, and *Ticonderoga*-class guided missile cruisers. They provide all-weather capability for detection, classification, localization, and interdiction of surface vessels and submarines and are able to communicate with their parent vessel by data link. Secondary missions include SAR, vertical replenishment, medevac, fleet support, and radio relay. Operating squadrons are HSL-40, -42, -44, -46, and -48 at NAS Mayport, Fla., for Atlantic Fleet vessels; HSL-41, -43, -45, -47, and -49 at North Island, Calif., on the Pacific seaboard; HSL-51 at Atsugi AB, Japan; and HS-37 at Barbers Point, Hawaii. In total, they provide approximately 45 ship's detachments per year.

The **SH-60F,** or "CV-Helo" version, replaces SH-3H Sea Kings in the provision of antisubmarine protection within the immediate area of a carrier battle group. All LAMPS III sensors, avionics, and sonobuoy launchers are removed, being replaced by AlliedSignal AN/AQS-13F dipping sonar. Four crew members are carried. Deliveries began in 1989 to HS-10 at NAS North Island, Calif., other operational units being HS-2, -4, -6, and -8 at the same base; HS-1, -3, -5, -11, and 15 at Jacksonville, Fla., and HS-14 at Atsugi, Japan. Only 82 of the required 175 were received before manufacture was curtailed upon delivery of the last in December 1994.

Remanufacture of SH-60B/F airframes to a common **SH-60R** standard will begin in 1999, incorporating features of both versions. In most cases, dipping sonar will be added to former B models, as 58 SH-60Fs surplus to requirements are to be converted to HH-60Hs from 2002. *(Data for SH-60B.)*

Contractor: Sikorsky Aircraft Division of United Technologies Corporation.
Power Plant: two General Electric T700-GE-401C turboshafts; each 1,800 shp (transmission rating 3,400 shp).
Accommodation: pilot, tactical officer, and sensor operator.
Dimensions: rotor diameter 53 ft 8 in, fuselage length 50 ft 0¾ in, height 17 ft 0 in.
Weights: empty 13,648 lb, gross 20,244 lb.
Performance: max speed 145 mph, service ceiling 19,000 ft, endurance (SH-60F) 4 hours.
Armament: two Mk 46/50 torpedoes or AGM-119B Penguin missiles.

TH-57B/C SeaRanger

The **TH-57B** and **-57C** are related to the civil Bell 206B JetRanger III, with uprated 250-C20J engines and Navy-specified avionics. The TH-57B, of which 51 were built for the primary stage of instruction, has a basic VFR panel only and lacks a stability augmentation system (SAS). The **TH-57C** (89 built), however, is configured for advanced instrument training, with a SFENA three-axis SAS and full IFR avionics that include VOR, Tacan, ADF, HSI, and CDI. Among other features of the C are a rotor brake, jettisonable doors, and a 150-lb-capacity external cargo hook. All TH-57s are shared by two squadrons within Training Wing Five (HT-8, basic rotary, and HT-18, advanced) at NAS Whiting Field, Fla., where they are used to instruct several hundred Navy, Marine Corps, Coast Guard, and foreign pilots per year. *(Data for TH-57C.)*

Contractor: Bell Helicopter Textron.
Power Plant: one Allison 250-C20J turboshaft; 420 shp.
Accommodation: instructor (on left) and pupil; three rear seats for student "familiarization rides."
Dimensions: rotor diameter 33 ft 4 in, fuselage length 31 ft 2 in, height 9 ft 6½ in.
Weights: empty 1,852 lb, gross 3,200 lb (3,350 lb with external load).
Performance: max cruising speed 131 mph, max range 527 miles.

UH/HH-1N Iroquois

Barring any sudden change of plan, 100 Marine Corps UH-1Ns will shortly be signed up for a major upgrade to take them up to 2020. Funded from FY 2002, with first redeliveries two years later, the program includes a composites four-blade main rotor, General Electric T700 engines with 2,625-hp transmission rating, four-blade "pusher" tail rotor, and an as-yet-undetermined fuselage stretch. More immediately, FLIR Systems has just been contracted to supply up to 100 thermal-imaging systems for the helicopter. The **UH-1N** is based on the Bell 212 originally sponsored by Canada with a PT6T (T400) Turbo Twin-Pac installation. Deliveries to the Navy and Marine Corps began in 1971, and 211 were received, including six VVIP **VH-1Ns** for VXE-1 (since converted to **HH-1N,** as were 38 of the 205 UH-1Ns). Currently, 108 UHs are in USMC service, about nine serving with each of the nine AH-1 Cobra squadrons, equipped with chaff/flare and IR decoys and used for light attack and forward air control duties. The Navy has 34 HH-1Ns with base flights and VXE-6 at Point Mugu, Calif., which is assigned to Antarctic operations. *(Data for UH-1N.)*

Contractor: Bell Helicopter Textron.
Power Plant: Pratt & Whitney Canada T400-CP-400 (Turbo Twin-Pac); combined 1,250 shp (individual 900 shp).
Accommodation: pilot and 8–10 Marines or six litters and medical attendant.
Dimensions: rotor diameter 48 ft 2¼ in, fuselage length 42 ft 4¾ in, height 14 ft 4¾ in.
Weights: empty 6,370 lb, gross 10,500 lb.
Performance: max speed at S/L 139 mph, service ceiling 15,000 ft, range 198 miles.
Armament: provision for door-mounted 0.50-in or 7.62-mm machine gun(s) and/or 2.75-in rockets.

VH-60N White Hawk

Transport of the President and other VVIPs by helicopter is entrusted to the Executive Flight Detachment of Marine Corps squadron HMX-1 at Quantico, Va. Beginning November 30, 1988, the unit was augmented by the first of nine VH-60Ns. Though based on the Army's Black Hawk, these special-mission helicopters have a Seahawk-type flight-control system and ASI, soundproofing, radio operator's station, EMP hardening, additional avionics, and special interior fittings. *(Data similar to those for SH-60.)*

SH-60F Seahawk

UH-1N Iroquois *(Paul Jackson)*

AH-1F Cobra *(Paul Jackson)*

MH-6H "Little Bird" *(Ted Carlson)*

US Army

Attack Helicopters

AH-1S/E/F Cobra

Force reductions have bitten deep into the HueyCobra antiarmor/attack helicopter inventory and continued trimming will leave only 424 in all branches of the Army by FY 1998. Some of the 1,075 original AH-1Gs remain, albeit in upgraded form, augmented by new-build helicopters to three main configurations. **AH-1S** was the baseline version of current Cobras, combining TOW missiles with a 1,800 shp engine. Conversions to AH-1S totaled 377, of which about 140 remain in service. They include unarmed TH-1S Night Stalker training helicopters, which provide experience with the Martin Marietta FLIR-based night vision system and Honeywell integrated helmet and display sighting system of the AH-64 Apache.

Next in the course of development came the **AH-1P,** none of which remains in US military service. Exactly 100 were delivered in 1977–78, their most obvious external modification being the change to a cockpit canopy composed of flat, reinforced panels to reduce glinting and improve crew protection. Instrumentation and avionics were also upgraded to ease nap-of-the-earth flying. **AH-1E** covers the next 98 helicopters, built in 1978–79 and equipped with a universal 20-mm or 30-mm gun turret and an improved stores management system. (The long-barrel, 20-mm weapon is normally fitted.) The wing stores management system is improved, and there is automatic compensation for off-axis cannon-firing. About 30 are still in use.

Finally came the definitive **AH-1F,** comprising 149 new-build and 378 conversions from AH-1G, including TH-1F trainers. Bell added a new fire-control system, incorporating an AN/AAS-32 laser-ranger and tracker, pilot's HUD, air data sensor and ballistics computer, AN/ALQ-144 infrared jammer (to the rear of the rotor mast), AN/APR-39 radar warning receiver, an IR-suppressing exhaust, and secure communications. More than 450 are in use, and the AH-1F will remain the dominant HueyCobra variant in future. Upgrades applied to the Cobra fleet include C-Nite night sighting systems in 52 AH-1Fs, based in South Korea, from 1990, plus Guard helicopters from 1994; AN/AVR-2 laser warning; ATAS for adding air-to-air Stinger SAMs; and C-Flex life-extension modifications.

Contractor: Bell Helicopter Textron.
Power Plant: one Textron Lycoming T53-L-703 turboshaft; 1,800 shp (transmission rating 1,290 shp).
Accommodation: pilot (rear) and gunner in tandem.
Dimensions: rotor diameter 44 ft 0 in, length of fuselage 44 ft 7 in, height 13 ft 6 in.
Weights: basic 6,598 lb, gross 10,000 lb.
Performance: cruising speed 135 mph, service ceiling 10,550 ft, endurance 3 hr 0 min.
Armament: nose turret for 20-mm M197 or 30-mm gun; M65 system of eight TOW antiarmor missiles and two pods of rockets (M158/M200/M260), grenades, or machine guns.

AH-6J and MH-6H/J "Little Bird"

A and B Companies of the 160th Special Operations Aviation Regiment at Fort Campbell, Ky., have H-6s in various configurations, all optimized for covert missions. The 160th was established to operate night-

capable helicopters that could be internally airlifted to an operational area by Lockheed MC-130 Hercules transports and made ready to fly within four minutes. Initially, the Army converted existing equipment in the form of the Hughes (now MDH) OH-6A Cayuse, at least 42 of these small helicopters emerging as EH-6B, MH-6B, MH-6C, and AH-6C versions for electronic surveillance, night interdiction, and attack duties. They were nearly all sold, apart from eight AH-6Cs. Next in operational use were 30 new-built helicopters: three EH-6Es, 15 MH-6Es, eight AH-6Fs, and four AH-6Gs, all based on the MDH 500MG Defender, fitted with an Allison 250-C20 turboshaft. Many were reengined with 250-C30 power plants for increased hot-and-high performance, making them equivalent to the civilian MD530. At least 11 became **MH-6Hs**, joining two new-built examples funded in FY 1988; most Es have been converted to Hs. Multifunction displays and other improvements are reported also to have been installed.

MH- versions have "Black Hole" IR-suppressing exhausts, are equipped with FLIR and NVG-compatible cockpit lighting, and may carry rocket and minigun armament. Alternatively, four external seats can be installed for airlifting troops. The AH- models dispense with FLIR and instead mount heavier armament, such as TOW antiarmor missiles. Battle honors include Grenada, Persian Gulf (1987), Panama, and Somalia (1993).

The Army converted at least four MH-6Es to **MH-6J** standard, equivalent to the MD530N NOTAR (no tail rotor), and bought two new examples of the NOTAR, delivered July 1992, but plans to upgrade 39 more H-6s have been abandoned. Instead, up to 30 new H-6Js (mostly AHs, with a few MHs), bought with FY 1988–91 funds, are conventional MD530Fs with common avionics and folding tailbooms. Reports that the 160th has a strength of 18 MH-6s and a similar number of AH-6s imply that older H-6E/F/Gs have now been withdrawn. *(Data for AH-6J.)*

Contractor: McDonnell Douglas Helicopter Systems.
Power Plant: one Allison 250-C20B turboshaft; 420 shp (derated).
Accommodation: pilot and gunner, plus up to four internal passengers; alternatively, four external passengers.
Dimensions: rotor diameter 27 ft 4 in, fuselage length 23 ft 11 in, height 9 ft 0 in.
Weights (approximate): basic 2,000 lb, gross 3,350 lb.
Performance (approximate): cruising speed 140 mph, service ceiling 14,000 ft, endurance 2 hr.
Armament: combinations of TOW antiarmor or Stinger antihelicopter missiles, 2.75-in rocket pods, and 7.62-mm Miniguns.

AH-64A/D Apache

Emphasis in the Apache attack helicopter program is now switching from production of new **AH-64As** (most of the 827 on order have now been built) to remanufacture of existing aircraft to upgraded standard with radar, new weapons, and avionics. On current Apaches, primary sensors—mounted in the nose—are a Lockheed Martin Target Acquisition and Designation Sight and an AN/AAQ-11 Pilot Night Vision Sensor (TADS/PNVS). The system includes a laser for designation. PNVS includes a FLIR, with imagery projected in a single monocle, to permit night/adverse-weather nap-of-the-earth flying. Six Apaches currently in the former Yugoslavia are able to transmit video imagery directly to ground control centers, and three of them are further equipped to send this data instantly to the Pentagon via satellite. Deployment of the Apache was completed in 1994 with reequipment of the 4th Battalion, 501st Aviation Regiment in South Korea. Apaches then served with 35 battalions, including (from 1987) seven Guard and two Reserve, having attained IOC in 1986. Seven battalions (or cavalry squadrons) are based in Europe, each with an established strength of 18 Apaches, 13 scouting OH-58Cs, and three support UH-60As. Two battalions are based in South Korea, while training is at Fort Rucker, Ala., completed units going to Fort Hood, Tex., for working up. Apache battalions will fall to 25 by 1998 as a result of restructuring begun last year. Units are gaining an extra six Apaches but losing their OH-58s, leaving nine of the AH-64s to pick up the scout mission.

In the **AH-64D Longbow Apache,** a mast-mounted Lockheed Martin/Westinghouse Longbow millimeter-wave radar bestows "fire-and-forget" capability with the RF version of Hellfire. Other changes include Plessey AN/ASN-157 Doppler, double-capacity power distribution system, MIL-STD-1553B digital data bus, more efficient "manprint" crew stations, improved cooling for avionics bays, and a cockpit airbag for crash protection of the occupants. The first of six prototypes flew on April 15, 1992, and operational testing in 1994–95 showed the D model to be potentially seven times more likely to survive in the battlefield and four times more effective in locating and destroying targets. A preproduction AH-64 conversion flew on September 29, 1995, and a contract for the first 18 "production" upgrades was signed on December 14, 1995. The Army plans to modify 758 As to Ds, reaccepting the first in March 1997 and the last aircraft 10 years later. However, only 227 will be fully modified with Longbow and -701C engines, the remainder being capable of achieving this standard with four to eight hours' work in the field, adding radar and removing the 1,696 shp -701 power plants. IOC will be in August 1998. Battalions will normally operate nine Longbow Apaches and 15 without, evenly distributed among three companies. *(Data for AH-64D.)*

AH-64A Apache

RAH-66 Comanche

CH-47D Chinook

Contractor: McDonnell Douglas Helicopter Systems.
Power Plant: two General Electric T700-GE-701C turboshafts; each 1,890 shp.
Accommodation: pilot (rear) and gunner in tandem.
Dimensions: rotor diameter 48 ft 0 in, fuselage length (tail rotor turning) 48 ft 2 in, height 14 ft 1 in.
Weights: basic 11,800 lb, gross 17,650 lb.
Performance (with 16 Hellfire): cruising speed 162 mph, hovering ceiling 13,500 ft (IGE), max range 253 miles.
Armament: turreted 30-mm M230 Bushmaster Chain Gun; 16 Hellfire ASMs or up to 76 2.75-in rockets in M200 or M260 pods of seven or 19. Planned additional stub-wingtip hardpoints for total of four Stinger or two Sidewinder AAMs (or two Sidearm ARMs).

RAH-66 Comanche

First flight on January 4 this year of the prototype Comanche was a major boost for a program previously beset by frequent rescheduling. Six "early operational capability" aircraft will follow the two prototypes and, although equipped only with reconnaissance sensors, will undertake two years of service trials from 2001, paving the way for the first combat unit to form in 2007. Declared requirements are for 1,292.

Lighter, but only slightly smaller than the AH-64 Apache, the Comanche is optimized for low detectability—both radar and infrared—and can carry part of its weapon load internally until just before launch. Eight may be airlifted inside a C-5 Galaxy transport, requiring only removal of the all-composites, bearingless main rotor; RAH-66 is ready for flight 20 minutes after the C-5 lands. Combat turnaround time is 13 minutes. All Comanches will have provision for Longbow radar, although this will be fitted in only one-third of the fleet at any time. Avionics have high commonality with the Lockheed Martin F-22A.

Contractor: Boeing Helicopters and Sikorsky Aircraft consortium.
Power Plant: two LHTEC T800-LHT-801 turboshafts, each 1,432 shp (transmission rating 2,198 shp).
Accommodation: pilot (front) and WSO in identical, stepped cockpits.
Dimensions: rotor diameter 39 ft 0½ in, fuselage length 43 ft 3¾ in, height 11 ft 0¾ in.
Weights: empty (target) 7,765 lb (plus 500 lb with Longbow), gross 17,408 lb.
Performance: max level speed 201 mph, endurance 2 hr 30 min.
Armament: integral 20-mm gun; internal stowage for six AGM-114 Hellfire ATMs or 12 Stinger AAMs; further eight Hellfire or 16 Stingers on optional stub-wing.

Transport, Special-Duty, and Utility Helicopters

CH-47D Chinook

In April 1994, the Army received the last of 472 Chinooks, upgraded from CH-47A/B/C standards to CH-47D. This is now the standard medium-lift helicopter. Its improvements over earlier versions include uprated transmission, a reconfigured flight deck to reduce crew work load, redundant and improved electrical systems, modular hydraulic systems, single-point pressure refueling, provision for night vision goggles, an advanced flight-control system, and improved avionics. First deliveries were made in 1982, and IOC was achieved in February 1984. All intended active Army recipients in the US and Europe had been equipped by the end of 1988, when the Army National Guard began receiving the first of almost 100 CH-47Ds. Deliveries to units in South Korea followed in 1989, and others are used by the Reserve. Battalion strength is normally 16 Chinooks.

The CH-47D can lift a useful load of 22,800 lb over 35 miles and a maximum weight on the central hook of 26,000 lb. A typical cargo would comprise an M198 155-mm howitzer underslung, plus the 11-man gun crew and 32 rds of ammunition in the cargo hold. Over short distances, it is the only Army helicopter capable of transporting a 24,750-lb D5 bulldozer. The Army wants 300 of the current 430 CH-47Ds to be upgraded to ICH (Improved Cargo Helicopter) configuration be-

tween 2003 and 2015, with 22 percent more powerful -714A engines and possibly an elastomeric rotor hub and internal cargo handling system. *(Data for CH-47D.)*

Contractor: Boeing Helicopters.
Power Plant: two Textron Lycoming T55-L-712 turboshafts; each 3,750 shp (transmission rating 7,500 shp).
Accommodation: two pilots, two crew, and up to 55 troops or 24 litters.
Dimensions: rotor diameter 60 ft 0 in each, fuselage length 51 ft 0 in, height 18 ft 11 in.
Weights: basic 23,402 lb, gross 50,000 lb.
Performance: cruising speed 185 mph, service ceiling 22,100 ft, endurance 3 hr 0 min.
Armament: (optional) M24 system of two 7.62-mm machine guns; and/or XM41 system of 7.62-mm gun on rear cargo ramp.

EH-60A/L Quick Fix II, EH-60C, and MH-60A/K/L Black Hawk

Between 1987 and 1989, 66 UH-60A helicopters were retrofitted with 800-lb Tracor AN/ALQ-151(V)2 Quick Fix IIB systems for the location and monitoring of enemy communications in the 2–76 MHz band and appropriate jamming by a Fairchild AN/TLQ-17A at up to 150 W. The resulting **EH-60A** can operate at up to 10,000 ft (3,000 ft being more usual) in almost all weather, communicating via a secure link with other Army aircraft and ground stations. Extensive self-protection aids include engine ER suppressors, IR and radar jammers, missile detectors, and chaff/flare dispensers. Quick Fix aircraft are organic to divisions and armored cavalry regiments, assignments being two or three helicopters per unit. Four crew are carried, and endurance is two hours. In 1997, redelivery will begin of 32 EH-60s modernized to **EH-60L** Advanced Quick Fix with upgraded avionics and -701C engines for increased weight (22,500 lb at T-O) and four hours 30 minutes endurance. Under development is the **EH-60C** command-and-control Black Hawk, which will have equipment including Rockwell AN/ASC-15B and -15C consoles for the airborne battle staff.

In operational service since February 1994, the **MH-60K** is a special operations aircraft (SOA) Black Hawk variant. It is assigned to the 160th Special Operations Aviation Regiment's 3d Battalion at Savannah, Ga., and the 1st Battalion at Fort Campbell, Ky. The MH-60K has Hughes AN/AAQ-16 FLIR, Texas Instruments AN/APQ-174B terrain-following radar, uprated (1,800 shp T700-GE-701C) engines and gearbox, refueling probe, provision for additional cabin and external fuel tanks, folding tailplane, two 0.50-in pintle-mounted machine guns, Stinger AAMs, wire-strike protection, Seahawk-type AFCS, rescue hoist, and self-protection similar to EH-60. Prior to the MH-60K, the Army acquired some 30 **MH-60A**s (now used by the 1/245 Aviation Regiment at Fort Campbell) and a small number of **MH-60L**s, upgraded with radar, FLIR, and armament, as the Direct Action Penetrator. These provide armed escorts to MH-60Ks of the 160th SOAR and are in the process of gaining refueling probes. *(Data for MH-60K similar to those for UH-60A except as follows.)*

Accommodation: four crew plus up to 12 troops.
Weight: mission weight 24,500 lb.
Performance: cruising speed 140 mph, endurance 7 hr 35 min (unrefueled).

MH-47E/D Chinook

Only 25 of the hoped-for 51 **MH-47E**s were delivered to Army Special Forces between January 1994 and April 1995. Assigned to the 2d and 4th Battalions of the 160th SOAR at Fort Campbell, this larger counterpart of the MH-60K Black Hawk is able to conduct a 5½-hour, deep-penetration mission over a 345-mile radius in adverse weather, day or night, over all terrain, with a 90 percent success probability. Compared with the CH-47D transport, MH-47E has much more powerful engines, larger external fuel tanks, an in-flight refueling probe, and the capability to self-deploy to Europe; seating for 42 troops; and comprehensive self-defense capability in the form of weapons and ECM. Principal sensors are a Texas Instruments AN/APQ-174 radar with terrain-following provision down to 100 ft and Hughes AN/AAQ-16 FLIR in a chin turret. Other features include an integrated avionics system with four-screen EFIS cockpit compatible with NVGs; two dual high-speed MIL-STD-1553 digital data buses; jam-resistant radios; automatic target handoff system; inertial, Doppler, GPS, and terrain-reference navigation systems; laser- and radar-warners; and a 600-lb rescue hoist with 200 ft of usable cable. The longer nose of the civilian Chinook is fitted to allow possible addition of a second radar, and there are plans to retrofit Stinger missiles for self-defense.

Before the MH-47E was available, the 160th had obtained 11 **MH-47D** Chinooks fitted with 29 ft 3½ in extending refueling probes, weather radar, FLIR, and self-defense Miniguns. These remain in the inventory. *(Data for CH-47D, except as follows.)*

OH-58D Kiowa Warrior

UH-60L Black Hawk

UH-60Q Black Hawk

Power Plant: two Textron Lycoming T55-L-714 turboshafts; each 4,867 shp (transmission rating 7,500 shp).
Dimensions: fuselage length 52 ft 1 in.
Weights: empty 26,918 lb, max T-O weight 54,000 lb.
Performance: cruising speed 161 mph, service ceiling 10,150 ft, radius of action with special forces team 581 miles.
Armament: two pintle-mounted 0.50-in machine guns.

OH-58A/C Kiowa and OH-58D/D(I) Kiowa Warrior

Between 1994 and 1999, the Army is withdrawing 1,150 OH-58A/Cs from service, leaving 272 to continue into the next century. All are survivors of 2,200 Vietnam-era **OH-58A** scout/liaison helicopters, although few are still A models. Under a 1976 contract, 588 Kiowas were upgraded to **OH-58C** standard with features including infrared suppression measures, a new instrument panel, revised navigation equipment, and an observation sight above the port seat. Of these, 278 have antiglint flat-glass modifications and are designated OH-58C(FG), the rest being in original OH-58C(RG [round-glass]) configuration. Allocations are to attack helicopter, cavalry, and field artillery units. A welcome boost to performance has been obtained by replacing the 317 shp Allison T63-A-700 turboshaft by an A-720 delivering 420 shp. Some earlier Kiowas thus modified are known as **OH-58A+**, while a few **OH-58T**s have been noted with FLIR and raised skids for training.

The Army helicopter improvement program (AHIP) was launched to convert OH-58As to four-blade OH-58D standard, with IR jammers, laser warning equipment, chaff/flare dispensers, airborne target handoff system, crew night vision equipment, and mast-mounted sight. This contains a 12x TV camera, thermal imaging sensor, and laser-ranger/designator for day and night target acquisition and marking. The resulting **OH-58D** Kiowa is regarded by the Army as its first true scout helicopter. A total of 376 are currently funded, some of those bought in and after FY 1991 being for the Army National Guard.

Work began in September 1987 on an armed OH-58D. Three months later, the first of 15 "Prime Chance" conversions was preparing to deploy for Persian Gulf operations against Iranian gunboats threatening international shipping, armed with Air-to-Air Stinger (ATAS) antiaircraft and Hellfire missiles, 0.50-in machine guns, and 2.75-in rocket pods. The Army then decided to arm, at the time of conversion and through a retrofit program, all OH-58Ds, assigning them the name of **OH-58D(I) Kiowa Warrior** in early 1990. Warriors have a much more powerful engine, transmission uprated by 95 shp to 550 shp, structural improvements, and an integrated weapon control system. Armament was introduced on the production line at the 202d conversion; FY 1992–95 budgets funded the first 179 retrofits. There are plans for up to 81 to be further modified for special duties with a "squatting" landing gear, folding main blades, and tilting vertical stabilizer to allow them to fly within 10 minutes of being taken from the hold of a C-130 Hercules transport aircraft. These Multipurpose Light Helicopters (MPLHs) will also receive a cargo hook for loads of up to 2,000 lb and external attachments for six troop seats or four medevac litters.

OH-58Ds are based at Fort Eustis, Va., Fort Rucker, Ala. (for training), and with operational units in CONUS, South Korea, and Europe. Germany-based OH-58Ds have real-time video downlink, which can be relayed via Guardrail-capable aircraft. *(Data for OH-58D(I) Kiowa Warrior.)*

Contractor: Bell Helicopter Textron.
Power Plant: one Allison 250-C30R/3 turboshaft; 650 shp (transmission rating 550 shp).
Accommodation: pilot and observer/gunner.
Dimensions: rotor diameter 35 ft 0 in, fuselage length 34 ft 4¾ in, height 12 ft 10½ in.
Weights: basic 3,289 lb, gross 5,500 lb.
Performance: cruising speed 131 mph, service ceiling 15,000 ft, endurance 2 hr 24 min.

TH-67 Creek

Bell was declared winner of the Army's NTH (New Training Helicopter) competition in March 1993 with its TH-206 variant of the Model 206B-3 JetRanger, known in other incarnations as OH-58 Kiowa and (US Navy) TH-57 SeaRanger. Deliveries began October 15, 1993, to the main pilot training school at Fort Rucker, Ala., to replace veteran Bell UH-1H Iroquois of 223d Aviation Regiment at Lowe Heliport. Student training started on May 5, 1994. Three variants have been produced: The first 102 have either IFR instrumentation or provision for IFR and a further 35 are VFR only. The contract (which also included nine procedures trainers) was completed in February 1996, but a further 20 helicopters and three trainers are held on option. The Army has abandoned plans for a second student to be carried in the rear of the cabin, observing a closed-circuit TV picture of the flight instruments.

Contractor: Bell Helicopter Textron, Canada.
Power Plant: one Allison 250-C29JN turboshaft; 317 shp (flat rated).
Accommodation: pilot and two students.
Dimensions: rotor diameter 33 ft 4 in, fuselage length 31 ft 2 in, height 9 ft 6½ in.
Weights: basic VFR 1,879 lb, IFR 2,009 lb; gross 3,200 lb.
Performance: cruising speed 133 mph, service ceiling 13,500 ft, max range 376 miles.

UH-1H/V Iroquois

Army aviation without the "Huey" is difficult to contemplate but is a situation unlikely until far into the future. Despite plans for withdrawal of 1,474 UH-1s between 1994 and 1997, 1,176 will remain, serving in numerous units of the Army, National Guard, and Reserve. Army receipts totaled 9,325 UH-1s by 1967, including more than 4,800 new-built **UH-1H**s. The UH-1H may be armed if required, but more than 360 were converted to unarmed **UH-1V** medevac configuration, and most of these remain.

The UH-1H has been upgraded for its extended life. Changes have included an IR jammer, IR suppression measures, radar altimeter, radar warning receiver, chaff/flare dispenser, crash-resistant fuel system, closed-circuit refueling, improved main drive shaft, and new radios. In 1988, deliveries began of new composite-materials main rotor blades, which provide a six percent improvement in hovering capability and a five to eight percent reduction in fuel consumption in forward flight. Ambitious upgrade plans have been abandoned following the decision to buy more UH-60s, but 130 are being refurbished for extended service with three National Guard battalions.

Contractor: Bell Helicopter Textron.
Power Plant: one Textron Lycoming T53-L-13 turboshaft; 1,400 shp.
Accommodation: two pilots and 11 troops, or six litters and attendant.

Dimensions: rotor diameter 48 ft 0 in, fuselage length 41 ft 10¾ in, height 14 ft 5½ in.
Weights: basic 5,132 lb, gross 9,500 lb.
Performance: cruising speed 138 mph, service ceiling 12,600 ft, endurance 2 hr 45 min.
Armament: M23 subsystem of two 7.62-mm pintle-mounted machine guns; or M56 mine-dispensing pods; or M59 subsystem of paired 7.62-mm and 0.50-in machine guns.

UH-60A/L and UH-60Q Black Hawk

Originally to have terminated this year, Army procurement of Black Hawks is now set to continue through FY 2001, with 172 on top of the 1,520 previously funded. Most of these are employed as replacements for the UH-1 Iroquois in air assault, air cavalry, and aeromedical evacuation units of the regular Army. Though carrying the same 11-man squad as the Huey, the Black Hawk has more than twice the payload and better speed. Having entered service in 1978, it is the first utility/transport helicopter to increase division-level mobility, in that it can transport (for example) a 105-mm howitzer, its six-man crew, and 30 rounds of ammunition in a single mission. Utility battalions previously using 23 UH-1Hs now operate 16 Black Hawks. Underslung load limit is 8,000 lb. Additional features include armored or redundant components to resist small-arms fire, an impact-absorbing airframe to protect occupants in a crash, and ease of maintainability in the field. A compact design allows one Black Hawk to be airlifted by a C-130 Hercules, two by a C-141 Starlifter, and six by a C-5 Galaxy.

From FY 1982 contracts onward, Black Hawks have been able to carry an ESSS (external stores support system), which allows up to 10,000 lb of external equipment to be carried, including Hellfire and other weapons, or fuel tanks for self-deployment. NVG-compatible cockpits were introduced in 1985 and have been retrofitted. Similarly, a HIRSS (Hover Infrared Suppression System) is being installed to provide protection against heat-seeking missiles even while hovering. Since 1989, new UH-60s have had **Enhanced Black Hawk** modifications, including Omega navigation, satellite UHF, a specific threat radar warning receiver, and provision to replace the M60 doorway-mounted machine guns with M134 Miniguns. In 1993, work began on upgrading 300 older UH-60As for transfer to the Reserve and Guard.

After 1,049 Black Hawks had been delivered (including 66 EH-60s), production switched to the **UH-60L**, in which T700-GE-700 turboshafts were replaced with -701Cs delivering a total of almost 300 more shp, and which has an improved gearbox. The first UH-60Ls were delivered in November 1989 to the 1/149th Aviation, Texas ArNG. The **UH-60Q** conversion of the UH-60A (code-named "Dustoff") first flew on January 31, 1993, and 87 will be converted from UH-60As for medevac if funds are available. Specialist equipment not carried by UH-60As assigned to medical units includes patient monitoring and treatment systems, dual-mode IR/white searchlight, and onboard oxygen-generation equipment. *(Data for UH-60L.)*
Contractor: Sikorsky Aircraft, division of United Technologies Corporation.
Power Plant: two General Electric T700-GE-700C turboshafts; each 1,890 shp (transmission rating 3,400 shp).
Accommodation: three crew and up to 14 fully equipped troops; or four litters and six walking wounded.
Dimensions: rotor diameter 53 ft 8 in, fuselage length 50 ft 0¾ in, height 16 ft 10 in.
Weights: basic 11,516 lb, gross 24,500 lb.
Performance: cruising speed 183 mph, service ceiling 19,150 ft, endurance 2 hr 6 min.
Armament: M23 system of two 7.62-mm pintle-mounted machine guns; M56 mine-dispensing pods; 16 Hellfire antiarmor missiles; or Stinger AAMs.

Reconnaissance and Special-Duty Fixed-Wing Aircraft

EO-5B Airborne Reconnaissance Low

The ARL counternarcotics program was transferred to the Army (from direct Pentagon funding) in 1994, at which time three EO-5B conversions of the DHC Dash 7 airliner were already in service. Delivered in May 1993, these comprise two sigint machines (converted by TRW) and one imagery intelligence (imint) aircraft (from California Microwave). The latter has been contracted to produce three more conversions for delivery from mid-1996, all being ARL-M (multifunction) configuration, combining sigint and imint sensors in one airframe and adding a Hughes MTI/SAR (moving target indicator/synthetic aperture radar). Actual modification is by West Virginia Air International, which adds Sanders sigint (similar to RC-12 Guardrail aircraft), a Recon/Optical CA-860 IR linescanner, Westinghouse WF-360 FLIR, and Istec CA-864 daylight imaging system. The first three aircraft will be upgraded to ARL-M status, while in FY 1999 the fleet (which has been capped at six instead of the planned nine because of funding cuts) will gain a joint tactical terminal and links to a theater-level intelligence broadcast network. EO-5s are operated in civilian color schemes, and with N-numbers instead of military serials, for a low profile. They are deployed to Central and South America under US Southern Command, parented by D Flight, Military Intelligence Battalion Panama, although one deployed to former Yugoslavia in February 1996 to perform the type's secondary role of monitoring low-intensity conflicts. Dash 7s are designated EO-5A prior to full conversion. The FY 1996 budget includes unrequested funds to reengine the aircraft with LHTEC T800s.
Contractor: de Havilland Inc., Canada.
Power Plant: Two Pratt & Whitney Canada PT6A-50 turboprops; each 1,120 shp.
Accommodation: two pilots, plus sensor operators.
Dimensions: span 93 ft 0 in, length 80 ft 6 in, height 26 ft 2 in.
Weight: max T-O 44,000 lb.
Performance: max cruising speed 261 mph, service ceiling 20,900 ft, T-O field length 2,260 ft, landing field length 1,950 ft, range 1,347 miles.

RC-12D/G/H/K/N/P/Q Guardrail

No less than seven RC-12 versions of the civilian Super King Air are operational or about to enter service. The **RC-12D** Improved Guardrail V attained IOC in 1985 for battlefield surveillance duties in Europe, but was then transferred to several units in the USA and Korea before being assigned to a new Military Intelligence Battalion (Low Intensity) at Orlando, Fla., in 1996. Baseline from which later versions developed, the RC-12D provides a platform for the AN/USD-9(V)2 remotely controlled (*i.e.*, there are no on-board mission specialists) communications intercept and direction-finding system, which operates in the 20–75, 100–150, and 350–450 MHz bands and is able to report directly to tactical commanders at corps level and below. It is fitted with an aircraft survivability equipment suite, a Carousel IV-E inertial platform with Tacan, ESM antennas in the wingtip pods, and mission equipment, including an AN/ARW-83(V)5 airborne data relay. Prominent vertical "winebottle" antennas are located above and below the wing, while another protrudes from the rear fuselage. Dielectric panels cover other sensors in the tail and an undernose pod. Data processing is by an AN/TSQ-105(V)4 system, which senses and analyzes radio and radar signals, comparing them with a "threat library" and classifying accordingly. Direction and range parameters are included. With ESL Inc. as prime system contractor, Beech converted 13 C-12D airframes to RC-12D standard.

A further three C-12Ds became **RC-12Gs** in 1985 for operations with MIB (Low Intensity) from Howard AFB, Panama. Additionally, six conversions were completed in 1988 as Guardrail Common Sensor (System 3 Minus) **RC-12Hs**, with gross weight increased from 14,200 to 15,000 lb. All are with the 3d MIB at Camp Humphreys, South Korea.

Nine **RC-12K** Guardrail Common Sensor (System 4) aircraft, ordered in October 1985 with 1,100 shp PT6A-67 turboprops and 16,000 lb gross weight, were delivered to the 1st MIB at Wiesbaden, Germany, in May 1991 (eight) or converted to **RC-12N** prototype (one). This variant, of which 15 production versions have been delivered, is the Guardrail Common Sensor (System 1) and has a 16,200-lb maximum weight and a "glass" cockpit. A satellite link allows it to operate beyond line-of-sight range of the ground station. Self-protection measures include AN/APR-39 and AN/APR-44 radar warning systems and AN/ALQ-136, -156, and -162 countermeasures sets; while a Carousel INS, GPS, Have Quick secure radios, and an AN/APX-100 IFF are among the avionics. Most are operated by the 224th MIB at Hunter AAF, Ga., and the 304th MIB at Libby AAF, Ariz.

In the **RC-12P** Guardrail Common Sensor (System 2), T-O weight is 16,500 lb and mission equipment is modified; wingtip pods are smaller and lighter; and the aircraft is the first in US military service to have fiber-optic cabling for all data commands and audio distribution. Nine are in process of delivery. Finally, three **RC-12Q** Direct Air Satellite Relays are on order for delivery by 1997, increasing the RC-12 fleet to 52 and acting as mother ships to expand the RC-12P's operational area outside satellite footprints. *(Data for RC-12D.)*
Contractor: Raytheon Aircraft Company (Beech).
Power Plant: two Pratt & Whitney Canada PT6A-41 turboprops; each 850 shp.
Accommodation: two flight crew; eight passengers optional.
Dimensions: span 55 ft 6 in, length 43 ft 10 in, height 15 ft 5 in.
Weights: basic 8,143 lb, gross 14,200 lb.
Performance: cruising speed 300 mph, service ceiling 31,000 ft, endurance 5 hr 45 min.

RU-21A/B/C Ute

Only a handful of RU-21s remain in service, most having been replaced by RC-12 derivatives. First to appear were the **RU-21B** and **RU-21C,** which introduced 620 shp PT6A-29 turboprop engines and a 10,900- lb gross weight. Only three B and two C versions were produced, both having a prominent external aerial array (which differed slightly between the models) for sigint and electronic warfare missions. Similarly tasked were seven **RU-21A** conversions from U-21A, which grossed at 10,200 lb. The last three As, three Bs, and two Cs were in service with the 138th Aviation Company at Orlando, Fla., in 1996 operating the AN/TLQ-11 Cefrim Leader system with RU-21As for transmitter location, RU-21Bs supplying command and control, and RU-21Cs providing jamming. *(Data for RU-21H.)*
Contractor: Raytheon Aircraft Company (Beech).
Power Plant: two Pratt & Whitney Canada T74-PC-700 turboprops; each 550 shp.
Accommodation: two pilots and two equipment operators.
Dimensions: span 50 ft 11 in, length 35 ft 10 in, height 14 ft 2 in.
Weights: basic 6,814 lb, gross 10,200 lb.
Performance: cruising speed 236 mph, service ceiling 26,000 ft, endurance 4 hr 15 min.

RC-12K Guardrail *(Paul Jackson)*

C-12D Huron *(Ted Carlson)*

Fixed-Wing Transports

C-12C/D/F/L/R Huron

Attempts have recently been made to satisfy the Army's seemingly insatiable appetite for Hurons both by additional purchases of new C-12Rs and transfer of surplus USAF C-12Fs. Closely related to some of the later U-21 variants (which see), the C-12 (civilian equivalent, Super King Air 200) is used, often in ones and twos, by numerous Army units throughout the world as an executive and light cargo (2,000 lb) transport. First in the inventory were three FY 1971 Guardrail-configured RU-21Js, which have since been converted for transport and given the more appropriate designation **C-12L.** Sixty C-12As were supplied, with 750 shp Pratt & Whitney Canada PT6A-38 turboprops, and subse-

quently converted to **C-12Cs** with PT6A-41s, joining 14 new-built to this standard, plus one from the USAF. At least seven have been loaned to the Customs Service. Excluding reconnaissance conversions to RC-12 (which see) 24 cargo-door-equipped **C-12Ds** were procured in FYs 1978–84. Span over tiptanks is 55 ft 6 in. The Army National Guard bought 20 **C-12Fs** in FYs 1985–87, features including 850 shp PT6A-42 engines, cargo door, and 2,300-lb cargo capacity. The Army Reserve ordered 29 off-the-shelf B200Cs as **C-12Rs** for delivery in 1994–96. Regular Army units in Europe traded in C-12Cs for 15 C-12Fs transferred from USAF in 1995. *(Data for C-12C.)*

Contractor: Raytheon Aircraft Company (Beech).
Power Plant: two Pratt & Whitney Canada PT6A-41 turboprops; each 850 shp.
Accommodation: two pilots and eight passengers.
Dimensions: span 54 ft 6 in, length 43 ft 10 in, height 15 ft 5 in.
Weights: basic 8,084 lb, gross 12,500 lb.
Performance: cruising speed 300 mph, service ceiling 35,000 ft, max range 2,273 miles.

C-20E/F/J Gulfstream III/IV/II

Two late-production Gulfstream III executive jets were funded in FY 1987 and delivered the following year as **C-20Es** for VIP transport duties. They were joined by a **C-20F** Gulfstream IV in 1991. An ex–Coast Guard Gulfstream II (VC-11A) was obtained in 1989 and recently redesignated **C-20J.** One C-20E is based in Hawaii; the remaining three are at Andrews AFB, Md., with the Priority Air Transport Flight Detachment of Operational Support Airlift Command. *(Data for C-20F.)*

Contractor: Gulfstream Aerospace Corporation.
Power Plant: two Rolls-Royce Spey Mk 611-8 turbofans; each 13,850 lb thrust.
Accommodation: two or three crew and up to 19 passengers.
Dimensions: span 77 ft 10 in, length 88 ft 4 in, height 24 ft 5 in.
Weights: basic 35,500 lb, gross 73,200 lb.
Performance: cruising speed at 31,000 ft 586 mph, service ceiling 45,000 ft, T-O field length 5,280 ft, landing field length 3,386 ft, range (with 8 passengers) 4,859 miles.

C-23A/B/B+

Sixteen **C-23B** military versions of the Shorts 330 commuter aircraft were delivered over 24 months, from September 1990, to replace C-7 Caribous in the role of transporting aviation spares and components between Army National Guard bases and Aviation Classification Repair Activity Depots (AVCRADs). Changes from the USAF C-23A variant include strengthened wings and landing gear, modernized flight-deck instrumentation, an air-opening facility for the freight ramp, greater payload (7,280 lb), and uprated engines with five-blade propellers. When USAF withdrew its **C-23As**, nine found their way to the Army for operators including State Area Commands (STARCs) of the Guard, Rock Island Arsenal, Ill., and Aberdeen Proving Ground, Md. Four Shorts 330s are also in service, mainly with the Army Engineering Evaluation Support Agency at NAS Lakehurst, N. J. A further 20 **C-23B+** aircraft are being acquired in unusual fashion under a 1993 contract involving ex-civilian Shorts 360s being fitted with new-built twin-tail units and a rear loading ramp and having their fuselage "plug" removed to restore the aircraft to Shorts 330 length. This work is under way at Bridgeport, W. Va., by West Virginia Air Center. *(Data for C-23B.)*

C-23B

Contractor: Short Brothers plc, UK.
Power Plant: two Pratt & Whitney Canada PT6A-65AR turboprops; each 1,424 shp.
Accommodation: two pilots and one flight mechanic.
Dimensions: span 74 ft 10 in, length 58 ft 0½ in, height 16 ft 5 in.
Weights: basic 16,040 lb, gross 25,600 lb.
Performance: cruising speed at 10,000 ft 223 mph, T-O run 1,850 ft, landing run 1,130 ft, max range 1,188 miles.

C-26B Metro

Combined USAF and Army National Guard orders for SA227-DC Metro 23 commuterliners for support duties have resulted in the latter receiving 10 aircraft. These are employed on light transport duties by area STARCs, as with the C-23s described above.

Contractor: Fairchild Aircraft Inc.
Power Plant: two AlliedSignal TPE331-12UHR turboprops; each 1,100 shp.
Accommodation: two pilots, and up to 20 passengers or combination of freight and passengers.
Dimensions: span 57 ft 0 in, length 59 ft 4¼ in, height 16 ft 8 in.
Weights: empty 9,480 lb, gross 16,500 lb.
Performance: cruising speed at 11,000 ft 337 mph, service ceiling 25,000 ft, T-O to 50 ft 4,640 ft, landing run 2,770 ft, max range with 2,900 lb payload 1,858 miles.

U-21A Ute

The **U-21A** is a hybrid comprising a Queen Air 65-80 fuselage and King Air 65-90 wings. Diminishing numbers of the 124 built remain in service as light transport and communications aircraft, together with a dozen or so similar **U-21D/F/Gs**, the unique **VC-6A** (King Air 90), two ex-civil 90s, and one King Air 100. Raytheon Beech will refurbish 36 U-21s for continued service and is optioned for 17 further upgrades. *(Data for U-21A.)*

Contractor: Raytheon Aircraft Company (Beech).
Power Plant: two Pratt & Whitney Canada PT6A-20 turboprops; each 550 shp.
Accommodation: two pilots and up to 10 passengers.
Dimensions: span 45 ft 11 in, length 35 ft 10 in, height 14 ft 2 in.
Weights: basic 5,383 lb, gross 9,500 lb.
Performance: cruising speed 242 mph, service ceiling 26,150 ft, max range 1,216 miles.

Fokker C-31A *(Ted Carlson)*

UV-18A Twin Otter

Ideally suited for operations in the Far North, six of these STOL transports are used on wheels, floats, or skis by four detachments of Company B, 1/207th Aviation, Alaska Army National Guard. The early UV-18s are now 20 years old, and a replacement is being sought.

Contractor: de Havilland Inc., Canada.
Power Plant: two Pratt & Whitney Canada PT6A-27 turboprops; each 620 shp.
Accommodation: two crew and up to 20 passengers.
Dimensions: span 65 ft 0 in, length 51 ft 9 in, height 19 ft 6 in.
Weights: basic 5,850 lb, gross 12,500 lb.
Performance: cruising speed at 10,000 ft 210 mph, service ceiling 26,700 ft, T-O run 860 ft, landing run 1,940 ft, max range 806 miles.

Mil Mi-24D "Hind" *(Guy Aceto)*

Miscellaneous

Antonov An-2 "Colt": At least two Ukrainian-designed transport biplanes flown by Threat Support Activity/Operational Test and Evaluation Center (OPTEC), Fort Bliss, Tex., with a detachment at Fort Polk, La.

Beech Queen Air: Seven Model 65s and a single Model 80 operated by the Army Reserve for communications.

Beech T-34C: Three turboprop trainers on loan from the US Navy as photochase aircraft at Army Technical Test Center, Edwards AFB, Calif.

Cessna 182: Two aircraft based at the US Military Academy with the 2d Aviation Detachment for use by engineering students.

Cessna 310: Three communications aircraft with units including South Dakota and Oklahoma STARCs.

Cessna 402B: One light twin transport aircraft acquired in FY 1982 and operated by Rock Island Arsenal, Ill.

Cessna O-2A: Two ex-USN, ex-USAF, twin-boom light aircraft used by Army Intelligence Center, Libby AAF, Fort Huachuca, Ariz.

Cessna Citation V Ultra: Two executive jets ordered in February 1996 as forerunners of 35 required to satisfy the C-XX requirement for increased standardization of the personnel transport fleet.

Fokker C-31A: Two Friendship airliners bought in 1985 and used by the "Golden Knights" demonstration parachute team, based at Simmons AAF, Fort Bragg, N. C.

Grumman RV/OV-1D Mohawk: Final examples of this once widely used intelligence platform are being withdrawn, the last operational unit having been the 3d MIB in South Korea.

Kamov Ka-32 "Helix-C": One Russian helicopter employed by OPTEC, Fort Bliss.

Learjet C-21A: One communications aircraft with Operational Support Airlift Command, Andrews AFB, Md.

Mil Mi-2 "Hoplite": Russian-designed, Polish-built light helicopter for OPTEC.

Mil Mi-14 "Haze": One (plus one withdrawn from use) amphibious ASW helicopter acquired for OPTEC, Fort Bliss.

Mil Mi-17 "Hip-H": At least one Russian helicopter used by OPTEC at Fort Bliss.

Mil Mi-24 "Hind": Six "Hind-Ds" and "-Fs" at Fort Bliss for OPTEC.

Pilatus UV-20A Chiricahua: Two PC-6 Turbo-Porter STOL lightplanes bought in 1979 and now used by "Golden Knights" parachute team.

Pilatus Britten-Norman BN-2B-21 Islander: One aircraft acquired in FY 1988 for light transport by Army Engineering Evaluation Support Activity, NAS Lakehurst, N. J.

Piper PA-31T Cheyenne: One confiscated drug-running aircraft operated from Simmons AAF, N. C., by the 1st Battalion, 58th Aviation Regiment.

Rockwell Turbo Commander 680: One light transport operated by the 1st Battalion, 101st Aviation Regiment, Campbell AAF, Ky.

Volpar D18S: One uprated Beech 18 light twin acquired in FY 1989 and operated by Army Technical Test Center from Cairns AAF, Fort Rucker, Ala. ■

Verbatim

Air Expeditionary Forces

"To bolster US presence in unstable regions and to reinforce our diplomatic influence, the Air Force . . . developed a new operational concept that we've executed twice in the last six months. It's called the Air Expeditionary Force. This force consists of a package of fighters stationed in the continental United States that can pick up and deploy inside normal wartime deployment time lines, to another part of the world, to augment or substitute for other forces that have to rotate out of theater. They are supported by tankers and backed up by long-range bombers that remain in the United States.

"As our aircraft carriers become fewer, we're experiencing carrier gaps in different regions of the world—so one of the ways we can deal with that is by deploying an Air Expeditionary Force. We were called upon by the commander in chief of US Central Command to do that last October to Bahrain in the Persian Gulf, and just last week we completed another Air Expeditionary Force deployment to Jordan, where those forces will operate for the next two months."

Gen. Ronald R. Fogleman, USAF Chief of Staff, in an April 23, 1996, speech to the World Affairs Council, Orange County, Calif.

Sword and Cyber

"My concern is that we are creating a force that ten years from now [will have] a lot of headquarters and little combat capability."

Gen. John J. Sheehan, USMC, commander in chief of US Atlantic Command, in March 19, 1996, testimony to the Senate Armed Services Committee about current DoD enthusiasm for the tools of information warfare over more traditional weapons.

Give Us Helpful-Type Rhetoric

"Some Chinese lower-level officials told some visiting American officials that we wouldn't dare defend Taiwan [against a Chinese military attack] because they'd rain nuclear bombs on Los Angeles. . . . This is unhelpful-type rhetoric."

Winston Lord, assistant secretary of state for East Asian and Pacific Affairs, in a March 17, 1996, appearance on C-SPAN's "Sunday Journal."

"Deep and Enduring" Commitment

"The [Russian] commitment to democracy seems to be a deep one and an enduring one."

Secretary of State Warren M. Christopher, in a February 10, 1996, press conference in Helsinki, Finland, following his meeting with the new Russian Foreign Minister, Yevgeni Primakov.

Meanwhile, One Month Later . . .

"Last week's vote in the Russian Duma to reconstitute the Soviet Union was highly irresponsible. . . . It was as disturbing to us as I know it was for Ukraine. Ukraine and other countries of the former Soviet Union are independent, sovereign nations. Any unilateral attempt to change their status will be rejected by the international community."

Secretary Christopher, in a March 19, 1996, statement in Kiev, Ukraine, on the Communist-dominated Russian parliament's vote denouncing the breakup of the Soviet Union.

Spence Speaks

"The strain on our military personnel and their families continues to grow as the services are being asked to do more with less, while the perennial promise of adequate budgets continues to be pushed further out into the future."

Rep. Floyd D. Spence (R–S. C.), chairman of the House National Security Committee, in a March 4, 1996, statement on the Fiscal 1997 defense budget presented by President Clinton.

US "Will Surely Respond"

"It is important for the [US], as a friend, to be clear with the Taiwanese that they must not misjudge China on the question of Taiwan independence. . . . It is also important for the Chinese to understand that the United States values . . . its relationship with the people on Taiwan. It is crucial that the Chinese understand that, if China uses force to resolve the Taiwan issue, the United States will not stand idly by but will surely respond."

Sen. Sam Nunn (D-Ga.), in a February 23, 1996, floor speech on US foreign policy.

National Missile Defense

"Our [intention] is to position the US to respond [with an active defense] to a strategic missile threat as it emerges. We are not making a commitment to deploy the system today. What we are doing . . . is shifting our emphasis from technology to deployment readiness. . . . Within these three years of development, what we would do is develop and begin testing of the elements of an initial national missile defense system. If, after three years, we saw a threat situation that warranted a deployment, in another three years that system could be deployed. So, from where we stand today, deployment would be six years away. If a decision were made to deploy after the first three years, that IOC could be achieved in 2003."

Paul G. Kaminski, under secretary of defense for Acquisition and Technology, in a February 16, 1996, press briefing on national missile defense and other topics.

"Living Off the Force"

"I'm in the position of having watched the Air Force procurement accounts decrease by some sixty percent [since 1990]. We had no fighter procurement in our '94 budget, none in our '95 budget. There was a plus-up from the Hill in the '96 budget. We have made these kinds of decisions in order to try to keep a balanced force. We're living off of the force—[off] of the procurement of the past. It's got to stop."

General Fogleman, in March 13, 1996, testimony to the House National Security Committee. ■

Advisors and Councils

AFA President Gene Smith has appointed these advisors and councils for 1996.

By Joyce Phillips


Dalton


Grese


McDowell


McRee


Tinsley


Zumwalt

AFA Presidential Advisors

H. J. "Jerry" Dalton, Communications Advisor
Sandra G. Grese, Civilian Personnel Advisor
Maj. Daniel McDowell, Civil Air Patrol Advisor
Col. Julius R. McRee, Senior AFROTC Advisor
Donna L. Tinsley, Medical Advisor
Jule Zumwalt, Junior AFROTC Advisor

Air National Guard Council

Brig. Gen. Bruce F. Tuxill (Chair)
TSgt. Nancy J. Butcher
Maj. Steven J. Filo (Liaison)
CMSgt. Matthew J. Garofalo, USAF (Ret.)
Col. Gerald S. Kean
Capt. Ronald W. McDaniel
Lt. Col. Linda K. McTague
SrA. Julie A. Richart
Brig. Gen. Paul A. Weaver, Jr.


Tuxill


Butcher


Filo


Sparks


Beaman


Bonilla


Peterson

Civilian Advisory Council

Cathy B. Sparks (Chair)
Rick Beaman
Sara J. Bonilla (Liaison)
Leif E. Peterson
Ned M. Sanders
John B. Simpson
Sharma S. Wilkins
Sandra G. Grese (Advisor)


Garofalo


Kean


McDaniel


Sanders


Simpson


Wilkins


Grese


McTague


Richart


Weaver

Reserve Council

Brig. Gen. Michael J. Peters (Chair)
Maj. Catherine A. Chilton
Wayne R. Gracie
SMSgt. Gail L. Paich (Liaison)
Capt. Eric D. Vander Linden
TSgt. Deborah J. Whitfield
CMSgt. Michael H. Wysong
Maj. Sheila Zuehlke
Brig. Gen. John A. Bradley (Advisor)


Peters


Chilton


Gracie


Paich


Vander Linden


Whitfield


Wysong


Zuehlke


Bradley


Ellison Andrews Gasper Goerz Green Hassan


Hauger Holcomb Hughes Jaramillo Koskosky Lisse


Mackin McDaniel Overholts Redick Shaffer Stacey


Tanner Venturella Campanale

Enlisted Council

CMSgt. Rodney E. Ellison, AFSPC (Chair)
SrA. Robert D. Andrews, AIA
MSgt. Alejandra Gasper, IAAFA
SSgt. Jesse W. Goerz, ACC
TSgt. Frederick W. Green, AFMC
MSgt. Edward F. Hassan, USAFE
SSgt. Garth P. Hauger, 11th Wing
MSgt. David L. Holcomb, AMC
MSgt. Telia A. Hughes, USAFE
SSgt. Claudine M. Jaramillo, ANG
MSgt. Frank J. Koskosky, PACAF
MSgt. William C. Lisse, Jr., AFOSI
TSgt. Oscar D. Mackin, ACC
SMSgt. Edward C. McDaniel, AFPC
SrA. Dale L. Overholts II, USAFE
SrA. Mary L. Redick, USAFA
MSgt. Debra G. Shaffer, AFSPC
CMSgt. John E. Stacey, AFRES
CMSgt. James T. Tanner, Jr., Hq. USAF (Liaison)
TSgt. Paul Venturella, AFSOC
CMSAF David J. Campanale (Advisor)


Beamon Auch Bachelor Butler Buckman


Kumashiro LaVezzi Mills Montgomery Petrina


Ramsby E. Thomas J. Thomas Watson Regni

Veterans/Retiree Council

P. K. Robinson, Jr. (Chair)
Richard Carr (Chaplain)
Clayton T. Carter
Maralin K. Coffinger
Richard G. Galloway
Samuel M. Gardner
M. N. "Dan" Heth
Richard A. Ortega
CMSAF Gary R. Pfingston, USAF (Ret.)
Pat L. Schittulli
Thomas G. Shepherd
Richard C. Taubinger


Robinson Carr Carter Coffinger


Galloway Gardner Heth Ortega

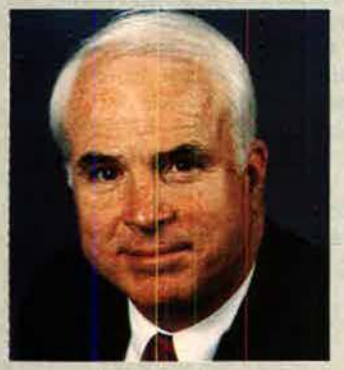

Pfingston Schittulli Shepherd Taubinger

Junior Officer Advisory Council

Capt. James R. Beamon, ACC (Chair)
Capt. Korvin D. Auch, PACAF
Capt. Steven E. Bachelor, AETC
1st Lt. Kristina L. Butler, ANG
Capt. Gerald A. Buckman, AFSOC
Capt. Patrick T. Kumashiro, USAFE
Capt. Lori S. LaVezzi, AFMC
Capt. Catricia L. Mills, AFPC
Capt. Sam H. Montgomery, Jr., Hq. USAF (Liaison)
Capt. Gilbert E. Petrina, Jr., ACC
2d Lt. Corey M. Ramsby, AFSPC
Capt. Edward W. Thomas, Jr., AFNEWS
Capt. Julie E. Thomas, AMC
2d Lt. Develyn J. Watson, USAFA
Col. John F. Regni (Advisor)

Air Force Association - Working for its National Membership. June 1996

National Report



"Air Force Magazine is essential reading for all Americans who want to stay current on the vital issues affecting the military and national security."

—Sen. John McCain

Coalition Tackles Another Tax Case

The Military Coalition (of which the Air Force Association is an affiliate member) is filing a friend of the court brief in a US Supreme Court case in which Massachusetts imposes a state income tax on military retirement pay. The crux of the case, *Leland A. Cooper, et al. v. Commissioner of Revenue of Massachusetts*, is that the measure is discriminatory because the state exempts from taxation the retirement benefits of all state and municipal retirees.

This case recalls a similar instance in which the state of Virginia was forced last year to reimburse military retirees with interest for the amounts it had taxed them between 1985 and 1988 while exempting state and local government retirees from taxation. The Military Coalition was a friend of the court participant in that action as well.

Because of the varying interpretations given by courts involving states' tax issues, the coalition has filed a steady stream of similar actions since 1991 in Georgia, Kansas, New York, and Oregon. Each of these briefs has worked to establish that military retirees deserve the same tax treatment as that received by state and local government employees.

Our Web Site Draws Heavy Traffic

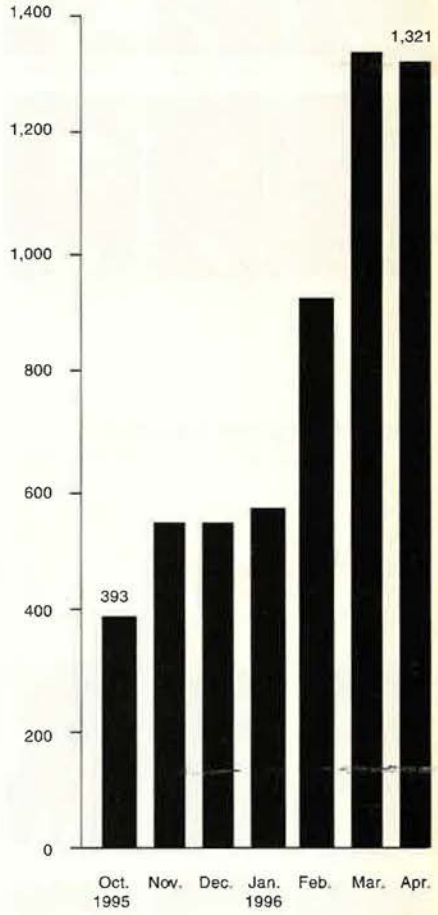
By the time it had been in existence for six months, the Air Force Association's World Wide Web site on the Internet was drawing almost 1,400 "hits" a day. Users were downloading information at the rate of seven to eight megabytes a day, the rough equivalent in text volume of about eight novels.

In cyberspeak, a hit is registered each time an Internet user accesses the Web site. "By category, the largest users of our site are individuals coming through commercial networks, suggesting that we are successfully penetrating the main pool of Internet users," said Steve Aubin, AFA director of Communications. "Next come military users and educational institutions, followed by government users and other nonprofits."

The site—the address of which is http://www.afa.org—went into operation at the time of the AFA National Convention last September. New files and features are added continuously. The ten files attracting the most hits in March, for example, were

- AFA's "Other Web Sites."
- *Air Force* Magazine Space Almanac.
- AFA's "What's New" file.
- *Air Force* Magazine selections (February).
- The *Enola Gay* file.
- AFA's "Welcome."
- *Air Force* Magazine archive.
- AFA Fact Sheet.
- *Air Force* Magazine selections (March).
- AFA news releases.

Average Hits Per Day on http://www.afa.org



More than 159,000 total hits through April.

The "Other Web Sites" selection includes direct links to the Air Force, the Department of Defense, other military-related sites, AFA's Industrial Associates, and AFA state and chapter sites. Close on the heels of the top ten selections were the AFA calendar, AFA policy and position papers, and the membership application.

AFA/AEF Report

By Frances McKenney, Assistant Managing Editor

Skies Over Taszar

They volunteered for the "I'll Go–Send Me" list, and so they went—to Taszar, Hungary, on four days' notice.

Unit commander Capt. Jon Hawbaker, SMSgt. Al Schnellenberger, and TSgt. Scott Hepler, from the 235th Air Traffic Control Flight (ANG), at Fort Wayne IAP, Ind., recently spoke at a **Fort Wayne Chapter** luncheon about their six-week deployment in December in support of Operation Joint Endeavor.

Captain Hawbaker said they were the first ANG unit sent to handle radar for an operational mission and were the second Air Force unit to reach Taszar. Their task was to set up air traffic control operations to help everyone else land.

The mobile air traffic control unit arrived with a radar unit, tactical air navigation systems, and radio equipment. Soon after, it began to snow and sleet. In twenty-four hours, eighteen inches of snow accumulated, but despite the harsh weather, the unit set to work. Within forty-eight hours, Taszar began receiving aircraft.

Captain Hawbaker said that, during his six weeks in Hungary, the 235th ATCF supported 1,500 Air Force, Army, and other nations' aircraft operations, involving the offloading of 8,500 tons of cargo and 3,500 passengers. Its radars controlled airspace up to 10,000 feet in an area forty miles wide and sixty miles long. "We could bring the aircraft in when the weather [visibility] was down to half a mile," he said.

Captain Hawbaker, who joined the Guard in 1974 and has been unit commander for three years, said the unit sent to Hungary was made up of thirteen members of the 235th—including traditional Guardsmen on the "I'll Go" list—and thirty-two others from eleven ANG units nationwide. "It was amazing to watch their *esprit de corps* and willingness to get their mission done," he commented.

While the unit was in Europe, the Fort Wayne Chapter gave their families food baskets at Christmas. The Captain said the unit members on the deployment were grateful to know someone was thinking of their families while they were gone.

Photo by Paul Kennedy

AFA Executive Director John Shaud (left) and Board Chairman James McCoy (right) welcome Rep. Tom Bevill (D-Ala.) to AFA's recent Capitol Hill educational display, "Revolution in the Air: The F-22, Fighters, and American Security in the 21st Century." Mr. Bevill, now in his fifteenth Congressional term, is a senior member of the House Appropriations Committee.

Arrivederci, Aviano

When members of the 301st Fighter Wing (AFRES) from NAS Fort Worth JRB Carswell Field, Tex., began returning home from Aviano AB, Italy, where they had supported air operations over Bosnia-Hercegovina for two months, the **Fort Worth Chapter** was there to greet them—even when they had to wait at the flight line until 2:00 a.m.

In mid-March, with all unit members back home, the chapter honored the 301st FW at a black-tie dinner-dance. Chapter President David Olson reported that 400 people attended. Sen. Kay Bailey Hutchison (R-Tex.) was the guest speaker.

The Fort Worth Chapter raised funds for the dinner tickets for the 110 301st FW members who attended the dinner, where they were saluted by the mayors of Fort Worth and North Richland Hills and by local business leaders. AFA Executive Director John A. Shaud, National President Gene Smith, and Texas State President Thomas Kemp also attended.

Like the 301st, the 175th Wing (ANG) from Baltimore, Md., spent two months based at Aviano as part of Operation Decisive Edge (part of Joint Endeavor). And, as in Fort Worth, an AFA chapter was at the flight line to greet the last of 600 Guardsmen from the wing returning home from supporting air operations over Bosnia. The Maryland ANG invited the **Baltimore Chapter** to join the wing's family members at Martin State Airport., where a dozen A-10 Thunderbolt II "Warthogs" and two C-130Es set down on the tarmac.

Chapter President John C. Phaller wrote that AFJROTC cadets from Baltimore Polytechnic Institute served as escorts for the families and friends waiting there. He said he heard the cadets' teeth chattering in the cold March weather but thought they enjoyed the experience anyway.

At the Fort Worth (Tex.) Chapter's black-tie dinner-dance, Chapter President David Olson, keynote speaker Sen. Kay Bailey Hutchison (R-Tex.), AFA National President Gene Smith, and Texas State President Thomas Kemp (l–r) honored the 301st Fighter Wing (AFRES).

The Baltimore *Sun* reported that the wing flew more than 30C day and night sorties (1,030 combat hours) during their part of the NATO peacekeeping effort.

Three Colonels and an Ace

With stories and film footage on World War II and Korean War pilot training, reminiscences about AFA's early leaders, and an autograph session afterward, USAF's top living ace thrilled them at the **Central Oklahoma (Gerrity) Chapter's** luncheon celebrating AFA's fiftieth anniversary. Col. Francis S. "Gabby" Gabreski, who is credited with 34.5 victories and also survived ten months as a prisoner of war at Stalag Luft I in Germany, would be a celebrity anywhere, but the Oklahoma City area takes a special interest in him: One of his nine children, Col. Donald F. Gabreski, is 72d Air Base Wing vice commander at Tinker AFB, Okla., and is married to Oklahoma City Air Logistics Center's Technology and Industrial Support Director Col. Terry L. Gabreski. Both are Central Oklahoma Chapter members.

Chapter Vice President for Communications Janet A. LaMotte said more than 300 people attended the luncheon at the Tinker AFB Officers' Club. The audience included some of Colonel Gabreski's World War II comrades who had not seen him for fifty years. A band played 1940s-era swing music, and a group of airmen dressed in World War II uniforms displayed memorabilia from that time, including *Life* Magazines, manuals, medals, and gas masks.

Colonel Gabreski presented the chapter's annual Beacon of Freedom Award, which recognizes an exceptional contribution to the quality of life at Tinker AFB, to TSgt. Michael Anderson of the 72d Operations Support Squadron. TSgt. Tonya Ahuna from the Office of the Staff Judge Advocate; SSgt. Vanerra Reddic, who was then with the 552d Training Squadron; and Jack Smith of the Contractor Logistics Support Directorate in the Oklahoma ALC received Extra Mile Awards. These quarterly chapter awards recognize an outstanding contribution to the Air Force, the Tinker community, and AFA.

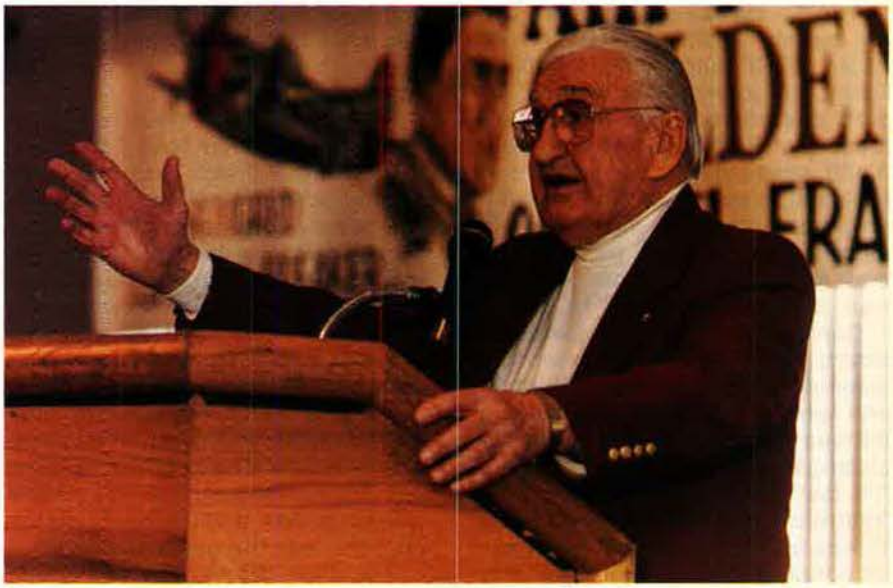
Colonel Gabreski was made an honorary citizen of the Sooner State through a proclamation from Governor Frank Keating. He also received a citation, recognizing his lifetime achievements, from Oklahoma City Mayor Ron Norick. Governor Keating declared February 4 AFA Day in the state.

Apollo 13 Astronaut in Enid

When Apollo 13 astronaut Fred W. Haise, Jr., spoke at the **Enid (Okla.) Chapter's** quarterly meeting at a local country club, Chapter Secretary Oscar Curtis reported that so many people showed up, some had to be turned away.

Mr. Haise, who served in the Marine Corps and Air Force as a fighter pilot, was the lunar module pilot for the 1970 mission. Two days after Apollo 13 began its voyage to the moon, an explosion in the spacecraft's service module forced Mr. Haise and astronauts James A. Lovell, Jr., and John L. Swigert, Jr., to use the lunar module Aquarius as a "lifeboat" to return to Earth.

Mr. Haise showed slides about this dramatic experience, the subject of last summer's popular movie "Apollo



USAF photo by Margo White

An Air Force legend, Col. Francis Gabreski, USAF (Ret.), helped the Central Oklahoma (Gerrity) Chapter celebrate AFA's fiftieth anniversary. The event at Tinker AFB, Okla., also gave the fighter ace a chance to visit with his son and daughter-in-law, who are chapter members.

13." After the former astronaut's presentation, the audience swarmed around him, asking questions.

Recently retired from Northrop Grumman, Mr. Haise shared AFA's David C. Schilling Award for outstanding contribution in the field of flight in 1978, having successfully completed three free flights in the space shuttle program's approach and handling test phases.

At this meeting, the Enid Chapter also presented Capts. Patrick G. Sanders, Stewart F. Greathouse, and David W. Hammack of the 71st Flying Training Wing at Vance with AFA Awards for Outstanding Performance.

Secretary Curtis also awarded two $250 Aerospace Education Foundation Eagle Grant scholarships to SrA. Timothy K. Schwader, a meteorologist, and SSgt. Brian A. Siegars, an air traffic controller, both from the 71st Support Squadron. The chapter presents these awards semiannually to help Vance AFB airmen further their education.

New Jersey AFA Vice President (North) John Weber, High Point (N. J.) Chapter President Sandy Sandlin, New Jersey AFA President Martin Capriglione, and CAP Lt. Col. Paul Kelly, the New Jersey-AFA CAP liaison (l–r), honored CAP Cadet Eric L. Vanderer (center) at the chapter's first awards dinner.

Coming Events

June 7–9, **Arizona/Nevada State Convention,** Las Vegas, Nev.; June 7–9, **Texas State Convention,** San Antonio, Tex.; June 14–15, **Arkansas State Convention,** Jacksonville, Ark.; June 21–22, **Alabama State Convention,** Mobile, Ala.; June 21–22, **Ohio State Convention,** Youngstown, Ohio; June 28–30, **New York State Convention,** Albany, N. Y.; July 6, **Mississippi State Convention,** Jackson, Miss.; July 12–13, **Georgia State Convention,** Robins AFB, Ga.; July 18–21, **California State Convention,** Fresno, Calif.; July 19–20, **Oklahoma State Convention,** Oklahoma City, Okla.; July 19–21, **Kansas State Convention,** McConnell AFB, Kan.; July 20, **Virginia State Convention,** Charlottesvile, Va.; July 26–27, **Florida State Convention,** Daytona Beach, Fla.; July 26–28, **Pennsylvania State Convention,** Trevose, Pa.; August 2–3, **Missouri State Convention,** Kansas City, Mo.; August 9–10, **North Carolina State Convention,** Goldsboro, N. C.; August 9–11, **Iowa State Convention,** Cedar Rapids, Iowa; August 15–18, **Washington/Oregon State Convention,** Portland, Ore.; August 16–17, **Colorado State Convention,** Colorado Springs, Colo.; August 17, **Indiana State Convention,** Indianapolis, Ind.; September 16–18, **AFA National Convention and Aerospace Technology Exhibition,** Washington, D. C.

One WASP's War Story

Among their many flying duties during World War II, Women's Airforce Service Pilots sometimes ferried "planes brought back from the combat zones, the ones on their last legs, to the repair depots," Dorathea Scatena said recently in an interview with a Bakersfield, Calif., newspaper. After the aircraft were repaired, they also test-flew them before they were sent back to the combat zones.

With such hair-raising experiences in her background, the former WASP regaled her audience at the **Bakersfield (Calif.) Chapter's** March meeting.

Chapter President Nick Robolino said the chapter members enjoyed Ms. Scatena's anecdotes, especially the one about testing P-51s in Alabama. The French cadets stationed there for training didn't like having to get her authorization before they could fly a repaired aircraft, she said.

Today, Ms. Scatena is commander of the local American Legion post and is retired from careers with Pacific Bell and in the architectural hardware business with her husband, a retired Marine Corps colonel. She spoke at Bakersfield Chapter's first membership meeting since its reactivation—after two years of inactivity—in January. Other special guests were California AFA Vice President (Area II) James H. Estep, Lt. Col. Jeryl R. Huffman, USAF (Ret.), an aerospace instructor at Bakersfield High School, and AFJROTC Cadet Sgt. Kara Mahill from Bakersfield High School.

The chapter ensured that Ms. Scatena's appearance at their meeting received wide publicity—from the newspaper as well as a local television station. "It was kind of a shock to me because they went all out," she said.

A High Point in AFA-CAP Relations

At its first annual awards dinner in February, the **High Point (N. J.) Chapter** honored Civil Air Patrol Cadet Flt. Officer Eric L. Vanderer, from the Picatinny Composite Squadron, N. J., as CAP Cadet of the Year.

The dinner, held at the Army's Picatinny Arsenal in Dover, N. J., emphasized the AFA-CAP partnership that the chapter began last year, according to Chapter President Sandy L. Sandlin.

Cadet Vanderer was selected for his award because he helped organize the cadet staff, filled in for the cadet commander when he was not available for duty, and exceeded a ninety-five percent attendance rate at meetings. The fifteen-year-old sophomore at Wallkill Valley Regional High School received a $50 savings bond and an AFA plaque. He was the first Cadet of the Year honored by an outside organization and with an awards dinner. Squadron Commander CAP Maj. Mike Dolan said this has really motivated his cadets to strive for the Cadet of the Year designation.

New Jersey State President Martin T. Capriglione and State Vice President (North) John R. Weber were among the forty-five special guests and CAP and chapter members who attended the awards dinner.

Hoping to hook a big one is Mark Huard (left), winner of a deep-sea charter fishing trip out of Key Largo, Fla. Community Partner Michael P. Laufle donated the day trip to help the John W. DeMilly, Jr., Chapter's recent fund-raising effort. With Mr. Huard is Chapter President Robert J. Jensen.

Working the Phone

Its former Chapter President Robert H. Witkop once described it as a "seasonal chapter." The last **PE-TO-SE-GA (Mich.) Chapter** meeting, for example, got snowed out, but current Chapter President Jonathan Dayton made a special effort to reel in the membership for the March gathering.

He called about a dozen chapter members along Lake Michigan's eastern shore, including Robert J. Greenwell, William R. Steffens, and Franklin P. Whitman of Petoskey, William J. McElroy and Laverne W. Sayan of Harbor Springs, and Carl E. Poll, Sr., of Harbor Point. Mr. Dayton, a former Strategic Air Command pilot, forward air controller, and flight instructor, said the members were happy to hear from him and even filled him in on chapter history.

The group gathered at the Flap Jack Shack in Charlevoix, Mich., chosen because of its proximity to a small airfield. Mr. Dayton and the other chapter leaders, Mr. Witkop, Thomas E. Largent, and David W. Hauser, flew in aboard Mr. Witkop's Cessna Cherokee.

Michigan State President James Rau was the meeting's guest speaker. In his remarks, Mr. Rau stressed that AFA is not a veterans organization so much as a supporter of a strong national defense. He showed a video on AFA membership and another—"The Force Behind the Force: The First Fifty Years of the Air Force Association"—about next year's USAF anniversary celebration.

More Chapter News

Sixteen teams from six states competed in the annual Ohio Valley AFJROTC Drill Championships, sponsored by the **Wright Memorial (Ohio) Chapter.** A drill team from Stebbins High School in Dayton, Ohio, took first-place honors at the event, held in Dayton in March. Chapter Vice President Kenneth R. Wheeler was pleased to present Cadet Col. Shelly Metcalf, commander of the championship drill team, with the huge, first-place trophy. The chapter has sponsored the meet for the past six years. Carl Peicolo, an aerospace science instructor at Tecumseh High School in New Carlisle, Ohio, reported that more than 300 cadets participated in the contest this year.

The **John W. DeMilly, Jr. (Fla.), Chapter** and **Miami (Fla.) Chapter** held a joint session in April to hear a presentation on the B-2 bomber by William G. Goodyear, Business Development manager at Northrop Grumman Corp. Miami Chapter President Stan Bodner said the group learned about capabilities of the stealth aircraft and watched videos of its test flights.

The commander of the 96th Air Base Wing, Col. Douglas L. Hardin, and his wife were special guests at the March meeting of the **Eglin (Fla.) Chapter.** The Colonel spoke about a recent operational readiness inspection and described the base's cleanup efforts after Hurricane Opal, with 115-mph winds and two tornadoes, caused $20 million to $30 million worth of damage in October.

Have AFA/AEF News?

Contributions to "AFA/AEF Report" should be sent to *Air Force* Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Phone: (703) 247-5828. Fax: (703) 247-5855. ■

Maj. Gen. Roger DeKok (second from left), director of Operations, US Space Command, spoke to the Dallas (Tex.) Chapter on NORAD's and USSPACECOM's missions. Chapter President John Lopez, Vice President for Public Affairs Bill Solemene, and Treasurer Robert Gehbauer (l–r) are shown here with him.

Unit Reunions

AFROTC Det. 650. October 5, 1996, at Ohio University. **Contact:** Amy Troiano, AFROTC Det. 650, 233 Lindley Hall, Ohio University, Athens, OH 45701. Phone: (614) 593-1343.

AFROTC Det. 670. November 1–3, 1996, in Stillwater, Okla. **Contact:** Tracy K. Burge, AFROTC Det. 670, 320 Thatcher Hall, Oklahoma State University, Stillwater, OK 74078-5042. Phone: (405) 744-7744.

Air Force Photo Mapping Ass'n. September 18–21, 1996, at the Ramada Plaza Resort Maingate in Kissimmee, Fla. **Contact:** Neal Nelson, 1957 Cree Trail, Casselberry, FL 32707-5605. Phone: (407) 830-8685.

Air Force Pubic Affairs & Broadcasting Alumni. July 11–14, 1996, at the Radisson Hotel in Hampton, Va. **Contact:** Dave Shea, Air Force Public Affairs Alumni Ass'n, P. O. Box 540, Fairfax, VA 22030-0540. Phone: (703) 284-4245 (day) or (703) 644-6860 (evening).

Air Weather Reconnaissance Ass'n. September 26–29, 1996, in Fort Walton Beach, Fla. **Contact:** Lt. Col. Ralph R. Ruyle, USAF (Ret.), 5167 S. Ferdon Blvd., Crestview, FL 32536. Phone: (904) 689-1244.

Armed Forces Air Intelligence Training Center (instructors and staff). September 6–8, 1996, at the Quality Inn City Center in Seattle, Wash. **Contact:** Vern Nordman, 1735 W. Sunn Fjord Lane, I-304, Bremerton, WA 98312. Phone: (360) 479-1547.

B-52 Stratofortress Ass'n. September 5–7, 1996, in Tucson, Ariz. **Contacts:** Meyers Jacobsen, 3423 N. Millard Dr., Tucson, AZ 85750. Phone: (619) 323-0579. Jerry Fugere, (520) 298-8661.

C-7A Caribou Ass'n. October 24–27, 1996, in San Antonio, Tex. **Contact:** Nick Evanish, 210 48th St., Gulfport, MS 39507-4317. Phone: (601) 863-8688.

Cannon AFB, N. M., personnel. August 2–4, 1996, at the Holiday Inn in Clovis, N. M. **Contact:** Lt. Col. Warren Henderson, USAF (Ret.), 1613 Fairway Terr., Clovis, NM 88101. Phone: (505) 763-4353.

Deming AAF, N. M., personnel. September 20–22, 1996, in Deming, N. M. Send two legal size SASEs for details. **Contact:** Reunion Committee, 402 S. Tin, Deming, NM 88030.

F-15E "Strike Eagle" Div., USAF Weapons School. June 21–23, 1996, at the Hilton Hotel in Las Vegas, Nev. **Contact:** Capt. Scott A. "K9" Kindsvater, USAF Weapons School, F-15E Division, 4269 Tyndall Ave., Nellis AFB, NV 89191. Phone: (702) 652-8398 or DSN 682-8398.

P-47 Warhawk Pilots Ass'n. September 18–22, 1996, at the Ramada Hotel in Warner Robins, Ga. **Contact:** Oliver Bateman, 2885 Walden Rd., Macon, GA 31206-7521. Phone: (912) 788-4070.

Prestwick AB, Scotland, personnel (1946–66). October 14–17, 1996, in San Antonio, Tex. **Contact:** Lee Hudson, 8626 Victoria Rd., Springfield, VA 22151. Phone: (703) 978-1412.

SAC Communicators Ass'n. September 13–15, 1996, in Bellevue, Neb. **Contact:** Mick Bloom, 1002 Day Dr., Bellevue, NE 68005. Phone: (402) 733-5340.

Supreme Headquarters Allied Expeditionary Force and European Theater of Operations, US Army Veterans Ass'n (World War II). October 4–6, 1996, at the Ramada Plaza Resort in Kissimmee, Fla. **Contacts:** Alan F. Reeves, 2301 Broadway St., San Francisco, CA 94115. Phone: (415) 921-8322. Don Thriffiley, 7340 Dundee St., New Orleans, LA 70126. Phone: (504) 241-3065.

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.

1st Air Commando Group (World War II). September 18–21, 1996, at The Greenwood Inn in Beaverton, Ore. **Contact:** William S. Burghardt, 20080 S. W. Tile Flat Rd., Beaverton, OR 97007. Phone: (503) 628-1417.

1st Strategic Air Depot Ass'n, 8th Air Force (Honington-Troston, England, 1942–46). October 3–6, 1996, in San Diego, Calif. **Contact:** Herbert H. Kaster, 720 Society Hill, Cherry Hill, NJ 08003. Phone: (609) 751-1763.

2d Aerial Port Squadron (Sewart AFB, Tenn.). September 20–22, 1996, in Murfreesboro, Tenn. **Contact:** Richard E. Vaught, 2399 Old Plank Rd., Newburgh, IN 47630. Phone: (812) 853-5679.

2d Bomb Wing (1947–63). September 19–22, 1996, in Arlington, Va. **Contact:** Maj. Gen. Robert L. Edge, USAF (Ret.), 8408 Willow Forge Rd., Springfield, VA 22152. Phone: (703) 451-1296.

3d Strategic Support Squadron. September 12–15, 1996, in Savannah, Ga. **Contact:** Curt Ailiff, P. O. Box 628, Guyton, GA 31312-0628.

5th Air Force (World War II and Korea). September 18–22, 1996, in Springfield/Branson, Mo. Units include the 314th Composite Wing and Hq. squadron, 5th Bomber Command, 5th Station Hospital, 80th Service Group, and 405th Signal Company. **Contacts:** Louis J. Buddo, Box 270362, St. Louis, MO 63127 (314th Composite Wing/5th Bomber Command). Jeff H. Seabock, 210 29th Ave., N. W., Hickory, NC 28601. Phone: (407) 324-6464 (5th Station Hospital). Virgil Staples, 1233 17th St., West Des Moines, IA 50265. Phone: (515) 225-8454 (80th Service Group). Phil Treacy, 2230 Petersburg Ave., Eastpointe, MI 48201-2682. Phone: (810) 775-5238 (405th Signal Co.).

5th Fighter Squadron ("Spitten Kittens"), 52d Fighter Group (World War II). September 5–7, 1996, in Oklahoma City, Okla. **Contact:** A. J. Nicholas, Rte. 2, Box 209B, Jones, OK 73049. Phone: (405) 771-4519.

8th Combat Cargo Squadron, 2d Combat Cargo Group. October 17–20, 1996, at The Menger Hotel in San Antonio, Tex. **Contacts:** V. Paul Vaughan, 4916 Wortser Ave., Sherman Oaks, CA 91423. Phone: (818) 784-2218. "Shack" Shackelford, 7318 Lakehurst Ave., Dallas, TX 75230. Phone: (214) 363-9865.

9th Bomb Group Ass'n. October 7–10, 1996, at the Tropicana Resort and Casino in Las Vegas, Nev. **Contact:** Herbert W. Hobler, 295 Mercer Rd., Princeton, NJ 08540. Phone: (609) 921-3800.

20th Fighter Wing. September 19–22, 1996, in Post Falls, Idaho. **Contact:** Lt. Col. B. R. Cothern, USAF (Ret.), 6864 Mt. Carrol St., Dalton Gardens, ID 83814-9564. Phone: (208) 772-3983.

27th Bomb Group (World War II). October 1–3, 1996, at the Holiday Inn South in Baton Rouge, La. **Contact:** Paul H. Lankford, 105 Hummingbird Dr., Maryville, TN 37803. Phone: (423) 984-7004 (day) or (423) 982-1189 (evening).

29th Fighter-Interceptor Squadron. October 3–6, 1996, in Colorado Springs, Colo. **Contact:** Philip G. Springer, 21605 Rolling Prairie Rd., Onaga, KS 66521. Phone: (913) 889-4396.

33d Air Depot Group (World War II). September 26–29, 1996, at the Ramada Hotel in Warner Robins, Ga. All 9th Air Force Troop Carrier Service Wing personnel invited. **Contact:** John L. McCullough, 1809 Waverland Cir., Macon, GA 31211. Phone: (912) 743-6138.

34th Air Depot Group. August 22–25, 1996, at the Holiday Inn Riverwalk North in San Antonio, Tex. **Contact:** John A. McGill, 7717 Timber Top Dr., Fair Oaks Ranch, TX 78015. Phone: (210) 755-8856.

37th Fighter Squadron (World War II). October 17–20, 1996, at the Clarion Hotel in Mobile, Ala. **Contact:** Francis C. Gallup, P. O. Box 415, Sunapee, NH 03782. Phone: (603) 763-2710.

38th Bomb Group Ass'n (World War II), including Hq., 69th, 70th, 71st, 89th, 405th, 822d, and 823d Bomb Squadrons. September 4–9, 1996, at the Radisson Hotel Seattle Airport in Seattle, Wash. **Contact:** Dale Howieson, 6375 Coniston St., Port Charlotte, FL 33981. Phone: (813) 697-8899.

40th Troop Carrier Squadron (68th Troop Carrier Squadron) Donaldson AFB, S. C., and Rhein-Main AB, Germany (1950–54). October 18–20, 1996, in San Diego, Calif. **Contact:** Charles N. Valentine, 124 Gardenia Ave., Camarillo, CA 93010-1908. Phone: (805) 482-2964.

Pilot Class 41-H, San Antonio, Tex. October 29–November 1, 1996. **Contact:** Bob Sheeks, 7709 Broadway #322B, San Antonio, TX 78209-3207. Phone: (210) 826-8842.

Pilot Class 42-A (Brooks Field, Tex.). September 25–29, 1996, at the Hilton Valley Forge in King of Prussia, Pa. **Contact:** Col. Harry M. Stephy, 576 Meadowview Cir., Greencastle, PA 17225. Phone: (717) 597-2306.

Cadet Class 42-A (Kelly, Foster, and Ellington AAFs, Tex.). October 3–6, 1996, at the Sheraton-Gunter Hotel in San Antonio, Tex. **Contacts:** Col. A. R. Bredewater, USAF (Ret.), 2 Royal Crest, New Braunfels, TX 78130. Phone: (210) 606-1408. Col. Mike M. Kovar, USAF (Ret.), 24407 S. Ribbonwood Dr., Sun Lakes, AZ 85248-7749. Phone: (602) 895-8848.

Cadet Class 43-K (Marianna, Fla.). September 15–16, 1996, at the Bahia Hotel in San Diego, Calif. **Contact:** Ralph Kling, 24718 Pappas Rd., Ramona, CA 92065-4914. Phone: (619) 789-3339.

Pilot Class 52-G. October 24–27, 1996, in San Antonio, Tex. Classes 52-F and 52-H are welcome as associate members. **Contact:** Randy Presley, P. O. Box 1238, Mt. Pleasant, TX 75456-1238. Phone: (903) 572-2195.

55th Weather Reconnaissance Squadron, (World War II). October 7–10, 1996, at the Ramada Branson Grand in Branson, Mo. **Contact:** Walter Pula, 3955 S. 93d E. Ave., Tulsa, OK 74145. Phone: (918) 627-8314.

69th Tactical Missile Squadron, 586th Tactical Missile Group, and 701st Tactical Missile Wing (1951–60). September 28–October 2, 1996, in Williamsburg, Va. **Contact:** Jim Sammons, P. O. Box 684, Addison, TX 75001. Phone: (214) 733-0160.

76th Troop Carrier Squadron (World War II). September 26–29, 1996, at the Ramada Plaza Resort Maingate in Kissimmee, Fla. **Contact:** Al A. Forbes, 1614-B Berwick Ct., Palm Harbor, FL 34684. Phone: (813) 785-6075.

79th Airdrome Squadron, 5th Air Force. October 24–26, 1996, at the Holiday Inn–Select in Little Rock, Ark. **Contact:** Fred Hitchcock, 29 Blueberry Hill Lane, Sudbury, MA 01776. Phone: (508) 443-6679.

79th Fighter Group Ass'n, including the 85th, 86th, and 87th Fighter Squadrons. October 9–13, 1996, at the Radisson Hotel in Hampton, Va. **Contact:** Edwin Newbould, 1206 S. E. 27th Terr., Cape Coral, FL 33904. Phone: (941) 574-7098.

81st Troop Carrier Squadron, 436th Troop Carrier Group (World War II). October 9–13, 1996, at the DoubleTree Club Rancho Bernardo, in San Diego, Calif. **Contact:** Harold N. Read, 17 Belton Dr., Barrington, RI 02806. Phone: (401) 246-0521.

86th Fighter-Bomber Group, including the 525th, 526th, and 527th Squadrons (World War II). October 9–12, 1996, at the Holiday Inn Hotel and Conference Center in Hampton, Va. **Contact:** Gil Hurt, 4920 Montcrest Dr., Chattanooga, TN 37416. Phone: (423) 344-6077.

89th Troop Carrier Group, Hq., 24th, 25th, 26th, 30th, and 31st Troop Carrier Squadrons, World War II (1942–45), Bergstrom Field, Tex. October 9–12, 1996, in San Antonio, Tex. **Contact:** Wayne Taylor, 5015 S. W. 20th Terr., Topeka, KS 66604-3576. Phone: (912) 272-2584.

93d Troop Carrier Squadron, 439th Troop Carrier Group. September 25–29, 1996, at the Holiday Inn Mountain View in Albuquerque, N. M. **Contact:** Lt. Col. Thomas L. Morris, USAF (Ret.), 456 St. George's Ct., Satellite Beach, FL 32937. Phone: (407) 773-6960.

111th Tactical Reconnaissance Squadron (World War II). October 8–13, 1996, at the Nassau Bay Hilton and Marina in Houston, Tex. **Contact:** William H. Humble, 211 Trudell Dr., San Antonio, TX 78213-2953. Phone: (210) 342-2763.

246th Signal Operation Company (World War II). September 5–8, 1996. **Contact:** Marie Huggins, 30031 S. W. 169th Ave., Homestead, FL 33030. Phone: (305) 247-0150.

314th Fighter Squadron, 324th Fighter Group (World War II). September 26–28, 1996, in San Diego, Calif. **Contact:** Mark E. Mellinger, 45 Kenwood Dr., Massapequa, NY 11758. Phone: (516) 798-5038.

325th Fighter Group, "Checkertails" (World War II). August 27–September 1, 1996, at the Holiday Inn Conference Center and Homewood Suites Dayton in Fairborn, Ohio. **Contact:** Ralph Cathcart, 113 N. Lincoln, Augusta, MI 49012-9721. Phone: (616) 731-2421.

344th Bomb Group Ass'n. August 28–31, 1996, in Albuquerque, N. M. **Contact:** Lambert Austin, 5747 Darnell St., Houston, TX 77096. Phone: (713) 774-3030.

349th Troop Carrier Group (World War II). September 12–15, 1996, at the Hilton East in Tucson, Ariz. **Contact:** Lt. Col. Hal L. Ashby, USAF (Ret.), 34 Shawnee Hills Dr., Carbondale, IL 62901-8815. Phone: (618) 457-6874.

390th Bomb Squadron, 42d Bomb Group, 13th Air Force (World War II). September 4–7, 1996, in Louisville, Ky. **Contact:** Frank J. Saler, 700 S. Fm Hwy. 1417, #B1-106, Sherman, TX 75092. Phone: (903) 868-1156.

398th Bomb Group Memorial Ass'n, 8th Air Force. September 25–28, 1996, in Springfield, Mo. **Contact:** George R. Hilliard, 7841 Quartermaine Ave., Cincinnati, OH 45236-2313.

401st Bomb Group Ass'n, 8th Air Force (World War II). September 12–15, 1996, at the Holiday Inn On The Bay in San Diego, Calif. **Contact:** George Menzel, P. O. Box 15356, Savannah, GA 31416.

402d Fighter Squadron, 370th Fighter Group, 9th Air Force (World War II). October 16–20, 1996, in San Antonio, Tex. **Contact:** Jimmie Jernigan, 13213 Mansfield Dr., Austin, TX 78732. Phone: (512) 266-1016.

405th Fighter Group (World War II). September 11–15, 1996, at the Bahia Hotel in San Diego, Calif. **Contact:** Charles Nachand, 4705 Zamora Way, Oceanside, CA 92056. Phone: (619) 940-8252.

464th Bomb Group, including the 776th, 777th, 778th, and 779th Squadrons. October 9–13, 1996, at the Hilton Oceanfront Resort in Daytona Beach, Fla. **Contact:** George Stockinger, 24355 Peninsular Dr., Daytona Beach, FL 32118. Phone: (904) 252-8283.

485th Bomb Group, 15th Air Force (Venosa, Italy). September 11–14, 1996, at the Marriott Riverfront in Savannah, Ga. **Contact:** Earl L. Bundy, 5773 Middlefield Dr., Columbus, OH 43235.

490th Bomb Squadron, 10th and 14th Air Forces, China-Burma-India (World War II), and 490th Strategic Missile Squadron. September 11–14, 1996, at the Best Western Sunnyside Inn in Clackamas, Ore. **Contacts:** Clyde Dyar, 710 White St., Walla Walla, WA 99362. Doug Knockey, 225 Olwell Way, Medford, OR 97501.

868th Bomb Squadron ("The Snoopers"). September 5–8, 1996, at the Dearborn Inn in Dearborn, Mich. **Contact:** Fred Stanley Howell, 33233 Avenue F, Yucaipa, CA 92399-2036. Phone: (909) 795-5658.

7330th Flying Training Wing, Furstenfeldbruck AB, Germany, (1953–58). September 5–9, 1996, at the Embassy Suites Downtown in St. Louis, Mo. **Contact:** Don Spiegel, 2450 St. Paul Rd., St. Paul, MO 63366.

37th Communications Squadron, Robins AFB, Ga. For a reunion, seeking members who served through deactivation in 1960. Continental Air

Command and other 14th Air Force personnel are welcome. **Contact:** CMSgt. James A. Lewis, Jr., USAF (Ret.), 150 Turtle Lane, Seguin, TX 78155-3141. Phone: (210) 303-3451.

Pilot Class 41-A, Maxwell AFB, Tex. Seeking members for a reunion. **Contact:** Irving W. "Pete" Boswell, 1648 Pioneer Dr., Melbourne, FL 32940-6745.

46th Fighter-Interceptor Squadron (1950s), Dover AFB, Del. Seeking members for a reunion in 1997. **Contact:** Lt. Col. George W. Peckham, USAF (Ret.), 254 Quail Ridge Cir., Highlands Ranch, CO 80126-2239. Phone: (303) 791-6680.

Pilot Training Class 56-O, Marana AB, Ariz. Planning a reunion for summer 1996 or later. **Contact:** John B. Kerr, Jr., 1439 Fulbright Ave., Redlands, CA 92373. Phone: (909) 390-1966.

460th/497th Fighter-Interceptor Squadrons, Portland IAP, Ore. Seeking members for a reunion. **Contact:** Col. Richard E. Chandler, USAF (Ret.), 29932 Peckenpaugh Rd., Shedd, OR 97377-9711. Phone: (541) 491-3621. ■

Bulletin Board

Seeking aircraft **test reports** for Bf-109 G-6 EB-102 #16416 and Bf-109 F-4 EB-1001 #7640. **Contact:** Gerd Lanio, Triesch Weg 14, 65614 Beselich, Germany.

Seeking unit histories of the **55th, 100th, and 4080th Strategic Reconnaissance Wings. Contact:** Stan Sadowski, 1720 Lake Shore Crest Dr., Apt. #16, Reston, VA 22090.

Seeking color **photographs,** eight-by-ten inches or smaller, of military aircraft. **Contact:** Phillip R. Aye, 6135 Good Hunters Ride, Columbia, MD 21045-4068.

Seeking contact with **Capt. William Stom,** from Boston, Mass., who was stationed at Le Bourget, France, in 1945 and knew Elisabeth Seguin. **Contact:** Nicole Ors, 37 Boulevard Fructidor, 13013 Marseille, France.

If you need information on an individual, unit, or aircraft, or if you want to collect, donate, or trade USAF-related items, write to "Bulletin Board," *Air Force* Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Letters should be brief and typewritten; we reserve the right to condense them as necessary. We cannot acknowledge receipt of letters. Unsigned letters, items or services for sale or otherwise intended to bring in money, and photographs will not be used or returned.—THE EDITORS

Seeking contact with **Robert Scott and William Bishop,** stationed at Kindley AFB, Bermuda, 1950–51. **Contact:** Martin C. Monson, 6893 Hwy. 68, Embarrass, MN 55732-9743.

Seeking information on **10th Air Rescue Squadron** pararescuemen killed in a crash in Alaska in the late 1940s. **Contact:** Will Chabun, 81 Bobolink Bay, Regina, Saskatchewan S4S 4K2, Canada.

Seeking contact with pilots, maintainers, and builders of the **Curtiss P-40. Contact:** Frederick A. Johnsen, P. O. Box 1897, Lancaster, CA 93539.

Seeking contact with B-47 crew members **Capts. Bill V. Brown and Charles E. Donegan and 1st Lt. Donald J. Rohr,** who were with the 448th Bomb Squadron, 321st Bomb Wing, McCoy AFB, Fla., in 1960. **Contact:** Jim Hickey, 7007 Ocala Ave., Fort Pierce, FL 34951-1596.

Seeking contact with crew members who knew **Lt. Bill Potter,** a KC-97 pilot in the 1950s. **Contact:** Maj. William E. Blue, Box 143, Reardan, WA 99029.

Seeking contact with **Ray Martin,** from York County, Pa., who was stationed with the 5th Air Police Squadron, Travis AFB, Calif., 1950–54. **Contact:** James D. Donaven, 2466 N. George St., York, PA 17402.

Seeking information on the **C-47 #316473** accident at the District Park Aerodrome in Newcastle, Australia, on August 10, 1944. Also seeking contact with **Joe H. Buckwater, Jack Carey, Jack Howard, Eric McCormick, and Howard McKinnon. Contact:** O. C. Wilkins, 2329 Maben Ave., Palm Harbor, FL 34683-5134.

Seeking information on service members who have been exposed to **radiation. Contact:** Loretta A. Williams, 3271 State Rte. 508, Bellefontaine, OH 43311.

Seeking contact with an F-100 pilot who ejected over **Qui Nhon AAF, South Vietnam,** in December 1968. **Contact:** Carl Blanda, 12159 S. Business Park Dr., Draper, UT 84020.

Seeking the whereabouts of **1st Lt. George S. Sessions,** stationed at Walker AFB, N. M., 1962–64. **Contact:** Terry Isaacs, South Plains College, 1401 College Ave., Levelland, TX 79336.

Seeking the whereabouts of **Dean Hull,** a navigator from Bloomington, Ill., and **Richard Moss,** a bombardier from Rochester, N. Y., both of whom served with the 5th Bomb Group, World War II. **Contact:** G. William Virts, 1048 S. Potomac St., Hagerstown, MD 21740-7321.

Seeking **patches** or emblems from the USAAF 433d Fighter Squadron, 475th Fighter Group. **Contact:** Richard J. Ryan, Grandview, Apt. #330, Westernport, MD 21562.

Seeking contact with **MSgt. John B. Godwin,** a loadmaster with the 37th Tactical Airlift Squadron, Rhein-Main AB, Germany. He may be living in Ohio. **Contact:** Joe "Andy" Jackson, 3512 King George St., Ocean Springs, MS 39564.

Seeking contact with **Capt. Robert Olson** and his B-29 crew, from the 93d Bomb Squadron, 19th Bomb Group, 20th Air Force, Kadena AB, Japan, 1953. **Contact:** Everett R. Taylor, 451 Maple Lake Cir., Utica, KY 42376.

Seeking information on forty-two members of the **44th Bomb Group,** 8th Air Force, whose four bombers disappeared over the North Sea on November 18, 1943. **Contact:** Forrest S. Clark, 703 Duffer Ln., Kissimmee, FL 34759.

Seeking records and memorabilia from **8th Air Force's** years in Strategic Air Command. **Contact:** Wayne Corbett, P. O. Box 1992, Savannah, GA 31402-1992.

Seeking contact with students of **1st Lt. Thomas J. Flynn,** an Army Air Corps instructor pilot in Victoria, Tex., who was killed in an aircraft accident in 1944. **Contact:** Capt. J. J. Brennan, 1614 S. Morgan Dr., Moore, OK 73160-7064.

Seeking information on copilot **2d Lt. Walter F. Brookings,** 545th Bomb Squadron, 384th Bomb Group, killed March 19, 1944. **Contact:** W. Moeckel, 476 Appleton St., Holyoke, MA 01040.

Seeking a mission profile, taped footage, or information on the pilot of an LTV **antisatellite intercept launch or interception,** possibly from an F-15, September 13, 1985. **Contact:** Norman E. Gaines, Jr., 28 Fieldstone Dr., Apt. #11C, Hartsdale, NY 10530.

Seeking an **Aviation Cadet Class 42-F** class book, published in Phoenix, Ariz., in January or February 1942. **Contact:** Lt. Col. Edward W. Spalding, USAF (Ret.), 1440 Larkspur Dr., Santa Paula, CA 93060.

Seeking **patches,** hats, pins, and decals from the 71st Fighter-Interceptor Squadron. **Contact:** Joe Fardon, P. O. Box 401, Ocean City, NJ 08226-0401.

Seeking contact with members of the **818th Combat Defense Force and Sentry Dog Section,** Lincoln AFB, Neb., 1956–62. **Contact:** Chuck Reid, 275 Castlewood Rd., Tyrone, GA 30290-9658.

Seeking contact with a serviceman who communicated with a Belgian teenage girl, Hortense Damon-Clew, while both were prisoners at a military **prison in Brussels,** Belgium, in May 1944. **Contact:** W. B. James, RSL Australia, GPO Box 303, Canberra, ACT, Australia 2601.

Seeking contact with USAF personnel who operate and maintain equipment manufactured by **Harsco's F. M. C. and United Defense Divisions. Contact:** Everett Cheshewalla, P. O. Box 437, Skiatook, OK 74070-0437.

Seeking contact with **Capt. John M. White,** who was stationed at Davis-Monthan AFB, Ariz., 1943–46. Also seeking contact with **Sgt. Pauline L. Ritter,** who worked in Special Services at Davis-Monthan, 1943–46. **Contact:** SMSgt. Charles H. Jacob, USAF (Ret.), 3408 Tibbett Ave., Bronx, NY 10463.

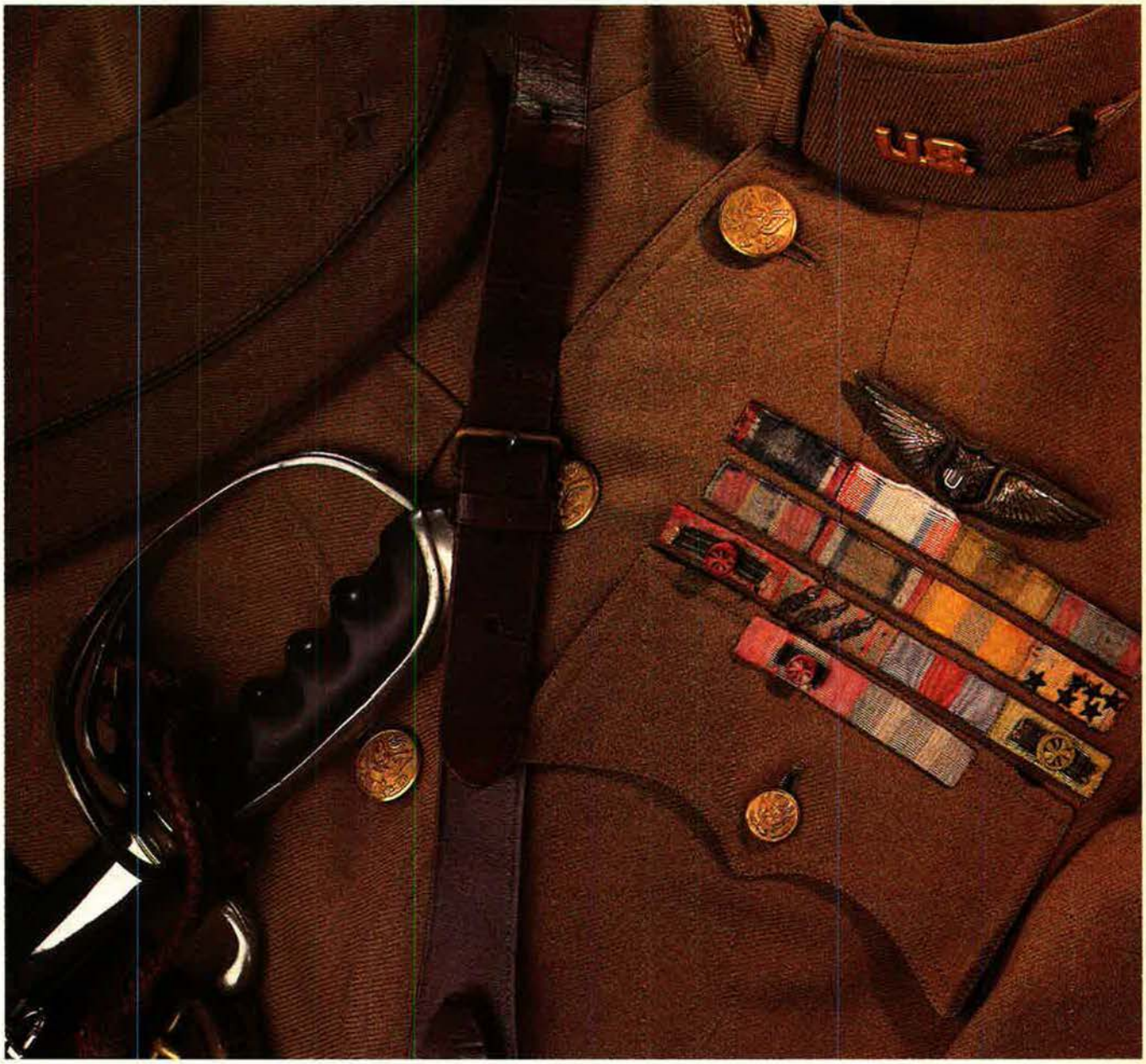
Seeking contact with personnel from the **7th and 14th Aerodrome Squadrons, 38th Service Squadron, 375th Base Headquarters and Air Base Squadron, 873d Airborne Engineer Aviation Battalion, and 920th Air Base Security Battalion. Contact:** Frank Pace, 315 W. 15th St., Dover, OH 44622.

Seeking contact with former **enlisted pilots or enlisted naval aviators. Contact:** James G. Scott, 324 Magnolia Ave., Space #6, Lemoore, CA 93245-2868. ■

Pieces of History

Photography by Paul Kennedy

A Trailblazer's Uniform



Memorabilia from the collection of the National Air and Space Museum, Paul E. Garber Facility

Brig. Gen. Billy Mitchell wore the uniform of an Army flyer from World War I until he resigned from the Army Air Corps on February 1, 1926, after being court-martialed for his aggressive advocacy of airpower. Years after he died, his wife donated this uniform—complete with 1902 standard-model saber, Sam Browne belt, and gilt buttons (which replaced the bronze and black buttons officers wore during battle because gold glinted in the sun)—to what is now the National Air and Space Museum, where it is being preserved for future display.

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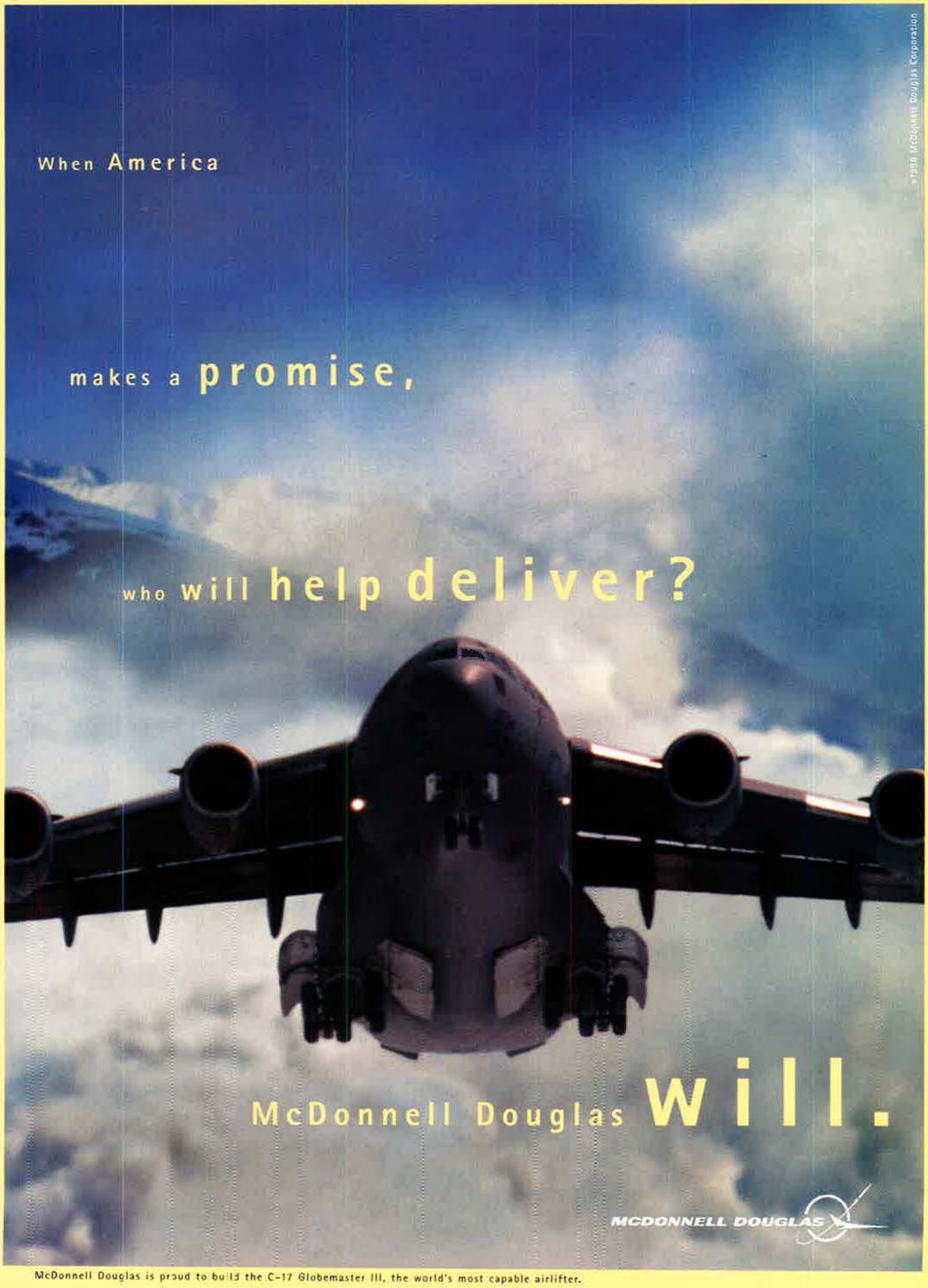

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