

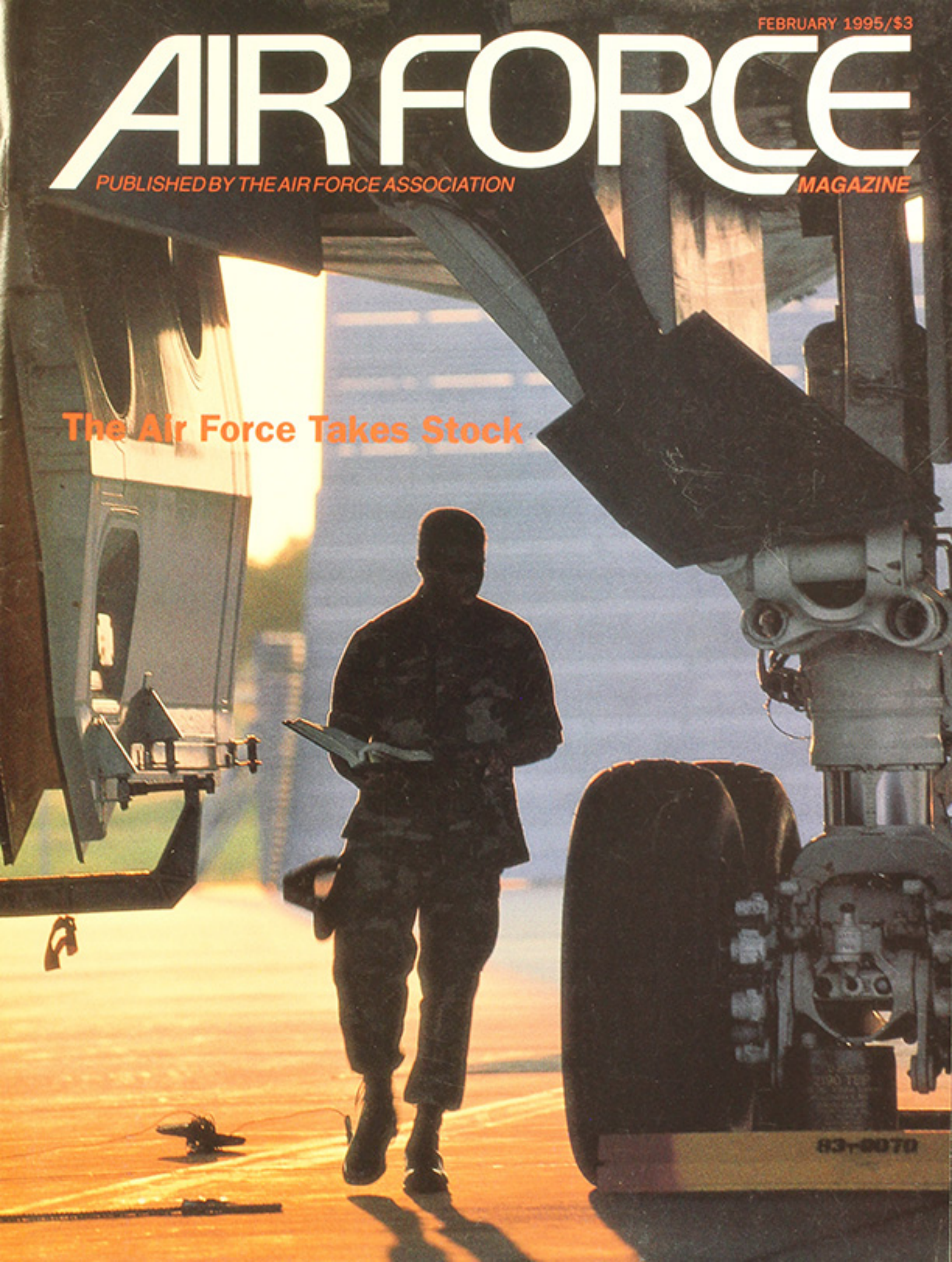
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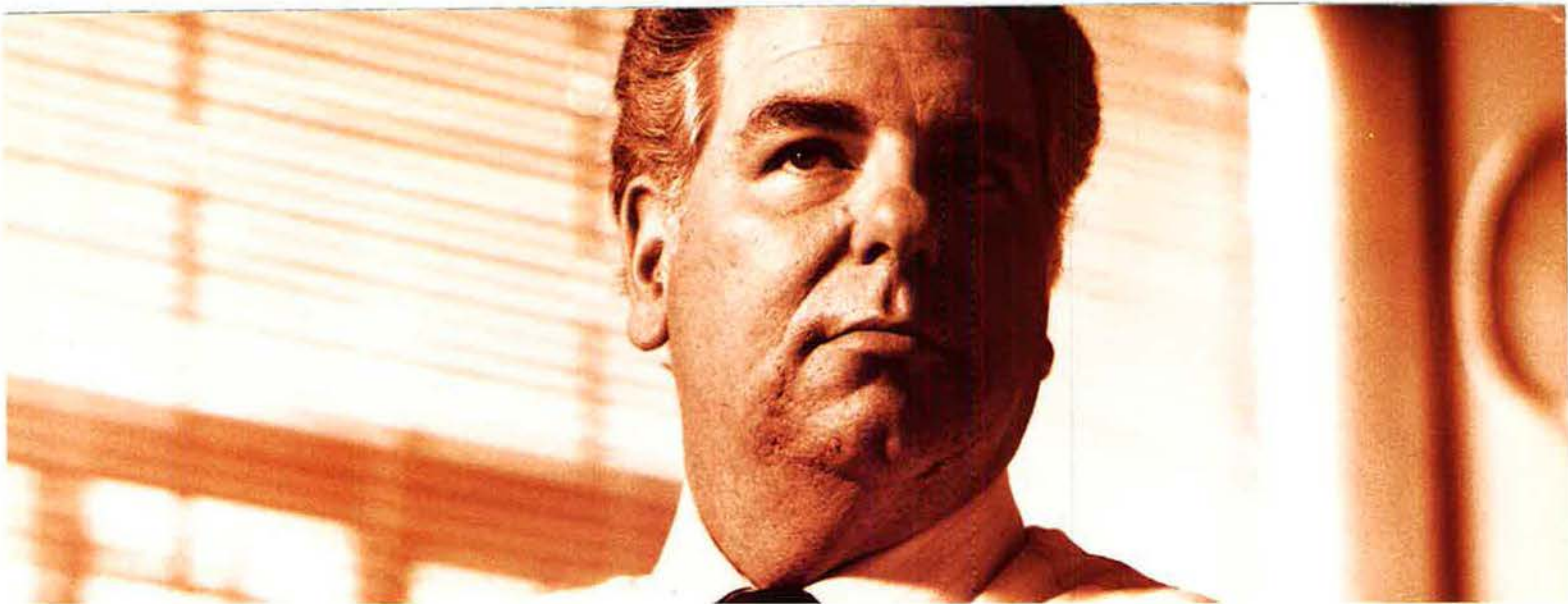
AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE

The Air Force Takes Stock





Frank Statkus, Vice President, F-22 Program Manager, Boeing Defense & Space Group

"THE NEXT AIR WAR MAY BE DECIDED WITHOUT A SHOT BEING FIRED."

The most successful war is the one that never gets fought. This is the adage of the F-22, a fighter built to dominate future battles, and therefore deter them from ever taking place. This is the first fighter to bring together features like supercruise, thrust vectoring, stealth, and advanced avionics. And yet, for all its sophisticated technology, it will actually require far less time and cost than current fighters to maintain, support and deploy. The F-22. When you have a fighter that's certain to dominate any challenger, there's a good chance it won't ever have to.



AIR FORCE

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MAGAZINE

February 1995, Vol. 78, No. 2

- 6 Letters
- 15 Aerospace World
- 20 Senior Staff Changes
- 22 Index to Advertisers
- 76 Valor
- 77 Books
- 78 Flashback
- 79 Verbatim
- 80 Industrial Associates
- 83 AFA/AEF Report
- 85 Unit Reunions
- 86 Bulletin Board
- 88 Pieces of History



About the Cover:
A maintainer at Dyess AFB, Tex., checks out a B-1B. For a picture of how USAF currently checks out, see "The Air Force Takes Stock," p. 24. Photo by Randy Jolly.

4 Editorial: Veterans

By John T. Correll
As the number of American veterans declines, most people's knowledge of the military is secondhand.

10 Washington Watch: Roles and Missions Ride Again

By John T. Correll
How do the individual services provide a joint force commander with core fighting capabilities?

24 The Air Force Takes Stock

By David J. Lynch
Air Force officials want to consolidate the changes of the past five years and move toward a solid future.

32 Off-the-Shelf Airlift

By John A. Tirpak
The NDAA is the Pentagon's ace in the hole should the C-17 program go sour.

39 Gallery of South Asian Airpower

By John W. R. Taylor and Kenneth Munson
A catalog of aircraft in use by nations of south Asia.

48 Eglin's War

Two commands successfully integrate operations during war games at Eglin AFB, Fla.

54 McCain Calculates the Cuts

Sen. John McCain asserts that cuts in airpower are greater than the Administration claims.

61 Snapshots From the Personnel Front

By Suzann Chapman
Air Force recruiters are meeting numerical and quality goals—for now.



32

66 How Ariane Does It

By Theresa Foley
Europeans continue to excel in commercial space launch while the US approach falters.

72 New Brooms on Capitol Hill

By Pat Towell
The GOP majority will put a new face on the congressional defense establishment.



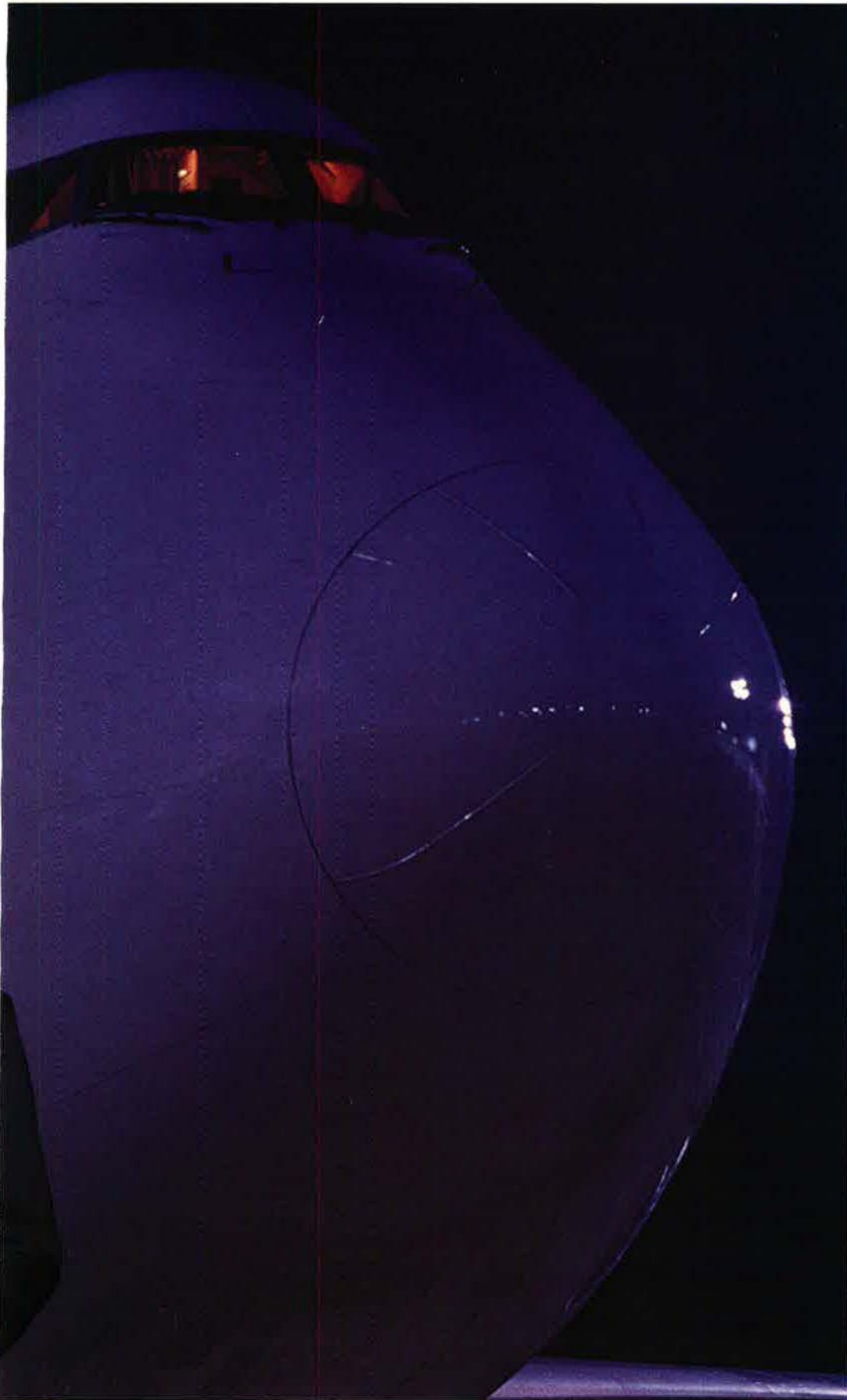
48

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A photograph of three people standing in front of a large, blue, curved surface that appears to be the fuselage of an aircraft. The lighting is dramatic, with strong highlights and deep shadows. The text is centered in the upper half of the image.

With today's defense budgets, simpler may be better.

Tina Traynor, Customer Engineering, Commercial Airplane Group; Sam Galagaza, Product Development, Defense & Space Group; Teresa Kerupiah, Preliminary



Design, Defense & Space Group.

The Pentagon is looking for ways to use available, proven commercial products to save money for the military. Everything from laptop computers to airplanes. One big example: the Boeing 747. Jumbo jets routinely fly millions of tons of cargo—including military cargo. So the Air Force is considering 747s for its fleet to cut costs. It won't be the first Boeing commercial jet to wear a uniform. America's flying command post is a 747. So is Air Force One. Boeing jetliners serve as aerial refueling tankers. They also are the 707 and the 767 AWACS (Airborne Warning and Control System). And Boeing 737s serve as trainers. There are limits to off-the-shelf opportunities, of course. But, where it makes sense, it can save billions and still make certain America's forces are ready and well-equipped.

BOEING

By John T. Correll, Editor in Chief

Veterans

IN 1951, New York Giants center fielder Willie Mays was the National League's rookie of the year. The following season he wore a different uniform. Like many others of his generation from all walks of life, he had been inducted into the Army. Among those soldiering the same year as Willie Mays was a future senator of some note, PFC Edward M. Kennedy of Massachusetts. Later on—with several gold records already behind him—Elvis Presley did his hitch, too.

It was a time when virtually all men who could serve in the armed forces did serve. Those who didn't were more pitied than envied. Draftees were out in two years. Recruits stayed at least four years but got a better choice of duty and training. Most veterans were proud of the experience. A great many of them regarded it as an important part of their personal development.

Things changed in 1973 with the coming of the all-volunteer force, which did more than end the military draft. It also brought to a close what had been a major rite of passage that celebrities and the sons of the rich and the famous shared with the rest of us. After 1973, men reaching age eighteen were no longer pushed toward service by the draft or by cultural norms. The volunteer force set up a major shift in the demographics of the nation.

Military service peaked during the mobilization for World War II. Accordingly, seventy-six percent of American men today between the ages of seventy and seventy-four are veterans. By contrast, less than a tenth of men under age thirty are veterans. With conscription abolished and the armed forces getting smaller, veterans are a diminishing minority. For the most part, what young people know of military service they will have heard from their fathers, seen in the movies, or otherwise gained second-hand.

■ Over the past two centuries, forty-one million persons have served the nation in war. Most of them, about eighty-five percent, served in one of

the major conflicts of the twentieth century. World War II alone accounted for forty percent of all who have served in American forces throughout history.

■ Some of those who served did not survive to join the ranks of veterans. In the two world wars, Korea,

**Veterans are
a diminishing minority.
What most people
know of the military
they've heard
from their fathers or
otherwise gotten
secondhand.**

and Vietnam, for example, 613,727 American military members lost their lives. (Another 1,132,435 sustained wounds that were not mortal.)

■ At present, twenty-nine percent of the nation's civilian men age eighteen or older are veterans. The current population of living American veterans is 26.5 million. Since 1993, the number of Vietnam-era veterans, now 31.2 percent of the total, has exceeded the number of living World War II veterans. The average veteran is 56.6 years old. About 4.4 percent of all veterans are women.

■ While the population of veterans is decreasing, the number of military retirees is increasing. This trend reflects the large standing forces of the postwar period and a greater representation of career people in the force. The current military retired population is 1.555 million. This year, for the first time, the number of retirees will surpass the number of persons serving on active duty (1.526 million). Since 1972, the service accounting for the largest share of retirees (36.5

percent) has been the Air Force, which has 164,882 officer and 403,182 enlisted retirees.

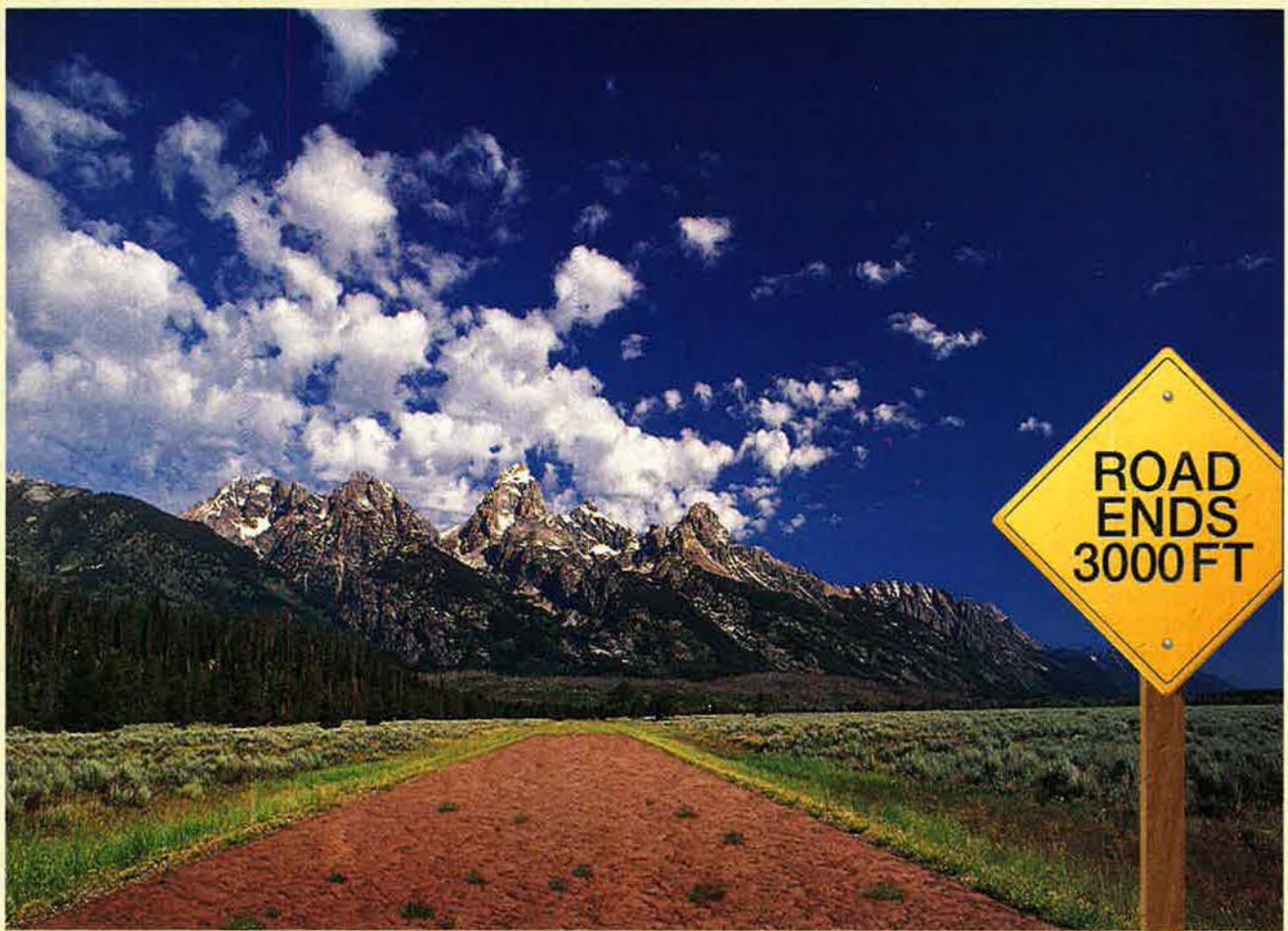
■ In the new 104th Congress, 39.26 percent of the members are veterans, compared with 44.3 percent in the departing 103d Congress. Military experience is more prevalent in the Senate, where fifty-four percent of the members have served in the armed forces, than in the House of Representatives, where thirty-six percent have served. One surprise is that more freshman members of the 104th Congress are veterans (21.65 percent) than was the case with the 103d (18.52 percent).

The percentage of veterans in Congress can be expected to deteriorate with each passing election. Elsewhere in government, the representation has deteriorated already. According to John Wheeler, a Vietnam veteran who campaigned for the Clinton-Gore ticket, only four percent of male staff members in the Executive Office of the President in June 1994 were veterans.

The military still rates higher than other institutions in national attitude polls, but that could change. News coverage of the armed forces emphasizes waste, mistakes, and scandal. The entertainment industry depicts the military as bumbling, corrupt, and depraved. When people do not have experience on which to base their judgments, images delivered by the news and entertainment media can have a powerful influence.

It does not follow automatically that no one except veterans can understand the military and military people. As the percentage of veterans continues to decline and fewer Americans have military experience, however, the nation's leaders have an added responsibility. They must try harder to understand.

It is not simply a matter of tradition or a footnote in historical trivia. The decline of national military experience marks a gradual but fundamental change in the relationship between the armed forces and the society they serve. That is an issue of national security. ■



There's less land in our landing.

The C-17 has just landed and it's no big deal. Which is not to say the airlifter is anything shy of noteworthy. But one of the reasons it is so remarkable is that it requires so little distance to land— only 3,000 feet.

It's even agile on the ground. With an impressive 169,000 pound full payload, thrust



reversers back and turn the C-17 in less space and time than other aircraft its size. Reverse engine exhaust is sent up and forward so the ground crew and Army troops can remain close at hand.

Add non-stop, direct delivery; a Low-Altitude Parachute



Extraction System (LAPES); and wide-body capacity to fly large cargo like the M1 tank and Patriot missile launchers.

Now you have an airlifter like no other.

The C-17. You can't land a better deal.

MCDONNELL DOUGLAS

Performance Above and Beyond.

Letters

Who Won William Tell?

Your January cover showing an F-15 "On Top at William Tell" made me feel like President Truman when he read the headline "Dewey Defeats Truman." Since the top three overall winners at William Tell were F-16s and CF-18s, I have to wonder what the F-15s were on top of. Your scoreboard on p. 45 also failed to mention the "Top Operations Team" category and the winners, the 119th Fighter Group "Happy Hooligans."

It is true that the individual top gun winner was an F-15 pilot, and he certainly deserves recognition and praise but not at the expense of the total force, which includes the Air National Guard.

I am extremely proud of the accomplishments of the Fargo unit, and I am a solid supporter of the militia principles on which this nation was founded. As charter president of AFA's Happy Hooligan Chapter, I am disappointed that the article shows a clear bias toward a specific aircraft. . . .

Col. Michael J. Haugen, ANG
Commander, 119th Fighter Group
Fargo, N. D.

Managing the Force Mix

The subject of "New Concepts for the Force Mix" [December 1994, p. 46] is the "temping" of the Air Force, as is fashionable in corporate America in the effort to cut costs by eliminating all "nonessential" positions. This approach to cost cutting is flawed. Many corporations are finding out that long-term costs are actually greater. The decimation of in-house expertise reduces efficiencies and gradually "dumbs down" the organization, which reduces initiative, responsiveness, and flexibility. In a recent *New York Times* article, Secretary of Labor Robert Reich states, "They think it is cheaper to buy than to build. . . . But if we don't make it in-house, we don't gain the experience and knowledge that goes with making it. And then we can't develop a whole range of technologies that are likely to evolve from that component." While he is referring to technology, his statement applies to many aspects of the Air Force.

Furthermore, the RAND study, in stating that the "services took in hordes of civilians from businesses, trades, and professions" in World War II, ignores the US military's dismal performance in the war's first half, due in part to a lack of experience and prewar ill-preparedness. Taking the study to its logical conclusion would leave us with a few pilots who have an operational background but who understand neither support nor technology; a large number of nonoperational, nontechnical, professional contract managers; and a "horde" of contractors whose main purpose in life is to make money. Is this a recipe for an Air Force second to none?

The real question is not how to get rid of the officers we have but rather how to get more out of them. To a certain extent, those in the support-officer fields have undermined themselves; frequently one finds no difference between them and the civilians. The solution is to force a difference. Let civilians be civilians. Blue-suiters should magnify their connection with the military, either by being experts in military affairs or by broadening into operational fields, neither of which civilians typically do. Lately we seem to have become a force of specialists while forgetting the all-important connection to the operational Air Force. Maybe it's time to reforge that link, rather than throw the baby out with the bathwater, as the two studies suggest.

Maj. James B. Wissler,
USAF
Montgomery, Ala.

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

In response to officer personnel management issues raised in "New Concepts for the Force Mix" and the (probably correct) assumption that the Air Force would not be receptive to bringing back the warrant officer (WO) ranks, the service's position may not be serving either the best interests of the taxpayers or, in a world of rapidly changing technology, the Air Force itself. The possibility of bringing back the WO structure need not be considered a new level of supervision but rather an opportunity to create a set of ranks that offers qualified individuals the opportunity to serve in technical or administrative jobs for extended periods without having to be concerned with the trappings associated with the fully commissioned ranks.

Historically, officer force management has been a hit-or-miss proposition in the Air Force, resulting in the pyramidal up-or-out system, including separation of technically qualified people due to nonpromotion, reduced promotion quotas, delayed promotion cycles, and low morale. Introduction of the warrant structure could allow the Air Force to develop a cadre of skilled individuals dedicated to improving their technical skills through the years without having to be concerned about "career management" or making the required pilgrimages to the altar of careerism.

While the requirement that an officer possess a college degree has led to a higher level of status for officers, that requirement does not always match the needs of the officer's assignment. As a former nav/WSO/intelligence type who has lived through an over-and-out cycle, I can honestly testify that my bachelor's degree in industrial psychology was never put to use in the Air Force and my square-filling master's degree, Squadron Officer School, and Air Command and Staff College courses were of minimal practical value.

Many like myself would have been all too willing to assume the warrant ranks in exchange for the opportunity to maximize our flying time and give up pointless additional duties, face



SOMETIMES IT TAKES A COMPETITION TO PROVE YOU HAVE NO COMPETITION.

Once again, the multirole F-16 did what it does best - dominate the competition. This time, it was William Tell, the definitive USAF air superiority competition. The F-16 teams captured every major event - Overall, Operations, GCI, Maintenance, and Loading.

Demonstrating its multirole talent, the F-16 also consistently dominates Gunsmoke, the premier worldwide air-to-

WILLIAM TELL '94 FINAL RESULTS					
PLACE	OVERALL	GCI	MAINTENANCE	LOADING	OPERATIONS
1st	F-16	F-16	F-16	F-16	F-16
2nd	CF-18	F-16	F-16	F-16	CF-18
3rd	F-16	CF-18	F-15	F-15	F-15
4th	F-15	F-15	F-15	F-15	F-16
5th	F-15	F-15	F-15	CF-18	F-15
6th	F-15	F-15	CF-18	F-15	F-15
7th	F-15	F-15	F-15	F-15	F-15
8th	F-15	F-15	F-15	F-15	F-15

ground competition, sweeping all events. The F-16 is the only aircraft ever to win both weapons competitions.

The F-16 is also undefeated where it counts most - in the real world. It has a 69-0 record in aerial combat and the world's

only three combat AMRAAM kills. With this capability and a \$20 million price tag, what's left to tell?



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Publisher
Monroe W. Hatch, Jr.

Editorial

Editor in Chief
John T. Correll

Executive Editor
Robert S. Dudney

Senior Editor
John A. Tirpak

Associate Editors
Suzann Chapman
Tamar A. Mehuron

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Brian Green
John W. R. Taylor

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Sherryl Coombs

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Editorial Associates
Heather C. Martin
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Advertising

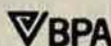
Advertising Director
Patricia Teevan
1501 Lee Highway
Arlington, Va. 22209-1198
Tel: 703/247-5800
Telefax: 703/247-5855

Industry Relations Manager
Elizabeth B. Smith • 703/247-5800

Marketing Manager
Lynne Setter • 703/247-5800

US Sales Manager
William Farrell • 708/295-2305
Lake Forest, IL

European Sales Manager
David Harrison • 44-81-698-9456
Kent, England

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Letters

time, and the politics of promotional musical chairs.

Most aircrew, technical, and administrative tasks could be accomplished by WOs educated with an applicable associate's degree and appropriate training. This level of requirements would lower recruiting costs, and the WO ranks would cost less to maintain than a comparable number of commissioned officers.

Instead of being spring-loaded to the "no" position on the subject of WOs, the Air Force would better serve the country by keeping an open mind.

Lawrence Pratt
San Jose, Calif.

Talking a Good Game

I read with interest Bill Gertz's "What Next For Launchers?" [November 1994, p. 56]. My only question is, why do we ask ourselves the same question year after year? Having been in the launch-vehicle business for many years, I can remember that same question being asked over and over.

It's not that it isn't a valid question—it is. It's not that we don't need more reliable and more cost-effective vehicles—we do. What it boils down to is the lack of Air Force, NASA, and congressional commitment to do something about the question.

The answer is the same one we've come up with for years. Money needs to be spent judiciously on a technology program that will eventually provide the breakthroughs that will allow us to procure more cost-effective and reliable vehicles. The problem is that everyone wants an answer now. The years have proved that the answer is not a simple and convenient equation. You can't have a valid technology breakthrough without investing some well-thought-out dollars.

Back in 1985-86, the Space Transportation Architecture Study (STAS) did an excellent job of pulling together, from both the Air Force's and NASA's perspectives, a credible technology plan to answer the question. The plan was never funded, and, so far as I know, the STAS (\$20 million using four contractors) was never officially published.

Since then we've had at least three "new" programs that effectively did the same thing as the STAS—and still there is no technology plan being touted, followed, and funded.

Where are we today? Are we going to redo the STAS again? We're back where we were in 1985. Yes, we have accomplished some technology breakthroughs, but not the kind of concentrated far-reaching

technology programs needed to provide a major leap forward.

If we are finally going to do something, let's do it right. Make a launch-vehicle technology program a priority in all the government offices that deal with launch vehicles. If this doesn't happen, perhaps it is time for a radical change of how we deal with the launch-vehicle question. Perhaps Congress should consider taking the job away from DoD and NASA and creating a separate agency that has its own budget to deal with the question and finally get the job done.

How do I see that current initiative? We're talking a good game again. I won't believe anything is different, though, until I see some hard funding—money appropriated and contracts let. Will we be able to launch less expensive and more reliable boosters by 1999? It's possible but not probable. We always seem to talk a better game than we actually play.

Col. William F. H. Zersen,
USAF (Ret.)
San Pedro, Calif.

Bogged-Down Launchers

The August 1994 issue of AIR FORCE Magazine indicates that the push for improved launch capabilities, Air Force Space Command's top priority, has bogged down and that we will be using Deltas, Atlases, and Titan IVs for thirty-seven years ["Recent Space Issues and Development," p. 52].

This reminds me of our situation after World War I. We had a large inventory of aircraft engines and did little in the way of developing better engines until they were used up. The result was predictable. The quality of our engines suffered. During World War II, the British gave us the Rolls-Royce Merlin engine, and we duplicated it for the P-51. They also gave us the Whittle engine, which greatly helped our belated development of jets.

How can we expect to lead in aerospace if we don't develop state-of-the-art launch capability? Very likely, launch capabilities will be developed in the near future that are so efficient that our old ICBMs will be as obsolete for satellite launch as the Liberty engine—and, heaven forbid, those efficient launchers will be someone else's system.

When will we ever learn?

Joe Lyons
San Antonio, Tex.

Impressive but Not Orbital

Orbital Sciences Corp. has conducted some impressive space launches

in its short history, but your report of a successful "single-stage-to-orbit" launch of a Sergeant rocket is misleading [*October 1994 "Aerospace World," p. 23*]. The Sergeant is a single-stage rocket to be sure, but unless you include orbits that intersect the Earth, this vehicle falls far short of the recently promulgated national goal for a single-stage-to-orbit (SSTO) next-generation space-launch system. The Sergeant is a sounding rocket. The SSTO is envisioned as a reusable launch system to provide cost-effective and responsive space transportation to Earth orbit for military, civil, and commercial users early in the twenty-first century.

Dennis E. Beebe
Solvang, Calif.

Cannibal Controversy Continues

I was shocked and disappointed by your October 1994 editorial [*"The Cannibal Dynamic," p. 2*], criticizing comments by Maj. Gen. Jay M. Garner, then the Army's assistant deputy chief of staff for Operations and Plans (Force Development). In his comments, he dared to question the Air Force's need for the F-22 as did the CBO, the JCS, and the GAO.

As a soldier who has planned and executed joint exercises and operations over the years, I believe in jointness and the necessity of combined-arms warfare. I spent ten months in Saudi Arabia during Operation Desert Storm and was angered by Gen. Michael J. Dugan's "unjoints" allegations, prior to his relief, on how the war would be won from the air. Former Air Force Chief of Staff Gen. Merrill A. McPeak's partisan comments on how indeed the war was won by airpower alone also angered me.

More armored vehicles, trucks, and artillery pieces were destroyed in the 100-hour ground war by "lowly" ground forces while the dashing aviators in their trendy leather jackets took forty-five days to accomplish far less. Also it was the Army ground forces and rotary-wing aircraft that eliminated two of the three Iraqi early warning radar sites that allowed the first wave of more than 2,000 aircraft to penetrate Iraqi airspace undetected. Could it be that the stealthy F-117 was assisted by Army ground forces?

Let's face it. General McPeak drove "a stake through the heart of jointness" early in his tenure as Chief of Staff and continued to twist it in the heart of the Army by making a grab for the traditional Army missions of air defense, groundbased communications from space, and deep battle while diverting resources from close air support. He "picked the menu" for the

last four years; now the Air Force is in the pot.

Lt. Col. Mike Sidwell,
USA
Fort Monmouth, N. J.

I am amused but also troubled by the controversial and acrimonious commentaries over General Garner's remarks by my fellow professional military officers [*"On the Cannibals' Menu," December 1994 "Letters," p. 4*]. Setting aside whether General Garner's comment was appropriate or not, we, including AIR FORCE Magazine, should understand that it will take a balanced and orchestrated effort by all services with their unique forms of combat power to deter and defeat all threats to our national interests.

To say that "the nation should look outside the Air Force for further reductions in end strength," as General McPeak said, is just as inappropriate as saying that the F-22 program should be scrapped to fund the Army's RAH-66 program, as General Garner implied. To say that the Air Force and Navy are just "add ons" to the Army when it comes time to tally up a nation's military shows a lack of understanding of what makes up a nation's military power—its ability to deter war in a political crisis and, failing that, to be able to reach out and touch someone with cold steel and hot lead. . . .

While ground commanders may think that only tanks and infantry count in toppling an adversary's centers of gravity, we can't forget that airpower effectively denies enemy ground combat power the freedom of movement to sustain itself logistically in effective firing position and that seapower also denies logistical support and freedom of movement of the enemy's combat power not only on the high seas but also on land many miles from any ocean.

These actions of denying movement and logistical sustainment are key elements of a force's combat power. It is the defeat of ground combat power that ultimately determines political victory when an enemy is determined to fight with all means available. We must understand that the principles of war apply equally to all branches of service, that the quick and efficient destruction of our adversaries' combat power requires the unique capabilities of all services, that no service dominates in the equation of battlefield success, and that they all have limitations and weaknesses that preclude them from doing it alone.

AIR FORCE Magazine and its read-

ership would be wise to review the principles of war, the components of relative combat power, and how all services interrelate to fulfill Clausewitz's axiom that war's role is to obtain a political objective, not to claim a lion's share of credit. . . .

Maj. Tezeon Y. Wong,
USAR
Newbury, Ohio

"We have met the enemy, and he is us." At least the self-centered, inter-service, bickering letters I read each month in AIR FORCE Magazine lead me to that conclusion.

When I took the Oath, I promised to defend my country against all enemies, foreign and domestic. I have tried to do just that, but I have always defined the enemy before I engaged.

The worst mistake we in the service of this great country can make is to turn on each other in the misguided sense that we are somehow going to benefit our particular branch by pulling others down with us.

Let us define the real enemy and stop the childish harangue that can only be used against us by that enemy. That real enemy is the left-wing Congress led by a President who has never failed to show his true feelings for our military and the contempt he holds for us. . . .

Why not put our talents to use in a concerted effort among all services—Air Force, Army, Navy, Marines, and Coast Guard—to convince the conservative members of Congress and their staffs that the bloodletting has gone too far and that the safety of our country is truly at risk after the vicious cutbacks in men and women, machines, and reserve supplies so vital to success in combat?

You all (privates and generals) may rest assured that the carping letters you write are being compiled, cataloged, and utilized by the congressional staffers whose job it is to shoot holes in the defense budget. In combat, we don't supply the enemy. We interdict and cut off his supplies to weaken his forces. . . .

With the major shift to the political right in the recent elections, can't we all address our genuine fears and positive complaints to our representatives and senators to make them aware of the real issues at stake? They control the funding you squabble over. Your sister services do not. The real issues are the safety and survival of our country and its future welfare, as seen firsthand by you, the men and women pledged to defend her.

Maj. Henry A. Barkalow,
USAF (Ret.)
Hampton, Va.

Washington Watch

By John T. Correll, Editor in Chief

Roles and Missions Ride Again

Behind the melodrama in the headlines is a serious question: How do the individual services provide core fighting capabilities to a joint force commander?



IN OCTOBER, less than two weeks before he retired, Air Force Chief of Staff Gen. Merrill A. McPeak came out swinging on service roles and missions. In a remarkable speech to

the Heritage Foundation October 13, he suggested the cancellation of the Army's deep-attack missile system, the transfer of Army theater air defenses to the Air Force, and Air Force withdrawal from the close air support function.

General McPeak acknowledged that he had "just violated one of the cardinal rules of civil discourse within the Pentagon by questioning the need for a system being fielded by another service." His comments were surprising also because they were not directed primarily at the Navy—the Air Force's traditional rival for power projection and deep-attack roles—but at the Army.

The blunt-spoken McPeak continued to express his views in other statements and in interviews with the trade press. Predictably, the reaction was strong. Among those shooting back was Lt. Gen. Jay M. Garner of the US Army Space Command, who decried an "Air Force *über alles* mentality." (In August, General Garner made news himself by declaring that "airpower contributes at the margins" in battle and that air forces and navies are merely "add ons" to armies, which are "the foundation of nearly all national military forces.")

The other services oppose a bid the Air Force has had on the table for some time to formally take charge of military operations in space. The Air Force provides most of the money and manpower for space programs,

but for a variety of reasons—including a wary reluctance to depend on the Air Force—the Army and the Navy do not want to disband their own space commands.

Meanwhile, a congressionally mandated Commission on Roles and Missions continued to hear presentations from the services and to study the problem behind closed doors. Congress wants to eliminate functional overlaps in service missions, leading to presumed savings from consolidation. The commission is sifting a long list of issues, ranging from overseas presence to central logistics support. Its report is due in May 1995.

The roles and missions argument is far from settled and almost certainly will broaden before it plays out in Congress later this year. The similarity between Marine units and Army light infantry is a smoldering issue, as is the operation of fighter aircraft within the sea services by both the Navy and the Marine Corps. The classic roles and missions issue, of course, is how to divide the tactical airpower job between aircraft carriers and the landbased fighters and bombers of the US Air Force.

Fogleman Changes the Tempo

Gen. Ronald R. Fogleman, who succeeded General McPeak as Chief of Staff on October 26, is spreading the word that he wants to "take the high drama out" of the roles and missions debate. He told the Commission on Roles and Missions on December 14 that the Air Force would prefer to work the air defense integration problem "under existing ownership arrangements." General Fogleman has not picked up the proposal to abolish the Army's deep-strike missile program, choosing instead to emphasize the Air Force's "core competency" in deep attack. Furthermore, he said, the Air Force will continue to perform the close air support mission.

At the request of Adm. Jeremy M. Boorda, Chief of Naval Operations, General Fogleman also withdrew in November a paper the Air Force had

submitted to the commission on relative capabilities to project power and maintain "presence" abroad. The Navy claimed that the Air Force had gotten its facts and figures wrong. Particularly galling to Admiral Boorda was the contention that the Navy could provide as much presence with its air-capable amphibious ships as it could with large deck carriers. (By the end of this decade, the Navy will have twelve carriers and eleven air-capable amphibious ships.)

In his letter asking the commission to disregard the paper previously submitted, Maj. Gen. Charles D. Link, Air Force special assistant for Roles and Missions, said that "General Fogleman wishes to afford Admiral Boorda the opportunity to correct the information."

By late December, the Air Force and the other services had settled down to a truce of sorts on the issue with occasional shots fired back and forth.

The Four Battles

The services have always fought about roles and missions, but the argument was rekindled in 1986 by the Goldwater-Nichols Defense Reorganization Act, which required that every three years, the Chairman of the Joint Chiefs of Staff submit a full report on roles and missions. In July 1992, Sen. Sam Nunn (D-Ga.), then chairman of the Senate Armed Services Committee, added pressure to the requirement with his call for a "no-holds-barred, everything-on-the-table" review. Senator Nunn was particularly interested in the savings possible from eliminating some of the overlaps between services in the projection of airpower.

As demonstrated by working documents that leaked to the public, the internal Pentagon debate that winter was fierce. (General McPeak says that he made then the same arguments he is making now but was outvoted by the other service chiefs.) In the end, all of the services were able to preserve their turf. The roles and missions report that Gen. Colin L. Powell, Chairman of the Joint Chiefs

of Staff, delivered in February 1993 did not rock the boat very much.

Congress was not satisfied with that and as part of the next defense bill prescribed a comprehensive review of roles and missions by a commission of private citizens. That commission, chaired by Dr. John P. White of Harvard University, has been at work for almost a year.

In his presentation to the commissioners on December 14, General Fogleman stuck with a concept, introduced by General McPeak, that divides up the "battlespace" on the conventional battlefield into four parts: a rear battle, a close battle, a high battle, and a deep battle. As General McPeak explained it, the rear and close battles "revolve around seizing, holding, and securing ground" and are therefore jobs for a ground forces commander from the Army or the Marine Corps. "On the other hand, the air component commander should fight the high and deep battles," he said, anticipating that "the air commander will likely be an Air Force or Navy officer, depending on which service brings the most important resources to a particular fight."

The significance of this, General McPeak said, was that "how you allocate combat roles and support functions among the services should relate to how we fight on the battlefield." The four "battles" in the concept align roughly with the core competencies of the individual services, which provide forces and capabilities to the joint force commander.

Differences With the Army

Some of the most controversial McPeak proposals flowed from the "four battle" concept. He homed in on the Army Tactical Missile System (ATACMS), a \$6 billion program to attack fixed and moving targets deep in the enemy's rear. That, he said, is "a capability that airpower has provided for at least fifty years" and in any case is part of the deep battle to be fought by the air component commander. That is anathema to such officers as General Garner, who believes that Army shooters should handle much of the deep attack, including the primary firepower directed at Scud missile sites. The present ATACMS has a 100-kilometer range; an extended system, now in development, would reach 400 kilometers.

The Air Force still believes that General McPeak had a point when he said that "each service has an inherent right to self-defense, but over time, the exercise of this right has led to significant overlap in capabilities and to the world's most disintegrated

air defense system. As a result, we are spending a lot more for theater air defense than we need to and, even so, cannot be confident that our air defenses will be effective." Nevertheless, the Air Force will now work toward a solution that leaves ground defense batteries in Army hands.

The proposal to give up the close air support mission—and the force structure to go with it—did not sit well with the Army. The use of fixed-wing aircraft for close air support has been diminishing for some time. "In Desert Storm, ground commanders preferred to use their own artillery and attack helicopters while pushing fixed-wing aircraft far in advance of friendly lines," General McPeak said.

General Fogleman told the commission that the revised Air Force position regards fixed-wing close air support as "declining but still necessary" and that the Air Force will continue to provide it. That decision took on an extra dimension December 9 when the Pentagon announced that the Army's RAH-66 Comanche attack helicopter program had been "restructured" as a technology effort, leading to two flying prototypes but no production aircraft.

Ironically, General McPeak had been a vocal supporter of the Comanche. It was also McPeak who stopped an Air Force plan four years ago that would have retired the slow, low-flying A-10 close air support aircraft and concentrated the tactical air attack on the enemy's flanks and rear echelons with F-16s instead.

The Airpower Combination

In his briefing to the Roles and Missions Commission December 14, General Fogleman—figuring, perhaps, that the last thing he needed just then was another confrontation—touched lightly on a list of "other issues" that included overseas presence, the tactical air force mix, and force structure and munitions required for the deep battle.

Before the deed is done, however, much more will be heard of those "other issues" because the central questions in the roles and missions debate are about airpower, and especially about the relationship of carrier-based naval aviation and land-based Air Force fighters and bombers.

"All services recognize the pivotal role air and space capabilities play on the battlefield," General McPeak said at the Heritage Foundation. "So each service naturally wants its own capability to strike deep at the enemy, its own ability to defend against aerial attack, and so on. All this is natural and exactly what we would expect,

but as the defense budget drawdown begins to really hurt, the question for US armed forces becomes how much airpower independence the nation can afford for each of our services."

In fact, General McPeak says, "our nation has too much tacair," pointing out that "the United States has nearly twice as many fighter aircraft as any other nation." The combined programs of the services represent more tactical airpower than the nation needs or can afford, he says. What hit the headlines, though, was General McPeak's proposal "to transfer enough Marine Corps F/A-18 squadrons to the Navy to fill out their carrier air wings and retire the remaining Marine F/A-18s." Retiring six of these squadrons would save up to \$230 million a year.

(Although it has not yet become a burning public issue, the airpower partnership of the Navy and the Marine Corps is a testy one. "The Marines are averse to relying solely on carrier-based airpower," a Congressional Research Service report said in 1993. "Their major concern is the carrier's style of launching, recovering, and rearming aircraft on deck. To highlight this concern, the Marines cite a Navy study showing it would require 366 carrier-based F/A-18s" to "generate the same number of sorties as seventy-five shore-based aircraft in a high-threat environment.")

Brig. Gen. John Costello, head of the Army's roles and missions team, told the *Washington Post* that "the Air Force has made some attractive cost-saving recommendations—at the expense of the other services."

Contrary to the image of him painted by his critics, General McPeak readily accepted force and program cuts for his own service. He has said consistently that twenty fighter wing equivalents, down from thirty-six wings in 1990, are enough. He was willing to give up another two wings of fighter force structure if the Air Force shed the close air support role.

What General McPeak (and the Air Force) do push is the value of stealthy aircraft and precision guided munitions in modern warfare. In the Persian Gulf War, the Air Force's F-117 Stealth fighters flew only two percent of the combat sorties yet struck more than forty percent of the strategic targets. The Navy has no stealthy aircraft and has no programs in progress to acquire any. The top aircraft operating from its carrier decks for some time to come will be an upgraded model of the F/A-18.

"Forward . . . From the Sea"

The Navy is acutely aware that landbased aircraft from the US Air

Force delivered ninety percent of the US precision guided munitions and seventy-two percent of the US gravity bombs in the Gulf War.

A year after that, the Navy announced that it was shelving its ambitious "Maritime Strategy" in favor of a concept called "From the Sea," which concentrated on operations along the littorals and coastlines of continents. In September 1994, the Navy replaced that concept with an "updated, expanded, and amplified" strategy called "Forward . . . From the Sea." The main difference is the emphasis on forward presence.

The change was stimulated, apparently, by the Bottom-Up Review conclusion that ten carriers would be enough for the Navy's part of fighting two major regional conflicts simultaneously but that additional carriers would be needed if that strategy were overlaid by a naval-oriented presence mission.

"Littoral" was not defined precisely in the previous concept but was assumed to mean land in the general vicinity of the shoreline. According to an article in *Naval Institute Proceedings* in October, however, the new Navy Doctrine Command has now redefined "littoral" to include "the portion of the world's land masses adjacent to the oceans within direct control of and vulnerable to the striking power of seabased forces." As the author notes, the submarine-launched D5 missile would make the entire world a littoral by that definition.

It is "presence," therefore, that justifies two of the twelve carriers in the Navy's long-range plan. It is a deep definition of "littoral" that supports the requirement for long-range strike aircraft to operate from those carriers. Using amphibious ships instead for naval presence undercuts the requirement for additional carriers. Furthermore, since amphibious ships cannot accommodate larger aircraft, the most likely fighters to be thus deployed would be Marine Corps AV-8B Harriers, which lack the range to cover extremely deep littorals.

In a letter to General Fogleman December 12, Admiral Boorda said that carriers and air-capable amphibious ships "have fundamentally different missions and are not interchangeable except in operations at the lowest level of the spectrum."

A curiosity in this argument is that Adm. William A. Owens, vice chairman of the Joint Chiefs of Staff, has installed outside his Pentagon office a large model of a "mobile offshore base." It consists of oil rig platforms—

modules that are 500 feet long and 300 feet wide—bolted together to form a landing strip on top with port, warehouse, and living facilities below. The model in the Pentagon hallway has more than thirty aircraft, mostly helicopters and fighters, parked along the runway. Literature available nearby lists a number of primary missions, beginning with "forward projection of US deterrent capability."

Allegations of Humility

The standard accusation is that General McPeak—unlike those from humbler services—sought to put the Air Force first. As a matter of fact, none of the services has a monopoly on parochialism.

"The crux of the matter is that Gen. Merrill McPeak and many of his mentors, followers, and supporters believe that the Air Force can win wars, that firepower from the air will drive an enemy into submission," Gen. Frederick J. Kroesen, USA (Ret.), senior fellow, Institute of Land Warfare, Association of the US Army, wrote to the *Washington Post* in November 1994.

No sooner had General Kroesen thus flayed General McPeak for parochialism than he declared, "The recent air campaign against Iraqi forces gained not a single one of the US or UN objectives in the Persian Gulf War. Four days of land combat—aided immeasurably by the air campaign—achieved every goal and victory."

This same view of the Gulf War is found in *Certain Victory*, a report published by the Army in 1993. "Desert Storm confirmed that the nature of war has not changed," it said. "The strategic core of joint warfare is ultimately decisive land combat."

(As indicated by General Kroesen, the Gulf War experience hangs over the roles and missions debate, but most people will not remember the facts of it the way he does. This was the conflict, for example, in which airpower destroyed Iraq's command-and-control system the first day, closed down the supply routes, kept the world's sixth largest air force from flying, destroyed sixty percent of the enemy's tanks and artillery before the ground war started, and induced large numbers of Iraqis to surrender rather than endure more bombing.)

The Air Force has made the case that overseas presence is a shared mission and that its bombers and fighters, stationed within the theater or deploying from the US, are another means by which presence can

be achieved. In some instances, long-range aircraft from the United States will be the first US forces to reach a crisis area.

Adm. Leighton W. Smith, Jr., prime architect of the "From the Sea" strategy, told the Newport News *Daily Press* that landbased airpower from the United States "in any way, shape, or form, is not forward presence. I don't care what you do, how you color that son of a bitch, it is not forward presence."

The full pride of the Navy was expressed in a staff commentary attached to Admiral Boorda's letter to General Fogleman. "Naval forces, and carriers in particular, are most frequently the force of choice to respond to emerging crises," it said. "They are flexible, sovereign, sustainable, and arrive ready for combat."

Generally overlooked in all the hue and cry is that the basic Air Force pitch is to put joint considerations first and focus on the core competencies that the air, land, and sea components can provide. That is the idea behind the functional division of battle space in the four-battle concept.

"Most of the contentious issues between the services revolve around different notions of joint warfighting," General Fogleman said in his briefing to the Roles and Missions Commission. For example, he said, "the Army is devoted to the land battle [and] proceeds from the assumption that joint warfighting is about how components bring expertise and capabilities to bear in support of the land battle."

"The Air Force understands that it can't do everything" and "does not wish to be placed in the position of defending its abilities to win wars unilaterally," said General Link, the Air Force's point man on roles and missions for both McPeak and Fogleman.

McPeak at his McPeakiest said the same thing. "We simply cannot afford to configure each service's combat forces for sustained, independent operations," he said in the Heritage Foundation speech. "In the final analysis, jointness means depending on one another."

"The Air Force can perform key roles independent of other forces, but it is generally employed jointly with the other services," General Fogleman said in his briefing to the commission. Among the leading imperatives, he said, is the need to "focus on core competencies for best investment leverage" and to "build mutual trust." ■

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Aerospace World

By Suzann Chapman, Associate Editor

Fogleman Seeks to Ease Operations Tempo

Gen. Ronald R. Fogleman, during his first European visit as Air Force Chief of Staff, announced new initiatives to reduce the operations tempo for US Air Forces in Europe.

These initiatives include such measures as using F-15s from Alaska to relieve heavily tasked F-15Es based at RAF Lakenheath, UK, the General said during a December 5 stop at Ramstein AB, Germany.

Since the Persian Gulf War, USAFE units have supported five other contingency operations, often simultaneously.

General Fogleman said the Air Force will look at using active-duty units from other theaters and will continue USAFE's use of Air National Guard and Reserve units.

"I'm encouraged by the flexibility the Guard and Reserve are showing in covering extended TDYs here in the European theater," he said. "We are going to become more dependent on our Guard and Reserve forces."

B-1B Exceeds Congressional Goal

In a critical new readiness test, the B-1B far surpassed all of its major goals, USAF announced.

Congress decided to put the B-1B to the test when the Air Force said shortages in spare parts and personnel caused the new bomber to suffer relatively low mission capable rates. The lawmakers directed the Air Force to conduct a broad operational readiness assessment (ORA). The test B-1B force was to get full supplies of spares and support crews. In return, it was to achieve and maintain a mission capable rate of at least seventy-five percent.

In the six-month ORA, conducted by the 28th Bomb Wing, Ellsworth AFB, S. D., the wing achieved a cumulative mission capable rate of eighty-five percent, said Gen. John Michael Loh, commander of Air Combat Command. As a result, the General expects to get the support needed in the future, including an upgrade to

give B-1s a precision weapons capability and enough funding to retain ninety-five of the aircraft in fully operational condition.

The ORA included a two-week deployment to Roswell, N. M., to simulate a wartime environment. During the deployment, B-1 crews maintained round-the-clock operations, flying the same number of missions they would in wartime. According to General Loh, the wing performed flawlessly under combat surge conditions: "Every sortie scheduled was flown and was effective, which is remarkable for any airplane."

Lt. Col. Thomas Owskey, commander of the 700-person deployed B-1B unit, said, "We flew 109 of 109 scheduled sorties. It just doesn't get any better than that."

C-17 Aces Ops Test

The C-17, USAF's newest airlifter, has demonstrated its capability to operate from small, austere airfields with unpaved runways in the southwestern United States. The round of tests held last November included landings, takeoffs, and various ground maneuvers conducted at three unpaved runways and one aluminum-matted runway, the Air Force reported.

The C-17 managed successful takeoffs and landings with three gross weights: 340,000, 395,000, and 423,000 pounds. The landings included a touchdown at approximately ten feet per second with a 93,000-pound M60 tank aboard, followed by an offload and onload of the tank, then redeparture. Ground maneuvers also included backing and a 180-degree star turn on a ninety-foot-wide unpaved runway.

Test data will be used to complete specification compliance testing during the C-17 program's development phase. According to Air Mobility Command officials, test managers said remote airfield testing was "very satisfactory."

Chief Wins Allen Trophy

CMSgt. Robert D. Harbin, NCO in charge of maintenance for the 523d

Fighter Squadron, Cannon AFB, N. M., won the USAF-wide 1994 Gen. Lew Allen, Jr., Trophy.

"Although it's an award for myself, it certainly represents all the good folks who work real hard in the squadron," said Chief Harbin. "Without them, I couldn't have won the award."

The Air Force Chief of Staff sponsors the trophy annually to recognize officers and enlisted members who excel in career fields that directly support aircraft sortie generation.

Personnel Systems Reviewed

Air Force Chief of Staff Gen. Ronald R. Fogleman initiated a new study of the evaluation and assignment systems to determine how they fit the current downsized and restructured environment.

The officer system review began in December, followed by the enlisted system review in January.

"Since we have had some confirmed improprieties with the Officer Evaluation System and have experienced vacancies in critical positions over the last several months, we will focus on the officer evaluation and voluntary assignment system first," said General Fogleman.

A special officer review group held its first full meeting December 13 at Air Force Military Personnel Center, Randolph AFB, Tex.

The General said in a message to Air Force units that the reviews would attempt to get a broad cross section of input from command, grade, and duty areas. He said that they "want to get grass-roots input from raters, ratees, and users on perceptions, problems, and potential improvements."

Charges Against F-15 Pilot Dropped

The Air Force has dropped negligent homicide and dereliction of duty charges against Lt. Col. Randy W. May, an F-15 pilot, for his role in the accidental 1994 shootdown of two Army UH-60 Black Hawk helicopters over northern Iraq.

Maj. Gen. Eugene D. Santarelli, commander of USAFE's 17th Air

Force, dismissed the charges in mid-December.

The charges had resulted from an Air Force investigation last summer, at the conclusion of which General Santarelli opened an Article 32 hearing on whether Colonel May should face a court-martial. On November 22, USAFE announced that Col. Edward M. Starr, the investigating judge, had recommended against a court-martial. General Santarelli decided to accept Colonel Starr's recommendation.

Colonel May and Capt. Eric A. Wickson, another F-15 pilot, shot down the two helicopters on April 14, 1994, mistaking them for Soviet-made Iraqi Mi-24 "Hinds" violating the no-fly zone airspace. No charges were filed against Captain Wickson.

Colonel May, a decorated nineteen-year veteran, said his decision to fire was the last action in a long chain of errors. Even after the dismissal of charges, he still faced possible disciplinary action, said an Air Force spokesman.

AWACS Officer Faces Court-Martial

In another case growing out of the Black Hawk affair, the Air Force decided to press ahead with a court-martial for one officer who was aboard an E-3 Airborne Warning and Control System (AWACS) aircraft involved in the accident.

Lt. Gen. Stephen B. Croker, 8th Air Force commander, in mid-December referred Capt. Jim Wang for court-martial on three counts of dereliction of duty, the Air Force announced. Captain Wang was the officer in charge of controllers aboard the E-3.

General Croker dropped charges against four other officers on the aircraft.

In a statement, Captain Wang said that he was not derelict in his duty. "I acted in accordance with the training I received and with the tools I was provided. Failures that occurred were the result of systemic failures in the operation to which I was deployed," he asserted.

Captain Wang said Operation Provide Comfort, the enforcement of the no-fly zone over northern Iraq, was "tremendously flawed and destined for tragedy."

The Pentagon's accident investigation said five AWACS crew members failed to respond to data indicating the Black Hawks were US, not Iraqi, helicopters and failed to inform the F-15 pilots of the location and identity of the Black Hawks.

USAF Plans Civilian Reductions

The Air Force announced December 8 that it will cut about 11,700 civilian jobs in Fiscal Year 1995 in what it views as the first phase of a planned 38,000-civilian-job reduction. The jobs cover about sixty Stateside bases.

Officials said that the Air Force hopes to achieve the reductions through voluntary incentive programs, normal attrition, and retirements.

According to Air Force officials, the service will try to help civilians who leave through voluntary or involuntary means to find new jobs through the Defense Department's Priority Placement Program, referrals to other federal and state agencies, and private companies.

DoD Plans Treatment Centers

The Department of Defense announced it will establish specialized treatment centers to help investigate and care for Persian Gulf War veterans afflicted with illnesses that have so far defied diagnosis. Officials said these veterans account for about fifteen percent of all cases of illness reported by those who served in the Gulf War.

At a December 13 Pentagon press briefing, Steven Joseph, assistant secretary of defense for Health Affairs, said the centers will be located at the Air Force's Wilford Hall Medical Center and the Brooke Army Medical Center in San Antonio, Tex.; Walter Reed Army Medical Center, Washington, D. C.; and National Naval Medical Center, Bethesda, Md.

Mr. Joseph presented preliminary findings of the Comprehensive Clinical Evaluation Program (CCEP), which has registered some 11,000 active-duty, Reserve, and National Guard members who served in the Gulf War. To date, evaluations of 1,019 persons—including fifty family members—indicate that about eighty-five percent have illnesses that are recognizable and treatable.

"We're really not clear yet as to what the diagnosis is" for the other fifteen percent, said Mr. Joseph. "Those are the people . . . for whom it's most important that we now set up these . . . specialized care centers."

DoD also will ask for an increase of \$15 million—\$20 million in its Fiscal 1996 budget proposal to help with research. According to a DoD press release, it will also pursue the following initiatives:

- Implement changes to deployment policies, such as evaluating in-

dividual health before and after deployment; providing preventive health information on potential hazards; deploying medical experts early to assess population disease incidence, distribution, and control; and enhancing family support systems.

- Conduct population and clinical investigations to identify potentially unifying diagnoses or common causes for the "unexplained illnesses" possibly related to the Gulf War and work with independent agencies to review these investigations.

- Study the role of stress in the military environment, including deployments.

- Continue to work closely with the Veterans Administration to evaluate and treat people with health-care problems possibly related to the Gulf War.

"No Single Agent" Finding Supported

Initial results from DoD's CCEP support earlier independent findings that there is "no clinical evidence for a single or unique agent causing a 'Gulf War Illness.'"

The National Institutes of Health Technology Workshop Panel and the Defense Science Board Task Force on Persian Gulf War Health Effects had earlier reported that many veterans suffer from not a single disease or apparent syndrome but rather "multiple illnesses with overlapping symptoms and causes."

To ensure a comprehensive review, the Pentagon provided an early version of the CCEP's findings to the Institute of Medicine of the National Academy of Sciences for its expert evaluation and recommendations. The institute has selected a panel of experts from across the country to review progress of DoD's evaluation process and findings.

The Defense Department expects the next group of fully evaluated results, based on several thousand additional CCEP patients, to be ready in the spring. Again, DoD will ask the institute to review the findings and contribute recommendations for additional screening tests as well as evaluation process modifications.

The CCEP provides an in-depth medical evaluation of DoD beneficiaries who are experiencing illnesses that may be related to service in the Persian Gulf War.

ANG, AFRES to Draw Down

The Department of Defense announced that the force structure for Air Force Selected Reserve, which



Hatch Ending Tour at AFA; Search for Successor Begins

Gen. Monroe W. Hatch, Jr., USAF (Ret.), Executive Director of the Air Force Association and the Aerospace Education Foundation since 1990, has announced plans to step down this fall after five years in the position. The Executive Committee of the Association had asked General Hatch to extend his tour with AFA, but he declined for personal reasons, including the desire for more free time to spend with his family.

A search committee has been appointed to identify possible candidates to replace General Hatch. The committee consists of Gen. Russell E. Dougherty, USAF (Ret.), Martin H. Harris, and CMSgt. Walter E. Scott, USAF (Ret.). All three are national directors of the Air Force Association. Those wishing to be considered by the search committee must submit their requests in writing to:

AFA Executive Director Search Committee
P.O. Box 17306
Arlington, VA 22216

Before joining AFA in October 1990, General Hatch spent thirty-five years in the US Air Force, completing his service as Vice Chief of Staff. General Hatch plans to end his tour with the Association September 30, 1995.

includes Category A unit Reservists and Category E Individual Mobilization Augmentees, will drop 3,400 positions between Fiscal 1995 and 1999.

These cuts come on top of the Selected Reserve force-structure reduction of 2,900 positions, from 87,700 in Fiscal 1994 to 84,800 in Fiscal 1995.

Reserve force structure is the total number of positions required to support established units and individuals in the active-duty force.

The Reserve's end strength—the number of positions authorized and funded by Congress—dropped from 81,500 positions in Fiscal 1994 to 78,700 in Fiscal 1995. The projected end strength for Fiscal 1999 is 73,300.

The Air National Guard will lose 700 positions in Fiscal 1995 and another 2,100 by Fiscal 1999, leaving 117,200.

Reserve Still Recruiting

Despite reductions, the Air Force Reserve, just like the active-duty Air Force, is still looking for qualified applicants, especially those with prior service who are already trained.

According to AFRES statistics, some 10,000 Reservists exit each year, and the Reserve must recruit replacements and find others to support changing roles and missions.

Panama Riots Injure Airmen

Fifty-seven Air Force service members and seventeen Cubans were injured during refugee riots at Operation Safe Haven camps in Panama in December. Some thirty of those wounded were hospitalized.

Air Force officials said that most of the injuries were not serious and all but a few of the injured service members returned to duty. Most of the injured airmen were Security Police.

The disturbances started December 7, when about 300 Cubans from two refugee camps broke through camp gates, throwing rocks and damaging military vehicles.

US Army military police and Air Force Security Police restored order two days later. US forces made no direct contact with the Cubans and did not use weapons, according to US officials. The four Safe Haven community camps each hold about 2,100 people.

Quick Fix Avoids F-111 Grounding

USAF officials report that an innovative engine-servicing procedure prevented a lengthy grounding of some F-111 fighters and saved the Air Force more than \$500,000.

Following two mishaps within two months involving a TF30-P-109 engine on Cannon AFB, N. M., F-111E aircraft, maintenance officials at the base recommended a precautionary stand-down for the Cannon F-111Es and EF-111As. Both aircraft use the TF30-P-109 engine.

A safety report revealed that a parts mismatch between two air seals and a fan disk caused fan blade vibrations, leading to the engine failures. Maintenance crews faced the task of disassembling 118 engines for inspection, which they estimated could take three months.

Three days into the inspections, propulsion flight specialists found they could identify numbers on the sus-

pect parts by using a video borescope. The instrument is commonly used to check internal engine conditions. Using the video borescope, maintenance crews checked all the engines within fifty-four hours. They returned ninety-eight engines to service without having to tear them down. Via telephone, Cannon technicians also instructed deployed technicians on how to borescope EF-111 engines in the Middle East and Turkey.

Loh Lauds B-2, F-22 Systems

Gen. John Michael Loh, commander of Air Combat Command, plans to use the B-2, the Air Force's new, stealthy bomber, in actual combat contingencies and training exercises in 1995.

"The B-2 program is going very, very well," General Loh said in an interview with ACC's news service last December. "We now have four operational aircraft. . . . I intend to put the B-2 in Red Flag in 1995 and make it available for some limited operational contingencies if it's needed."

Current Defense Department plans call for acquisition of twenty of the revolutionary B-2s, with initial operational capability slated for 1997.

While the B-2 is the newest asset for global power projection, the General also said that the F-22 program is ACC's number one priority for modernization "because of what it means for achieving air superiority in the future."

C-17 Readiness Review Ends

The 437th Airlift Wing flew 114 sorties and logged 522 hours during a fourteen-day review designed to

assess the C-17 lifter's operational capabilities in peacetime and war-time situations.

The wing operated six primary C-17s and one backup in the November test, marking the first time for many support crews to turn numerous C-17s in an operational setting, according to Lt. Col. Dale Shrader, 437th AW director of C-17 evaluation planning. "The airplane performed, and the system supported it."

ANG Mechanic Invents Tool

TSgt. Erwin "John" Woodshank, Jr., a Nebraska Air National Guard jet engine mechanic, used his twenty-six years of experience to create a tool and adapt a process from the RF-4C to dramatically reduce cost and time for engine trims on the KC-135R.

The prototype tool costs about \$70. It takes ten minutes to install on all four KC-135R engines. When it has been installed, mechanics in the cockpit start the engines, then mechanics on the ground perform trim checks on two engines at once and then the other two engines, all without having to shut down the engines or open their covers.

The Air Force's standard method for KC-135R engine trims employs a remote power trimmer that costs \$5,650. The remote trimmer requires each of the aircraft's engines to be shut down, and adjustments can only be made on one engine at a time.

Sergeant Woodshank said that another drawback of the remote trimmer is that it often breaks and is not as accurate as his invention. "My tool won't wear out or need maintenance because of its mechanical makeup," he said. "This tool also puts trim adjustments right on the money. It's not a guess. It's exact."

The tool is being tested by jet engine technicians at Tinker AFB, Okla. Officials said it has already saved the Nebraska ANG and other ANG units thousands of dollars and could save the Air Force millions.

USAF Seeks New Space System

The Air Force, looking beyond previously announced early warning satellite programs, has asked potential suppliers to step forward with their ideas for a new Spacebased Infrared (SBIR) system.

An Air Force announcement in *Commerce Business Daily* said that the new system would not be "a continuation of previous efforts to develop a follow-on to the Defense Support Program (DSP)," a reference to

two ill-fated satellite programs, the Follow-On Early Warning System and the Alert, Locate, and Report Missiles system.

The Air Force will hold a competition for engineering and manufacturing development, which consists of two phases. The first includes performance, cost, and requirements and development of candidate solutions. This phase also includes developing options to make the transition from DSP to SBIR. Based on results of this phase, the Air Force will narrow the field.

In the second EMD phase, a single contractor team will finalize a selected design, validate manufacturing and production processes, and test and evaluate the SBIR system. The contractor team will also conduct an assessment and plan for integration of a low-Earth orbit component for the SBIR system in the next decade.

New Force-Structure Changes Released

The Air Force announced in November that it plans additional force-structure changes for Air Combat Command and the Air Force Reserve.

Under the 1995 Defense Authorization Act, the 2d Bomb Wing, Barksdale AFB, La., officially gained eight B-52H aircraft. This gave the wing an official authorization total of forty B-52Hs and increased its military manpower by 367 people. The 917th BW, an Air Force Reserve unit at Barksdale, maintained its eight B-52Hs with no change in manpower.

At Dyess AFB, Tex., the 7th Wing converted two B-1Bs to reconstitution reserve status, which reduced wing manpower by sixty people. The 28th BW, Ellsworth AFB, S. D., will convert twelve B-1Bs to reconstitution reserve status early this year, cutting manpower at the base by 428 people.

According to Air Force officials, reducing the number of B-1s funded for flying at these two wings will help pay for the bomber's conventional upgrade program. They added that the B-1s will be ready for mobilization, replacement, or reconstitution, if needed.

Based on overall force-structure reductions, the Air Force needs fewer ground radar elements to support theater forces, so it plans to inactivate the 83d Air Control Squadron, Holloman AFB, N. M. This will decrease military manpower at the base by 112 people.

To meet the standards of the 1995

Defense Authorization Act, the Air Force plans to assign ten additional B-52H bombers to the 5th BW, Minot AFB, N. D., bringing its total to twenty-six and increasing its manpower by 524 people. Previous announcements associated with the Defense Nuclear Posture Review and the 1993 Defense Base Realignment and Closure Act gave the 5th BW eight aircraft instead of ten.

The Air Force Reserve's first associate KC-135 unit, designated the 931st Air Refueling Group, will activate at McConnell AFB, Kan., increasing manpower at the base by 424 drill and 125 full-time civilian authorizations. Plans call for the wing to be fully operational with two squadrons by late 1996.

USAF Earns Charge Card Refunds

The Air Force was refunded \$1.3 million in the first year of a new agreement with American Express. The Air Force distributed that money among the major commands to help offset appropriated-fund travel expenses.

This "sponsor refund" returns one-sixth of a penny for every dollar charged. However, an Air Force official said, the refund is given only for charges made with the card. Automatic teller machine cash advances and traveler's checks don't count toward the refund.

An additional incentive program, the "productivity refund," started at the end of December 1994. During the first year of official government American Express card use, the company collected data on speed of payments and delinquency rates. After comparing those figures with this year's, the company will determine a productivity refund based on interest expense savings for American Express—calculated on improvement in the speed of bill payment.

American Express will refund eighty percent of the cash value of interest savings directly to each major command. The faster people pay their bills, the greater the refund.

Eyes and Ears Meet in Gulf

Crosstalk about missions in southwest Asia brought Rivet Joint and AWACS crews together to conduct joint debriefs with associated fighter crews.

The RC-135 Rivet Joint and E-3A AWACS form a battle management information team providing critical data to the warfighter, said USAF officials. Each aircraft has unique capabilities that provide battlefield commanders, weapons controllers, and

cockpit crews with real-time information on which to base split-second combat decisions.

"They have the eyes, and we have the ears," said Brig. Gen. Thomas J. Keck, commander of 55th Wing and its RC-135s. "Working together, we can provide warfighters with a battlefield information picture that's crystal clear."

Beyond the joint debriefings, Rivet Joint and AWACS crews plan to expand their knowledge of each other's systems and take briefing teams to the combat users to explain their processes and gain direct feedback. They also plan to conduct joint training missions and personnel exchanges.

Flare Caused Gunship Crash

Air Force Special Operations Command safety officials said that the crash of an AC-130H gunship last March was caused by the explosion of a three-pound marker flare that got stuck in the barrel of an on-board 105-mm howitzer.

The officials revealed their findings in a December addendum to the initial accident report issued last July.

Seven crew members died, and six survived the crash, which occurred in the Indian Ocean about seventy-five miles northeast of Malindi, Kenya. The Air Force never found the body of a fourteenth crew member.

The crew and aircraft, assigned to the 16th Special Operations Squadron, Hurlburt Field, Fla., was on its daily patrol mission supporting the United Nations humanitarian relief effort in Somalia.

Following the initial accident report, the AFSOC commander started an investigation to test whether dispensing markers from the aircraft could have caused the crash. AFSOC officials said that although it was not an approved procedure, gunship crews had routinely dispensed the flares from the howitzers to use as targets to align weapons when they were not over a land range.

Test firings conducted by the Air Force Wright Laboratory at Eglin AFB, Fla., produced markings inside a 105-mm barrel nearly identical to those found in the downed aircraft. Further analysis by Benet Laboratories in Watervliet, N. Y., supported the theory that a flare had exploded in the howitzer barrel.

AFSOC officials say they have prohibited use of the howitzer barrel to dispense marker flares since the start of the accident investigation.

More Bases to Close

The rate of reduction in Air Force bases has not kept pace with reduc-

tions in force structure, budget, and end strength, according to Rodney A. Coleman, assistant secretary of the Air Force for Manpower, Reserve Affairs, Installations, and Environment. The Air Force has closed only about fifteen percent of its bases, while other parts of its structure have been cut by at least thirty percent.

Mr. Coleman gave details of the comparison to a Kansas City, Mo., community conference in October:

- The Air Force budget is down approximately thirty percent since a peak of \$115 billion in Fiscal 1985.

- Fighter force structure, the common measure of air forces, is down thirty percent from its Fiscal 1988 post-Vietnam peak.

- Active-duty end strength is down thirty-five percent from its 1986 peak of 608,199.

Mr. Coleman, a former General Motors executive, took part in the automotive giant's closure of some thirty plants. Applying similar metrics to measuring Air Force "plant" size, such as plant replacement value, calculations show that the Air Force has reduced the total plant by about fifteen percent through the first three rounds of base closures in 1989, 1991, and 1993.

"It is, therefore, easy to reach the inescapable conclusion that we must close additional bases," said Mr. Coleman.

Conversion Proceeds Apace

Through the first three rounds of closure actions, the Air Force identified twenty-seven installations for closure or major realignment. So far it has closed or realigned nineteen bases, some of which are already being converted for civilian use.

Mr. Coleman said local communities now hold fifty-one percent of the property from round one closures in 1989 and thirty percent from round two in 1991. More than 5,600 new jobs have been created so far at seventeen bases.

He added that several reuse plans project a net gain in jobs within five years of base closure.

"Classroom Without Walls"

To cope with its reduced work force and budgets, the Air Force Institute of Technology has introduced a video-teleseminar, a live, one-way video with two-way audio interaction, via satellite network.

According to AFIT officials, this new delivery medium, using high-quality, full-motion compressed digital video, has increased the number of students trained per year from 300 in-residence students for AFIT's first

course to 3,000, with no decline in academic performance.

AFIT has saved \$5.5 million and more than twenty-five man-years in travel time for the students.

The dollar savings will offset the cost of the Air Force's Air Technology Network (ATN), part of a single satellite network that can reach all DoD agencies. In addition to the initial uplink capability at Wright-Patterson AFB, Ohio, the Air Force will install uplinks at Keesler AFB, Miss., Sheppard AFB, Tex., and Maxwell AFB, Ala. Every Air Force base will have downlink capability.

Air Education and Training Command has already begun using the ATN. AETC broadcast a KC-135 maintenance course in mid-November to four bases, then conducted a C-130 maintenance course on November 30, reaching students at Pope AFB, N. C., and six Reserve units.

USAF Recycling Pays Off

Next year, 100 percent of Air Force installations will recycle solid waste, according to Thomas W. L. McCall, Jr., the new deputy assistant secretary of the Air Force for Environment, Safety, and Occupational Health.

Bases save money by reducing the amount of garbage they produce and can earn money from commodity brokers for material formerly thrown away.

For example, Whiteman AFB, Mo., reduced the amount of garbage it produced by fifty percent over a two-year period. Tinker AFB, Okla., recycled 5,000 tons of metal, wood, and tires. A composting program at Seymour Johnson AFB, N. C., saves more than \$21,000 per year. The Air Force Academy reduced garbage by ten percent with an estimated savings of \$230,000.

Air Force Center for Environmental Excellence officials said that at least fifty percent of the paper and ten percent of the nonpaper products the Air Force buys contain recycled material.

ANG Crew Saves Ukrainian Seaman

An HH-60G helicopter aircrew from the New York ANG's 106th Rescue Group, F. S. Gabreski IAP, hoisted a Ukrainian seaman to safety in December, nearly two days after his freighter sank in stormy seas 750 miles off the coast of Nova Scotia.

According to the Coast Guard, twenty-nine other seamen had been aboard the freighter.

Although a Canadian Forces C-130 arrived on scene a few hours after the ship's crew began broadcasting

a distress signal, sixty-five-mile-per-hour winds and fifty-foot waves prevented immediate rescue attempts.

The next morning, the Coast Guard organized a joint search-and-rescue mission, using ten aircraft from the New York ANG, Marine Corps Reserve, USAF, and Canadian Forces.

After spotting the bodies of seven men and two empty life rafts and reporting the location to the Coast Guard, the 106th RG helicopter crew started back to base. A brightly colored object caught the eye of flight engineer TSgt. John Krulder. "It looked like a piece of the debris was waving at me," he said.

The rescued seamen said that two other men had been near him in the water. However, rescue forces reported only one other survivor.

Environmentalism Supports Mission

Thomas W. L. McCall, Jr., deputy assistant secretary of the Air Force for Environment, Safety, and Occupational Health, wants the Air Force to build a "pollution prevention ethic" throughout the service.

Pollution prevention is one of the tools to allow the Air Force to fulfill its mission, Mr. McCall told the Air Force News Service. "Protecting the environment goes hand-in-hand with accomplishing the mission, supporting our people, maintaining our readiness, and lowering the cost of doing business."

Air Force goals include eliminating the purchase of ozone-depleting

chemicals by the end of 1994, reducing the need for hazardous waste disposal by twenty-five percent, and cutting the need for solid waste disposal by thirty percent by 1996. The Air Force has budgeted \$160 million to fund the pollution prevention program objectives.

AFRES Tests Oil-Spill Response

Only the finalizing of unit tasking codes remains before oil dispersal becomes an official military mission, according to Air Force Reserve officials.

The military necessity became only too apparent as a result of the massive crude-oil contamination of the Persian Gulf during Operation Desert Storm.

In December, AFRES's 910th Airlift Wing, DoD's only fixed-wing aerial spray unit, demonstrated its ability to keep US coastal waters clean after an oil spill.

During three sweeps over Lake Pontchartrain, near New Orleans, La., the AFRES C-130 sprayed tiny drops of water from nozzles of its specially designed Modular Aerial Spray System. The plane can spray an oil dispersant at the rate of three to ten gallons per acre in ninety-foot-wide paths. It can treat up to 40,000 gallons of oil before having to refill its tanks.

Tanker Copilots Train, Save Money

Aircrews from the 458th Operations Group at McGuire AFB, N. J.,

began flying C-12F Hurons in November as part of their Companion Trainer Program.

The program allows tanker copilots to gain flying experience, strengthen their self-confidence, and develop their decision-making skills, according to Col. Robert Glass, the 458th Operations Group's commander.

"By using the C-12 . . . we save money not only by using a smaller aircraft but also by [not having to send] the copilots to another base for the necessary training," he said.

AFRES Helps Rescue Greek Seamen

In November an Air Force Reserve C-141 crew from McGuire AFB, N. J., returning to base after a weekend of flying, heard a distress call from a Greek-registered cargo ship, sailing from the United States to Italy with a load of coal.

The aircraft crew found the burning ship, with its crew visible on deck, and then made three passes at 300 feet and dropped three life rafts.

Down to minimum safe fuel, the C-141 crew passed along information about the ship's location, as well as weather and sea conditions, to the Coast Guard, which picked up the ship's crew. One cargo ship crew member died in the incident.

"Year of Training" Heralded

Helping operational commands conduct their missions is one benefit of "Year of Training" initiatives, said Gen. Henry Viccellio, Jr., commander of Air Education and Training Command.

During a November trip, the General talked with Pacific Air Forces troops about the Mission-Ready Technician program. It provides in-depth technical training for future F-16 crew chiefs.

An airman completes the MRT program as a three-level crew chief certified on nearly 100 individual tasks involving the preparation and operation of the aircraft. "In this status, he or she can contribute to a unit's sortie-generation effort on the first day assigned," said General Viccellio.

He added, "A supervisor at Kunsan AB, [South] Korea, told me [that] in his view, MRT-certified people were arriving at the unit eight to ten months ahead in training compared to their contemporaries who were not certified."

CMSAF: Troops Not Complaining

The new Chief Master Sergeant of the Air Force, David J. Campanale,

Senior Staff Changes

RETIREMENTS: B/G Sebastian F. Coglitore, M/G John C. Fryer, Jr., M/G Raymond E. O'Mara.

CHANGES: B/G Donald G. Cook, from Cmdr., 21st Space Wing, Hq. AFSPC, Peterson AFB, Colo., to Cmdr., 45th Space Wing, and Dir., Eastern Range, AFSPC, Patrick AFB, Fla., replacing M/G Robert S. Dickman . . . M/G Robert S. Dickman, from Cmdr., 45th Space Wing, and Dir., Eastern Range, AFSPC, Patrick AFB, Fla., to Dir., Space Prgms., Ass't Sec'y of the Air Force for Acquisition, OSAF, Washington, D. C., replacing retired B/G Sebastian F. Coglitore . . . B/G Curtis H. Emery II, from Spec. Ass't to the Cmdr., USAFE, Incirlik AB, Turkey, to Ass't Dep. for Acquisition, Theater Missile Defense Ops., BMDO, OSD, Washington, D. C. . . . M/G Richard N. Goddard, from Dir., Log., Hq. USAFE, Ramstein AB, Germany, to Dir., Log., Hq. ACC, Langley AFB, Va., replacing M/G Ronald C. Spivey . . . B/G William R. Hodges, from IG, Hq. ACC, Langley AFB, Va., to Dir., Log., Hq. USAFE, Ramstein AB, Germany, replacing M/G Richard N. Goddard . . . M/G Philip W. Nuber, from Chief, Jt. US Mil. Mission for Aid to Turkey, USEUCOM, Ankara, Turkey, to Dir., DMA, Ass't Sec'y of Defense for C³I, OSD, Fairfax, Va., replacing retired M/G Raymond E. O'Mara.

SENIOR EXECUTIVE SERVICE CHANGE: Jon S. Ogg, to Dir. of Engineering, F-22, ASC, Hq. AFMC, Wright-Patterson AFB, Ohio, replacing Eric E. Abell. ■

says most Air Force members "are not complaining" about the demands of the highest operations tempo since the Berlin Airlift. Indeed, he said, "the vast majority enjoy the challenge."

He told the Air Force News Service, however, that the stress created by frequent and prolonged deployments is a problem for their families.

Although the Air Force now has family support centers to help families cope with stress, Chief Campanale believes more can be done to put people at ease about using these agencies. "I tell people that asking for help is not a sign of weakness," said Chief Campanale, "but a sign of strength."

Team Shoots to Save \$100 Million

An Air Force Materiel Command aircraft program management team claims that its innovative business practices will save the Air Force some \$100 million over the next ten years.

The team, which administers Air Force Contractor Logistics Support contracts for the C-21A airlifter, increased the contract period from five to ten years. This allowed potential contractors more time to absorb start-up costs and increased the number of vendors in the competition. The C-21A is used by almost all Air Force major commands.

By reviewing mission capable rates and other readiness indicators, the team also helped eliminate excessive requirements. This paved the way for competing companies to use commercial standards, rather than military specifications. As a third method to reduce costs, the team examined commercial fleet operations.

News Notes

■ In December, Defense Secretary William J. Perry took his first flight aboard a B-2 bomber, flying with the 509th Bomb Wing, Whiteman AFB, Mo. "When this wing is fully operational, it will be a fearsome capability," said the Secretary, who was the Pentagon's chief weapons development official during the Carter Administration and played a key role in the development of stealth aircraft, including the B-2.

■ The B-1B bomber, taking another step toward achieving a capability for global conventional operations, successfully dropped thirty inert CBU-89 cluster bombs during three passes in a test flight at Edwards AFB, Calif., said Gen. John Michael Loh, commander of Air Combat Command. Until last year when ACC began a program to have B-1s carry conventional clus-

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ter and precision guided munitions, the bomber could only drop Mk. 82, 500-pound, general-purpose bombs, which fall freely from the aircraft to the target.

■ *Reluctant Dragon*, assigned to Dyess AFB, Tex., became the first B-1B to surpass the 3,000-hour mark. Lt. Col. Doug Raaberg, 9th Bomb Squadron commander, who piloted the aircraft, said, "To put 3,000 hours on this airframe, tells me, and each

and every one of us here on the flight line, the airplane has many years to go and has a prominent role in our future aviation plans."

■ A Learjet under contract to the California Air National Guard crashed into a residential street in December, destroying an apartment complex and spreading fuel and fire as it approached the Fresno Airport about two miles away. The pilot and copilot, both civilians, were killed, and about

twenty persons on the ground were injured. Ed Winchester, Fresno chief of police, said that it appeared the pilot had taken extraordinary measures to avoid hitting a nearby school.

■ Some 190 members of the Air Force Reserve's 419th Fighter Wing, Hill AFB, Utah, deployed to Turkey in December as part of Operation Provide Comfort II, supplying F-16 fighters to patrol a northern Iraq security zone and protect Kurdish towns from Iraqi aggression. Wing officials said the deployment will last about ten weeks, but most Reservists will serve a thirty-five-day tour. Only a few will remain in Turkey for the entire deployment.

■ The USAF Thunderbirds demonstration team needs a commander/leader and two pilots for the 1996-97 demonstration year, said the Air Force Military Personnel Center. Applicants must be qualified for aviation service with at least 1,000 flying hours in jet fighters. The commander/leader must be a lieutenant colonel. Pilot applicants must have fewer than twelve years of active-duty experience. Military personnel flights have information needed for applicants to complete their packages, due by March 1, 1995.

■ Osan AB, South Korea, hosted the first-ever Pacific Air Forces bombing competition, Combat Spirit 1994, in December. F-16 and OA-10 aircrews participated. The Top Gun award went to Capt. Tim Saffold of the 25th Fighter Squadron, Osan AB.

■ To cover service members separated throughout the drawdown, DoD officials said the "Troops to Teachers" program [see "Troops to Teachers," June 1994 "Aerospace World," p. 16] is now open to veterans discharged or retired since October 1990. Initially, only service members who separated after January 1994, when DoD established the Teacher and Teacher's Aide Placement Assistance Program, could apply.

■ Commissary shoppers may use their credit cards at Keesler AFB, Miss., as part of a Defense Commissary Agency pilot program to accept Visa and MasterCard at selected stores. DeCA will accept the credit cards at six commissaries, including some Navy, Army, and Marine Corps facilities, for about thirty to sixty days, then review the program for possible expansion.

■ Using their new night vision goggles and handheld infrared pointers allows 55th Fighter Squadron pilots at Shaw AFB, N. C., to locate ground targets faster and easier, according to SSgt. Gary Parks, 55th FS enlisted tactical air controller. The pilots and ground team using the goggles see a pencil-thin, infrared beam created by a ground commander's pointer aimed at the target. Capt. Rob Givens, an A-10 pilot, said that the system enables the squadron to provide close air support twenty-four hours a day with a better chance to distinguish an enemy position from a friendly one.

■ Incirlik AB, Turkey, opened its new \$24 million runway in December, paving the way for Operation Provide Comfort assets to operate again from one location. The base's old runway, built in the 1950s, began cracking after forty years of use and increased activity during Operations Desert Shield, Desert Storm, and Provide Comfort. Normally, one C-141 and one C-5 would fly into Incirlik each week. When the runway became unusable by large aircraft, seven C-130 missions had to be flown to compensate. Construction of the new runway began last June.

■ Hollywood's "Top Gun," actor Tom Cruise, visited Osan AB, South Korea, in December while on a promotional tour for a new movie. Capt. Tom Abbott, a 36th Fighter Squadron pilot, took the star for an orientation ride in an F-16.

■ The Scientific Advisory Board celebrated its fiftieth anniversary in December. In 1944, Gen. Henry "Hap" Arnold asked Theodore von Kármán to form a group of "practical scientists" to study how the Army Air Forces could benefit from technology. Dr. von Kármán so impressed General Arnold with the resulting eleven-volume report that the General asked von Kármán and the group to become permanent advisors.

■ Starting in Fiscal 1995, the Air Force will promote 180 additional people under the Stripes for Exceptional Performers program. Last year the Air Force promoted only 243 airmen under the program, the lowest number since STEP started in 1982. Air Force Chief of Staff Gen. Ronald R. Fogleman approved the increase in response to concerns from commanders and Senior Enlisted Advisors.

■ B-52 flight training entered a new era in November when Barksdale AFB, La., began teaching its first class of pilots to fly the heavy bomber. The mission to train B-52 pilots, navigators, radar navigators, and electronic warfare officers transferred to Barksdale when Castle AFB, Calif., closed.

■ The vice chief of staff of the Air Force, Gen. Thomas S. Moorman, Jr., received the Order of the Sword from Air Force Space Command's enlisted force in November. This is only the third time the command has given the award. General Moorman said he is "an unabashed supporter of the enlisted force because [it is] absolutely unique in the world. There is no other country in this world that has the professional enlisted corps

Index to Advertisers

Air Group 1	87
Boeing Defense & Space Group	2-3
Cessna Aircraft Co.	44A-44H
Club Car	21
Computer Business Services, Inc.	86
E-Systems, Inc., ECI Div.	59
E-Systems, Inc.	38
Flight Group One	86
Jostens	85
Lockheed F-22 Team	Cover II
Lockheed Fort Worth Co.	7
Loral Corp.	Cover III
Magnavox Electronic Systems Co.	14
McDonnell Douglas Aerospace	5 and Cover IV
Northrop Grumman	13
Rockwell International, Tactical Systems Div.	81
TRW/Exide Electronics/General Electric	60
Unicover	23
AFA Member Supplies	87
AFA National Report	82

that the United States armed forces does."

- The 375th Airlift Wing, Scott AFB, Ill., comptroller team representing Air Mobility Command won the overall title in "Top Dollar," the Air Force comptroller's first worldwide bare-base field-training competition, held in November. The teams, bringing their own 3,000-pound logistics kit, which included forms, office equipment, and safes, competed in profiles ranging from emergency payments and contracting to chemical warfare preparation and an obstacle course, in settings similar to those encountered in Desert Shield and Desert Storm.

- The Air Force captured the gold medal for the 1994 Armed Forces Soccer Championship held at Charleston AFB, S. C., in early November.

- People responsible for successful aircrew survival and recovery following ejections and bailouts may now receive the Aircrew Saver Award, according to Air Force safety officials. The award recognizes Air Force specialists in egress, aircrew protection and survival equipment, and proper operation of ejection systems and parachutes used to bail out of disabled aircraft.

- The Mission Planning and Joint Surveillance and Target Attack Radar System program offices at Electronic Systems Center, Hanscom AFB, Mass., won the 1994 Gen. Bernard A. Schriever Award in November. The trophy is awarded annually to an Air Force Materiel Command major program team or teams.

- The C-17 Globemaster III passed the USAF-required 45,000-hour durability milestone—a period equivalent to 1.5 lifetimes on the airframe—two weeks ahead of schedule, according to the McDonnell Douglas Corp., which builds the Air Force's newest airlifter.

Purchases

CFM International received an \$80.3 million face-value increase to a firm fixed-price contract for twenty-four CFM56 engines for the KC-135 aircraft. Expected completion: November 1996.

Martin Marietta Astronautics Group, Space Launch Systems Co., received a \$66.7 million face-value increase to a fixed-price incentive fee contract to acquire the Pulse Code Modulation Wideband Instrumentation system for Titan IV launch vehicles Nos. 24 through 41. Expected completion: September 1999.

The National Aerospace Plane National Contractor Team received a \$42.1 million face-value increase to

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a cost plus award fee contract to procure preliminary design of the NASP flight-test article for use in design of future hypersonic vehicles. Expected completion: October 1995.

Martin Marietta Aerospace Corp. received a \$24.3 million face-value increase to a firm fixed-price contract for Fiscal 1995 Nonunified Payload Integration Support Task Orders to resolve technical issue related to the Titan IV launch vehicle. Ex-

pected completion: September 1995.

Harris Corp., Information Systems Division, received a \$23.2 million face-value increase to a cost plus award fee contract for upgrade of the instrumentation consolidation facility at the Air Force Space Command's Ascension Island Tracking Station and for upgrade of the telemetry processing capabilities at Ascension and Cape Canaveral AFS, Fla. Expected completion: December 1998. ■

USAF leaders believe it's time to consolidate the changes and set a steady course for the future.

The Air Force Takes Stock

By David J. Lynch

AFTER five years of sweeping and often disorienting change, the Air Force will now try to consolidate its position and assess how its personnel and weapons match up with today's threats.

That was the central message delivered by Gen. Ronald R. Fogleman, USAF's new Chief of Staff, and a host of other top Air Force officials who attended the annual Air Force Association symposium October 28 in Los Angeles.

Speaking just forty-eight hours after he assumed his new leadership post, General Fogleman sought to dispel rumors that he would initiate major policy and personnel changes.

"There has been some speculation that I am poised to slam on the brakes and take the Air Force in a whole new direction," General Fogleman told an audience of service and defense industry officials. "That is simply not the case."

General Fogleman said that today's Air Force appears to be "on course" with major procurement programs and policies. He applauded changes launched by his predecessor, Gen. Merrill A. McPeak, who adapted a shrinking force to new

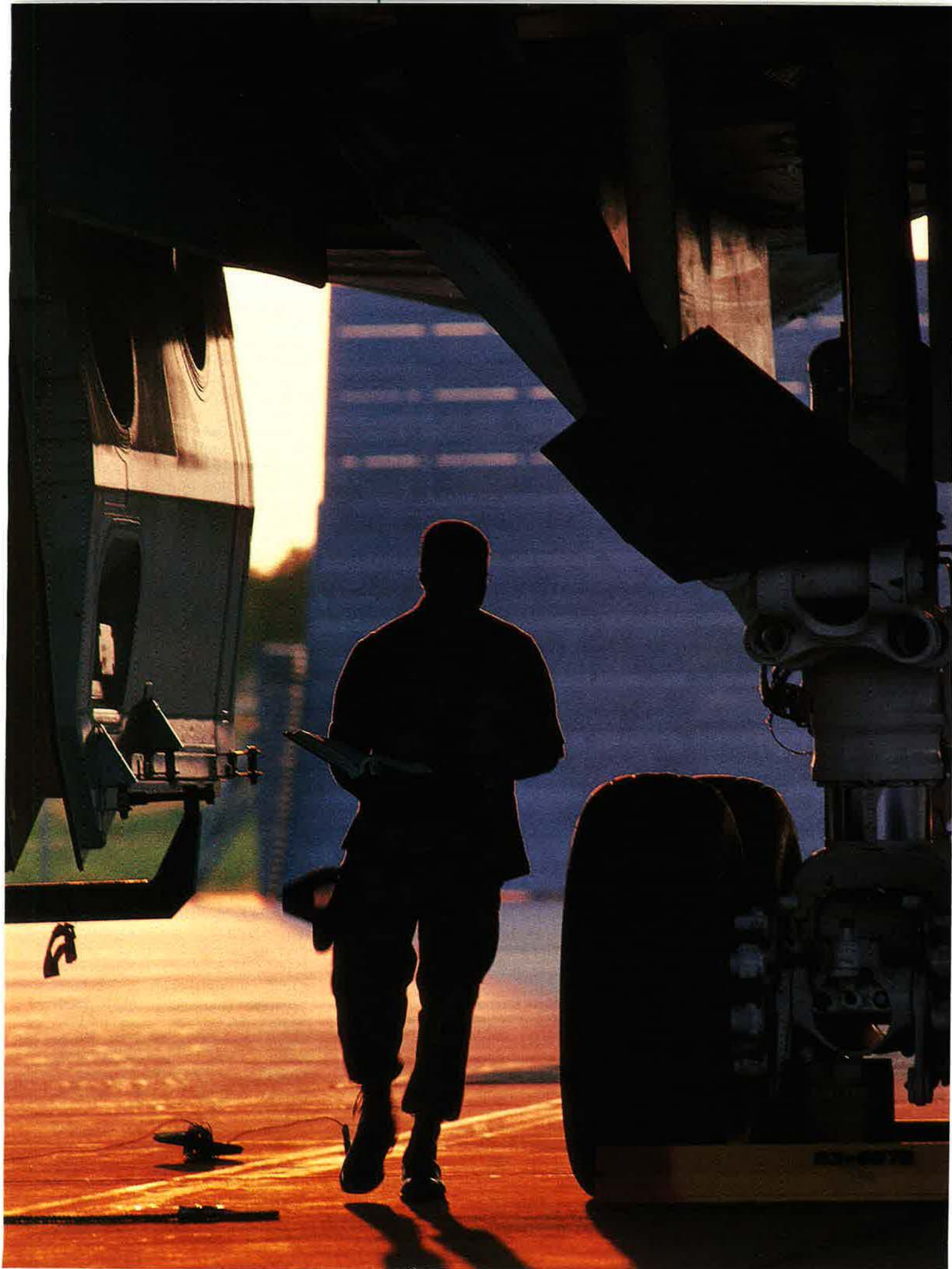
security demands and reformed Air Force training.

The theme of stability was a major one at the conference, and it was addressed by several of the speakers. These included (in addition to General Fogleman) Sheila E. Widnall, Secretary of the Air Force; Clark G. Fiester, assistant secretary of the Air Force for Acquisition; Gen. Joseph W. Ashy, commander in chief of US Space Command and commander of Air Force Space Command; Gen. John G. Lorber, commander of Pacific Air Forces; and Lt. Gen. Stephen B. Croker, commander of Air Combat Command's 8th Air Force.

Several of the speakers noted that when measured against the Air Force of the mid-1980s, today's force is noticeably leaner. Annual spending and the number of combat aircraft have been reduced by about fifty percent. It's all part of an overall uniformed personnel drawdown to 1.45 million service members from a recent peak of 2.1 million.

Is the Cutting Over?

In the wake of this major shrinkage in budgets, personnel, weapons,





USAF operations tempo has risen sharply, with some 20,000 personnel deployed on TDY to trouble spots from Haiti to Kuwait. This new MC-130H Combat Talon II, based at Hurlburt Field, Fla., is among the systems in heaviest use.

and bases, congressional and military leaders seem prepared to assess what remains rather than cut further, according to General Fogleman. "I really think that a lot of the change that we have been facing is now behind us," he said. "There is a consensus that while nobody wants to say we've cut too much too fast, nobody is really interested in cutting much more."

That statement suggests that General Fogleman is more optimistic on this point than General McPeak, who said two weeks earlier, just before his retirement, "I am absolutely convinced that we have not seen the bottom of this defense drawdown yet."

If General Fogleman proves correct in his assessment, it will be because the post-Cold War world has turned out to be anything but serene. At the time of the new Chief of Staff's speech, some 20,000 Air Force personnel were deployed to trouble spots around the world, from Haiti to Bosnia-Herzegovina to the Persian Gulf.

Any one of these missions by itself would be significant, General Fogleman said, but "combined, these operations reflect a truly unprecedented level of activity."

Still, the Air Force—like the other US armed services—faces unresolved budgetary questions, concerns over new missions, and a tough interservice fight over future responsibilities. For example, General Mc-

Peak was maintaining at the end of his tour that the Air Force should consider additional cuts in force structure in order to preserve such vital new systems as the F-22 fighter, the C-17 transport plane, the Joint Primary Aircraft Training System (JPATS), and the Triservice Stand-off Attack Missile (which was ultimately canceled).

In remarks to reporters at the AFA symposium, Secretary Widnall appeared to agree. She declared the Air Force "uniquely dependent upon modernization."

General Fogleman, with the operator's eye for current problems and needs, seemed less willing to give up any additional pieces of the Air Force's structure. "The CINCs are very concerned about force structure," he said, "and the reason they're concerned is the whole optempo issue"—meaning the major rise in the frequency of Air Force deployments overseas in the past few years.

No Hard Turns

General Fogleman conceded that he would have to leave some leeway for making additional "adjustments" in the composition of the active-duty Air Force. He added, however, "We need to provide our people greater stability." Any force adjustments in the next few years "will be relatively small," he said, "more like . . . trimming an aircraft in flight than making a hard turn."

For example, he urged the Pentagon to declare a pause in the base-closing process after the round of closures to be made in 1995. General Fogleman also indicated that maintaining the quality of life for men and women in uniform will be a top priority during his tenure.

The Chief of Staff and others at the conference noted that strains are beginning to appear. Specialists in some weapon systems, such as the E-3 Airborne Warning and Control System, HC-130 special operations aircraft, and rescue units, for example, have been forced to deploy for more than the 120 days annually that is generally regarded by service officials as the highest desirable level.

General Fogleman reported that he wants to take steps to turn that trend around as well as preserve funds for traditional programs aimed at protecting morale, such as housing, medical care, salaries, and on-base services.

Stability may be elusive. On the horizon loom some key questions, both about individual procurement programs, such as the C-17 and F-22 aircraft, and broader topics, such as service roles and missions and concerns over the Air Force personnel and promotion system.

Backing Embattled Aircraft

General Fogleman, who chose the AFA forum to deliver his first major address as USAF's Chief of Staff, issued a strong and not unexpected endorsement of both aircraft programs.

The General, who served as commander in chief of US Transportation Command and commander of USAF's Air Mobility Command, defended a decision to use the C-17 during last fall's showdown with Iraq over its threatening moves toward Kuwait. Making its first operational flight, the McDonnell Douglas airlifter flew troops and cargo to Saudi Arabia. C-17 critics accused the Pentagon of using the aircraft, which had yet to reach its formal initial operational capability, simply to bolster support for the embattled program.

General Fogleman said he opted for the C-17 because it was the best way to transport the Army's 7th Transportation Group to the desert battlefield area quickly so that it

could prepare ports for incoming units. Two C-17 sorties later, the corps—and its outsize cargo—was in place.

General Fogleman also defended the F-22, saying it would in the future provide the same kind of air superiority that allowed the US to conduct Operation Desert Storm with impunity.

“It is not . . . another slick, fast toy” with which to “convert JP-4 [jet fuel] into noise,” he said. “It is about air superiority, and we should not lose the bubble on that.”

General Fogleman’s expression of support was essentially identical to one issued by his predecessor not long before the AFA conference. General McPeak, speaking to reporters in Washington, described the F-22 as “a revolutionary new capability [that] will make everybody else obsolete overnight.”

Conference attendees also heard that the B-1B bomber is making a comeback, despite the fact that it has long been a controversial system.

General Croker told the conference that the B-1B was performing very well in a new six-month test that began June 1, 1994, and was on its way to dispelling some of the lingering doubts about the weapon system.

The B-1B operational readiness assessment, known as Dakota Challenge 1994, ended December 1. It was intended to resolve questions in Congress about just how much fund-



Staff photo by Guy Aceto

General Fogleman gave the C-17 a ringing endorsement. The new airlifter made its first operational flights last fall, when the General selected it to transport Army troops and cargo swiftly to the Persian Gulf region.

ing would be required to provide logistics and spare parts for the aircraft as well as to demonstrate its combat effectiveness.

The six-month test was carried out by B-1Bs assigned to the 28th Bomb Wing, Ellsworth AFB, S. D. The goal was to achieve and maintain a mission capable rate of seventy-five percent. Prior to the test, the B-1B fleet’s mission capable rate was sixty-six percent. General Croker attributed this to inadequate funding of spares and support items. He noted

that in 1993 the B-1B fleet received only sixty-eight percent of required funding for spare parts and that at one point there was a \$13 million repair backlog of broken parts.

The General pointed out that by early 1994, however, funding for spares had increased to ninety-six percent of the required level. That improvement already was paying off in a more ready aircraft—even before Dakota Challenge. “We already had a maturing aircraft before the test even started,” said General Croker. “We were steadily improving our reliability and sustainability.”

Steady B-1 Improvement

For the test, B-1B program officials made sure that Ellsworth had 100 percent of required manpower, adequate supplies of spare parts, and other necessary support. The results showed up quickly, said General Croker. The bomber unit jumped to an eighty-four percent mission capable rate and held steady at that level.

Similar improvement was seen in other major readiness indicators, such as the twelve-hour fix rate, a measure of how often an aircraft that lands with malfunctioning systems can be repaired and returned to the air within half a day. This fix rate “has improved dramatically,” said General Croker, adding that by September the rate had risen to nearly 100 percent for the test aircraft.



Photo by Randy Jolly

The B-1B has made a strong comeback, performing well in a critical operational readiness test. Given full complements of support crews, spare parts, and supplies, the B-1B test force posted an eighty-four percent mission capable rate.



At Ellsworth AFB, S. D., better in-house capability is keeping more B-1B repair work "at home," with fewer parts going to Air Force depots. That helps hold down costs and keeps more of the big airplanes flight-ready.

He attributed the pretest improvement in the fleet to a number of factors. First, a reduction in the number of active-duty B-1 bases from four to two eased the overall logistical and support burden.

Second, upgraded test software resolved a nagging problem with misdiagnosed faults. At one time, for example, twenty-eight percent of the B-1B parts sent off base to be fixed weren't even broken. "It wasn't because we were stupid," said General Croker. "It was because the test sets weren't accurate."

Third, process improvements have reduced the number of individual parts that could sideline a bomber from more than 1,200 to only seventy-five.

Fourth, better in-house repair capability is keeping more repair work "at home" and resulting in fewer parts going to Air Force depots. That helps hold costs down. For example, repair crews at Ellsworth developed a software program to check the actuator rigging force of the B-1B's horizontal stabilizer. As a result, a job that once required twenty-four hours to do by hand now takes "only minutes," General Croker said.

He cited a lengthy list of comparisons showing that the B-1B is coming into its own.

For example, the B-1B was criticized in its earliest years for failure of its defensive avionics systems and mishaps that periodically grounded

the plane. The B-1B's experience was hardly unique, General Croker said. The B-52 bomber, now considered one of the most successful systems ever produced, was grounded fifty-seven times during its first eight years. Over the same time span, the B-1B was sidelined only eight times.

"Bottom line is the B-1 is getting a bum rap," General Croker said.

More than three decades after they were produced, ninety-four giant B-52s continue to form a critical element of the USAF bomber force.

The BUFFs are far from tired. General Croker noted that on August 3, two B-52s completed a grueling, forty-seven-hour, 20,000-mile transglobal mission from Barksdale AFB, La., to targets in Kuwait and back. In the process, they established a new endurance record for the aircraft and dropped more than thirteen tons of ordnance within three seconds of the planned release time.

"The B-52 is viable, has life left, is doing a great job," said General Croker.

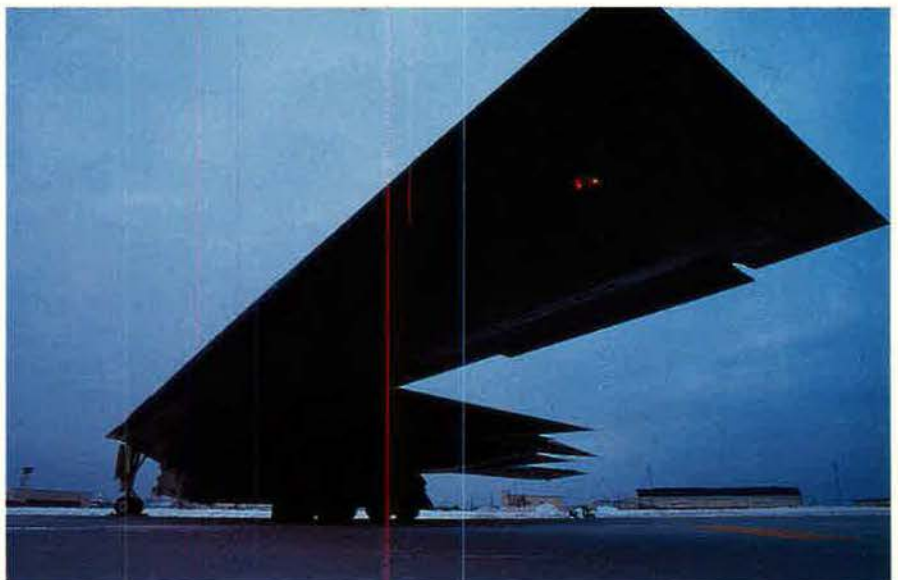
He reported that the venerable bomber has the capability to carry the conventional air-launched cruise missile, the TV-guided Have Nap missile, and the Navy Harpoon anti-ship weapon.

B-2 "Working Like Dynamite"

In recent years, the bomber debate has revolved around Northrop Grumman Corp.'s B-2 Stealth bomber. Like the B-1B, the B-2 was the subject of political controversy and was beset by teething problems. Today, however, General Croker reports that the bomber is in better shape than anyone anticipated at this point.

"These airplanes are working like dynamite," he said.

Of the B-2's first ninety-five sorties, said General Croker, only two were canceled because of faulty parts. Plans called for the first B-2 to fly



The B-2 Stealth bomber has scored high, reaching a key initial inspection six months ahead of schedule. Plans called for the first B-2 to fly four sorties a month, but almost immediately it was flying four per week.

four sorties a month, but almost immediately the airplane was flying four sorties each week.

The first aircraft reached a key initial inspection six months ahead of schedule, according to General Croker. The Air Force has accelerated the demonstrations of new capabilities. In September, test B-2s dropped their first inert bombs over the Utah Test and Training Range. Also on tap are live weapon releases including all Global Positioning System-equipped weapons.

The Air Force anticipated that by year's end it would have trained twelve pilots along with eight qualified instructors, four load crews, and 400 maintenance personnel.

For the bomber fleet, the key question today is the availability of precision guided munitions for planned upgrades. While Air Force officials plan to upgrade all three bombers for precision conventional strikes, sufficient money and weaponry are unlikely to become available for the task before the end of the decade.

General Croker said that to save money in the interim, the service is reducing the size of the B-1 and B-52 bomber fleets it is authorized to fly and equip with aircrews.

For example, the Air Force will keep in active service its full complement of ninety-five B-1B bombers, but it will actually fund and fly only sixty-two at any given time. Likewise, the service will hold on to all ninety-four B-52s but will fund and fly only sixty-five at any given time. The flying time will be divided among all 189 bombers.

"Every airplane will be flown at a smaller utilization rate," said General Croker, "but all the modernization upgrades . . . will be done so that the airplanes are being flown [and] used and are fully capable."

The Pentagon is eager to get the new precision weapon capabilities into USAF's bomber fleet. In fact, the Office of the Secretary of Defense asked the Air Force last fall to consider accelerating the introduction of some precision capabilities into the B-1B.

At the conference, it was clear that the service is intent on doing its work in different ways. As Secretary Widnall's remarks made plain, space is one area where new ways of doing business are appearing.



In what Air Force Secretary Sheila E. Widnall called a "landmark decision," USAF is opening for commercial use some of its unused launch facilities at Vandenberg AFB, Calif. USAF's partner will be the Western Commercial Space Center.

A Landmark Decision

Reflecting the Air Force's effort to strengthen military cooperation with the civilian space industry, Secretary Widnall announced that the Air Force is negotiating a long-term lease of unused facilities at Vandenberg AFB, Calif., with the Western Commercial Space Center, a public-private group.

She said that plans call for development of a commercial spaceport at Vandenberg, with a commercial launchpad and satellite processing facilities to be built on land once intended for space shuttle launch support.

Secretary Widnall described the potential twenty-five-year lease as a "landmark decision for the Air Force," representing just the beginning of efforts to exploit existing military space capacity for civilian purposes.

The California Spaceport is expected to provide launch services for small commercial boosters that will put satellites into orbit for personal telecommunications and remote sensing, according to Secretary Widnall. "This is a prime example of how the Air Force is helping to bolster US economic progress in the rapidly growing commercial space arena," she said.

Space is also a topic that demonstrates how acquisition reform can overlap with roles and missions worries.

To help streamline space system acquisition, the Air Force recommended to Deputy Defense Secretary John M. Deutch last year that it become the Pentagon's executive agent for space. The Air Force has been criticized by other services for making a power grab, but the service rebuts the charge by noting that it currently receives eighty-three percent of all space-related funding and controls ninety-three percent of the military's space personnel.

"This is *not* a military roles and missions issue," insisted Secretary Widnall. "It's a 'reinventing government' issue. . . . Space acquisition is clearly one of our core competencies."

Air Force plans call for establishment of a Joint Space Management Board, co-chaired by the deputy director of Central Intelligence and the under secretary of defense for Acquisition and Technology. That arrangement represents official hopes to better exploit the "natural synergy" between classified and unclassified space programs, according to Secretary Widnall.

Space Warfare Center

General Ashy, the new head of US Space Command (and Air Force Space Command and North American Aerospace Defense Command), reported that there has been "considerable dialogue" at high government levels about another multiservice



At Misawa AB, Japan, Air Force maintainers work on an F-16D. PACAF's new commander, Gen. John Lorber, says the forward-deployed airpower contained in the command's fighter squadrons is critical to the balance of power.

concept: establishment of a Joint Space Warfare Center.

"This was also a major topic at our component commanders' conference," said the General. "We unanimously agreed that the establishment of a joint center would be very beneficial to our collective joint war-fighting capabilities, so that the [service] teams within the team can operate effectively."

Air Force Space Command opened its own Space Warfare Center at Falcon AFB, Colo., in November 1993 to devise better ways to get usable space information into the hands of fighting forces.

General Ashy said that he had discussed the joint center concept with Gen. John M. Shalikashvili, the Chairman of the Joint Chiefs of Staff, and Admiral William A. Owens, the vice chairman, and that they were soon to receive his proposal for such a center.

"Our concept includes establishing the center at Falcon AFB in order to make good use of the available facilities and capabilities already there," said General Ashy. "Functions to be accomplished as we envision them are applications; testing; development of tactics, techniques and procedures, and doctrine; teaching; simulation and modeling; and providing direct support to the warfighters."

He added that he expected to create space support teams for each

theater CINC. Their responsibilities would include working with the respective combatant command staffs.

One who would welcome such assistance is General Lorber, new commander of Pacific Air Forces. "The end of the Cold War has not changed the mistrust that exists in the Pacific region," he said. "Nations are still building large military forces."

General Lorber noted some examples. India, with a population of 900 million, has 1.2 million troops

under arms, along with 700 combat aircraft, many of them latest-generation Soviet MiG-29s and Su-27s. Indonesia, with 200 million people, flies the F-16 and other front-line aircraft. All in all, General Lorber noted, the world's seven largest militaries have forces in the Pacific region.

He went on to say that forward-deployed airpower, represented by PACAF's fighter squadrons, is critical to the balance of power in the region. Maintaining the fighter power of these relatively small forces is the General's highest priority. "Obviously, we want to keep PACAF at a high state of readiness," he said.

Air Force officials were wary of succumbing to the temptation to overpromise on proposed acquisition reforms. Secretary Widnall told reporters at the conference that even though the cost savings are expected to be large, they won't be seen for years. "The rewards have yet to come in," she said. "We can't count on them."

Likewise, Mr. Fiester alluded to the need to change "the culture" of Air Force procurement before permanent improvements will be seen. He plans to spread the reform gospel during a "road show" that will take him to all development and logistics commands this year.

Five Pilot Programs

For much of the past decade, at least since the conclusion of the 1985



Preparing pilots to fly advanced fighter aircraft like these F-15E dual-role fighters from Seymour Johnson AFB, N. C., will require such sophisticated new training equipment as the Joint Primary Aircraft Training System.

Packard Commission, the Pentagon and armed services have talked of buying more commercially available systems, reducing the burden of military specifications, and rationalizing an awkward procurement system. After years of false starts within the Pentagon, said Mr. Fiester, such reforms appear to have a firm commitment from Defense Secretary William J. Perry.

He noted that some progress already has been made. Last fall, President Clinton signed the Acquisition Streamlining Act of 1994. The legislation established five pilot programs for testing commercial practices and performance-based contracting. Four are Air Force programs: the Joint Direct Attack Munition (JDAM), the nondevelopmental airlift aircraft (a potential alternative to the C-17), the commercially derived engine, and JPATS.

There are early signs of progress, said Mr. Fiester. On the JDAM program, he noted, the statement of work was trimmed to just seven pages from its initial 100-page length: "There are no military specs, no military standards anywhere in this program."

Mr. Fiester said his efforts in the JDAM matter were aided by the intervention of Secretary Widnall, who gave him authority to waive any USAF acquisition regulation. To date, Mr. Fiester has shrunk a list of forty-seven acquisition rules to a total of about a dozen. Further reductions are planned.

A separate directive from Secretary Perry limits the three service acquisition executives' authority to invoke milspecs on both new and existing projects. The Air Force also intends to shift "more of the overall responsibility" to defense contractors for program execution, Mr. Fiester said. Under the new plan, the government will handle "functional performance specifications," while the contractor will design the system.

Underlying the new approach are both a commitment to acquisition reform and a recognition of government manpower limits. Mr. Fiester said the Air Force expects a reduc-



Photo by Ross Harrison Koly

This Mk. 84 iron bomb will not be sufficient for most future operations. The Air Force plans to upgrade its aircraft with precision guided weapons, though the task will take years and cost billions.

tion of thirty-five to forty percent in civilian manpower at key product and logistics centers over the next few years.

"We are clearly going to scale back, very substantially, the size of the program offices," he said. "As part of that, we will be depending more heavily on industry to carry the ball for us."

Air Force officials also are focusing more strongly than before on trade-offs between requirements and cost. Under incessant budget pressures, program officials find it impossible to ignore cost questions at any stage of program development. From the outset of a program, supporters will be expected to defend their requirements in the context of overall cost.

"What we are going to do is put affordability on the table at the very beginning of the requirement, making affordability an independent variable, and try to address early on whether that extra ten percent is really needed if it drives the cost up by twenty or thirty percent," Mr. Fiester said.

In another initiative, the Air Force and the Navy are pursuing a "lean aircraft initiative," by which they

hope to develop ways to build major systems efficiently in small quantities. With the help of twenty defense contractor representatives and support from the Massachusetts Institute of Technology, the services are looking for ways to reduce system costs in ways that could be applied to existing programs, like the C-17.

In that regard, the Air Force is looking at the best way to use the \$125 million appropriated by Congress to preserve the B-2 production base. USAF officials said that they want to develop lean production techniques for the B-2, helping Northrop Grumman devise ways to build a smaller number of bombers with much lower overhead at a rate of "a couple" every year and do it much less expensively.

General Croker said, "We have asked the Congress to let us prove that we can do that and, in the meantime, to spend money to preserve the equipment that is in place—in other words, not dismantle the production facility." The Air Force is doing this while conducting a study to determine now many bombers the United States needs to support its current military strategy.

Mr. Fiester said that final resolution of many questions regarding Air Force modernization will turn on affordability. "The real keystone to affordability is what we are doing in acquisition streamlining across a broad range of fronts," he said. ■

David J. Lynch covers defense and aerospace for the Orange County Register in California. He is a former editor of Defense Week Magazine. His most recent article for AIR FORCE Magazine was "Airlift's Year of Decision" in the November 1994 issue.

The “nondevelopmental airlift aircraft” is a hedge against problems with the C-17.

Off-the-Shelf Airlift

By John A. Tirpak, Senior Editor

WHEN chronic quality, cost, and schedule problems with the C-17 airlifter came to a head in late 1993, the Pentagon was in a serious bind; no other airlifters were readily available to take the C-17's place, should the program fail.

Worse, strategic airlift—the modernization of which had been neglected for a decade—was fraying at the edges. The C-141, already having been heavily modified and literally stretched, was aging out of the inventory at a rate faster than expected. Even lower-time aircraft were having fatigue-related problems.

Some, particularly in Congress, called for the cancellation of the C-17, but the Pentagon knew that such a step would do nothing to solve the airlift problem. The Air Force had neither the time nor the money to start over from scratch on a new airplane.

In December 1993, however, DoD put McDonnell Douglas Corp. on notice: Unless the C-17 project was shaped up, the US would buy no more than forty transports already under contract at that point and would meet the rest of its airlift requirement with other types of aircraft.

To provide what he called a realistic “hedge against the failure of the C-17 program,” Deputy Secretary of Defense John M. Deutch launched a new airlift project. It was dubbed the Nondevelopmental Airlift Aircraft (NDAA) Project. It will be the fallback if the C-17 can't get healthy and perform as advertised.

Secretary Deutch even renamed the C-17 line in the budget “Strategic Airlift,” to remind McDonnell Douglas that it wouldn't necessarily get all the dollars available for new cargo aircraft.

The NDAA will be either a proven military airlifter or a commercial wide-body minimally altered for the military mission. By taking an airplane “off the shelf,” the Pentagon hopes to save billions in development costs and years in development time.

The solution is “back to the future” for the Pentagon. In the late 1930s, with war looming, the services urgently needed a cargo airplane but had no money to design one from scratch. Turning to the commercial Douglas DC-3, the services adapted it to the military mission, and it performed beautifully. The

NDAA will be either a proven military transport, such as the C-5, or a minimally altered commercial wide-body, such as Boeing's 747-400 freighter, seen here in production at the Everett, Wash., plant.



Pentagon is hoping it can repeat the experience.

Even if the C-17 fully recovers from its difficulties by the decision deadline—slated for this November—the NDAA may still be bought. It could supplement a full buy of C-17s if requirements show that a cheaper airplane is sufficient to do some portion of the strategic mobility mission or that the planned inventory of Globemaster IIIs just won't be sufficient for America's airlift needs.

Plenty of Candidates

Next month, a final request for proposal (RFP) will be issued for NDAA aircraft. With precious few "new starts" in the Air Force's acquisition plans, there has been no shortage of contractor interest in the program.

Candidates include Boeing Co.'s 747-400 freighter, McDonnell Douglas's MD-11, a new version of Lockheed's C-5 Galaxy produced on a new line, and a number of fixed-up used cargo airplanes, such as DC-10s, L-1011s, and 747s, all of which would have to be modified with harder decks, special doors, and other

alterations that would improve freight-handling capabilities.

To be eligible, an airplane has to be capable of carrying the Army's new Family of Medium Tactical Vehicles.

Two NDAA tracks are being pursued: "C-XX," which would be a commercial aircraft derivative, and "C-XY," which would be an existing military transport. By including both, the Air Force can measure the advantages of having airdrop and outsize-cargo capability against presumed lower costs of a purely commercial design, which would lack such capabilities.

The NDAA program is being closely watched by skeptics in Congress who worry that the Air Force will try to stack the deck in favor of the C-17—its preferred choice—and not give a fair shake to airplanes that could possibly serve as suitable alternatives.

"Obviously, we're under a lot of scrutiny on this," remarked Brig. Gen. James S. Childress, the Air Force's Program Executive Officer for Tactical and Airlift Systems. "This has to be squeaky clean."

Though the C-17 is the Air Force's

stated preference, not everyone is convinced that only a dedicated military transport can do the job. As the C-17 was struggling last year, Boeing did some calculations that suggested that there might be a cheaper way to do the airlift mission—namely, with its 747-400 jumbo freighter.

"Forty C-17s may be all you need," said Michael T. Boyce, head of business development for Boeing's Military Airplanes Division.

Boeing said its analysis leads to that conclusion. Using the 1991 Persian Gulf War as a case study, Boeing determined that outsize equipment needs to be flown to forward areas of a theater of war only in the initial days of a conflict. Thereafter, resupply could be achieved with faster, longer-legged, and more fuel-efficient civil transports needing no aerial refueling.

"After the initial danger, when we had to get large things over there in a hurry, most of Operation Desert Shield was done with sealift and with commercial freighters leased for the occasion," carrying chiefly passengers and pallets, Mr. Boyce said.

After reviewing the Boeing study, USAF decided that the analysis was



In the "C-XY" competition, only Lockheed's C-5 Galaxy remains in the running. A new D model of the giant airlifter would be built at Lockheed's Georgia facility and would have "glass cockpit" avionics and displays.

"not unreasonable," Mr. Boyce said. However, "from an operational perspective, [the Air Force wants] the most flexible platform," which would be the C-17. "We understand that. The only reason we've been proposing this is that they might not be able to afford the most flexible aircraft."

Boeing elected not to offer modified used 747s because the rules say that all offered aircraft must be in the same configuration, Mr. Boyce said. "They're looking for at least two or three squadrons of aircraft," he noted. "That's seventeen to thirty-four airplanes. To find that many airplanes all in the same configuration is nearly impossible."

Boeing's 747-400 proposal would involve hardened decks, a side-loading door, and a flip-up nose. Cargo could be hoisted to the doors on scissors-type platforms similar to those used in civil cargo operations around the world.

Operationally, the 747 would fly cargo to the nearest suitable airport in a crisis. From there, the materiel would have to go either by ground or C-130 to forward areas. Mr. Boyce said this worked well in Desert Shield and Desert Storm.

Though there would likely have to be some additional investment in C-130s for moving the cargo to forward airfields, the overall savings in transit time, aerial refueling equipment, and acquisition cost would more than pay for it, said Mr. Boyce.

He added that Boeing has been "very pleasantly surprised" with the program office's earnestness about using commercial practices and that the draft RFP was released ahead of schedule.

There was still some government-unique boilerplate—"requirements typical of a government acquisition but not a commercial acquisition"—but he feels there's a willingness to do much better.

Only the C-5 Remains

In the C-XY competition, there were several early entries, but only Lockheed's C-5D Galaxy remains in the running.

The Ukrainian-built Antonov An-124 "Condor"—the Soviet Union's longtime counterpart to USAF's C-5 Galaxy—had to be excluded because it wasn't certified by the Federal Aviation Administration. Proposed rehabilitations of the C-141 fleet were counted out when Congress ruled that the NDAA must be a wide-body aircraft, a characteristic the C-141 doesn't meet.

The C-5D is not a modification program. New aircraft would be built at Lockheed's Georgia facility, next to P-3 Orions and C-130 Hercules.

The C-5D would have the advantages of commonality with existing C-5s, an existing support structure, and an in-place cadre of experienced crews. It would also feature "glass cockpit" avionics and displays as

well as improvements in reliability and maintainability.

"We will improve the dependability of the airplane," said Manuel Lores, Lockheed Aeronautical Systems Co.'s NDAA program manager. "We will enhance both the avionics and the subsystems. We'll have digital/glass cockpit and truly modern flight stations."

Though a two-person flight crew has been looked at, "we'll probably still have a pilot, copilot, and flight engineer," he said.

The largest mandatory change would be to get the C-5D's engines to conform to stringent FAA Stage 3 noise regulations. A new engine would be needed. Lockheed is discussing various options with General Electric Co. and Rolls-Royce.

Some of the C-5D's alloys would be changed to include more corrosion-resistant materials, but overall the basic C-5 design would remain unchanged. Drastically reworking the design would make it too expensive and would violate the basic tenet of the competition—that the airplane be essentially an off-the-shelf solution.

Because the Air Force has amassed a great deal of information on what it costs to own and operate C-5s, the service has a "pretty good idea" of what Lockheed's bid will look like, said NDAA program manager Daniel L. Kugel. Lockheed knows it will have to be competitive on price if it is to beat the civilian entries. The company's bid will have to include the costs of restarting the assembly line.

Just How Much Is Needed?

Now nearing completion are two studies attempting to figure out just how much strategic airlift the US military needs. One of these, the Strategic Airlift Force Mix Analysis, is being conducted by Air Mobility Command. The other is the Mobility Requirements Study/Bottom-Up Review Update, being done by the Office of the Secretary of Defense.

These two studies will come up with a minimum number of "C-17 equivalents" needed to keep the airlift force viable well into the next century. The studies are being conducted independently. Their results will be compared to determine a final, consensus figure of how much airlift the US needs in the post-Cold



Boeing proposes to build a 747-400 with hardened decks, a side-loading door, and a flip-up nose. Cargo could be lifted into the aircraft on scissors-type platforms, which are used in civilian aviation around the world.

The Envelope, Please

The NDAA competition is structured so that contractors will bid to fill any gap in airlift not covered by the C-17. They will bid against notional buys of forty, sixty, eighty, or 120 C-17s—figures that roughly correspond to squadrons of aircraft. For each “core” level of C-17s, the contractors will propose a number of their own NDAs to fill out the unmet requirement.

The Air Force will review each bid and examine it on the basis of best value to the government over the aircraft’s life cycle. That means the up-front cost of buying the airplane will be measured against the predicted cost to operate and fix it over an expected service life of thirty to forty years. Such a strategy looks at savings over the long run rather than just up-front cost. It may happen that the “cheapest” aircraft—in terms of procurement costs—will not be selected.

For each core C-17 inventory level, a certain type and number of NDAs will be judged the most cost-effective companion aircraft to buy. Those results will be sealed and kept secret until a decision is made on how many C-17s will be bought.

“The decision on which mix [to buy] will already have been made” when the final buy of C-17s is determined, Mr. Kugel said. When the decision is announced, “then, we open that envelope.”

War world. At the moment, the Air Force is holding to its official requirement for 120 of the new C-17s. The conclusions are to be in hand by the time the Air Force releases the final RFP.

“The 120 figure was the imposed inventory objective as of a couple of years ago,” under the Major Aircraft Review undertaken by Defense Secretary Dick Cheney, General Childress said. Secretary Cheney decided that the original planned buy of 210 C-17s was too high, given the demise of the Soviet Union and, with it, the need to airlift ten divisions of troops to Europe in ten days.

“The studies are showing the requirement is . . . up to 140,” based on the real-world post-Cold War experiences of the last two years, General Childress said. “I don’t know if [the Pentagon leadership] will entertain a figure above 120, though,” because of funding restraints, he added. In any event, “we’re looking at various force mixes to provide lift at the least cost to the taxpayer.”

One solution has been ruled out. The Air Force will not hire out its freight-hauling work to commercial carriers.

“Air Mobility Command needs . . . an aircraft that is immediately available to go anywhere they have to go,” General Childress said. He added that it’s not feasible simply to call a freight company and expect it

to provide an aircraft at a moment’s notice.

He said the requirements studies will assume full industry participation in the Civil Reserve Air Fleet, the program that “drafts” participating commercial freighters in wartime.

Come November 1995, the Pentagon’s Defense Acquisition Board will decide whether the C-17 program has been turned around. If it has, the DAB will decide how many more C-17s the Air Force can afford.



Are new 747-400s already in the US fleet? It hasn’t happened yet, but Boeing would be only too pleased to see Air Force livery on its freighter, as shown in this retouched photo produced by the company.



The Air Force already has experience with off-the-shelf aircraft: the KC-10, a military version of the McDonnell Douglas DC-10. AMC ran time-and-motion studies on loading and unloading KC-10s to gather data for the NDAA program.

In this way, he said, the DAB won't be swayed by knowing which contractor will benefit from pegging C-17 purchases at any given level.

Because all the aircraft to be offered differ greatly in size, range, payload, etc., there likely will be "a different answer for any break-point" in the number of C-17s to be built, Mr. Kugel said.

A Pathfinder

Besides providing a framework to take advantage of an off-the-shelf design, the NDAA program is structured as a "pathfinder" effort aimed at cutting red tape and the cost of excessive bureaucracy, he pointed out.

"It is an acquisition pilot program under the acquisition reform bill," aimed at obtaining a commercial product "in a commercial way . . . with minimal government bureaucracy," Mr. Kugel said.

When the draft RFP went out last fall, "there was not a single milspec in there," he added proudly, referring to the unwieldy and expensive military specifications that weigh down most government contracts. "Typically, you'd have [an RFP] 500 to 600 pages long," he said, but the draft RFP for the NDAA was only 120 pages. The fewer rules and regulations, the less paperwork, time, and expense, the theory goes.

The size of the NDAA program office has also been kept to a mini-

num. Whereas a typical major program may have 200 or more personnel working on it, Mr. Kugel's shop contains just twenty-two workers.

Another "commercial practice" is to have both the Air Force and the contractors all working from the same rules, data, and assumptions.

For instance, the Air Force has developed a computer modeling program that measures loading time, speed, range and payload, and effectiveness over a given period of time. This model has been provided to the contractors, and they know exactly what factors they'll be judged on.

"They'll have the same models and numbers that will be available to the source selection board," Mr. Kugel said.

Some of the data used to build the model were acquired last spring when AMC ran time-and-motion studies

Finding the Right Mix

Buying a modified civil transport for some part of the strategic airlift mission—while buying fewer than the planned 120 C-17s—is probably the most cost-effective way to meet US airlift requirements, RAND Corp. found in a recent study.

In a study titled "Finding the Right Mix of Military and Civil Airlift, Issues and Implications," RAND analysts claimed, "The Air Force could conserve resources and still meet our assessment of future intertheater airlift needs by buying fewer C-17s than planned and buying a civil-style transport with long-range capability to carry bulk cargo and oversize equipment."

RAND reasoned that a future major conflict probably would unfold within reasonable proximity to airports large enough to accommodate wide-body civil jets. Moreover, the study said, such airports would have to be found (or built) in order to make use of Civil Reserve Air Fleet (CRAF) transports.

The study's authors noted that regional commanders in chief dislike the idea of giving up the flexibility offered by a purely military airlifter like the C-17. The Boeing 747-400 cargo plane, for example, can operate from only 650 airports, while the C-17 and C-5 each can use about 1,800 airports. (Compared to the C-5, the C-17 can use shorter runways, but the C-5 can use softer runways because its wide landing gear spreads its weight over more area.) Civil transports can't perform the airdrop or outsize-cargo missions.

The RAND report also noted that funding is increasingly tight and that a mixed buy of C-17s and militarized civil freighters could cost \$7 billion to \$25 billion less than an all-C-17 purchase. This, the authors argued, is not a minor consideration, given that cost will be the chief factor applied to the C-17/nondevelopmental airlift alternative decision.

A mix of C-17s and C-5s was deemed to be the most expensive, though most militarily flexible, alternative studied.

RAND also found that:

- The Air Force can, with improved scheduling, make better use of the lift assets it possesses, though increased efficiency still would not produce enough airlift to meet all needs.

- The Air Force routinely overestimates the amount of airlift it can generate. Using the Persian Gulf War as a case study, RAND determined that USAF may actually have as much as thirty percent less airlift capability than it thinks it does.

- Though the CRAF program is a success, the Air Force shouldn't count on it too heavily. RAND determined that national leaders tend to balk at calling up the maximum number of CRAF carriers because of potential disruption to the civilian economy. CRAF participants might withdraw from the program if they felt they would be called on routinely, instead of only during dire national need.

- The C-17 is not a replacement for the C-130 in the intratheater lift role, given the C-17's inability to use soft runways.

The RAND analysis was undertaken in the wake of the Gulf War and does not take into consideration developments since 1992.

on loading and unloading 747s and KC-10s at McChord AFB, Wash. Until then, models predicting the speed of loading civilian aircraft were "pretty generic," General Childress said.

Now "we have the ability to model the movement of cargo through the system very realistically," he continued. "The way you make the playing field fair is by making the model fair."

Troops who participated in the studies said they were surprised at how quickly the loading could be accomplished on the commercial airplanes.

Some commercial airplanes have dropped out of the competition. McDonnell initially planned to bid the "MD-17," a nonmilitary version of the C-17 that was considered a potential seller among such freight companies as UPS and Federal Express, but it was withdrawn last fall. Airbus, the European airliner consortium, also pulled out, without explanation.

Full of Ideas

Contractors were invited to offer suggestions for streamlining and cost-cutting, Mr. Kugel said, and they have been "full of ideas."

One typical and unpopular contract feature was dropped early on—the clause that gives the government sole discretion to change the contract.



Staff photo by Guy Aceto

The C-17 is USAF's number one airlift priority. Even if the C-17 recovers from its difficulties, however, the Pentagon might still choose to continue with the NDAA program, using it to supplement a full buy of C-17s.

"Now any changes made to the contract have to be by mutual agreement," Mr. Kugel said. What the government had never fully appreciated was that "to make a change may have serious impacts on the production line" and add costs that might be avoided with a little consultation and cooperation.

Structuring the NDAA program in this cooperative fashion has not been easy, Mr. Kugel explained. "It's real hard because we don't think that way. People here have

done things the same way for twenty years."

Colleen Preston, the deputy under secretary of defense for Acquisition Reform, has "cleared the program and assured us we'd get all the waivers we need," Mr. Kugel added.

Contractors so far have been "skeptical and enthusiastic" about the commercial-practices approach, he said. One suggested that the program office should count up how many contract pages it was simply copying from earlier projects to get a feel for the true level of innovation on the NDAA.

"If we just Xerox a whole lot, then we aren't making any progress," Mr. Kugel said. The comment gave him incentive to "write our specs so [they are] functional and don't suggest the solution."

In recent months, the C-17 showed all the signs of a turnaround. Deliveries had closed with the schedule and even were coming in early. The Air Force reported that overall quality was up. Initial tests were concluded successfully, and the Globemaster III even racked up some operational successes.

The changes were no doubt driven in large measure by McDonnell's C-17 management shake-up. However, the NDAA program certainly played a role in getting the company's attention and may prove to be worth every penny that has been—or may not have to be—spent on it. ■



Staff photo by Guy Aceto

In recent months, the C-17 staged a major turnaround. Deliveries are coming in early, and overall quality is up. Initial tests have been successful, and the Globemaster III even racked up some operational successes.



Our Pledge

I pledge allegiance to the flag
of the United States of America
and to the republic for which it stands,
one nation
under God,
indivisible,
with liberty
and justice for all.



E-SYSTEMS

The science of systems.

Gallery of South Asian Airpower

By John W. R. Taylor and Kenneth Munson

Attack Aircraft

A-5

China extensively redesigned the J-6 (license MiG-19) fighter-bomber into a dedicated attack aircraft (Chinese designation Q-5), the principal external change being "cheek" intakes instead of a single nose intake for the twin engines. Several hundred Q-5s were built, in various versions.

The much-improved A-5C, to meet a 1981 order from the Pakistan Air Force, has a Martin-Baker zero/zero seat, upgraded avionics, and can carry weapons and drop tanks standard on other PAF aircraft, including Sidewinder air-to-air missiles (AAMs). Nanchang delivered 52 for Nos. 7, 16, and 26 Squadrons at Peshawar and Masroor, although numbers are now reportedly down to little more than 40. Bangladesh received 20 A-5Cs to equip No. 8 Squadron at Chittagong and No. 21 at Dhaka. The 24 ordered by Myanmar for 1993-95 delivery are reportedly A-5Ms, with uprated WP6A engines (8,267 lb thrust), two additional underwing stores stations, and a new all-weather nav/attack system. (Data for A-5C.)

Contractor: Nanchang Aircraft Manufacturing Company, People's Republic of China.

Power Plant: two Shenyang WP6 turbojets; each 7,165 lb thrust with afterburning.

Dimensions: span 31 ft 10 in, length 50 ft 7 in (excl nose-probe), height 14 ft 9 3/4 in.

Weights: empty 14,317 lb, gross 21,010-26,455 lb.

Performance: max speed (clean) at 36,000 ft 740 mph, at S/L 752 mph, ceiling (clean) 52,000 ft, T-O run (clean) 2,460 ft, landing run with brake-chute 3,480 ft, combat radius (max external stores) 248-373 miles, range (with external fuel) 1,240 miles.

Accommodation: pilot only, on zero/zero ejection seat.

Armament: 23-mm Norinco Type 23-2K gun, with 100 rds, in each wingroot. Ten weapon stations (two pairs in tandem under fuselage and three under each wing) for up to 4,410 lb of stores including bombs, rockets, AAMs or ASMs, other ordnance, electronic countermeasures (ECM) pods, or drop tanks.

A-7E Corsair II

During the past year, the Thai government approved the purchase of 14 former US Navy A-7E Corsair II single-seat light attack aircraft and four two-seat TA-7Cs for operation by the Royal Thai Navy. No further details are yet available, and the following data apply to the standard USN A-7E.

Contractor: Vought Corporation, USA.

Power Plant: one Allison TF41-A-2 (Spey) non-afterburning turbofan; 15,000 lb thrust.

Dimensions: span 38 ft 9 in, length 46 ft 1 1/2 in, height 16 ft 0 3/4 in.

Weights: empty 19,127 lb, gross 42,000 lb.

Performance: max speed at S/L 691 mph, at 5,000 ft with 12 Mk 82 bombs 646 mph, ceiling 43,000 ft, T-O run 5,600 ft, typical combat radius 490 miles.

Accommodation: pilot only, on ejection seat.

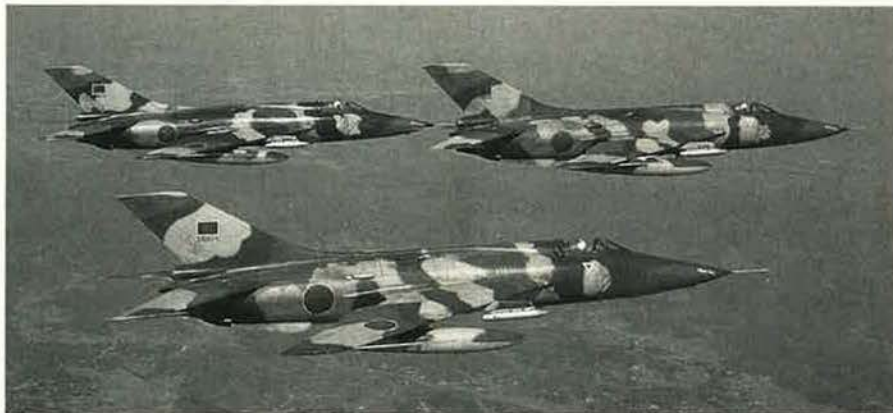
Armament: one 20-mm M61 multibarrel gun; two pylons under fuselage and three under each wing for more than 15,000 lb of Sidewinder AAMs, TV- and laser-guided ASMs, ARMs, bombs, cluster bombs, rockets, and gun pods.

A-37B Dragonfly

The Royal Thai Air Force has a single squadron of this strengthened, reequipped, and reengineered development of USAF's T-37B Tweet primary trainer for counterinsurgency missions. More than doubled permissible gross weight, compared with that of the trainer, enables the relatively small A-37B to carry up to 4,100 lb of weapons and other stores. Speed and range are considerably increased, with added provision for in-flight refueling.

Contractor: Cessna Aircraft Company, USA.

Power Plant: two General Electric J85-GE-17A turbojets; each 2,850 lb thrust.



A-5Cs, Bangladesh Air Force (Peter Steinemann)



IA 58A Pucará, Sri Lanka Air Force (Denis Hughes)

Dimensions: span over tip tanks 35 ft 10 1/2 in, length 29 ft 3 1/2 in, height 8 ft 10 1/2 in.

Weights: empty 6,211 lb, gross 14,000 lb.

Performance: max speed at 16,000 ft 507 mph, ceiling 41,765 ft, T-O run 1,740 ft, landing run 1,710-4,150 ft, range with max payload 460 miles, ferry range 1,012 miles.

Accommodation: crew of two, side by side, on ejection seats.

Armament: one 7.62-mm Minigun in front fuselage. Eight underwing stations for bombs, rocket packs, gun pods, cluster weapons, or other stores.

AU-23A Peacemaker

This version of the Swiss Pilatus Turbo-Porter short takeoff and landing (STOL) utility transport was militarized by Fairchild for counterinsurgency and border-control duties. Of the 15 acquired by USAF for evaluation under the Credible Chase program, 13 were transferred to the Royal Thai Air Force in the early 1970s under the Pave Coin program. Twenty more Peacemakers were acquired by Thailand from 1975, and about 20 are still in service with No. 2 Wing at Lop Buri for armed utility missions.

Contractor: Fairchild Industries, USA.

Power Plant: one Garrett TPE331-1-101F turboprop; 650 shp.

Dimensions: span 49 ft 8 in, length 36 ft 10 in, height 12 ft 3 in.

Weight: gross 6,100 lb.

Performance: max speed 175 mph, ceiling 22,800 ft, T-O run 515 ft, landing run 295 ft, range 558 miles.

Accommodation: pilot and provision for up to nine passengers on seats that are quickly removable for equipment or freight carrying. Hatch in floor for dropping supplies or leaflets or for a camera installation.

Armament: up to 2,000 lb of external stores on 500-lb capacity underfuselage station and four underwing hardpoints. One side-firing 20-mm gun in cabin, plus two side-firing or underwing pod-mounted 7.62-mm guns. External weapons (with minimum crew/passenger load) can include bombs, gun pods, napalm, and unguided rockets; other stores include flare launchers, smoke dispensers, and camera pods.

G-4 Super Galeb

As the first stage in the rapid expansion of the Air Force of Myanmar, 12 Super Galebs were received from the former Soko factory in Mostar in 1990-92. Far more formidable than the straightwing G-2A Galeb, which they had replaced in production, the sweptwing G-4s are capable of dual-role advanced training/light attack duties. In addition to a 23-mm gun, each can carry up to 2,822 lb of weapons underwing.

Contractor: Vazduhoplovna Industrija Soko, Yugoslavia.

Power Plant: one Rolls-Royce Viper Mk 632-46 turbojet; 4,000 lb thrust.

Dimensions: span 32 ft 5 in, length 40 ft 2 1/4 in, height 14 ft 1 1/4 in.

Weights: empty 6,993 lb, gross 10,379-13,889 lb.

Performance: (at 10,379 lb gross weight): max speed at 13,120 ft 565 mph, max cruising speed at 19,700 ft 525 mph, ceiling 42,160 ft, T-O run 1,877 ft, landing run 2,674 ft, range with two drop tanks 1,553 miles.

Accommodation: crew of two, on tandem zero/zero ejection seats. Rear seat raised.

Armament: removable centerline gun pod containing 23-mm GSh-23L twin-barrel gun with 200 rds. Two pylons under each wing for such weapons as napalm tanks, cluster bombs containing eight 35-lb fragmentation munitions, containers for 40 antipersonnel or 54 antitank bomblets, 16-tube rocket packs, triple carriers for 220-lb bombs, 12.7-mm gun pods, or drop fuel tanks.

IA 58A Pucará

When the Sri Lanka Air Force took delivery of the first of four Pucarás, in December 1993, it became the only operator of this twin-turboprop close-support aircraft outside South America. Intended for low-level attack duties similar to those for which USAF's A-10A was produced, the Pucará's armored cockpit floor is resistant to .30-caliber ground fire from 500 ft. Fuel tanks are self-sealing. The rear seat is raised 10 inches above the front seat to give its occupant a clear forward view; dual controls and blind-flying instruments are standard. Onboard ECM is optional.

Contractor: Fábrica Militar de Aviones, Argentina.

Power Plant: two Turbomeca Astazou XVIG turboprops; each 978 shp.

Dimensions: span 47 ft 6¼ in, length 46 ft 9¼ in, height 17 ft 7¼ in.
Weights: empty 8,862 lb, gross 14,991 lb.
Performance: max speed at 10,000 ft 310 mph, ceiling 32,800 ft, T-O run at 12,125 lb weight 985 ft, landing run 656 ft, combat radius 140–606 miles.
Accommodation: crew of two on tandem zero/zero ejection seats. Rear seat raised.
Armament: two 20-mm Hispano DCA-804 guns, each with 270 rds; four 7.62-mm FN-Browning M2-30 guns, each with 900 rds; one underfuselage and two underwing pylons for up to 3,307 lb of gun and rocket pods, bombs, cluster bombs, napalm, mines, torpedoes, ASMs, camera pods, or drop tanks.

Jaguar International

The Indian Air Force chose the Anglo-French Jaguar to fulfill its DPSSA (deep penetration strike aircraft) requirement in 1978, after evaluating it in competition with the Swedish Viggen and French Mirage F1. The IAF has ordered a total of 131 (116 single-seaters and 15 tandem two-seaters). The IAF name is **Shamsher** ("Assault Sword"). The first 40 were built by British Aerospace with Mk 804 Adour engines. On March 31, 1982, Hindustan Aeronautics flew the first of 45 more powerful Mk 811-engine Jaguars assembled from European-built component kits. The remaining 46 have been manufactured almost entirely in India, and production is approaching an end. Twelve single-seaters are being equipped for maritime attack with Thomson-CSF Agave radar in a modified nose; a new DARIN (display attack and ranging inertial navigation) nav/attack system that includes SAGEM Uliss 82 inertial navigation system (INS), a GEC-Marconi COMED (combined map and electronic display), and Smiths Industries head-up display and weapon aiming computer system (HUDWACS); and Sea Eagle antiship missiles.

The basic strike aircraft are operated by Nos. 5, 14, 16, and 27 Squadrons; No. 6 Squadron has the maritime version, plus a few Canberras, for its antiship duties. (Data for HAL-built single-seater.)

Contractor: Hindustan Aeronautics Ltd, India.
Power Plant: two HAL-built Rolls-Royce Turbomeca Adour Mk 811 turbofans; each 8,400 lb thrust with afterburning.

Dimensions: span 28 ft 6 in, length 55 ft 2½ in (incl nose-probe), height 16 ft 0½ in.

Weights: empty 15,432 lb, gross 24,149–34,612 lb.
Performance: max speed above 19,685 ft Mach 1.5, at S/L 745 mph, ceiling 45,000 ft, T-O run 1,855–4,100 ft, landing run with brake-chute 1,540–2,200 ft, typical attack radius with internal fuel and max external stores 334 miles (lo-lo-lo), 530 miles (hi-lo-hi).

Accommodation: pilot only, on zero/zero ejection seat.
Armament: two 30-mm guns in fuselage; two Magic AAMs overwing; centerline pylon and two under each wing; max external load 10,500 lb, including eight 1,000-lb bombs, BL755 or Belouga cluster bombs, packs of 68-mm rockets, or a reconnaissance camera pack. Two BAe Sea Eagle antiship missiles in maritime version.

MiG-23/27 (NATO "Flogger")

The 95 **MiG-23BN** (Flogger-F) single-seat light attack aircraft ordered for the Indian Air Force in 1980 were almost identical to its MiG-23MF interceptors except for a redesigned forward fuselage. This is tapered sharply in side elevation to house a Sokol-23N nav/attack system. The underbelly 23-mm gun is retained, but the cockpit sides are armored; low-pressure tires are fitted for off-runway operation; the fuel tanks are redesigned to fill with neutral gas as the contents are used, to prevent explosion after impact; active and passive ECM are provided. These aircraft equip Nos. 10 (Winged Dagger), 220 (Desert Tigers), and 221 Squadrons, under the Indian name **Vijay**.

Hindustan Aeronautics subsequently undertook license assembly of the similarly configured but more specialized tactical strike **MiG-27M** (Flogger-J) under the Indian name **Bahadur** ("Valiant"). The R-29B-300 turbojet is unchanged, but the 27M has fixed engine air intakes instead of the variable-geometry type of the MiG-25; two-position afterburner nozzles; a wider and deeper nose, housing a laser rangefinder and target tracker behind a sloping window, to permit use of laser-guided missiles; a 30-mm six-barrel gun; a PrNK-23M nav/attack system, providing automatic flight control, gun firing, and weapons release, even during maneuvers; provision for new stores, including a three-camera reconnaissance pod; and other refinements. It is flown by Nos. 2, 9 (Wolf Pack), 18, 22, 31 (Ocelots), and 222 (Tigersharks) Squadrons. With 125 HAL-assembled MiG-27Ms completed by January 1994, and total manufacture planned to exceed 200, eight squadrons will eventually fly this type. A midlife update will replace the PrNK-23M nav/attack system with HAL/Smiths/SAGEM DARIN. (Data for MiG-27M.)

Design Bureau: Mikoyan OKB, Russia.
Power Plant: one Soyuz/Khachaturov R-29B-300 turbojet; 25,350 lb thrust with afterburning.



Jaguar maritime Shamsher, Indian Air Force (Peter Steinemann)



Cessna CC-7 Skymaster, Sri Lanka Air Force (Denis Hughes)



Sea Harrier FRS Mk 51, Indian Navy (Denis Hughes)

Dimensions: span 45 ft 10 in spread, 25 ft 6¼ in swept, length incl nose-probe 56 ft 0¼ in, height 16 ft 5 in.
Weights: empty 26,252 lb, gross 39,685 lb.

Performance: max speed at 26,250 ft Mach 1.7, at S/L Mach 1.1, ceiling 45,900 ft, T-O run 2,625 ft, combat radius at S/L 242 miles, ferry range 1,553 miles.

Accommodation: pilot only, on ejection seat.
Armament: one underbelly 30-mm six-barrel GSh-6-30 gun; seven external hardpoints for 6,615 lb of 500-kg bombs, 57-mm rockets, two Kh-23 ("Kerry") ASMs, four R-60 ("Aphid") AAMs, or other stores.

Mirage 5

Originally, the Mirage 5 was intended as a specialized ground-attack development of the Mirage III fighter. The radar was deleted and other avionics and systems simplified to permit increased internal fuel capacity and external stores load within the same gross weight, but subsequent options resulted in a narrowing of the differences between the equipment standards of the III and 5. Pakistan, the only south Asia operator of the Mirage 5, ordered 28 single-seat 5PA1s in 1970, followed by 18 single-seat 5PA2s, 12 5PA3s, and two 5DPA2 trainers in 1979. The 5PA2s have Cyrano IV multimission radar, while the 5PA3s are equipped with Agave radar for compatibility with Exocet antiship missiles. The PA3s and some PA2s equip the PAF's No. 8 Squadron at Masroor; No. 22 Squadron, the Mirage OCU (Operational Conversion Unit), has a mix of PA3s and PA2s as well as the two-seat DPA2s. (Data generally as for Mirage III.)

O2-337 Sentry

A few of the 10 **O2-337** armed conversions of the Cessna T337 "push and pull" light twin bought in 1980–83 for counterinsurgency and antipiracy missions are believed to remain available to No. 3 Squadron of the Royal Thai Navy. Used airframes were rebuilt by Summit to zero-time status before delivery, and four standard NATO MALL-4A pylons were mounted underwing on each aircraft to carry weapons and other stores. No. 3 Maritime Squadron of the Sri Lanka Air Force uses a basic **Cessna 337 Skymaster** for visual surveillance from Trincomalee (China Bay). (Data for O2-337.)

Contractor: Summit Aviation Inc, USA.

Power Plant: two Teledyne Continental TSIO-360 turbocharged piston engines; each 225 hp.

Dimensions: span 38 ft 2 in, length 29 ft 10 in, height 9 ft 2 in.

Weights: empty 3,160 lb, gross 5,200 lb.

Performance: max speed at S/L 188 mph, at 10,000 ft 206 mph, ceiling 28,500 ft, T-O run 538 ft, landing run 449 ft, range 1,100–1,353 miles.

Accommodation: provision for up to six seats.

Armament: Each pylon can carry up to 350 lb, including 7.62-mm or 12.7-mm gun pods, rocket pods, bombs, containers, markers, flares, and other stores.

OV-10 Bronco

The twin-turboprop, twin-boom OV-10 was the first aircraft designed from the start for specialized counterinsurgency operations. The Royal Thai Air Force deploys its **OV-10C** Broncos for light ground-attack and forward air control (FAC) missions. About 24 equip Nos. 411 and 711 Squadrons, based as Wing 41 at Chiang Mai and with Wing 71 at Surat Thani, respectively. They have engaged in frequent border clashes, in company with the RTAF's A-37B Dragonflies.

Contractor: Rockwell International Corporation, USA.
Power Plant: two Garrett T76-G-416/417 turboprops; each 715 ehp.

Dimensions: span 40 ft 0 in, length 41 ft 7 in, height 15 ft 2 in.

Weights: empty 6,893 lb, gross 9,908–14,444 lb.
Performance: max speed at S/L 281 mph, ceiling 24,000 ft, T-O run (9,908 lb gross weight) 740 ft, landing run 740–1,250 ft, combat radius with 3,600 lb weapon load 228 miles.

Accommodation: crew of two, in tandem.

Armament: two short spools each house two 7.62-mm M60C machine guns, with 500 rds per gun. Four pylons under spools each have a capacity of 600 lb; a centerline fifth pylon can carry 1,200 lb. Stores can include bombs, flare bombs, cluster bombs, rocket packs, 7.62-mm Minigun and 20-mm gun pods, flares, smoke canisters, and Sidewinder AAMs.

Sea Harrier

Fastest of the Harrier V/STOL combat aircraft family, the carrier-based Sea Harrier has a max Mach number of 1.25 at high altitude. Its supreme capability as a dogfighter was demonstrated more than a decade ago in the Falklands campaign. The 23 **Sea Harrier FRS Mk 51s** bought subsequently for operation from the Indian Navy's two carriers, *INS Vikrant* and *Viraat*, are similar to the Royal Navy's original FRS Mk 1s. They are based at Dabolim, in Goa, when not embarked, together with the four **Harrier T Mk 60** tandem two-seat trainers of the Navy's jet OCU. The trainers are similar to the nonmaritime Harrier but have Sea Harrier avionics except for Blue Fox air-to-air/air-to-surface radar. (Data for FRS Mk 51.)

Contractor: British Aerospace plc, UK.
Power Plant: one Rolls-Royce Pegasus Mk 104 vectored-thrust turbofan; 21,500 lb thrust.

Dimensions: span 25 ft 3 in, length 47 ft 7 in, height 12 ft 2 in.

Weights: empty 14,052 lb, gross 26,200 lb.
Performance: max speed at S/L more than 736 mph, high-altitude intercept radius 460 miles, strike radius 288 miles.

Accommodation: pilot only, on zero/zero ejection seat.

Armament: one centerline and four underwing hardpoints for up to 8,000 lb of stores, including Sea Eagle ASMs, 1,030-lb free-fall and 1,120-lb parachute-retarded bombs, rockets, and flares. Four Magic 2 AAMs can be carried on outboard pylons. Provision for replacing underfuselage strake fairings with two 30-mm Aden gun pods.

Su-22M-4 (NATO "Fitter-K")

The status of the squadron of single-seat variable-geometry Su-22M-4 attack fighters bequeathed to the Afghan Republican Air Force when Soviet forces quit Afghanistan is unknown. They represented the final and most advanced variant of the Fitter family, with the same power plant as, and indistinguishable externally from, the Russian Air Force's Su-17M-4. The outer wings offer manually set sweep angles of 30°, 45°, and 63°. Other features compared with early swinging Fitters include ranging radar and a laser rangefinder in the intake centerbody, Doppler navigation radar inside the bottom of the deepened nose, additional fuel in a deeper spine fairing, and a cooling air intake forward of the dorsal fin.

Design Bureau: Sukhoi OKB, Russia.
Power Plant: one Saturn/Lyulka AL-21F-3 turbojet; 24,800 lb thrust with afterburning.

Dimensions: span 44 ft 10½ in spread, 32 ft 10¼ in swept, length incl probes 62 ft 5 in, height 16 ft 0½ in.

Weights: empty 23,738 lb, gross 41,888 lb.

Performance: max speed at height Mach 1.74, at S/L Mach 1.1, ceiling 46,600 ft, T-O run 2,955 ft, landing run 3,120 ft, range at high altitude 1,430 miles, at S/L 870 miles.

Accommodation: pilot only, on ejection seat.

Armament: two 30-mm NR-30 guns in wingroots, each with 80 rds. Nine pylons under wings and fuselage for up to 8,800 lb of bombs, rocket packs, 23-mm gun pods, two R-60 ("Aphid") AAMs, or ASMs including Kh-25ML ("Karen"), Kh-27 ("Kegler"), Kh-29 ("Kedge"), and Kh-58 ("Kilter"). When gun pods are fitted, with downward attack capability, the two underbelly pods can be mounted to fire rearward.

Bombers and Maritime Aircraft

BN-2 Maritime Defender

About 1,200 of these small STOL utility transports have been sold worldwide since the late 1960s, a substantial proportion of them as **Defenders** or **military Islanders**, with either 260 hp O-540 or 300 hp IO-540 piston engines or 320 shp turboprops. Maritime Defenders have a "thimble" nose fairing for their search radar. Major operator in south Asia is the Indian Navy, whose 12 Maritime Defenders have Bendix RDR 1400 radar and are allocated to INAS 318 at Port Blair. INAS 550 at Cochin received six standard Defenders for multiengine training and general observation duties. Pakistan's Navy recently formed a new squadron, No. 93 at Mehran, to operate the two Maritime Defenders of the Maritime Security Agency on EEZ (exclusive economic zone) patrol. A former Seychelles police islander has been militarized and transferred to that country's Defense Force, also for maritime patrol, and a second may be in service with the Seychelles Navy. (Data for turboprop Maritime Defender.)

Contractor: Pilatus Britten-Norman, UK.

Power Plant: two Allison 250-B17C turboprops; each 320 shp (flat rated).

Dimensions: span 49 ft 0 in, length 36 ft 3 3/4 in, height 13 ft 8 3/4 in.

Weights: empty 4,040 lb, gross 7,000 lb.

Performance: max cruising speed at 10,000 ft 196 mph, at S/L 177 mph, ceiling over 25,000 ft, T-O run 837 ft, landing run 757 ft, range 679 miles (IFR), 838 miles (VFR).

Accommodation: crew of one or two; mission stations for four observers or seats for up to nine passengers, or six litters and two medical attendants.

Armament: two underwing hardpoints on each side for gun or sensor pods, releasable weapons, or (inboard) auxiliary fuel tanks.

Br 1150 Atlantic 1

Three former French Navy Atlantic 1 maritime patrol aircraft were sold to Pakistan in the mid-1970s; a fourth was acquired later. They are operated on behalf of the country's Navy by No. 29 Squadron of the Pakistan Air Force, based at Sharea Faisal, and late last year France donated three more surplus examples, stripped of their avionics, to provide spares for the Pakistani fleet.

The "double-bubble" fuselage has a pressurized upper deck accommodating both the normal operational crew (two pilots, a flight engineer, three observers, a radio navigator, ESM/ECM/MAD operator, radar/IFF operator, tactical coordinator, and two acoustic sensor operators) and a relief crew. Equipment includes a retractable radar, magnetic anomaly detector (MAD) tailboom, and an Arar electronic surveillance measures (ESM) pod on the fin tip. Sonobuoys and marker flares are stowed in the rear fuselage. Thomson-CSF of France is to upgrade two of the original Pakistani Atlantics (with options on the other two) by installing its Ocean Master radar, a maritime situation control system, new sonobuoy signal processing and navigation equipment, and DR 3000A ESM.

Contractor: SECBAT consortium, France, Germany, Italy, Belgium, and the Netherlands.

Power Plant: two Rolls-Royce Tyne RTy20 Mk 21 turboprops; each 6,106 ehp.

Dimensions: span 119 ft 1 1/4 in, length 104 ft 2 in, height 37 ft 2 in.

Weights: empty 55,115 lb, gross 98,105 lb.

Performance: max speed at height 409 mph, max cruising speed at 19,685 ft 363 mph, ceiling 32,800 ft, T-O to 50 ft 4,430 ft, landing from 50 ft 3,215 ft, range 5,590 miles, max endurance 18 hr.

Accommodation: crew of 12 (see above), plus provision for full relief crew.

Armament: internal weapons bay accommodates all standard NATO bombs, mines, 385-lb depth bombs, four homing or nine acoustic torpedoes, or two Exocet ASMs. Underwing pylons for two more stores.

Canberra

With Jaguar production nearing completion, the Indian Air Force is expected to retire its remaining

Canberras from first-line attack duties this year. Versions in service include **B(I).58s** flown by No. 6 Squadron for antiship strikes, together with **B.66s** (refurbished ex-RAF B.15s and 16s), ex-RNZAF **B(I).12s**, and a few **TT.18** target tugs modified by HAL from ex-RAF T.4s. The remaining **PR.57s** and **67s** are used for photographic duties by No. 106 Squadron. No. 35 Squadron has specially equipped ECM Canberras and MiG-21s. (Data for Canberra B(I).58.)

Contractor: English Electric Company, UK.

Power Plant: two Rolls-Royce Avon RA.7 Mk 109 turbojets; each 7,500 lb thrust.

Dimensions: span 63 ft 11 1/2 in, length 65 ft 6 in, height 15 ft 7 in.

Weights: empty approx 23,170 lb, gross 56,250 lb.

Performance: max speed at S/L 510 mph, at height 560 mph, ceiling 48,000 ft, T-O to 50 ft 6,000 ft, landing from 50 ft 3,900 ft, combat radius approx 800 miles.

Accommodation: pilot and navigator, side by side on ejection seats, with blister canopy for pilot only.

Armament: in bomber role, up to 6,000 lb of 500- to 4,000-lb bombs carried internally. As interdicator, pack of four 20-mm Hispano guns in bomb bay, plus two 1,000-lb bombs or flares, and 2,000 lb of bombs, rockets, or flares on underwing pylons.

Dornier 228

This German STOL transport has appeared in several variants, of which the **228-100** series can carry 15 passengers; the **228-200** series (of which the -212 is now the standard model) is 5 ft longer. No. 1 Squadron of the Royal Thai Navy has three of the latter, with Bendix RDR 1500 radar, for maritime reconnaissance.

India contracted in 1983 to license-build up to 150 Dornier 228s at HAL's Kanpur Division, but only about 60 had been delivered by January 1994, preceded by a few German-built examples. First recipient was the Indian Coast Guard (36 228-101s ordered), with which they serve at CGAS 744 and 750 for coastal patrol, anti-pollution, and antimuggling missions. These have 360° scan Marec radar in an underfuselage fairing, Omega navigation, an IR/UV linescan for pollution detection, a one-million-candlepower searchlight, loudspeaker, marine markers, a sliding cabin door to permit air-dropping a 20-man life raft, and provisions for underwing antipollution sprays.



BN-2T Maritime Defender, Pakistan Maritime Security Agency



Dornier 228-101, Indian Coast Guard (Denis Hughes)



F27 Mk 200 Friendship, Pakistan Air Force (P. R. Foster)

The 25 Dornier **228-201s** for Nos. 41 and 59 Squadrons of the Indian Air Force have a large rear-fuselage cargo door and are used for various utility and logistic support roles. The shore-based Indian Navy version (27 planned) is also the 228-201, equipped for maritime surveillance and antiship missions with Super Marec radar and antiship missiles. Deliveries, initially replacing the few remaining Breguet Alizés of INAS 310 at Dabolim, began in mid-1993. (Data for 228-201.)

Contractors: Dornier Luftfahrt GmbH, Germany; Hindustan Aeronautics Ltd, India.

Power Plant: two Garrett TPE331-5-252D turboprops; each 776 shp.

Dimensions: span 55 ft 8 in, length 54 ft 4 in, height 15 ft 11 1/2 in.

Weights: empty 8,128 lb, gross 13,184 lb.

Performance: max cruising speed at 10,000 ft 266 mph, ceiling 28,000 ft, T-O run 1,595 ft, landing run 790 ft, range with max payload 508 miles, with max fuel 1,742 miles.

Accommodation: crew of one or two; transport, 22 troops (or 21 paratroops plus jumpmaster); ambulance, six litter patients plus nine sitting casualties/medical attendants.

Armament: none in basic transport role; two underwing 7.62-mm gun pods or ASMs optional on Indian Coast Guard aircraft.

F27 Maritime, Friendship, and Troopship

Maritime, surveillance, and transport variants of the twin-turboprop Fokker F27 Friendship serve with four nations in south Asia. The basic unarmed **F27 Maritime** is configured primarily for coastal surveillance or search and rescue, although a **Maritime Enforcer** variant can be equipped by the operator for antisubmarine warfare (ASW), antiship, or armed surveillance (Fokker does not install armament). Three F27 Maritimes are operated by No. 1 Squadron of the Royal Thai Navy; although armed with Harpoon ASMs, they do not have full Enforcer-standard avionics.

The RTN's No. 2 Squadron also operates a pair of **F27 Mk 400M Troopships** for personnel/cargo transport. No. 12 Squadron of the Pakistan Air Force has a pair of **F27 Mk 200 Friendships** for VIP and calibration duties, plus one or two for EW. Three or more Mk 200s, including some converted and upgraded to F27 Maritime, are used by the Pakistan Navy and two by the Indian Coast Guard. The Myanmar Air Force has one **F27 Mk 100**, with lower-rated (1,715 shp) Dart Mk 514 engines, and three Fairchild-built **FH-227Bs**, a stretched version of the Mk 200 with 2,250 shp Dart Mk 532s. (Data for F27 Maritime.)

Contractor: Fokker Aircraft BV, the Netherlands.

Power Plant: two Rolls-Royce Dart Mk 552 turboprops; each 2,210 shp.

Dimensions: span 95 ft 1 1/4 in, length 77 ft 3 1/2 in, height 28 ft 6 1/2 in.

Weights: empty 27,600 lb, gross 45,000-47,500 lb.

Performance: (at 38,000 lb weight): normal cruising speed at 20,000 ft 287 mph, ceiling 29,500 ft, T-O run 3,200 ft, landing run 2,000 ft, max range 3,107 miles.

Accommodation: crew of two or three. Maritime, two to four tactical compartment operators. Troopship, up to 46 paratroops, 24 litters plus nine sitting casualties/medical attendants, or 13,283 lb of cargo.

Armament (not fitted by Fokker): Enforcer has two stations under fuselage and three under each wing for two or four torpedoes/depth bombs and/or two antiship missiles; provision for drop tank on each center underwing station.

Il-38 (NATO "May")

Like the US Navy's P-3 Orion, this intermediate-range, shore-based, antisubmarine/maritime patrol aircraft had its origin in a turboprop airliner first flown 38 years ago. To house all the required role equipment and operators, the fuselage of the Il-38 had to be lengthened by comparison with the 110/122-passenger Il-18, and the wings were moved forward to keep the center of gravity right. Standard operational avionics include nav/weather radar in the nose, search radar (NATO "Wet Eye") in an undernose radome, and an MAD tailsting. Weapons and other stores are carried in two internal bays in the fuselage, forward and aft of the wing carry-through structure. INAS 315 (Winged Stallions) of the Indian Navy has flown five refurbished former Soviet Navy Il-38s from Dabolim, Goa, since 1977.

Design Bureau: Ilyushin OKB, Russia.

Power Plant: four ZMKB Progress/Ivchenko Al-20M turboprops; each 4,190 ehp.

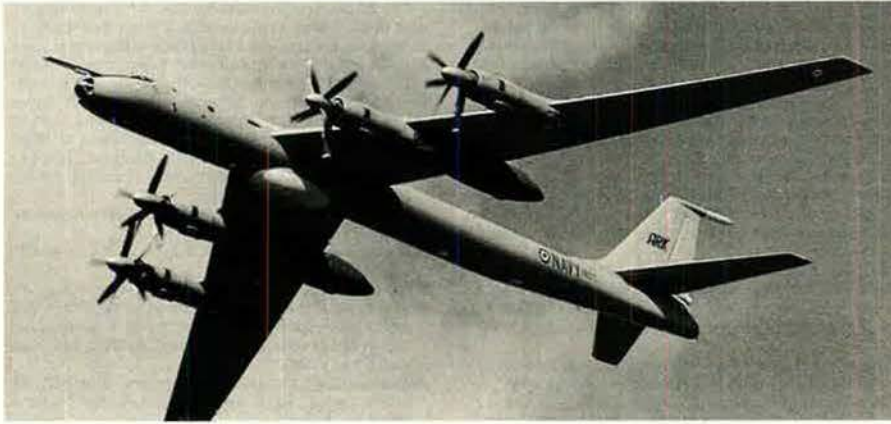
Dimensions: span 122 ft 9 1/4 in, length 129 ft 10 in, height 33 ft 4 in.

Weights: empty 79,367 lb, gross 140,000 lb.

Performance: max speed at 21,000 ft 448 mph, patrol speed at 2,000 ft 248 mph, T-O run 4,265 ft, landing run 2,790 ft, range 4,473 miles, endurance 12 hr.

Accommodation: crew of 12.

Armament: attack weapons and sonobuoys in weapons bays.



Tu-142M, Indian Navy (Denis Hughes)

N24A Searchmaster/N22B Missionmaster

Thailand is the only south Asian operator of this Austral short/medium-range STOL utility twin. No. 2 Squadron of the Royal Thai Navy has three N24A Searchmaster Ls for maritime patrol and surveillance, each equipped with a 360° scan Litton APS-504(V)2 search radar with a 40-in flat-plate phased-array antenna in an undernose "lozenge" radome; Doppler, Omega, or inertial long-range navigation; and Barra SSQ-801 sonobuoys. One or more now have a side-looking airborne radar. Their primary role is antipiracy patrols in the Gulf of Thailand, for which the nation receives UN funding. At Phitsanulok, No. 461 Squadron of the Royal Thai Air Force has about 20 of the shorter-fuselage N22B Missionmasters for utility and tactical transport duties (crew of one or two, plus up to 14 passengers). Some of these have been adapted as makeshift gunships. (Data for Searchmaster L.)

Contractor: Government Aircraft Factories, Australia.
Power Plant: two Allison 250-B17C turboprops; each 420 shp.

Dimensions: span 54 ft 2 in, length 47 ft 1 in, height 18 ft 2 in.

Weights: empty 5,897 lb, gross 9,100 lb

Performance: normal cruising speed 193 mph, ceiling 20,000 ft, T-O run 970 ft, landing run 780 ft, range 840 miles.

Accommodation: crew of five.

Armament: provision for four underwing hardpoints, each for a 500-lb store including gun and rocket pods.

P-3 Orion

Five former US Navy P-3As were delivered to the Royal Thai Navy in 1993-94. Two are being converted into P-3T patrol aircraft, with modified tactical navigation suite and AN/AWG-13 Harpoon antiship missile control system. One will become a LP-3T utility/trainer, with some tactical sensor capability, including AN/AAS-36 IR detection, ESM, and TO-44/A tactical computer. Two will be cannibalized for spares. (Data for P-3C Update III.)

Contractor: Lockheed Aeronautical Systems Group, USA.

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

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 110,000 lb gross weight at 25,000 ft 378 mph, patrol speed at 1,500 ft at same weight 237 mph, ceiling 28,300 ft, T-O run 4,240 ft, landing distance 2,770 ft, mission radius (three hours on station at 1,500 ft) 1,530 miles.

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

Armament: one 2,000-lb or three 1,000-lb mines, or up to eight depth bombs or torpedoes, or depth bomb/torpedo combinations, in internal weapons bay. Ten underwing pylons for torpedoes, mines, rockets, or other stores.

Tu-142M (NATO "Bear-F")

The only export customer for Russia's giant Tu-95/142 turboprop combat aircraft is India, which acquired 10 Tu-142M (Bear-F) long-range maritime reconnaissance aircraft in 1988 for Naval Squadron INAS 312 at Dabolim, Goa. Equipped to the standard known to NATO as Mod 3, their J-band overwater search-and-surveillance radar is housed in a large radome under the center-fuselage. A faring that projects rearward



F-6, Pakistan Air Force (Denis Hughes)

from the tip of the tailfin contains MAD gear. Bear-F's basic endurance of around 30 hours can be extended by in-flight refueling.

Design Bureau: Tupolev OKB, Russia.

Power Plant: four KKBM Kuznetsov NK-12MV turboprops; each 14,795 ehp.

Dimensions: span 167 ft 8 in, length 162 ft 5 in, height 39 ft 9 in.

Weight: gross 407,850 lb.

Performance: max speed at 25,000 ft 575 mph, ceiling 41,000 ft, combat radius (unrefueled) 5,150 miles.

Accommodation: basic crew of 10 (commander, copilot, five weapon system operators, flight engineer, flight signaller, gunner) can be supplemented by relief crew members for long missions.

Armament: depth charges, torpedoes, and sonobuoys in two weapons bays in rear fuselage. Two 23-mm guns in manned tail turret.

Fighters

F-5E Tiger II

Since receiving F-16s, the Royal Thai Air Force has reassigned its F-5s to surface-attack roles, including antiship missions. It is reported to have nine single-seat F-5A fighters and two two-seat F-5B combat trainer counterparts, serving alongside 38 second-generation F-5E single-seaters and six two-seat F-5Fs. The F-5Es are being updated with Litton LV-39 INS, AN/ALR-46 radar warning receivers, ALE-40 chaff/flare dispersers, and HUDWACS, plus provision for carrying a podded GPU-5/A 30-mm gun or the kind fitted to the A-10A Thunderbolt II. A few RF-5 reconnaissance variants are also in service. (Data for F-5E.)

Contractor: Northrop Corporation, USA.

Power Plant: two General Electric J85-GE-21B turbojets; each 5,000 lb thrust with afterburning.

Dimensions: span 26 ft 8 in (27 ft 11½ in over wingtip AAMs), length (incl nose-probe) 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 Mach 1.64, ceiling 51,000 ft, T-O run 2,300-5,700 ft, landing run with brake-chute 2,500 ft, typical hi-lo-hi combat radius with max internal fuel, two 530-lb bombs, and two Sidewinder AAMs 553 miles.

Accommodation: pilot only, or ejection seat.

Armament: two 20-mm M39A2 guns in nose; AIM-9 Sidewinder AAM at each wingtip; one underfuselage

and four underwing stations for up to 7,000 lb of bombs, cluster bombs, rocket packs, napalm tanks, missiles, or other stores.

F-6 (NATO "Farmer")

Very large numbers of Mikoyan MiG-19s were license-built and later developed in China by Nanchang and Shenyang for the Chinese armed forces (designated J-6) and for export (F-6). The standard J-6/F-6 day fighter-bomber, corresponding to the Soviet MiG-19SF (Farmer-C), was by far the most numerous model. Variants included 634 Shenyang JJ-6 (export FT-6) tandem two-seat trainers.

A large number of F-6s (reportedly 74) were donated to Pakistan in the late 1960s after US military aid was suspended following the 1965 Indo-Pakistan war. Further batches of 60 were ordered in 1972 and 1977. They were modified in Pakistan to carry Sidewinder AAMs and, later, to have Martin-Baker zero/zero ejection seats. A quantity of FT-6s were delivered from 1980. The Pakistan fleet has now reduced to about 90 F-6s, still equipping Nos. 15, 17, and 23 Squadrons and an OCU. Each unit has a few FT-6s as well, and the latter type also serves as a conversion trainer with the PAF's three squadrons of A-5Cs. However, phasing out began following the arrival of F-7s, and about 40 were transferred to the Bangladesh Defense Force Air Wing in 1990. Many F/FT-6s were lost in spring 1991 during that country's disastrous floods. Bangladesh had previously received 24 F-6s directly from China, but only No. 25 Squadron (Trendsetters) at Chittagong, the fighter OCU, is now an F-6 unit. It is still not certain whether a 1992 Chinese offer to Myanmar was taken up. (Data for F-6 day fighter.)

Contractors: Nanchang Aircraft Manufacturing Company and Shenyang Aircraft Corporation, People's Republic of China.

Power Plant: two Shenyang/Chengdu WP6 turbojets; each 7,165 lb thrust with afterburning.

Dimensions: span 30 ft 2¼ in, length incl probe 48 ft 10½ in, height 12 ft 8¾ in.

Weights: empty 12,700 lb, gross 22,045 lb.

Performance: max speed at 36,000 ft Mach 1.45, at S/L 832 mph, ceiling 58,725 ft, T-O run 2,953 ft, landing run with brake-chute 1,970 ft, combat radius with two drop tanks 426 miles, max range on internal fuel 863 miles.

Accommodation: pilot only, on ejection seat.

Armament: three 30-mm NR-30 guns, in nose and each wingroot. Two pylons under each wing, inboard of hardpoint for external tank, to carry packs of eight air-to-air rockets, AAMs, two 550-lb bombs, or air-to-surface rockets of up to 212-mm caliber.

F-16 Fighting Falcon

Twenty-eight Block 15 F-16As and 12 combat-capable two-seat F-16Bs were delivered to the Pakistan Air Force between 1983 and 1986, but follow-on orders in 1988 and 1989 for 54 As and 17 Bs were embargoed by the US government when Pakistan refused to sign the nuclear nonproliferation treaty. Attrition has reduced the original 40 to about 35, but because spares for these were also embargoed the number still serviceable may be lower than that figure and their alleged ability to carry nuclear weapons correspondingly impaired. They equip Nos. 9 (Griffins) and 11 (Arrows) Squadrons at Sargodha and No. 14 (Shaheens) Squadron at Kamra; equipment includes Thomson-CSF Atlas laser target designation pods.

The additional 71 aircraft were to have been to Block 15 OCU (operational capabilities upgrade) standard, with updated radar, improved fire-control and stores-management systems, and Westinghouse AN/ALQ-131 jammer pods. Eleven had been completed before the October 1990 embargo and a further 17 since then. Delivery of these 28 has been approved, but work on the remaining 43 has been halted.

Deliveries of 14 Block 15 OCU F-16As and four F-16Bs to No. 103 Squadron of the Royal Thai Air Force at Korat began in June 1988. A similar-size batch, due for delivery from March 1995, consists of 12 Block 15 OCU F-16As and six F-16Bs. (Data for Block 15 F-16A.)

Contractor: General Dynamics Corporation, USA (now Lockheed Fort Worth Company).

Power Plant: one Pratt & Whitney F100-PW-220 turbofan; 23,450 lb thrust with afterburning.

Dimensions: span 31 ft 0 in, length 49 ft 3½ in, height 16 ft 8½ in.

Weights: empty 16,285 lb, gross 37,500 lb.

Performance: max speed at 40,000 ft Mach 2.05, ceiling more than 50,000 ft, T-O run 3,250 ft, landing run (with brake-chute) 2,430 ft, combat radius more than 575 miles, range with drop tanks more than 2,415 miles.

Accommodation: pilot only, on zero/zero ejection seat.

Armament: one M61A1 multibarrel 20-mm gun, with 515 rds, in port-side wing/body fairing. One underfuselage and six underwing stations, plus AAM rail at each wingtip. External stores (load limit 12,000 lb)

can include wide range of single or cluster bombs, rockets, laser-guided and electro-optical weapons and sensors, Pave Penny laser tracker pod, forward-looking infrared or jammer pods, or drop tanks.

LCA

Although it is not due to enter service until 2002 at the earliest, the Indian government gave the go-ahead to develop the LCA (Light Combat Aircraft) as long ago as 1983. It was intended to replace both the Ajeet (which has already been retired) and the MiG-21 in Indian Air Force service, and development delays are the primary reason for the recently commissioned IAF MiG-21 upgrade program. Airframe design, for the dual roles of air superiority and light close air support, was undertaken by the Indian Defense Ministry's Aeronautical Development Establishment and was frozen in 1990. A delta wing with compound leading-edge sweep is blended with a circular-section fuselage and twin "cheek" intakes for the single engine. On-board features will include a Lockheed Martin quadruplex fly-by-wire flight-control system with HOTAS cockpit controls.

The main cause of the LCA's protracted development has been the slow progress of the Indian turbofan engine planned for the production version, which could yet be abandoned for an off-the-shelf foreign engine. Meanwhile, the two prototypes being built by Hindustan Aeronautics will be powered by US General Electric turbofans. Latest estimate for the oft-deferred first flight, following a February or March 1995 rollout, is June 1996. IAF requirement for the LCA is believed to be about 200.

Contractor: Hindustan Aeronautics Ltd, India.

Power Plant: one General Electric F404-GE-F2J3 turbofan in prototypes; 18,100 lb thrust with afterburning. Production LCA to have Indian GTRE GTX-35VS turbofan of 18,740 lb thrust.

Dimensions: span 26 ft 10 3/4 in, length 43 ft 3 3/4 in, height 14 ft 5 1/4 in.

Weights: empty approx 12,125 lb, gross (clean) 18,740 lb.

Performance (estimated): max speed at height Mach 1.6, ceiling over 50,000 ft.

Accommodation: pilot only, on zero/zero ejection seat.

Armament: one 23-mm twin-barrel GSh-23 gun in fuselage, with 220 rds; three hardpoints under each wing and one under fuselage for more than 8,818 lb of short/medium-range AAMs and ASM's, bombs, rockets, or other weapons, or up to five drop tanks.

MiG-17 (NATO "Fresco") and FT-5

Forty-five years after the prototype first flew, MiG-17s can still be seen in south Asia. Whether those operated as fighter-bombers by the 393d Regiment of the Afghan Republican Air Force, at Mazar-e-Sharif, are still operational is unknown. In any case, their early-1950s origin must imply a limited effectiveness in even a low-intensity environment.

Two FT-5 tandem two-seat trainers, developed from the single-seat MiG-17PF by Chengdu Aircraft Industrial Corp., were the first jet aircraft bought by Sri Lanka from China in 1991. They equip No. 5 Squadron at Katunayake, alongside four F-7s and one FT-7. Armament of the FT-5 comprises a single 23-mm gun in a removable belly pack. It is powered by a 5,952 lb thrust Xian WP5D nonafterburning turbojet. (Data for MiG-17PF.)

Design Bureau: Mikoyan OKB, Russia.

Power Plant: one Klimov VK-1F turbojet; 7,450 lb thrust with afterburning.

Dimensions: span 31 ft 7 in, length 38 ft 3 3/4 in, height 12 ft 5 1/4 in.

Weights: empty 9,147 lb, gross 13,845 lb.

Performance: max speed at 13,125 ft 696 mph, ceiling 52,000 ft, T-O run 1,970 ft, landing run 2,720 ft, max range with external tanks 1,200 miles.

Accommodation: pilot only, on ejection seat.

Armament: three 23-mm NR-23 guns; provision for 1,100 lb of bombs or rocket packs under wings.

MiG-21 (NATO "Fishbed") and F-7M Aiguard

Since the Soviet withdrawal from Afghanistan in 1989, the latter country's air force has received increasing numbers of ex-Soviet MiG-21s, which currently number 65 or more and equip four squadrons forming part of No. 322 Fighter-Interceptor Regiment.

Several hundred MiG-21s were assembled and later built under license for the Indian Air Force by Hindustan Aeronautics Ltd in a program that ran for a decade and a half and embraced three major variants. First of these was the MiG-21FL, of which HAL produced about 200 from 1962 to 1968 before switching for the next three years to the improved MiG-21M and MF. Of these earlier models, the IAF still operates three squadrons of FLs (Nos. 8, 29, and 30) and three M/MF squadrons (Nos. 17, 101, and 108). Most of the 400 or so now in IAF service, equipping a further 10.5 squadrons, are of the upgraded MiG-21bis version produced by HAL

from 1980 to 1987. The proportionate number of MiG-21U combat-capable two-seat trainers that serve alongside them were all supplied by the USSR. In the spring of 1994, the Mikoyan factory was selected to apply its MiG-21-93 upgrade to 100 of the IAF's MiG-21bis for redelivery from early 1997. This will combine a ring-laser INS, MIL-1553B data bus, radar warning receiver, and cockpit voice recorder with the ability to carry R-27 ("Alamo"), R-73 ("Archer"), and R-77 ("AMRAAMski") AAMs. A further 70 Indian MiG-21s may be upgraded later.

Virtually all other MiG-21 variants in the region are F-7M Aiguards, an export version of the domestic J-7 II developed in China from the original J-7 (license-built MiG-21F-13). An early order came in 1985 from the Pakistan Air Force for 20 aircraft, modified to meet PAF requirements. Deliveries to No. 20 Squadron at Rafiqi began in July 1988; they became operational some 16 months later. Designated F-7P by the PAF, they have since been supplemented by 60 more F-7Ps and 15 two-seat FT-7s (PAF designation F-7TP), equipping No. 2 Squadron at Masroor, No. 18 Squadron at Rafiqi, and a training unit, No. 25 (OCU) Squadron, at Mianwali. A further 40 F-7Ps were ordered in October 1992 to offset the US embargo on Pakistan's order for 71 F-16s. Other recent F-7 recipients include the air forces of Bangladesh, Myanmar, and Sri Lanka. Bangladesh has 16 F-7Ms in service with No. 5 Squadron (Supersonics) at Dhaka and No. 35 (Thundercats) at Chittagong. A few ex-Soviet MiG-21MFs and a single MiG-21UM may also survive with the former squadron. The four aircraft that (with a single FT-7) equip Sri Lanka's No. 5 Squadron at Katunayake are a hybrid version design-



Mockup of LCA (Denis Hughes)



Mirage IIIDP, Pakistan Air Force (Peter Steinemann)

nated F-7BS, with an early-model F-7B fuselage and the four-pylon wings of the F-7M. Delivery of Myanmar's 36 F-7Ms (including a few FT-7s) was due to be completed by the end of 1994. (Data for F-7M.)

Contractor: Chengdu Aircraft Industrial Corporation, People's Republic of China.

Power Plant: one Chengdu WP7B(BM) turbojet; 13,448 lb thrust with afterburning.

Dimensions: span 23 ft 5 1/2 in, length excl probe 45 ft 9 in, height 13 ft 5 1/2 in.

Weights: empty 11,269 lb, gross 16,603 lb.

Performance: max speed at height Mach 2.05, ceiling 59,710 ft, T-O run 3,117 ft, landing run with brake-chute 2,953 ft, combat radius on internal fuel (hi-lo-hi) 373 miles, range with three drop tanks 1,081 miles.

Accommodation: pilot only, on ejection seat.

Armament: two 30-mm Type 30-1 guns in lower front fuselage. Four underwing hardpoints for two or four PL-2/2A/5B/7 or Magic AAMs, pods of 18 x 57-mm or seven x 90-mm rockets, bombs of up to 1,100 lb, or drop tanks (one 190 US gallon on centerline and/or two 127 US gallon under wings).

MiG-23 (NATO "Flogger")

India's No. 224 Squadron (Warlords) flies MiG-23MF (NATO Flogger-B) variable-geometry single-seat in-

terceptors bought in 1983. Known by the Indian name Rakshak, this version has Sapfir-23D ("High Lark") radar, with a search range of 43 miles and tracking range of 34 miles, an undernose infrared sensor pod, and radar warning system. It carries both close-range and medium-range AAMs. Also in service are about 10 MiG-23UB (Flogger-C) tandem two-seat trainers, with a 22,045 lb thrust Tumansky R-27F2M-300 turbojet.

Less is known about the current status of 25-30 MiG-23MFs that the Afghan Republican Air Force inherited when Soviet forces evacuated Afghanistan in 1989. They are reported to have served with two squadrons of No. 322 Fighter-Interceptor Regiment at Bagram, north of Kabul. (Data for MiG-23MF.)

Design Bureau: Mikoyan OKB, Russia.

Power Plant: one Soyuz/Khachaturov R-29-300 turbojet; 27,540 lb thrust with afterburning.

Dimensions: span 45 ft 10 in spread, 25 ft 6 1/4 in swept, length (incl nose-probe) 54 ft 10 in, height 15 ft 9 1/4 in.

Weight: gross 34,725-45,570 lb.

Performance: max speed at height Mach 2.35, at S/L Mach 1.1, ceiling 59,000 ft, combat radius 600 miles.

Accommodation: pilot only, on ejection seat.

Armament: one twin-barrel 23-mm GSh-23L gun in belly pack. One pylon under center-fuselage, one under each engine air intake duct, and one under each fixed inboard wing panel, for AAMs, bombs, rocket packs, or other stores. Use of twin launchers under the air intake ducts permits carriage of four R-60T ("Aphid") missiles, in addition to two R-23R ("Apex") on underwing pylons.

MiG-29 (NATO "Fulcrum")

Three squadrons of MiG-29s form the primary air-superiority equipment of the Indian Air Force. The 65 MiG-29 (Fulcrum-A) single-seaters and five MiG-29UB (Fulcrum-B) two-seat combat trainers received to date equip No. 28 (First Supersonics), No. 47 (Flying Archers), and No. 223 (Tridents) Squadrons, under the Indian name Baaz ("Eagle"). The aircraft appear to retain all or most of the operational equipment fitted to MiG-29s in service in the CIS, including coherent pulse-Doppler look-down/shoot-down radar, an infrared search and track (IRST) sensor, anti-FOD (foreign object damage) doors in the engine air intakes, 360° radar warning system, laser rangefinder, and flare packs in the "fences" forward of the tailfins. Reports of an Indian order for the highly advanced MiG-29M version appear to have been premature. (Data for basic MiG-29.)

Design Bureau: Mikoyan OKB, Russia.

Power Plant: two Klimov/Sarkisov RD-33 turbofans; each 18,300 lb thrust with afterburning.

Dimensions: span 37 ft 3 1/4 in, length 56 ft 10 in, height 15 ft 6 1/4 in.

Weights: empty 24,030 lb, gross 33,600-40,785 lb.

Performance: max speed at height Mach 2.3, at S/L Mach 1.225, ceiling 55,775 ft, T-O run 855 ft, landing run with brake-chute 1,970 ft, range 932-1,300 miles.

Accommodation: pilot only, on ejection seat.

Armament: six close-range R-60T/MK ("Aphid") or four R-60T/MK and two medium-range R-27R-1 ("Alamo-A") AAMs on six underwing pylons; provision for carrying R-73A/E ("Archer") close-range AAMs; able to carry bombs, submunitions dispensers, napalm tanks, and 57-mm, 80-mm, and 240-mm rockets, up to maximum 6,615 lb, in attack role. One 30-mm GSh-301 gun in port wingroot extension, with 150 rds.

Mirage III

About 18 of the original 23 Mirage IIIs (18 Mirage IIIEP all-weather low-altitude attack fighters and five IIIDP tandem two-seat trainers) ordered for the Pakistan Air Force between 1967 and 1975 now equip the service's No. 5 Squadron at Rafiqi. For their primary role, the fighters are equipped with Thomson-CSF Cyrano II fire-control and ground-mapping radar, GEC-Marconi Doppler radar, and navigation/bombing computers, but qualification began in late 1993 of a new SAGEM weapon delivery, navigation, and reconnaissance system known as MAESTRO (modular avionics enhancement system targeted for retrofit operations), to extend their air-to-air performance and provide air-to-ground attack capability. A new multimode pulse-Doppler radar is also expected. The 42 Mirage IIIOs and eight two-seat DOs acquired when Australia replaced them with Hornets are being reworked by Pakistan's Mirage Rebuild Factory at Kamra to augment the PAF's Mirage fleet. Plans were to rebuild 36, the first of which was completed in late 1991, to equip two further squadrons; the remainder are expected to be cannibalized for spares. Ten more Mirages (nine IIIEs and one two-seat IIIBL) were acquired from Lebanon in 1994. (Data for Mirage IIIEP.)

Contractor: Avions Marcel Dassault-Breguet Aviation, France.

Power Plant: one SNECMA Atar 9C turbojet; 13,670 lb thrust with afterburning.

Dimensions: span 26 ft 11 1/2 in, length 49 ft 3 1/2 in, height 14 ft 9 in.

Weights: empty 15,540 lb, gross 21,165–30,200 lb.
Performance: max speed at 40,000 ft Mach 2.2, at S/L Mach 1.135, ceiling 55,775 ft, T-O run 2,295 ft, landing run with brake-chute 2,295 ft, combat radius (lo-lo-lo) 305 miles.
Accommodation: pilot only, on ejection seat.
Armament: two 30-mm DEFA 552 guns in fuselage; one R.530 AAM under fuselage and two Magic AAMs under wings. Bombs or rocket pods can be carried underwing on attack missions.

Mirage 2000

Between 1985 and 1988, the Indian Air Force received 42 single-seat **Mirage 2000H**s and seven two-seat **2000TH**s to equip Nos. 1 (Tigers) and 7 (Battle Axe) Squadrons, both based at Maharajpura AFB, Gwalior. They represented its only genuine modern multirole fighters and have proved their worth in combat situations in Sri Lanka and the Maldives Islands. Indian name for the **Mirage 2000H** is **Vajra** ("Divine Thunder"). Plans to acquire substantially more were shelved in favor of an order for Russian MiG-29s.

The IAF's 2000Hs are generally similar to French Air Force **Mirage 2000Cs**, with RDM (Radar Doppler Multimode) (range 62 miles), Uliss 52 INS, head-up and head-down cockpit displays, ECM jammers and chaff/flare dispenser, Spirale passive countermeasures, and Servar radar warning receivers. Fly-by-wire flight controls are standard, contributing to a safe minimum speed of 115 mph in stable flight. In air-defense configuration, the aircraft can attain a speed of Mach 2.26 at 39,350 ft within 2½ min of leaving the runway. (Data for **Mirage 2000H**.)

Contractor: Dassault Aviation, France.
Power Plant: one SNECMA M53-P2 turbofan; 21,385 lb thrust with afterburning.
Dimensions: span 29 ft 11½ in, length 47 ft 1¼ in, height 17 ft 0¼ in.
Weights: empty 16,534 lb, gross 37,480 lb.
Performance: max speed at height Mach 2.26, ceiling 59,000 ft, T-O run approx 1,475 ft, range with four 550-lb bombs more than 920 miles.
Accommodation: pilot only, on zero/zero ejection seat.
Armament: two 30-mm DEFA 554 guns in fuselage; five hardpoints under fuselage and two under each wing for max external stores load of 13,890 lb. Two Super 530D and two Magic 2 AAMs for air defense. Ground-attack weapons include 18 x 550-lb retarded bombs or BAP 100 antirunway bombs, 16 Duraland penetration bombs, two 2,200-lb laser-guided bombs, six Belouga cluster bombs, ASMs, and packs of 18 x 68-mm or 100-mm rockets.

tion for Indian Air Force and Army use and one for the Indian Navy and Coast Guard with a retractable tricycle wheel landing gear. Possible future programs include a tandem-seat gunship version and a civil model. Design features include a German-designed fiber elastomer main rotor head with four hingeless blades, a four-axis automatic flight-control system, and digital engine controls. The naval version will have a folding tailboom, flotation gear, and a harpoon decklock. Composites are used extensively in construction of the airframe. Although no production contracts have yet been placed, Indian armed forces/Coast Guard requirements are expected to total at least 250.

Contractor: Hindustan Aeronautics Ltd, India.
Power Plant: two Turbomeca TM 333-2B turboshafts; each 1,000 shp.
Dimensions: rotor diameter 43 ft 3¾ in, fuselage length (incl tail rotor) 42 ft 3¾ in, height 12 ft 10¼ in.
Weights: empty 5,511 lb, gross 8,818 lb (army/air force version), 11,023 lb (naval version).
Performance: max speed 180 mph, ceiling 19,635 ft, max range 497 miles.
Accommodation: crew of two, on crashworthy seats; 10–14 passengers, or equivalent equipment or freight, in cabin.



AH-1 HueyCobra, Pakistan Army



ALH prototype

Helicopters

AH-1 HueyCobra

The Pakistan Army's first 10 HueyCobras were followed by a further 10 received in 1985. They equip Nos. 31 and 32 Squadrons, both based at Multan. Attempts to take up an option for 10 more were embargoed by the US government, though Pakistan is reported to have acquired some additional AH-1s, presumably via a third party. The Royal Thai Army operates four AH-1s, delivered in November 1990. Standards are comparable with the US Army's AH-1F full-capability TOW (Tube-launched, Optically tracked, Wire-guided) missile-carrying version, with a Hughes laser range-finder/tracker, Kaiser pilot's HUD, digital fire-control computer, Doppler navigation, hot metal and exhaust plume IR suppressor, IR jammer, IFF, and composite rotor blades. (Data for **AH-1F**.)

Contractor: Bell Helicopter Textron, USA.
Power Plant: one Allied Signal T53-L-703 turboshaft; 1,800 shp.
Dimensions: rotor diameter 44 ft 0 in, span 10 ft 9 in, fuselage length 44 ft 7 in, height 13 ft 5 in.
Weights: empty 6,598 lb, gross 10,000 lb.
Performance: max speed 141 mph, ceiling 12,200 ft, range 315 miles.
Accommodation: pilot and copilot/gunner in tandem armored cockpits.
Armament: two weapon stations under each stubwing; outer stations can each carry four TOW antitank missiles, inboard stations each a launch tube for seven to 19 x 2.75-in rockets. GE undernose turret for 20-mm M197 three-barrel gun with 750 rds.

ALH

Design of India's ALH (Advanced Light Helicopter), in collaboration with MBB of Germany, started just over 10 years ago, to develop a multirole aircraft to replace the license-built Cheetahs and Chetaks of the Indian armed forces. Three of the scheduled four prototypes have flown (first flight August 20, 1992), and two basic versions are being developed initially: a skid-gear ver-



Ka-28, Indian Navy (BAE/Chris Riding)

Armament: military variant, cabin-side pylons for two antitank missiles, AAMs, or 68-mm rocket pods; options for ventral 20-mm gun turret and up to 2,205 lb of land mines or other stores on external sling. Naval variant, two torpedoes, depth charges, or antiship missiles on cabin pylons; max sling load 3,307 lb.

AS 330 Puma and AS 332 Super Puma

The prototype Puma multipurpose helicopter first flew April 15, 1965, and Anglo-French production totaled 697 for delivery to 46 countries, more than 30 of which have used them for military duties. Production continues by IAR in Romania. Major user in south Asia is the Pakistan Army, which has about 30 of the **AS 330L** final production model for miscellaneous trans-

port duties; a single **AS 330J**, similar to the L, serves as a VIP transport with the Pakistan Air Force. The Royal Nepalese Air Force has two earlier Pumas, an **AS 330C** (1,400 shp Turmo IVB engines) and an **AS 330G**, with metal instead of composite rotor blades. The latter forms part of the Nepalese Royal Flight, together with an **AS 332L Super Puma** (1,877 shp Makila 1A1 engines, updated transmission, and airframe improvements). (Data for **AS 330L**.)

Contractors: Aerospatiale, France; Westland Helicopters, UK.
Power Plant: two Turbomeca Turmo IVC turboshafts; each 1,575 shp.
Dimensions: rotor diameter 49 ft 2½ in, fuselage length 46 ft 1½ in, height 16 ft 10½ in.
Weights: empty 7,970 lb, gross 16,315 lb.
Performance: max cruising speed at S/L 160 mph, ceiling 15,750 ft, range 341 miles.
Accommodation: crew of two; 16 fully equipped troops, six litter patients and six seated persons, or 7,055 lb of internal or external freight.
Armament: provisions for side-firing 20-mm gun, two 7.62-mm machine guns, rocket packs, and other weapons.

Bell 212 and 412

About 103 of these twin-turbine helicopters are in military service or on order by south Asian countries, consisting of about 94 of the lower-powered **Bell 212** and nine examples of the **Bell 412**, which has a four-blade main rotor and updated power plant. About 11 **Bell 212**s serve with No. 31 (VIP) Squadron of the Bangladesh Air Force at Dhaka and 10 (of which nine have been converted locally for counterinsurgency missions) with No. 4 Squadron of the Sri Lanka Air Force at Katunayake. The latter has converted its four 412s to a similar armed configuration.

Largest regional user is Thailand, whose army has 25 or more 212s (20 more were ordered in 1993) and four 412s, border police thirteen 212s, and navy fourteen 212s with No. 4 Squadron. The Royal Thai Air Force has one 212 and one 412, forming part of the country's Royal Flight. (Data for **Bell 212**, with 412 in parentheses.)

Contractor: Bell Helicopter Textron, USA/Canada.
Power Plant: one Pratt & Whitney Canada PT6T-3B (PT6T-3B-1) Turbo Twin Pac turboshaft; flat rated at 1,290 shp (1,400 shp).
Dimensions: rotor diameter 48 ft 2¼ in (46 ft 0 in), fuselage length (both) 42 ft 4¼ in, height 12 ft 10 in (10 ft 9½ in).
Weights: empty 5,997 lb (6,495 lb), gross 11,200 lb (11,900 lb).
Performance: max cruising speed at S/L 115 mph (140 mph), ceiling 13,000 ft (16,500 ft), max range 261 miles (408 miles).
Accommodation: pilot and up to 14 passengers or equivalent cargo.
Armament (both): can include a 12.7-mm or 0.50-in machine gun in ventral turret, plus provisions for externally mounted antitank or antiship missiles, gun pods, or rocket pods.

Ka-25PL (NATO "Hormone-A")

Although the greatly superior Ka-28 is well established in service, the Indian Navy continues to operate about five of the seven Ka-25PL helicopters that it purchased for operation from its *Kashin II*-class destroyers. Primary mission is ASW, with secondary surveillance and search-and-rescue (SAR) duties. They are of traditional Kamov design, with contrarotating coaxial rotors. Equipment includes search radar in a large flat-bottomed undernose radome, dipping sonar, and sonobuoys stored on a rack on the starboard side. Lack of autohover capability prevents use of the dipping sonar at night or in adverse weather.
Design Bureau: Kamov OKB, Russia.
Power Plant: two Mars GTD-3M turboshafts; each 986 shp.

Dimensions: rotor diameter (each) 51 ft 7¾ in, fuselage length 32 ft 0 in, height 17 ft 7½ in.
Weights: empty 10,505 lb, gross 15,873 lb.
Performance: max speed 130 mph, ceiling 11,000 ft, range 250–405 miles.
Accommodation: crew of two; main cabin is large enough to contain 12 folding seats.
Armament: one 18-in ASW torpedo in underfuselage weapons bay.

Ka-28 (NATO "Helix-A")

For antisubmarine duties from its new and upgraded *Kashin*-class ships, the Indian Navy has procured at least 17 Ka-28 helicopters, of which three are assigned to training duties. Assigned to No. 333 Squadron, they are generally similar to the CIS Navy's Ka-27PL. Each can be stowed in much the same hangar space as a Ka-25 but offers greatly improved performance and military capability. The general configuration is little changed, with contrarotating coaxial rotors, but the cabin is enlarged and twin fins replace the triple tail unit

of "Hormone." Two TV3 turboshafts enable flight to be maintained on one engine at max gross weight. Equipment includes an undernose 360° search radar, dipping sonar, IFF, radar warning receivers, IR jammer, and ESM. The autopilot provides automatic approach and hover on a preselected course, using Doppler radar, enabling use of the dipping sonar at night and in adverse weather. Ka-28s normally operate in pairs, one tracking the hostile submarine, the other dropping depth bombs. Officially released information claims an effectiveness against submarines cruising at up to 40 knots, at a depth of 1,650 ft, out to 125 miles from the helicopter's base, by day and night.

Design Bureau: Kamov OKB, Russia.

Power Plant: two Klimov TV3-117V turboshafts; each 2,190 shp.

Dimensions: rotor diameter (each) 52 ft 2 in, fuselage length 37 ft 1 in, height 17 ft 8½ in.

Weight: gross 26,455 lb.

Performance: max speed 168 mph, ceiling 12,000 ft, range 310 miles.

Accommodation: crew of three.

Armament: two torpedoes or four depth bombs, plus sonobuoys, in ventral weapons bay.

Lynx

Following its recent purchase of six surplus Royal Navy Type 21 frigates, the Pakistan Navy announced its requirement for a commensurate number of antisubmarine helicopters to serve on board these ships. First step toward meeting this need was taken in June 1994 with an order for three Westland Lynx, plus options on three more. The order is being met by the transfer of ex-RN Lynx HAS. Mk 3s, the first two of which were delivered in August 1994; the third is due to follow in April this year. Capable of antisubmarine classification and strike, air-to-surface-vessel search and strike, reconnaissance, search and rescue, troop transport, fire support, vertrep, communications, and fleet liaison, the HAS. Mk 3 has a nose-mounted GEC-Marconi Seaspray search and tracking radar, and can carry Sea Skua antiship missiles. (Data for HAS. Mk 3.)

Contractor: Westland Helicopters Ltd, UK.

Power Plant: two Rolls-Royce Gem 41-1 turboshafts; each 1,120 shp.

Dimensions: rotor diameter 42 ft 0 in, fuselage length 45 ft 3 in, height 11 ft 5 in.

Weights: empty 7,370 lb, gross 10,500 lb.

Performance: max cruising speed 144 mph, ceiling 8,450 ft, max range 368 miles.

Accommodation: pilot and copilot or observer, plus up to 10 passengers, six litters and a medical attendant, or 2,000 lb of internal equipment or cargo; in SAR configuration, crew of three and 600-lb capacity external rescue hoist.

Armament (ASW configuration): two pylon-mounted Mk 44, Mk 46, or Sting Ray homing torpedoes, one each side of fuselage, plus six marine markers; or two Mk 11 depth charges or up to four BAe Sea Skua semiactive homing antiship missiles.

Mi-8/17 (NATO "Hip")

First flown in 1962, the basic production version of this family of multipurpose helicopters was the Mi-8 with two TV2 turboshaft engines and a starboard-side tail rotor. Since the beginning of the 1980s, customers wanting higher performance from the same basic airframe have been able to buy the Mi-17 (Hip-H), with 1,923 shp TV3-117MT engines in shorter nacelles and with the tail rotor on the port side.

The Mi-8 Hip-C is the standard heavily armed assault transport, intended to put down troops, equipment, and supplies behind enemy lines within 15-20 minutes of a nuclear or conventional bombardment/air strike. The Mi-8 Hip-F is even more heavily armed, with a 12.7-mm nose machine gun and a triple stores rack on each side of the cabin, able to carry up to 192 rockets in six packs, plus six 9M14 (NATO "Sagger") manual command to line of sight antitank missiles. Approximate numbers of Mi-8/17s active with south Asian air forces are: Afghanistan 45, Bangladesh 12, India 95, Pakistan Army 10, and Sri Lanka 11. The Mi-8MT and Mi-8MTV are Hip-Cs and Fs updated to Mi-17 standard. (Data for military Mi-8 Hip-C.)

Design Bureau: Mil OKB, Russia.

Power Plant: two Klimov TV2-117A turboshafts; each 1,677 shp.

Dimensions: rotor diameter 69 ft 10¼ in, fuselage length 59 ft 7½ in, height 18 ft 6½ in.

Weights: empty 16,007 lb, gross 26,455 lb.

Performance: max speed at 3,250 ft 161 mph, ceiling 14,750 ft, range 311 miles as passenger transport.

Accommodation: crew of two or three; 24 troops on tip-up seats along cabin sidewalls, or 12 litter patients and an attendant, or 8,820 lb of freight or vehicles, loaded via rear clamshell doors and hook-on ramps.

Armament: twin rack on each side of cabin, able to carry 128 x 57-mm rockets in four packs, or other weapons.



Mi-17, Sri Lanka Air Force (Denis Hughes)



Mi-25, Afghan Air Force (via A. J. Walg archives)



SA 316 Alouette III, Pakistan Navy (Peter Steinemann)

Mi-25/35 (NATO "Hind")

Mi-25s and -35s or -35Ps are known to have been delivered to Afghanistan (about 55) and India (32 for two squadrons). The Mi-25 is an export version of the Mi-24, the standard attack helicopter of the CIS armed forces that has the added capability of carrying eight combat-equipped troops in its main cabin. It corresponds to the Mi-24D (Hind-D) gunship, with a 12.7-mm four-barrel nose gun, four weapons pylons under its stubwings, and wingtip launchers for four 9M17P Skorpion ("Swatter") antitank missiles.

The Mi-35 is the export counterpart of the Mi-24V (Hind-E), with up to 12 9M114 ("Spiral") radio-guided, tube-launched, antitank missiles in pairs on its wingtip and underwing stores pylons. It has a HUD for the pilot, replacing the former reflector gunsight, and an enlarged undernose missile guidance pod, R-60 ("Aphid") AAMs and the same range of alternative weapons as those of Hind-D can be carried on the underwing pylons. The Mi-35P is similar to the CIS forces' Mi-24P (Hind-F), with a GSh-30-2 twin-barrel 30-mm gun (with 750 rds) mounted on the starboard side of the nose, replacing the usual Gatling. (Data for Mi-35P.)

Design Bureau: Mil OKB, Russia.

Power Plant: two Klimov TV3-117 turboshafts; each 2,190 shp.

Dimensions: rotor diameter 56 ft 9¼ in, fuselage length 57 ft 5¼ in, height 21 ft 4 in.

Weights: empty 18,078 lb, gross 26,455 lb.

Performance: max speed 208 mph, ceiling 14,750 ft, range on internal fuel 310 miles, with auxiliary tanks 620 miles.

Accommodation: crew of two (pilot at rear); flight mechanic, and provisions for eight troops or four litter patients in main cabin.

Armament: one GSh-30-2 twin-barrel 30-mm gun; up to 12 9M114 antitank missiles. Alternative loads on four underwing pylons include 32-rd packs of 57-mm rockets, 20-rd packs of 80-mm rockets, UPK-23-250 pods each containing a GSh-23L twin-barrel 23-mm gun, up to 3,300 lb of bombs, mine dispensers, or other stores. Provisions for firing AKMS guns from cabin windows.

Mi-26 (NATO "Halo")

The 10 Mi-26s of No.126 (Feather Weight) Helicopter Unit of the Indian Air Force represent the only known military export deliveries of the world's largest production helicopter. Features of the aircraft include a cargo hold and payload very similar in size to those of a C-130H Hercules, loading via clamshell doors and ramp at the rear of the cabin, main landing gear legs that are adjustable individually in length to facilitate loading and to permit landing on varying surfaces, and all equipment necessary for day and night operation in all weathers. Optional items include a closed-circuit TV system to observe slung payloads, infrared jammers and suppressors, infrared decoy dispensers, and a color-coded identification flare system.

Design Bureau: Mil OKB, Russia.

Power Plant: two ZMKB Progress D-136 turboshafts; each 10,000 shp.

Dimensions: rotor diameter 105 ft 0 in, fuselage length 110 ft 8 in, height 26 ft 8¾ in.

Weights: empty 62,170 lb, gross 123,450 lb.

Performance: max speed 183 mph, ceiling 15,100 ft, range 497 miles with standard fuel, 1,190 miles with auxiliary tanks.

Accommodation: crew of four; compartment for four additional persons aft of flight deck and about 20 tip-up seats along each sidewall of hold. Max accommodation for 80 combat-ready troops, or 60 litter casualties and four or five attendants. Freight loads include two airborne infantry combat vehicles or a standard 44,100-lb ISO container.

Armament: none.

SA 315B Lama and Cheetah

Aerospatiale developed the Lama (first flight March 17, 1969) from its Alouette II to meet an Indian forces' requirement for a helicopter capable of efficient operations in the Himalayas. In 1972, one was flown to a height of 40,820 ft, still unbeaten as an altitude record for helicopters. When manufacture ended in France, it was taken over by HAL, which has delivered more than 220 since 1972, under the Indian name Cheetah. More than 140 are in service with the Indian forces for air observation post and liaison duties. The Pakistan Army Aviation Corps has 18 Lamas, of which the first six came from Romanian production in 1987. They, too, are employed primarily for high-altitude missions, in the Karakoram mountains and to the Siachen glacier. (Data for HAL SA 315B.)

Contractor: Hindustan Aeronautics Ltd, India.

Power Plant: one HAL-built Turbomeca Artouste IIIB turboshaft; derated to 542 shp.

Dimensions: rotor diameter 36 ft 1¼ in, fuselage length 33 ft 6¾ in, height 10 ft 1¼ in.

Weights: empty 2,193 lb, gross 3,858 lb normal, 4,078 lb with slung cargo.

Performance: max cruising speed 119 mph, ceiling 21,000 ft, range (max) 341 miles.

Accommodation: pilot and copilot or passenger, side by side, three passengers to rear; or pilot, two litter patients, and medical attendant. External sling loads up to 2,205 lb.

Armament: none.

SA 316 Alouette III and Chetak

French production of the original SE 3160 was superseded in 1969 by the SA 316B with updated Artouste engine, built also by Romania (200) and Switzerland (60). License manufacture of the SA 316B continues in India, where about 330 have so far been built under the Indian name Chetak, in addition to early Alouette III imports from France. Up to 220 of these, some equipped for an antitank role, are with nine or more helicopter units of the Indian Army; small batches also serve with the Indian Navy (principally INAS 321 and 331) and Indian Coast Guard (CGAS 800). With the smaller Cheetah, the Chetak is destined for replacement by HAL's new Advanced Light Helicopter (ALH). Nepal has a Royal Flight Alouette and two Army Chetaks, and about 10 SE 3160s are used by the Myanmar Air Force for liaison duties. The Pakistan Air Force has about a dozen Alouettes (average of two each with six squadrons) for SAR and light duties; that country's army has about 24 for liaison; its Navy's No. 333 Squadron has four equipped with depth charges for ASW. A single Alouette III is operated by the Seychelles People's Air Force for coastal patrol and other duties. (Data for HAL-316B Chetak.)

Contractors: Aerospatiale, France; Hindustan Aeronautics Ltd, India.

Power Plant: one HAL-built Turbomeca Artouste IIIB turboshaft; derated to 550 shp.

Dimensions: rotor diameter 36 ft 1¼ in, fuselage length (incl tail rotor) 33 ft 4½ in, height 9 ft 9 in.

Weights: empty 2,711 lb, gross 4,850 lb.

Performance: max cruising speed at S/L 115 mph, ceiling 10,675 ft, range (max) 296 miles.

Accommodation: pilot and up to six passengers or equivalent cargo; normally pilot only, or pilot and

gunner, in armed versions; two litters and two other persons in SAR or medevac configuration.

Armament: range of possible weapons includes a tripod-mounted 7.62-mm machine gun with 1,000 rds aft of pilot's seat, or 20-mm gun with 480 rds, turret-mounted on port side of cabin. Instead of guns, can carry two or four wire-guided antitank missiles on external rails or 68-mm rocket pods. ASW version can carry two torpedoes or depth charges, or one of these weapons plus an MAD bird.

Sea King

In 1959, Westland was licensed to build the Sikorsky SH-3 antisubmarine helicopter for the Royal Navy, with extensive power plant and equipment changes. It then produced similar Sea Kings for export customers, including the navies of India and Pakistan, which still operate them in ASW, SAR, and other forms. India received 12 Mk 42s in the early 1970s, for No. 330 Naval Air Squadron, followed in 1980 by three Mk 42As. Later deliveries included 20 Mk 42Bs for No. 336 NAS and six assault and transport Mk 42Cs.

About three dozen of these original 41 remain in service; typical equipment on the ASW Mk 42B includes MEL Super Searcher radar, Doppler navigation, GEC-Marconi AQS-902 sonobuoy processor and tactical processing system, Alcatel HS-12 dipping sonar, Chelton 700 sonics homing, GEC-Marconi Hermes ESM, Louis Newmark AFCS (automatic flight-control system), and fittings for Sea Eagle antiship missiles. The seven Mk 45 Sea Kings operated since 1975 by No. 111 Squadron (Sharks) of the Pakistan Navy are broadly similar but equipped for Exocet missiles. (Data for Mk 42A/45.)

Contractor: Westland Helicopters Ltd, UK.

Power Plant: two Rolls-Royce Gnome H.1400-1 turboshafts; each 1,660 shp.

Dimensions: rotor diameter 62 ft 0 in, fuselage length 55 ft 9 3/4 in, height 15 ft 11 in.

Weights: empty 13,672 lb, gross 21,000 lb.

Performance: cruising speed at S/L 129 mph, ceiling 14,000 ft, radius of action (three torpedoes, two hours on station) 144 miles.

Accommodation: flight crew of two; ASW, two systems operators; SAR, up to 22 survivors; transport, up to 28 troops.

Armament: provisions for Sea Eagle or Exocet missiles, up to four homing torpedoes, four depth charges, Ultra Electronics minisonobuoys, smoke floats, marine markers, and other weapons and equipment.

UH-1 Iroquois/Bell 205

These single-engine workhorse members of the original "Huey" family still serve with many countries, mostly in light transport, SAR, utility, or liaison roles. South Asian operators are Myanmar (about 12 from an original 18 UH-1Hs), Pakistan (Army 15 from an original six UH-1Hs and 10 205A-1s), and Thailand (Air Force 28 UH-1Hs for utility roles, Navy four UH-1Hs for SAR and utility, Army a mixed bag of about 85 UH-1As, Bs, and Hs for utility, and Border Police 18 Bell 205A-1s). (Data for UH-1H.)

Contractor: Bell Helicopter Textron, USA.

Power Plant: one Allied Signal T53-L-13 turboshaft; 1,403 shp.

Dimensions: rotor diameter 48 ft 0 in, fuselage length 41 ft 10 1/4 in, height 11 ft 9 1/4 in.

Weights: empty 5,210 lb, gross 9,500 lb.

Performance: max cruising speed 127 mph, ceiling 12,600 ft, range 318 miles.

Accommodation: pilot and 11-14 troops, or six litters and a medical attendant, or 3,880 lb of cargo.

Armament: normally none.

W-3 Sokół

Poland's Swidnik helicopter factory and design center has produced more than 5,250 Russian Mi-2s under license since 1965. In 1979 it attempted to find a follow-on type to compete in Western markets. This aircraft, the Kania (420 shp Allison 250-C20B turboshafts) achieved only limited success, but further development led to the much-improved W-3 Sokół, with Polish-built Russian engines.

Compared with the Mi-2, the Sokół has a fuselage some 25 percent larger, more than twice the power, and the ability to carry some 2.5 times the payload. It first flew November 16, 1979, production began in 1985, and the 77 ordered by early 1994 included 12 for the Myanmar Air Force, primarily for SAR and liaison missions.

Contractor: PZL Swidnik, Poland.

Power Plant: two PZL Rzeszów PZL-10W turboshafts; each 900 shp.

Dimensions: rotor diameter 51 ft 6 in, fuselage length 46 ft 7 1/2 in, height 12 ft 5 1/2 in.

Weights: empty 8,002 lb, gross 13,448-14,110 lb.

Performance: (at 13,448 lb weight): max cruising speed at 3,280 ft 146 mph, ceiling 16,725 ft, range 444 miles (internal fuel), 761 miles with auxiliary fuel.

Accommodation: crew of one or two; up to 13 passengers, four litters and a medical attendant, or up to 4,630 lb of internal or external cargo.

Armament: (Polish Air Force, optional): one GSh-23 twin-barrel 23-mm gun on lower port side of fuselage; twelve 9M114 ("Spiral") antitank missiles and two 12 x 80-mm rocket pods on cabin-side outriggers.

Reconnaissance and Special Mission Aircraft

IAI-201 Arava

Production of this Israeli general-purpose STOL transport was dominated by the IAI-201 military version, which first flew in March 1972; more than 70 were built. Three delivered to the Royal Thai Air Force in the early 1980s have specialized avionics by Elta of Israel and are employed by No. 404 Squadron at Takhli as elint and/or communications relay aircraft. The pod-and-boom Arava has a hinged tailcone that opens more than 90° to give unrestricted access to the 450 cu ft cabin. Elint versions vary, some having pylon-mounted pods and radomes, others having numerous external blade antennas.

Contractor: Israel Aircraft Industries.

Power Plant: two Pratt & Whitney Canada PT6A-34 turboprops; each 750 shp.

Dimensions: span 68 ft 9 in, length 42 ft 9 in, height 17 ft 1 in.

Weights: empty 8,816 lb, gross 15,000 lb.

Performance: max cruising speed at 10,000 ft 198 mph, ceiling 25,000 ft, T-O run 960 ft, landing run 820 ft, max range 621 miles.

Accommodation: crew of one or two; up to 24 troops, 16 paratroops with two dispatchers, 10 litters with two medical attendants, small vehicles, or equivalent cargo, in main cabin.

Armament: (optional): fuselage-side attachments for two 0.50-in single-gun packs, with pylon below each pack for six-rd rocket pod.

MiG-25R (NATO "Foxbat-B")

Since their delivery in 1981, the Mach 2.83 Foxbats of No. 102 (Trisronics) Squadron of the Indian Air Force have provided a capability unmatched by any other south Asian state. Comprising four MiG-25R (Foxbat-B) single-seat reconnaissance aircraft and two tandem two-seat MiG-25RU (Foxbat-C) trainers, they are strictly "straight and level" aircraft, with no concessions to agility. Construction is 80 percent welded tempered steel, with eight percent titanium in areas subject to extreme heating, such as wing and tail leading edges, and 11 percent heat-resistant aluminum alloy, by weight. With a 1,400-gallon underbelly tank, the MiG-25R can fly long distances at a cruising speed of Mach 2.35. Any one of three interchangeable photographic/elint modules, with five camera windows and flush dielectric panels, can be carried in the forward fuselage.

Design Bureau: Mikoyan OKB, Russia.

Power Plant: two Soyuz/Tumansky R-15BD-300 turbojets; each 24,675 lb thrust with afterburning.

Dimensions: span 44 ft 0 1/4 in, length 70 ft 8 1/2 in, height 20 ft 0 1/4 in.

Weights: empty 43,200 lb, gross 81,570-90,830 lb.

Performance: max speed at height Mach 2.83, at S/L Mach 0.98, ceiling 68,900 ft, T-O run 4,100 ft, landing run 2,625 ft, range at supersonic speed 1,015-1,323 miles, subsonic 1,158-1,491 miles.

Accommodation: pilot only, on zero-height/80-775 mph ejection seat.

Armament: none.

Mirage IIIR

Pakistan's first photoreconnaissance Mirages from France were three Mirage IIIRPs, delivered in 1969 and basically similar to the IIIE fighter except for an extended nose containing five Omera Type 31 cameras instead of a Cyrano fire-control radar. These can be mounted in various arrangements to provide day or night photography at low, medium, or high altitude. The two 30-mm guns and air-to-ground weaponry capability of the IIIE are retained. A later (1975) order was placed for 10 more, and most of these 13 aircraft continue in service, currently with No. 5 Squadron of the Pakistan Air Force at Rafiqui. Recent improvements include a dorsal antenna for a radar warning receiver. (Data as for IIIE except as follows.)

Dimensions: length 50 ft 10 1/4 in.

Weight: empty 14,550 lb.

Transports

An-12/Y-8 (NATO "Cub")

Some of the 12 An-12BP paratroop and medium-range cargo transports that equipped the Afghan Republican Air Force in the early 1990s are believed to survive, despite use by that country's warring factions. Powered by four 3,945 ehp ZMKB Progress/Ivchenko AI-20K turboprops, the An-12 carries 90 troops, 60 paratroops, or 44,090 lb of freight. Loading is via a door under the upswept rear fuselage, but the An-12BP lacks an integral ramp for vehicles.

Except for its more pointed nose transparencies, the Chinese Y-8A is outwardly indistinguishable from the An-12BP. It is manufactured without a license, and its redesigned Chinese turboprops have a higher rating than the AI-20K. It also introduced a rear-loading ramp/door. Two Y-8Ds are operated by No. 2 Transport Wing of the Sri Lanka Air Force at Ratmalana, differing from the standard military Y-8A only in having avionics by Collins and Litton. They are reported to have been modified in Sri Lanka for use as bombers. Four Y-8Ds are flown by the Air Force of Myanmar. (Data for Y-8A.)

Contractor: Shaanxi Aircraft Company, People's Republic of China.

Power Plant: four Zhuzhou WJ6 turboprops; each 4,260 ehp.

Dimensions: span 124 ft 8 in, length 111 ft 7 1/2 in, height 36 ft 7 1/2 in.

Weights: empty 78,264 lb, gross 134,480 lb.

Performance: max speed at 22,965 ft 425 mph, ceiling 34,120 ft, T-O run 4,035 ft, landing run 3,609 ft, range with max payload 791 miles, with max fuel 3,554 miles.

Accommodation: crew of five and 14 passengers in pressurized forward section of fuselage; unpressurized main cabin for 96 troops, 58 paratroops, or 60 litter patients and 20 seated casualties plus three attendants, or two army trucks or helicopters. Rear loading ramp/door (not on An-12).

Armament: two 23-mm guns in manned tail turret.

An-24 and An-26 (NATO "Coke" and "Curl")

The status of the 50-passenger An-24 that equipped the fixed-wing element of the Afghan VIP squadron in the late 1980s is uncertain. More likely is that some of the 20 or more An-26 freighters then based at Kabul are still serviceable. Except for a redesigned "beaver-tail" rear fuselage, the addition of an auxiliary turbojet in the rear of the starboard engine nacelle, fewer cabin windows, and more powerful turboprops, the An-26 differs little from the An-24. It was the first type to use Oleg Antonov's unique rear-loading ramp. This forms the underside of the rear fuselage when retracted, in the conventional way, but can be slid forward under the rear of the cabin to facilitate direct loading onto the floor of the hold, or when the cargo is to be air-dropped. (Data for An-26.)

Design Bureau: Antonov OKB, Ukraine.

Power Plant: two ZMKB Progress/Ivchenko AI-24VT turboprops; each 2,780 ehp; plus 1,765 lb thrust RU-19A-300 auxiliary turbojet for turboprop starting and to provide additional power for takeoff, climb, and cruising flight, as required.

Dimensions: span 95 ft 9 1/2 in, length 78 ft 1 in, height 28 ft 1 1/2 in.

Weights: empty 32,518 lb, gross 50,706-52,911 lb.

Performance: cruising speed at 20,000 ft 270 mph, ceiling 24,600 ft, T-O run 2,855 ft, landing run 2,135 ft, range with max payload 770 miles, with max fuel 1,652 miles.

Accommodation: crew of five, plus station for load supervisor or dispatcher; 12,125 lb payload. Electrically powered mobile hoist, capacity 4,409 lb, and conveyor to facilitate loading and air-dropping. Provision for carrying 40 paratroops on sidewall tip-up seats, or 24 litters and an attendant.

Armament: provision for pylons on the sides of the fuselage for carrying up to 4,409 lb of weapons or supply containers.

An-32 (NATO "Cline")

The An-32 has an airframe basically similar to that of the An-26 but with much more powerful turboprops, triple-slotted trailing-edge flaps outboard of the engines, automatic leading-edge slats, enlarged ventral fins, and a full-span slotted tailplane. Together with improvements to the landing gear retraction mechanism, deicing and air-conditioning systems, electrical system, and engine starting, these changes offer greatly enhanced performance under high-altitude and hot climatic conditions. Typically, the An-32 will operate from unpaved strips at airfields 14,750 ft above S/L in an ambient temperature of ISA + 25°C.

India took delivery of 123 An-32s, and these are named Suttej, after a Punjabi river. They went to Nos. 12, 19, 33, 43, 48, and 49 Squadrons, plus training

wings. Afghanistan is reported to have at least six. No. 3 Squadron of the Bangladesh Air Force, based at Jessore, replaced its three An-26s with two An-32s in mid-1989. Three are being supplied to the Sri Lanka Air Force.

Design Bureau: Antonov OKB, Ukraine.

Power Plant: two ZMKB Progress AI-20D Series 5 turboprops; each 5,042 hp.

Dimensions: span 95 ft 9 1/2 in, length 78 ft 0 1/4 in, height 28 ft 8 1/2 in.

Weights: empty 38,158 lb, gross 59,525 lb.

Performance: max cruising speed 329 mph, ceiling 30,840 ft, T-O run 2,495 ft, landing run 1,542 ft, range with max payload 745 miles, with max fuel 1,565 miles.

Accommodation: crew of three or four; up to 50 passengers, 42 paratroopers and a jumpmaster, 24 litter patients and three medical personnel, or 14,770 lb of freight.

Armament: provision for carrying four bombs or other stores on hardpoints on each side of the fuselage, below the wings.

C-47 Skytrain and RC-47

The career of the inimitable C-47 stubbornly refuses to come to an end, and among the services still employing statistically significant numbers is the Royal Thai Air Force, whose No. 603 Squadron at Don Muang has about 15, including one camera-equipped RC-47 for photoreconnaissance. The Royal Thai Navy has four C-47s and two DC-3 civil counterparts. (Data for C-47B.)

Contractor: Douglas Aircraft Company, USA.

Power Plant: two Pratt & Whitney R-1830-90C radial piston engines; each 1,200 hp.

Dimensions: span 95 ft 6 in, length 63 ft 9 in, height 17 ft 0 in.

Weights: empty 18,135 lb, gross 26,000–31,000 lb.

Performance: max speed at 10,000 ft 224 mph, ceiling 26,400 ft, range 1,600 miles.

Accommodation: crew of two; up to 27 troops, 18–24 litters, or 10,000 lb of cargo in main cabin.

Armament: none.

C-130 Hercules

The longevity of the Hercules is apparent from the fact that quite a number of late-1950s C-130As and Bs remain in service, as well as many C-130Es. The south Asian operator of these variants is Pakistan's No. 6 Squadron at Chaklala, with four C-130Bs, seven C-130Es, and a single commercial L-100. The 11 C-130s were recently upgraded by Singapore Aerospace, prolonging their careers even further. The current-standard C-130H, introduced in 1964 with uprated engines and more modern avionics, and the stretched (112 ft 9 in long) C-130H-30 are operated by No. 601 Squadron of the Royal Thai Air Force at Don Muang (six of each). (Data for International C-130H.)

Contractor: Lockheed Aeronautical Systems Company, USA.

Power Plant: four Allison T56-A-15 turboprops; each 4,508 shp.

Dimensions: span 132 ft 7 in, length 97 ft 9 in, height 38 ft 3 in.

Weights: empty 76,469 lb, gross 155,000–175,000 lb.

Performance: max cruising speed 374 mph, ceiling 33,000 ft, T-O run 3,580 ft, landing run (130,000 lb weight) 1,700 ft, range with max payload 2,354 miles.

Accommodation: crew of four, plus loadmaster; up to 92 troops, 64 paratroopers, 74 litters and two medical attendants, or equivalent weight of vehicles, artillery pieces, or cargo in main cabin.

Armament: none.

C-212 Aviocar

Eight of these small Spanish STOL utility transports, mostly Indonesian-built NC-212-200s, serve with the Royal Thai Air Force, the first and major Aviocar operator in the south Asia region. The -200 series has been the main production version of this useful aircraft, accounting for nearly 250 of the 400-plus delivered from production lines in Spain and Indonesia. Spanish production now concentrates on the C-212-300, with winglets and other improvements, but the -200 continues as the current Indonesian-built version. A second south Asian customer emerged in late 1993, when the Myanmar Air Force ordered two NC-212-200s. (Data for C/NC-212-200.)

Contractors: Construcciones Aeronauticas SA (CASA), Spain; Industri Pesawat Terbang Nusantara (IPTN), Indonesia.

Power Plant: Two Allied Signal TPE331-10R-511C turboprops; each 900 shp (flat rated).

Dimensions: span 62 ft 4 in, length 49 ft 8 1/2 in, height 20 ft 8 in.

Weights: empty 9,700 lb, gross 16,975 lb.

Performance: max cruising speed at 10,000 ft 227 mph, ceiling 28,000 ft, T-O run 1,445 ft, landing run 656 ft, range at max cruising speed 253 miles (with 5,952 lb max payload), 1,094 miles (with max fuel).

Accommodation: crew of two; 24 troops (or 23 paratroopers and jumpmaster), 12 litters and four medical personnel, or up to 5,952 lb of cargo.

Armament: one 551-lb hardpoint on each side of fuselage optional, for machine gun pods, rocket pods, or one of each.

G222

Like USAF, with its C-27A Spartans, the Royal Thai Air Force has chosen Italian-built G222s to meet a light tactical transport requirement. Six were ordered in 1993, to replace aging Fairchild C-123B/K Providers. With their rear-loading ramp, the G222s will make possible rapid loading and unloading of cargo and/or personnel on short unprepared airstrips, in remote areas, as well as airdrops. Deliveries are scheduled to take place in 1994–98.

Contractor: Alenia, Italy.

Power Plant: two General Electric T64-GE-P4D turboprops; each 3,400 shp.

Dimensions: span 94 ft 2 in, length 74 ft 5 1/2 in, height 34 ft 8 1/4 in.

Weights: empty 34,610 lb, gross 61,730 lb.

Performance: max speed at 15,000 ft 303 mph, ceiling 25,700 ft, T-O run 2,250 ft, landing run 2,860 ft, range with max payload 783 miles.

Accommodation: crew of two or three; 46 troops, 40 paratroopers, 36 litters and four attendants, or 19,840 lb of freight, vehicles, and guns.

HS 748

The largest south Asian operator of the HS 748 is the Indian Air Force, for which 64 were built under license by HAL: 29 as aircrew trainers, 20 HS 748(M) freight transports with side-loading cargo door, and 12 as VIP transports for the Headquarters Communications Squad-



C-130H Hercules, Royal Thai Air Force (Peter Steinemann)



HS 748, Indian Air Force (Denis Hughes)

ron at Palam. Most of these continue in service, the freighters with No. 11 (Rhinos) Squadron at Gwalior and the trainers with the Navigation and Signals School at Begumpet and the Transport Training Wing at Yelahanka. Two civil-registered 748s serve, under military control, with India's Border Security Force. A prototype ASWAC (airborne surveillance, warning, and control) version, with an empty 15 ft 9 in diameter dorsal rotodome, first flew in November 1990; trials were continuing in 1994.

British-built Hawker Siddeley 748s serve with the Royal Nepalese Air Force (one), the Sri Lanka Air Force's 2d Transport Wing (three), and No. 6 Wing of the Royal Thai Air Force (six). (Data for Series 2A.)

Contractors: Hawker Siddeley Aviation, UK (now British Aerospace); Hindustan Aeronautics Ltd, India.

Power Plant: two Rolls-Royce Dart Mk 532-2L/S turboprops; each 2,280 hp.

Dimensions: span 98 ft 6 in, length 67 ft 0 in, height 24 ft 10 in.

Weights: empty 25,453 lb, gross 46,500–51,000 lb.

Performance: max cruising speed 278 mph, ceiling 25,000 ft, T-O run 2,480 ft, landing run 1,140 ft, range with 9,527 lb payload 1,624 miles.

Accommodation: crew of two; up to 58 troops, 48 paratroopers and dispatchers, 24 litters and nine sitting patients/medical attendants, or up to 13,047 lb of cargo (17,547 lb at overload max T-O weight).

Armament: none.

II-76 (NATO "Candid")

Twenty-four II-76MDs were acquired to equip Nos. 25 and 44 (Mountain Geese) Squadrons of the Indian Air Force, with the name **Gajaraj**. Compared with the original military II-76M, the MD has D-30KP-2 up-rated engines that maintain full power up to ISA + 23°C. Gross weight and payload are increased; an additional 22,046 lb of fuel increases range with max fuel by 745 miles.

Freight handling is facilitated by rear ramp/doors and advanced mechanical systems for loading, unloading, and positioning containers and other freight inside the 8,310 cu ft hold. Being fully pressurized, the II-76 can carry troops as an alternative to freight. (Data for II-76MD.)

Design Bureau: Ilyushin OKB, Russia.

Power Plant: four Aviadvigatel D-30KP-2 turbofans; each 26,455 lb thrust.

Dimensions: span 165 ft 8 in, length 152 ft 10 1/4 in, height 48 ft 5 in.

Weight: gross 418,875 lb.

Performance: cruising speed at 29,500–39,370 ft 466–497 mph, T-O run 5,580 ft, landing run 2,950–3,280 ft, range with max payload 2,265 miles, with 44,090-lb payload 4,535 miles.

Accommodation: crew of seven, including two freight handlers; up to 140 troops, 125 paratroopers, or 110,230 lb of freight.

Armament: two 23-mm twin-barrel GSh-23L guns in manned tail turret. Provision for packs of ninety-six 50-mm IRCM flares in landing gear fairings and/or on sides of rear fuselage.

Skyvan

The 6-ft-6-in-square interior cross section of the diminutive Skyvan enables it to accommodate a wide variety of awkwardly shaped loads or cabin installations. Loading is easy, as a full-width rear door in the upswept rear fuselage gives unrestricted access to the hold. Two examples in service with the Royal Nepalese Air Force are **Skyvan Srs 3Ms**, intended for paratroop and supply dropping, assault landing, casualty evacuation, and troop, vehicle, and ordnance transport. The third was originally a VIP **Skyvan Srs 3** of the Nepalese Royal Flight. All have operated regularly into primitive airstrips up to 10,000 ft above sea level. (Data for Skyvan Srs 3M.)

Contractor: Short Brothers plc, UK.

Power Plant: two Allied Signal TPE331-2-201A turboprops; each 715 shp.

Dimensions: span 64 ft 11 in, length 41 ft 4 in, height 15 ft 1 in.

Weights: empty 7,400 lb, gross 13,700–14,500 lb.

Performance: (at 13,700 lb gross weight): max cruising speed at 10,000 ft 202 mph, ceiling 22,000 ft, T-O run 780 ft, landing run 695 ft, range with 5,000-lb payload 240 miles, with max fuel 670 miles.

Accommodation: flight crew of one or two; 16 paratroopers plus dispatcher, 22 troops, 12 litters plus two attendants, or 5,200 lb of cargo.

Armament: none.

Y-12 (II)

Following about 30 of the lower-power Y-12 (I), the Y-12 (II) has become the main production version of this modestly successful small Chinese STOL transport, of which nine were delivered to the Sri Lanka Air Force between 1986 and 1990. Although nominally belonging to the 2d Transport Wing at Ratmalana, they have provided positive proof of the "general purpose" part of their type description. All wear a dark brown infrared paint finish, and some have been used in a maritime patrol and surveillance role, while others have been adapted as makeshift bombers, able to carry a 1,000-lb weapon load in raids against the Tamil separatists. Corrosion has begun to degrade their airframes, and three of the nine were grounded in early 1994.

Contractor: Harbin Aircraft Manufacturing Corporation, People's Republic of China.

Power Plant: Two Pratt & Whitney Canada PT6A-27 turboprops; each 620 shp (flat rated).

Dimensions: span 56 ft 6 1/2 in, length 48 ft 9 in, height 18 ft 7 1/2 in.

Weights: empty 6,261 lb, gross 11,684 lb.

Performance: max cruising speed at 9,840 ft 181 mph, ceiling 22,960 ft, T-O run 1,115 ft, landing run 656 ft, range (max fuel) 832 miles.

Accommodation: crew of two; up to 17 passengers, 15 paratroopers, or 3,748 lb of cargo.


Armament: normally none. ■

Testing a core concept that combines assets of two major commands benefits everyone during this “war.”

Eglin's War

USAF photographs by SSgt. Wes Ticer



A soldier in a ghillie suit is lying in tall grass in the foreground. In the background, an airfield is visible with several fighter jets parked on the tarmac. The sky is clear and blue. The text is overlaid on the upper right portion of the image.

The 33d Fighter Wing and the Air Force Development Test Center went to war at Eglin AFB, Fla., last November. Fortunately, it was just an exercise. The 33d FW, a core fighting unit, is an Air Combat Command wing. It receives support functions during deployments from other bases through ACC because Eglin is an Air Force Materiel Command base. In this exercise of the core concept of operation, however, the 33d FW "core" and AFMC's AFDTC successfully integrated functions and personnel.



Eglin's war tested all aspects of base defense and gave the wings scenarios to validate the way they plan to go to war. Here, EOD specialists work on removing unexploded ordnance found near a building.



"Nomad 1," 33d FW Commander Col. William R. Looney III (above left), coordinated a response to a terrorist attack staged by the 96th Security Police Squadron. In camouflage from head to toe, the SPs lent fearsome realism to the exercise.



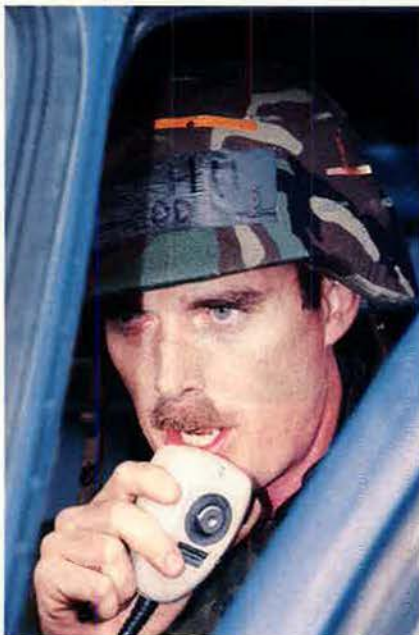


As in any war, this one called on the skills of medical, fire, and rescue personnel to take care of casualties. Above, fire and rescue workers prepare an "injured patient" for evacuation from a building. Medical help may be too late for this supine airman (right). He is being issued a "kill" card by a member of the exercise evaluation team. The card describes his "injuries" so that rescue workers can treat him appropriately.





Nuclear, biological, and chemical warfare training has never been more crucial. Whether the task is drinking water or loading an AIM-9 missile during an integrated combat turn, the troops adapt to performing their duties in cumbersome chemical protection gear.



Communication is a key to success in modern combat, even during a scripted, three-day war. The initial communication package team (above) had a particularly important role in this exercise—it connected people from diverse commands who had seldom if ever worked together.



The F-15s and their crews were housed in simulated shelters (above), but that didn't stop a B-1 from Dyess AFB, Tex., from attempting a low-level "attack" on Eglin in a test of the wings' ability to fly and fight under adverse conditions. Eglin has taken the lead in implementing the core concept; others are experimenting with the idea. In this November exercise, Eglin's ACC and AFMC units proved how well two organizations from different commands can work together in wartime or during contingencies.



Service data indicate that the reduction of US airpower is greater than generally believed.

McCain Calculates the Cuts

I HAVE become increasingly concerned that the summary data on the Clinton force plan understate the true nature of the cuts taking place in American airpower.”

So said Sen. John McCain (R-Ariz.), a senior member of the Senate Armed Services Committee. He asked each military service to provide figures on cuts in actual aircraft strength, rather than nominal wings—the Administration’s preferred unit of measurement.

He received numbers from the Air

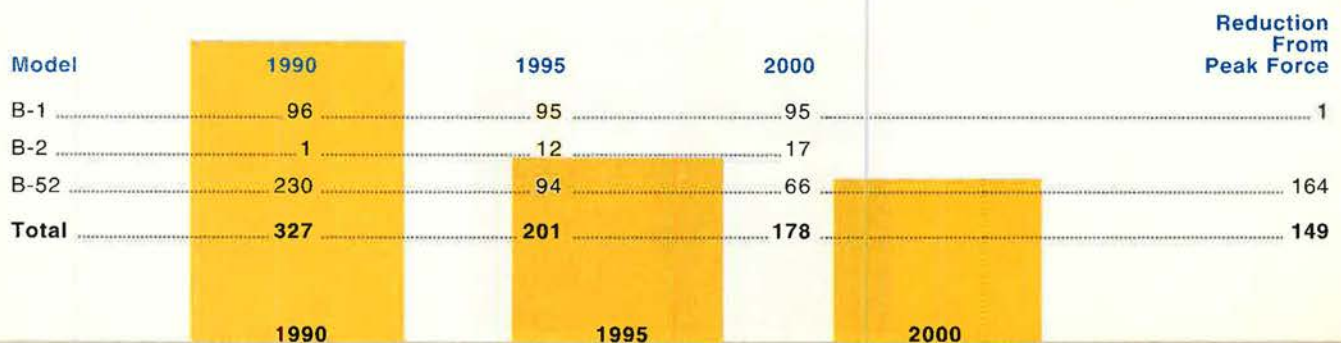
Force, Army, Navy, and Marine Corps. “The bottom line for each service,” he said, “is that combat air strength is being cut far more than the nominal data usually used to measure planned force cuts would indicate.”

As shown in the top table on p. 55, plans call for the Air Force to sustain cuts of forty-six percent for bombers, fifty-one percent for fighter/attack aircraft, seventy-three percent for reconnaissance and special-purpose aircraft, and thirty percent for special-operations aircraft.

Senator McCain charged, “The data I have show clearly that substantial risk is inherent in the cuts planned in key types of aircraft, such as the F-15 and F-111.”

Senator McCain said that the Air Force’s airlift capabilities will decline through 2005 and will at best be approximately ten million ton-miles per day (mtm/d) short of the fifty-two mtm/d requirement—even assuming that the Air Force does not lose a single airlift aircraft in an accident through 2010.

The Bomber Bust



Shrinking USAF Aircraft Inventory

	1985	1990	1995	2000	Percent Cut From Peak Force ¹
Bombers					
Active	268	327	181	149	54%
Reserve	0	0	20	29	NA
Total	268	327	201	178	46%
Fighter/attack					
Active	3,033	2,768	1,758	1,430	53%
Reserve	1,330	1,361	1,026	700	49%
Total	4,363	4,129	2,784	2,130	51%
Reconnaissance/special purpose					
Active	341	251	142	131	62%
Reserve	158	162	32	6	96%
Total	499	413	174	137	73%
Special operations					
Active	86	139	130	136	2%
Reserve	53	56	9	0	100%
Total	139	195	139	136	30%
Airlift					
Active	603	556	468	386	36%
Reserve	322	391	413	396	4%
Total	925	947	881	782	17%
Tanker²					
Active	545	533	321	—	41%
Reserve	128	146	291	—	NA
Total	673	679	612	—	10%

¹For the purposes of these charts, cuts are expressed in terms of the difference between the last year listed and 1985, 1990, and 1995—whichever year saw the largest inventory.

²For tankers, the last year listed is 1995.

Fewer Fighters

Model	1990	1995	2000	Reduction From Peak Force
A-7	330	0	0	330
A-10	572	235	220	352
F-4	369	74	0	369
F-15	799	523	510	289
F-15E	106	199	120	79
F-16	1,618	1,604	1,220	398
F-106	1	0	0	1
F-111	286	96	0	286
F-117	48	53	50	3
F-22	0	0	10	0
Total	4,129	2,784	2,130	1,999

Reconnaissance, Special Duty

Model	1990	1995	2000	Reduction From Peak Force
E-3	34	34	34	
E-4	4	4	4	
E-8	0	3	10	
EC-130	31	27	17	14
EC-135	47	17	17	30
EF-111	42	40	30	12
RF-4	236	24	0	236
RC-135	19	22	22	
OC-135	0	3	3	
Total	413	174	137	276

Special Operations

Model	1990	1995	2000	Reduction From Peak Force
AC-130	20	22	20	2
HC-130	54	28	28	26
MC-130	19	38	38	
HH-3	44	0	0	44
MH-53	34	41	40	1
MH-60	24	10	10	14
Total	195	139	136	59

Army Airpower

	1985	1990	1995	2000	Percent Cut From Peak Force ¹
Active					
Fixed wing					
Observation	180	122	86	59	67%
Utility	240	169	118	62	74%
Total	420	291	204	121	71%
Helicopter					
Medium lift	348	319	306	219	37%
Heavy lift	10	0	0	0	100%
Utility	2,542	1,828	1,604	1,459	43%
Attack	2,055	1,879	1,777	1,146	44%
Total	4,955	4,026	3,687	2,824	43%
Reserve					
Fixed wing					
Observation	60	35	4	4	93%
Utility	70	118	124	199	NA
Total	130	153	128	203	NA
Helicopter					
Medium lift	48	91	162	179	NA
Heavy lift	71	71	0	0	100%
Utility	1,475	1,623	1,464	946	42%
Attack	1,406	1,477	1,147	753	49%
Total	3,000	3,262	2,773	1,878	42%

¹For the purposes of these charts, cuts are expressed in terms of the difference between the last year listed and 1985, 1990, and 1995—whichever year saw the largest inventory.

Senator McCain pointed out that the drawdown has also dealt heavy blows to the airpower capabilities of the other services.

He said the cut in active US Army airpower, for example, is seventy-one percent in active fixed-wing aircraft and forty-three percent in active attack and support helicopters.

The cut in active primary Navy combat aircraft is thirty-seven percent, and the cut in other combat aircraft is twenty percent.

The cut in Marine combat airpower is seventeen percent for active primary combat aircraft and fifty-three percent for reserve primary combat aircraft. ■

Navy Airpower

	1985	1990	1995	2000	Percent Cut From Peak Force ¹
Active					
Primary combat					
Strike fighter	114	218	409	433	NA
Fighter	295	412	267	201	51%
Attack	542	472	172	64	88%
Total	951	1,102	848	698	37%
Other combat					
Antisubmarine	110	124	96	111	10%
Patrol	238	228	158	148	38%
Warning	91	107	108	106	2%
Total	439	459	362	365	20%
Support					
Transport	70	63	47	38	46%
In-flight refuel	1	3	1	1	67%
Observation	1	0	0	0	100%
Utility	58	79	74	74	6%
Training jet	483	494	305	259	48%
Training prop	332	379	257	250	34%
Rotary wing	563	659	531	519	21%
Total	1,508	1,677	1,215	1,141	32%
Reserve					
Primary combat					
Strike fighter	36	40	48	36	25%
Fighter	0	19	14	39	NA
Attack	67	39	4	4	94%
Total	103	98	66	79	23%
Other combat					
Patrol	112	90	72	64	43%
Warning	8	7	10	10	NA
Total	120	97	82	74	38%
Support					
Transport	26	25	53	53	NA
Utility	8	9	10	10	NA
Rotary wing	45	48	58	46	21%
Total	79	82	121	109	10%

¹For the purposes of these charts, cuts are expressed in terms of the difference between the last year listed and 1985, 1990, and 1995—whichever year saw the largest inventory.

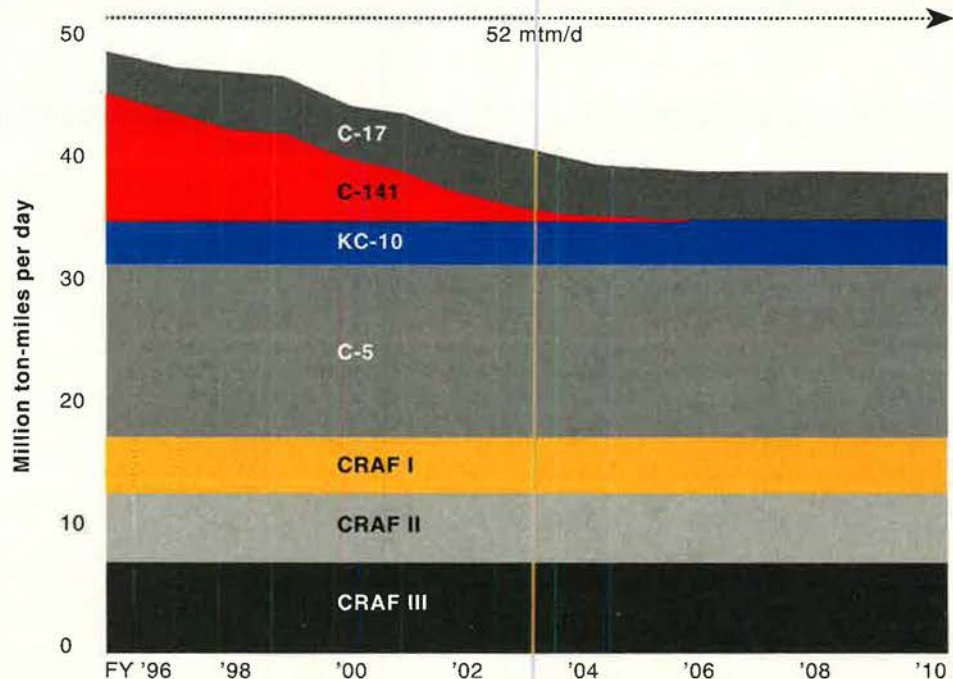
Marine Airpower

	1985	1990	1995	2000	Percent Cut From Peak Force ¹
Active					
Fixed-wing combat					
Fighter/attack	171	174	158	134	23%
Light attack	166	192	166	166	14%
Air warfare attack	63	54	72	72	NA
TAC/FAC	27	10	0	0	100%
Reconnaissance	21	8	0	0	100%
Total	448	438	396	372	17%
Fixed-wing support					
Electronic warfare	15	18	20	20	NA
Observation	40	26	0	0	100%
Refueler	36	42	44	44	NA
Total	91	86	64	64	30%
Helicopter					
Medium lift	200	200	232	232	NA
Heavy lift	176	164	117	121	31%
Utility	80	80	70	64	20%
Attack	84	84	116	128	NA
Total	540	528	535	545	NA
Reserve					
Fixed-wing combat					
Fighter/attack	30	36	48	48	NA
Light attack	66	66	0	0	100%
Total	96	102	48	48	53%
Fixed-wing support					
Electronic warfare	4	4	0	0	100%
Observation	18	12	0	0	100%
Refueler	12	18	24	24	NA
Total	34	34	24	24	29%
Helicopter					
Medium lift	24	24	24	24	NA
Heavy lift	16	18	16	16	11%
Utility	30	24	24	18	40%
Attack	8	24	24	36	NA
Total	78	90	88	94	NA

¹For the purposes of these charts, cuts are expressed in terms of the difference between the last year listed and 1985, 1990, and 1995—whichever year saw the largest inventory.

The Airlift Gap

Requirement vs. Capability



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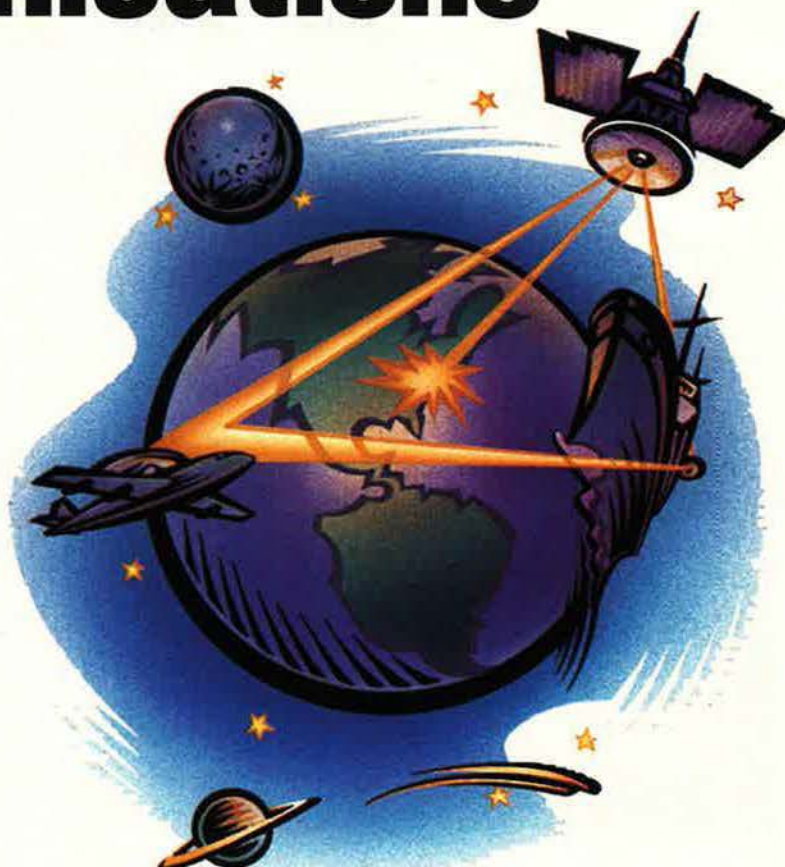
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The Air Force is currently meeting numbers and quality goals, but the outlook is decidedly uncertain.

Snapshots From the Personnel Front

By Suzann Chapman, Associate Editor

IN RECENT years, even as it struggled to reduce its present size, the Air Force discovered that it also had to run hard to get troops for the future.

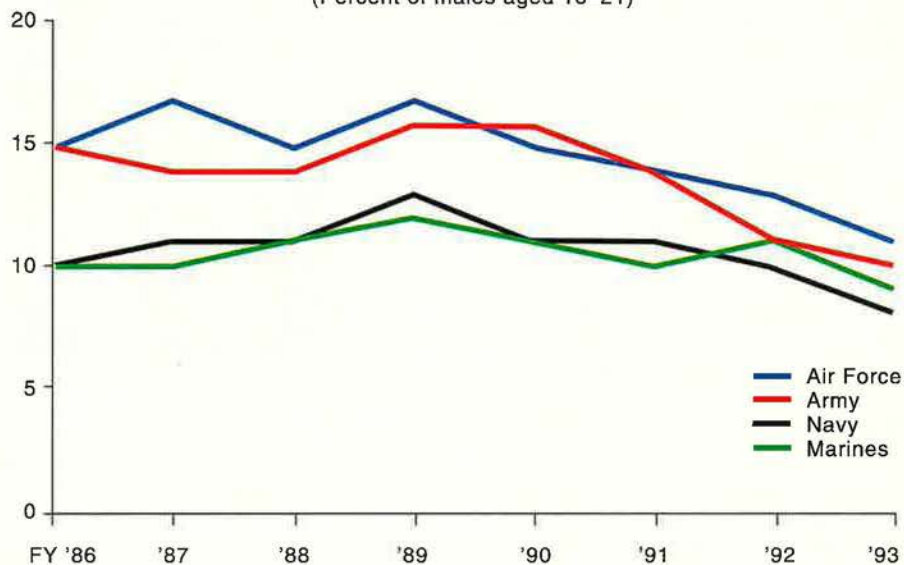
USAF must attract enough high-quality recruits each year to maintain a long-term balance of skills and ranks. In the 1990s, however, the Pentagon found that the propensity of young people to join the services had dropped from post-Vietnam highs in the 1980s. [See chart at right.] Potential enlistees simply came to believe military duty was less important than it had been during the Cold War.

The perception was fueled by news coverage of the drawdown of troop levels from 2.1 million to 1.4 million, which created "a sense that the services aren't hiring anymore," said Edwin Dorn, under secretary of defense for Personnel and Readiness.

Early in 1994, the military experienced a period of recruiting stagnation, falling short in numbers and quality. The Air Force, anxious to spread the word that it was still seeking high-caliber recruits, launched a major paid radio advertising campaign—its first since 1990. In the intervening years, the Air Force's ad

Lower Propensity to Serve

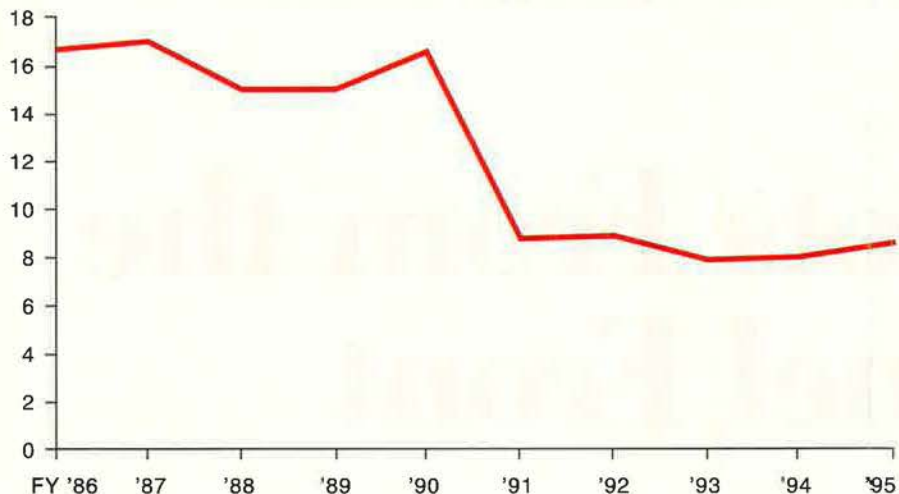
(Percent of males aged 16-21)



According to Pentagon studies, men aged sixteen to twenty-one have markedly less interest today in wearing the uniform, compared to the peak years of the late 1980s. The decline is seen in each service.

Falling Air Force Advertising Budgets

(\$ million, current dollars)



Expenditures on recruiting ads have fallen to half their 1980s level, though there was a slight increase last year.

budget had been slashed and the number of recruiters reduced. [See chart above.]

Recruiting eventually picked up, and in the end the Air Force achieved its overall goals for Fiscal 1994—but not without a struggle. “Our recruiters worked hard to make Fiscal 1994 a success,” said Lt. Gen. Billy J. Boles, Air Force deputy chief of staff for Personnel.

General Boles added that even in the midst of the drawdown, the quality of the Air Force’s accessions remains “very high.”

The Air Force booked 30,000 enlistments in Fiscal 1994, representing 100 percent of its overall target. The only shortfall came in the chronic problem area of recruiting medical specialists, both nurses and physicians.

The quality of recruits remained high, according to General Boles. The Air Force requires at least ninety-nine percent of new enlistees to hold high school diplomas. In Fiscal 1994, the figure was 99.2 percent, compared with about 98.1 percent a decade ago. Those enlistees who were accepted without high school diplomas scored in Category II or Category I on the standardized Armed Forces Qualification Test (AFQT).

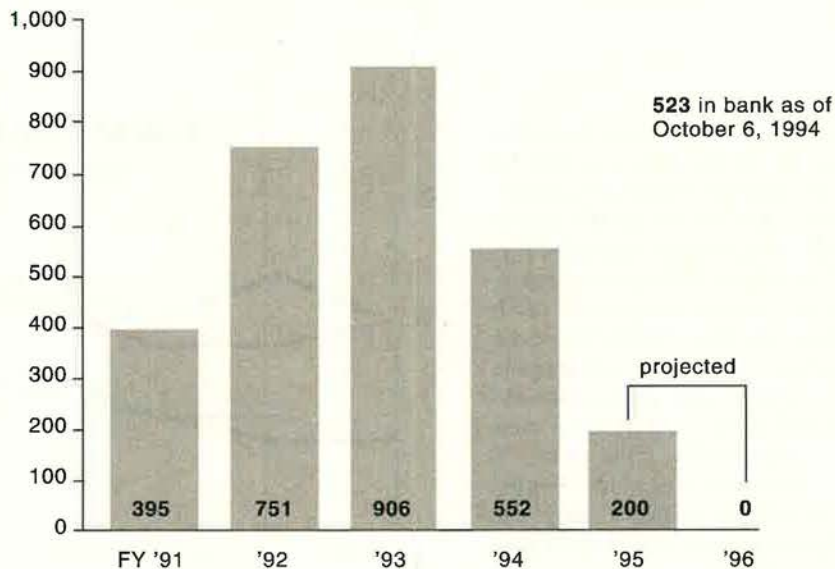
Tops Among the Services

Compared with the other services, the Air Force continues to attract high-quality recruits, as measured by AFQT

During the drawdown, the Air Force suffered a shortage of flying positions and began “banking” its prospective pilots in record numbers, an action many thought would severely damage officer recruiting. At the end of Fiscal 1991, there were 395 banked pilots waiting for a training or cockpit opening. The number peaked in Fiscal 1993 at 906 pilots but dropped to 552 in Fiscal 1994. The Air Force stopped placing pilots into the bank in September 1993 and expects to return its last banked pilot to the cockpit in Fiscal 1996. [See chart below.]

Even during the worst period of banking, however, Air Force officials saw no change in officer recruiting as a result of the lost flying opportunities. “For new rated officers,” said a USAF personnel officer, “the career opportunities are

Fewer Pilots in the “Bank”



The Air Force says the pilot “bulge” peaked in 1993 and will disappear next fiscal year.

results. More than eighty percent of Air Force accessions scored in the top half of the AFQT, while the figure for all of the services combined was seventy-two percent. The highest scoring year of the past decade was 1991, when the figure for the Air Force was 85.6 percent.

When it came to officers, the story was much the same, even when the individuals were pilot candidates.

favorable because we’ve turned the corner on the drawdown, and our efforts are now directed toward sustaining rather than reducing the rated force.”

Today, in fact, the projected pilot inventory (the total number of active-duty pilots) actually falls short of the projected requirements. All commissioning sources can expect their numbers of training slots to increase

annually through Fiscal 2001. [See chart at right.]

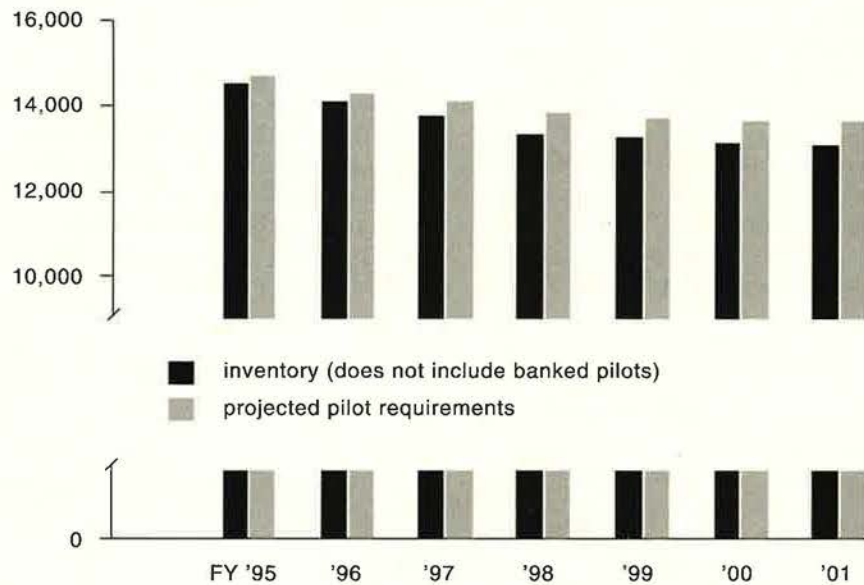
Some thought that the Air Force's decision to open combat roles to women might deter women from volunteering to join because they would be reluctant to risk assignment in such dangerous jobs. Personnel figures demonstrate that this has not been the case. The opening of more than ninety-nine percent of the jobs—including combat positions—has done nothing to slow the steady increase in the number of women in the Air Force. Officer and enlisted accessions for women have increased every year since the end of Fiscal 1985.

For all the success, however, nobody in the Air Force could be called overconfident about the personnel outlook for the future.

The Immediate Concern

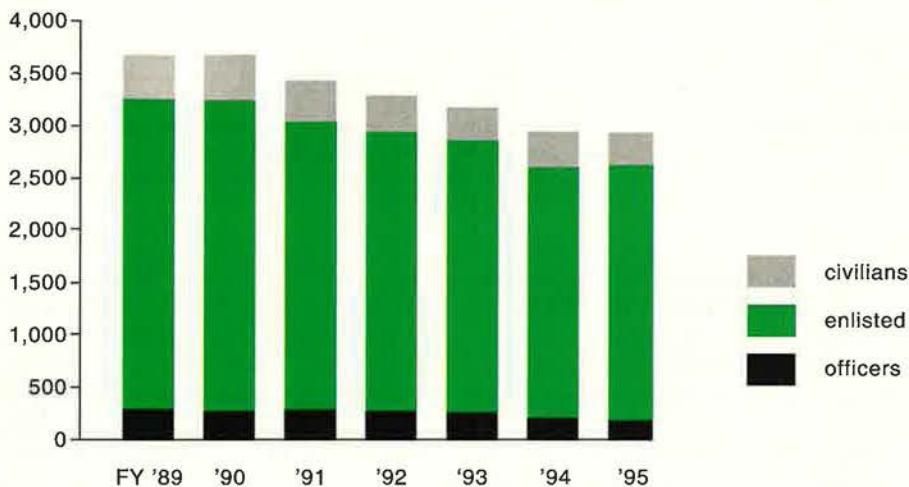
The unease stems not only from concern about the service's contin-

Pilot Shortage?



Air Force figures show that the pilot surplus of the early 1990s will be supplanted by a pilot shortage starting next fiscal year.

Fewer Air Force Recruiters



The number of recruiters has dropped; the work load may be increasing, with more difficulties in store.

ued ability to attract sufficient numbers of high-quality men and women but also from worry about USAF's prospects in the area of retention—holding on to the experienced troops the service wants to keep to help run the force and train new Air Force members.

The immediate issue is recruiting. Though the drawdown has made recruiting more difficult, the

job continues to attract the best noncommissioned officers from every career field, as seen in the slightly higher promotion rates for recruiters. Even so, the number of Air Force enlisted personnel allocated to recruiting fell by a full eighteen percent over five years—from 3,255 in Fiscal 1990 to 2,660 through Fiscal 1994. [See chart directly above.]

While the reduction may in part reflect the effects of the overall draw-down, the recruiting work load has remained fairly stable. All signs are that it will become more difficult in the next few years.

One reason: The decline in youth interest in military service arrived at a bad time—just as the number of young men and women in the prime service age group has dropped to postwar lows.

Said Secretary Dorn, "We are concerned because this decline in propensity [to serve] is occurring also at a time when . . . the enlistment age population also is beginning to decline. That gives us pause because we are recruiting from a smaller pool."

The problem will be compounded by the Defense Department's slightly higher recruiting requirements in Fiscal 1995, 1996, and 1997.

The Air Force projects that its own enlisted accession needs will increase from 30,000 in Fiscal 1994 to 38,500 in Fiscal 2001. Officer levels are to remain constant at 5,500 per year.

In addition to carefully watching recruiting trends, the Air Force is keeping a weather eye on retention. In the late 1970s, the mass exodus from the services of highly skilled and experienced noncommissioned

officers did much to bring about the military woes now known collectively as the "hollow force."

Thus far, the cumulative effect of the drawdown and increasing deployments does not seem to be affecting retention. [See charts on this page.] According to a Defense Department survey taken at the height of the drawdown in 1992, fully fifty-five percent of all military personnel said they still planned to stay

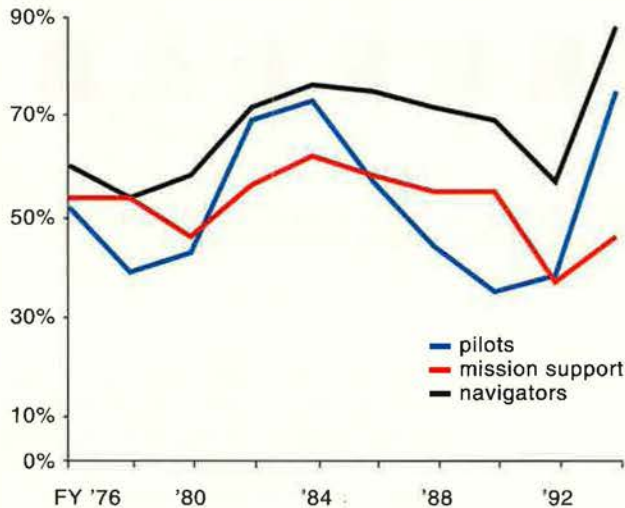
was a problem, and we were being taken to task [by critics in Congress] for asking for recruiting dollar increases and advertising increases [while] we were paying people to get out. Two years later [the critics] were the ones [increasing] advertising dollars because recruiting was a problem. I think that some time, [in] two years or whatever, retention will be a problem again. There will be something happening."

ters when I say SERBs have done more to damage morale and inject uncertainty into the force than any other personnel actions I've encountered in more than thirty-two years of active military service," said General Boles. "They abruptly ended careers of almost 4,500 successful, high-quality officers."

The SERBs and RIFs affected not just those who were selected to retire early but every single one of the

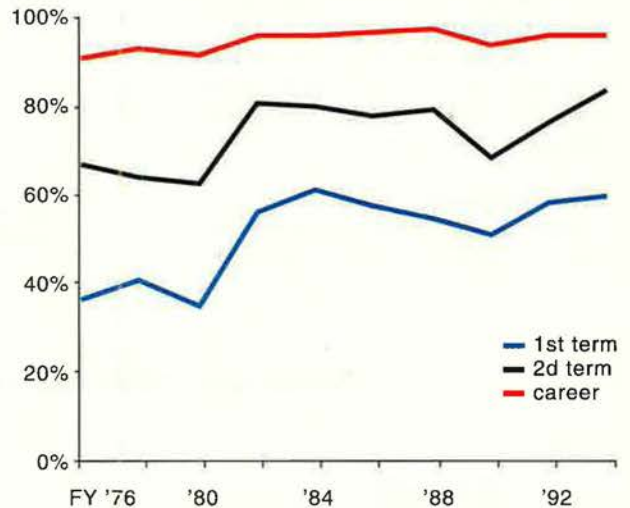
Retention

Officer Retention Is Erratic



USAF officer retention has fluctuated wildly according to the pace of the drawdown.

Enlisted Retention Stays Strong



The drawdown and high operations tempo have not affected USAF enlisted retention—yet. Air Force leaders worry that the trends could turn down suddenly.

for a career lasting twenty or more years. "I'm surprised [the figure] is that low," said General Boles, who believes that the retention figure for Air Force members is higher than the 1992 average for all the services combined. He added, however, that "I don't get overly sanguine about high numbers on this issue because it's a temperamental issue."

Something Will Happen

"You'll see that the mood can change very quickly" as the job market picks up, said General Boles. "The people who are working as crew chiefs, or working on the flight line, are a highly qualified, marketable resource. They're trained, they're drug-free, they exercise responsibility, so once the market opens up, they can get a job."

The General added, "Two years ago, we were saying that recruiting

Much will depend on the morale of the enlisted force, which has been through a traumatic downsizing and continues to be ridden hard during a period of increasing overseas deployments.

In the three-year 1992–94 period, the Air Force cut the force over and above normal attrition by more than 51,000 troops. The cuts came through use of such drawdown tools as Selective Early Retirement Boards (SERBs), reductions in force (RIFs), the Voluntary Separation Incentive (VSI)/Special Separation Benefit (SSB), and early retirement.

Without a doubt, the involuntary programs—the SERBs and RIFs—came as a tremendous shock to the all-volunteer force. No draftees were waiting to be sent home, so the Air Force could only cut troops who had chosen the Air Force as a career.

"I don't think I'm overstating mat-

Air Force troops who had to meet with the boards. Their families also were affected. Although the Air Force did not have to use an enlisted SERB, the prospect of it caused the same emotional impact on morale and created uncertainty within the enlisted force.

Air Force officials maintain that bonus programs, transition benefits, and early retirement programs had a positive impact on morale. They helped limit the damage caused by SERBs and RIFs. With these voluntary programs, the Air Force achieved eighty-three percent of its required reductions. One Air Force personnel officer said, "They allowed us to take care of our own and sent a positive signal to the rest of the Air Force."

Because the Air Force has already achieved its goals of 2,500 officer and 16,600 enlisted reductions for

Fiscal 1995, it has closed the bonus and early retirement programs. General Boles said that although USAF doesn't know the final numbers, there will probably be cuts in Fiscal 1996 and 1997.

"I think they will be small numbers in relation to where we have been," he said. "Our thinking now is that we will have to have some incentives, but whether that is VSI/SSB or early retirement, I'd be hard pressed to say." He added that he did not know "which programs will be open to what groups at this time."

Some Slower Promotions

Despite concerns that promotions might slow during the drawdown, the overall timing appears to be fairly steady. There are some exceptions, such as for majors and for staff and technical sergeants. As a result of large year groups eligible for promotion to major during the drawdown, the timing rose in 1993 above the nine to eleven years of service range, based on Defense Officer Personnel Management Act guidelines, to twelve years and two months.

Personnel officials project that the promotion phase point will again drop to eleven years by 2001 because of the smaller size of year groups now in the personnel pipeline.

The Air Force met or came close to Total Objective Plan for Career Airman Personnel guidelines because the percentage of the force serving in each grade remained initially steady and voluntary loss programs targeted grades, skills, and years of service. However, over the past five years, promotion to staff sergeant exceeded timing parameters by less than one year and promotion to technical sergeant by one year.

Of critical importance to retention and recruiting is military pay. An underlying principle of the All-Volunteer Force when it was created in the early 1970s was that military pay must be kept comparable with private-sector wages if it is to attract and retain high-quality volunteers.

Military pay shortfalls contributed greatly to the retention and hollow-force problems, which in turn led to full comparability pay raises in Fiscal 1981-82 to help solve those problems.

Air Force officials say that military pay currently lags behind private-sector wages by a cumula-

tive 12.6 percent. Since 1982, pay has lagged behind inflation by four percent. Before the most recent flurry of Pentagon actions to raise military pay, the planned limits would have widened the gap even further. Secretary of Defense William J. Perry has recently expressed support for a full statutory pay raise in Fiscal 1996.

The current Employment Comparability Index (ECI) gap (12.6 percent) has had minimal impact on recruiting and retention because the inflation gap remained relatively low. By Fiscal 2001, the ECI gap will increase to nearly sixteen percent, and the inflation gap may widen to more than seven percent.

The danger for retention and recruiting comes when a military person realizes he or she is losing money by staying on active duty. "They will put up with some of that—not willingly, but they just do, for some reason," said General Boles, "but when you get little things, such as losing money on housing, the VHA going down, the high cost of living. . . . When a few of those irritants add up, when they get to a certain level, then everybody just says, 'It's time to go.'"

He added, "We've watched that [happen]. We've watched it with pilots. We've watched it with the highly skilled people, like computer technicians, anybody who has a marketable skill."

The Health-Care Tool

Health care also is a critical retention tool. About thirteen percent of active-duty people responding to the 1992 DoD Survey of Military Medical Care Beneficiaries mentioned retiree health-care availability as a concern, indicating that retiree health care has a measurable effect on morale and retention of the active-duty force.

Though access to military treatment facilities is declining for retirees, health care is still available after retirement and reportedly will improve with the advent of DoD's Tricare [see "The Tricare Era in Military Medicine," October 1994, p. 38].

The Air Force believes that the perceived uncertainty of future military health care for families and former members troubles the active-duty force and affects retention and recruiting. Accordingly, the Air

Force wants to make easy and affordable health-care access for retirees a top goal in implementing DoD's Tricare.

Though two major problems—the drawdown and increased operations tempo—are taxing its troops in the 1990s, the Air Force believes morale is rebounding as the end of the drawdown nears. That does not mean there are no problems.

While it may not be able to track statistically the social impact of the drawdown and increased operations tempo, the Air Force is concerned that the heavy use of such programs as Family Support Centers, Family Advocacy, and Health Promotions is evidence that families need and are seeking help dealing with the stresses of longer and more frequent overseas operations and family separations.

Air Force officials said that Family Support Centers are geared to address the needs of military families during this time of high operations tempo. The goal is to increase stability within the family and provide a high quality of life for members and the families that support them.

Although the Air Force has no specific tool to measure morale, direct discussions with commanders and first sergeants in many different forums give Air Force leaders a feel for people's attitudes. Various staff agencies are working together to examine all available data with the goal of answering morale questions more definitively.

"We all know that when you get periods of uncertainty and periods of stress you're going to see things like spouse and child abuse," said General Boles. "People get a little tenser, and those who are prone to act hastily will do so. I think we have seen a slight increase in spouse and child abuse. We do not have a good . . . system that would track that in relation to personnel tempo or operations tempo, but I think it's just a conglomeration of things—drawdown, TDYs, all those kinds of things. I don't think there's a wing commander out there . . . who is not sensitive to that."

As for other potential stress indicators, such as drug or alcohol abuse, current data show that the problem has steadily decreased for ten years throughout the Air Force. ■

The European approach to commercial space launch has succeeded while the US program has faltered.

How Ariane Does It

By Theresa Foley

IN RECENT years, more than a few planeloads of US defense officials, rocket manufacturers, and congressional staff members have disembarked on the hot tarmac of Rochambeau International Airport in the steamy jungle of French Guiana. There, near the city of Cayenne, they climb into air-conditioned buses and travel thirty-seven miles up the South American coast to the European Space Agency's Centre Spatial Guyanais.

After downing room-temperature planter's punch—the traditional welcoming drink—visitors are whisked further into the hinterlands, where they encounter steel structures rising hundreds of feet above the ground. If they have timed the visit just right, they will see a gleaming white rocket sitting on its launchpad, standing out against the brilliant blue Atlantic, ready for flight.

These journeys to French Guiana are not junkets, though at times they seem to have no clear purpose. American officials have no money to replicate the sophisticated facility carved into the remote, tropical coastline. Moreover, they are barred by federal law from becoming a customer of commercial foreign launch compa-

nies. Why, then, do they go? They want to check things out—to see how the leader does business.

In the world of commercial launches, Arianespace is king. Arianespace has been launching more than half the world's commercial satellites for years, popping off rockets like clockwork as frequently as eight times a year. No one else comes close. By its own count, Arianespace has fifty to fifty-eight percent of the global commercial launch business, but competitors say its market share is even larger.

Arianespace and the US space-launch system have been going in opposite directions. As recently as 1982, Americans dominated the launch business, with a lock on ninety percent of the world market. That share has dropped to about thirty percent and is still sinking. Arianespace Chairman and CEO Charles Bigot has said that his major competition in the next decade will come not from the US but from Russia, China, and Japan.

Impressed and Envious

United States military officials who go to the wilds of French Guiana

Using a more powerful propulsion system, fewer engines, and the highly efficient "factory-to-pad" assembly and launch method, Ariane 5 (shown here in an artist's rendering) promises to further solidify Arianespace's position as king of commercial satellite launch.



invariably come away impressed. Arianespace, which is ready to replace its seven-year-old launch complex with new facilities this year, appears to have all the new hardware and equipment it could want, while competing US systems are entering their fourth decade of use. The France-based company will enter only its thirteenth year of full commercial operations in 1995, but its newest rocket, Ariane 5, will be introduced in the fall. When that happens, US space officials will be even more envious.

The Arianespace goal is to accelerate its launch rate to thirty missions in thirty months. Ariane launches fell behind schedule last year because of two failures, but a faster launch schedule will allow the company to catch up. The latest problem occurred with Flight 70 on December 1, 1994, when an Ariane 4 rocket malfunctioned and its payload disintegrated in flight. As a result, Arianespace officials postponed the next launch, which had been scheduled for December 29.

Mr. Bigot said on December 2 that the impact of the failure on the launch schedule would be "minimal."

One might wonder what makes Ariane so interesting to military officials. After all, Ariane carries no astronauts and little military cargo. On the outside, Ariane launchers look pretty much like US launchers.

US rockets, however, are based on thirty-five-year-old ICBM technology that has been upgraded over the years. Their disadvantages are tied to their genesis as delivery systems for weapons of mass destruction: In the 1950s, missile designers did not have economy and ease of operation on their list of engineering requirements.

Europe's top rocket designers had a distinct advantage when they tackled the question of how to make the best launcher for routine, commercial work. For Ariane 4 and 5, designers started with blank sheets of paper. Cost control and ease of operation were in the front of their minds. They looked at the US methods, kept the good, and discarded the bad.

"It's overstating the case to say Ariane is more efficient or to be envied," said Gen. Charles A. Horner, the recently retired commander in chief of US Space Command and commander of Air Force Space Com-

mand, who visited the French Guiana site. "What they do have is the advantage of coming into the launch business building on the lessons we've learned over time."

"What they did was very smart," said Barry Zilin, a Washington, D. C., consultant to the Air Force and launch companies whose firm recently completed a comparative study of US and Ariane launchers. "They studied the heck out of the US in the late 1970s, early 1980s. After all, we were the leaders. They looked at [NASA and Air Force] procedures. They looked at our design. They asked, 'What do I have to do to get a successful launch with the fewest people in the least amount of time?'"

The Europeans copied the US to get to their current leadership position, but now the tables have turned. Military launch officials say the US has much to learn from Arianespace about rocketry and the launch business. For starters, Europe has been willing to scrap its old launchpads, buildings, and equipment, replacing them three times in less than twenty years, counting the opening of the new complex this fall. The American approach has been to fix up old



Arianespace enjoys state-of-the-art equipment and launch control facilities without government involvement during routine operations and launch failure investigations. Flight-proven Ariane systems are commercially operated.

pads and facilities and make do with them indefinitely.

"The smart thing they're doing is to shut down the Ariane 4 assembly line after a few years of overlap," said Brig. Gen. Sebastian F. Coglitore, retiring director of space programs in the office of the assistant secretary of the Air Force for Acquisition. General Coglitore visited Arianespace's French facilities twice to inspect the production process for Ariane 4s and 5s.

Rough Start

When Arianespace began in the early 1980s, it was not a model of efficiency. The original Ariane launchpad, ELA 1, was used for Ariane 1, 2, and 3 rockets. Doug Heydon, president of the US branch of the European company, said it used a "classic stack-on-the-pad" operation. Only one mission could be prepared at a time because each needed to get into the gantry to start. When things went wrong, the delay could be lengthy, and everything behind the delayed mission was put on hold. In this sense, ELA 1 was like pads 36 and 17 at the Cape Canaveral, Fla., launch sites for Atlas and Delta rockets.

The ELA 1 system limited the launch rate, required too much processing time, tied up the pad, and required complex operations to be carried out on the pad instead of at a nearby site. Arianespace dismantled it.

In 1988, Arianespace ushered in an entirely new processing approach with a new launcher, Ariane 4. The stack-on-pad method was replaced by a process sometimes called "factory-to-pad," in which the satellite is delivered to the launch site ready to go. The biggest change was to move much

of the processing off the pad to nearby facilities. Buildings at the complex, called ELA 2, were designed for dual-mission processing, eliminating the wait for access to the gantry that had been a bottleneck.

US systems are custom-assembled on the pad, where they typically spend months. The Ariane 4 rocket requires only twenty-five to twenty-seven days to go from assembly to launch. The facility has to have eighteen days between launches, meaning that two launches can be carried out in a single month. (Arianespace has pulled off that trick twice.) The first fifteen days are spent inside the Vehicle Assembly Building, where the Ariane 4 is assembled on a launch table. The rocket is then transported a little more than half a mile from the assembly building to the pad for twelve more days of work. Five days before liftoff, the satellite payload is loaded.

Mr. Zilin recalls making the trip to French Guiana and watching the delivery of an Ariane 4 first stage. He was highly impressed with its efficiency. The Ariane stage had been built at Aerospatiale in France, placed in a shipping container by factory workers, pulled by a truck cab to the coast, loaded on a barge, and shipped

Air Force space officials say Ariane gleaned many of its operational secrets from the trials and errors of such pioneering programs as Titan III, which used a factory-to-pad method in the late 1970s. By Titan IV (shown here), however, US launch packages had become much bigger, more complex, and more expensive.



to South America. The unloading in French Guiana was a simple operation that required only a crane, a crane operator, and a truck driver. Eight hours were budgeted for the process. It took only two. No tools were needed until a worker bolted the stage onto its platform.

"It was a thing of beauty to watch how quickly it went, how flawless it was," said Mr. Zilin.

In comparison, US rockets would need dozens of people, many tools, and a lot of safety oversight to do the same task, he said.

Educating the Engineers

The reason the Europeans have had it so easy is that they forced their rocket engineers to sit beside an operations specialist when designing Arianes 4 and 5. The operators were in position to stop the engineers from designing operational nightmares into the hardware.

For example, said Mr. Zilin, the hoisting of parts and payloads, something that engineers apparently enjoy designing but operators hate to perform, is being kept to an absolute minimum for Ariane 5. Instead, hardware is carted around on pallets or rails whenever possible.

If Ariane 4 made US launch officials a little envious, Ariane 5 could turn them green. The new launcher will take simplicity in rocket design and ground operations a step further. Its propulsion system will be more powerful and require fewer engines.

Ariane 5 will have a large central cryogenic first stage, powered by one big Vulcain engine, instead of the four smaller Viking engines in Ariane 4. Instead of having small strap-on engines, the new rocket will have two large solid rocket motors, each with three segments. A solid rocket motor factory on site will produce a large portion of the fuel segments.

For several years, senior US military space officials have been calling for a particular kind of booster. What they have asked for, Arianespace will deliver with Ariane 5, according to several current and former military launch officials. The Air Force and NASA will watch this fall as Europe launches a rocket that looks like the one they pursued for five years with no success under the names Advanced Launch System, the National Launch System, and Spacelifter.



Arianespace has dramatically improved efficiency by moving rocket assembly from the pad to the factory and by requiring its rocket engineers to consult the operators before designing potentially needless systems. Five or six Ariane 5s could be launched annually.

The Evolution of Ariane

	Height (feet)	Approximate Liftoff Mass (1,000 lbs.)	Payload Mass (lbs.)
Ariane 5	177	1,595	15,000
Ariane 4	191	1,034	9,965
Ariane 3	160	528	5,940
Ariane 2	160	477	4,840
Ariane 1	156	462	3,960

General Coglitore said Ariane 5 is no minor upgrade of Ariane 4 but the system that would have resulted from USAF's ALS or NLS programs. The Europeans have shown the will to do what their US counterparts had neither the political nor financial strength for, he said.

Arianespace plans to launch five or six Ariane 5s annually. Each will be capable of carrying two of the largest communications satellites in production. Mr. Heydon of Arianespace said the launch rate can be surged to meet higher demand, but current commercial projections show that five or six launches per year will meet all needs.

With Ariane 5, virtually no processing will be done on the launchpad, which is little more than a slab of concrete with flame pits around

it. The European Space Agency (ESA) has constructed several buildings at the space center to process the larger rocket, incorporating more operational efficiencies.

Assembly Sequence

Ariane 5 will require roughly the same number of days to process as Ariane 4, but the sequence inside the buildings will be different. Ariane 5's large solid motors will be assembled in one building. Then the solid and liquid stages will be integrated inside a vehicle assembly building, and the processing will move to a final assembly building. Once Ariane 5 is assembled, tested, and loaded with its cargo, it will be rolled on rails out to the pad.

The umbilical connections to ground equipment will be carted out to the

launchpad along with the satellite just nine hours before liftoff. The Ariane 5 system has no gantry providing access to the rocket at the pad.

At least two advantages result. First, if there's a problem before launch, the whole package can be rolled back to the assembly building where workers and tools are waiting. The fix would be followed by a quick rollback for a second attempt to launch. Fixing a rocket on the pad takes longer as a rule. Second, damage to a launchpad from a catastrophic failure before liftoff would be negligible because the pad has nothing permanent to destroy, although destruction of the transportable equipment would still be a problem.

The Ariane 5 story contains considerable irony for the United States. Several former US officials claim that Ariane 5 represents many of the features of Titan operations in the late 1970s, before the United States made the fateful decision to shut down its use of expendable launchers and transfer all future military missions to the space shuttle.

General Cogliatore agrees that the Air Force operated Titan a la Ariane 5 some ten to fifteen years ago. Titan III was a factory-to-pad operation, he said. The Air Force's easily processed missions ended when military satellites were redesigned to fly on the shuttle. The packages became bigger and more complicated. When Titan IV was created to augment the shuttle, the big new rocket had a huge segmented fairing, with associated complexity of processing.

Mr. Zilin defended Titan IV, pointing out that it has been operated with as little as forty-five days' turnaround time between flights. The problem is that the secret satellites it carries are "self-insured, very complex, and extremely expensive," he said. Thus the owners are very cautious and refuse to be rushed. "The constraints don't apply to [Ariane] because they don't have these crazy satellites," said Mr. Zilin. "They've taken out all the stupidity. It's not a fair comparison."

A Smoother Process

Beyond technical and operational differences, a smoother political process for obtaining government money to develop launchers has benefited the Europeans. European governments have paid development costs

The Ariane Record

Launch Date	Ariane Launcher	Payloads	Launch Date	Ariane Launcher	Payloads
December 24, 1979	1	1	February 22, 1990	4	2
May 23, 1980	1	3	July 24, 1990	4	2
June 19, 1981	1	3	August 30, 1990	4	2
December 20, 1981	1	2	October 12, 1990	4	2
September 10, 1982	1	2	November 20, 1990	4	2
June 16, 1983	1	2	January 15, 1991	4	2
October 19, 1983	1	1	March 2, 1991	4	2
March 5, 1984	1	1	April 4, 1991	4	1
May 22, 1984	1	1	July 17, 1991	4	5
August 4, 1984	3	2	August 14, 1991	4	1
November 10, 1984	3	2	September 26, 1991	4	1
February 8, 1985	3	2	October 29, 1991	4	1
May 8, 1985	3	2	December 16, 1991	4	2
July 2, 1985	1	1	February 26, 1992	4	2
September 12, 1985	3	2	April 15, 1992	4	2
February 22, 1986	1	2	July 9, 1992	4	2
March 28, 1986	3	2	August 10, 1992	4	2
May 31, 1986	2	1	September 10, 1992	4	2
September 16, 1987	3	2	October 27, 1992	4	1
November 21, 1987	2	1	December 1, 1992	4	1
March 11, 1988	3	2	May 11, 1993	4	2
May 17, 1988	2	1	June 24, 1993	4	1
June 15, 1988	4	3	July 22, 1993	4	2
July 21, 1988	3	2	September 25, 1993	4	7
September 8, 1988	3	2	October 22, 1993	4	1
October 28, 1988	2	1	November 19, 1993	4	2
December 11, 1988	4	2	December 17, 1993	4	2
January 27, 1989	2	1	January 24, 1994	4	2
March 6, 1989	4	2	June 17, 1994	4	1
April 2, 1989	2	1	July 8, 1994	4	2
June 5, 1989	4	2	August 10, 1994	4	2
July 12, 1989	3	1	September 8, 1994	4	1
August 8, 1989	4	2	October 7, 1994	4	2
October 27, 1989	4	1	October 31, 1994	4	1
January 21, 1990	4	3	December 1, 1994	4	1

The first four launches were developmental; the next four launches were promotional. Arianespace, established in 1982, took over the Ariane launches beginning May 22, 1984. This list includes several launch failures.

for each version of the Ariane, its ground facilities, and the first flights. Once the system is flight-proven, ESA turns it over to the commercial company for all procurement, marketing, and operations.

In Europe, the idea of a government developing a space system, then handing it over to industry, is not a matter for much debate. The hand-wringing that occurs in the United States, where government officials expect industry to pay for development of commercial rockets, is unheard-of among Ariane's backers.

Under the ESA system, members make a full commitment at the beginning of a project to pay for it. For Ariane 5, for example, a 1987 decision of the ESA ministers' council delivered all the approvals necessary, including a twenty percent contingency fund for potential problems. About \$5 billion was approved for the life of the program. ESA did not need to develop annual budget requests, as US space agencies must do. Nor did European politicians meddle with the program after its approval.

Ariane's hardware contractors also diverge from their counterparts in the United States. The European industry readily accepts that a launcher line will be shut down to make room for a new one. Change is viewed as necessary for survival, not as a threat to the corporate bottom line.

Crisis management is handled differently at Arianespace, with its commercial bent. The last few times an Ariane has failed, Arianespace has managed to get back in operation in less than four months, shorter than the global industry standard.

The Europeans take more telemetry down from the rocket and receive the information in a different format than is the case in the United States, an advantage when a problem occurs, Mr. Heydon said. Mr. Zilin said the US rockets transmit extensive data to the ground in early flights, but for reasons of cost and performance, most sensors are removed after a rocket is proven.

Carrying 600 to 800 sensors on each flight is "a small price to pay for having really good, complete,



Unless the US commercial launch program gets the technological and management updates it needs to compete, American launch sites will continue to see a mere fraction of the activity this Arianespace site in French Guiana enjoys.

and repeatable data from all these flights," said Mr. Heydon.

Ariane's data are displayed and analyzed by computers; US rockets still employ engineers in a back room reading strip charts from each sensor, Mr. Zilin said. The paper information is useful after a failure, but the analysis is time-consuming.

When something is out of tolerance, Ariane computers indicate it visually as it occurs during the flight. As a result, Arianespace officials usually have a good idea where to look for the cause of failure at the time it occurs, as they did in December when Flight 70 failed.

Arianespace can get back to launching rockets faster because the government is not looking over its shoulder and making constant demands during the investigation, Mr. Zilin said. Martin Marietta, producer of the Titan and Atlas rockets, and McDonnell Douglas, builder of the Delta, "could recover as efficiently and effectively as any foreign company if they were left alone [to investigate a launch failure], but they are not," he said. NASA, the Air Force, and the Transportation Department usually are involved.

In the future, Ariane's ability to recover swiftly from failure will become more important to the United

States, even if US "Buy American" laws prevent Arianespace from bidding on US government missions. Edward "Pete" Aldridge, a former Secretary of the Air Force, predicted that the Defense Department will in time augment its military satellites with commercial-satellite capacity. Many of the satellites it will lease are going to be carried aboard Arianespace rockets, making the Pentagon an indirect user, and Ariane 5 is to launch at least one space station mission.

For its part, the United States is embarking on another effort to fix up its launcher fleet. The new program, called the Evolved Expendable Launch Vehicle (EELV), is a tepid replacement for the ambitious plans of Spacelifter and its predecessors. Under the EELV program, the Air Force will pay for improvements to one of the three US launch systems: Atlas, Titan, or Delta. Briefings to industry on the content of EELV had begun by late 1994, but details were still sketchy.

Military space officials would like to see the EELV program allow them to incorporate into US operations some of the lessons they have learned from their visits to the French Guiana launch site. Unless money, clear policy, and strong management converge behind EELV, however, using Ariane as a model for US launch operations is nothing more than wishful thinking. ■

Theresa Foley, a former editor of Space News, has covered Arianespace for many years. This is her first article for AIR FORCE Magazine.

The Republican landslide will remake the congressional defense establishment.

New Brooms on Capitol Hill

By Pat Towell

THE REPUBLICAN tidal wave that swept Capitol Hill on election day gives the new Congress a strikingly more pro-defense tone.

Pro-defense, bipartisan coalitions long have dominated congressional defense panels anyway, with most of their Democratic members notably more conservative—and more hawkish—than the run of Democrats in the Senate and House.

From that perspective, the new Republican majorities on the armed services committees and defense appropriations subcommittees do not represent a radically different point of view. The change in Congress, however, makes it more likely that President Clinton's avowed defense program—the maintenance of a modernized and combat-ready force able to fight and win two major regional wars beginning nearly simultaneously—will be fully funded.

Through last November, the Clinton defense team was acknowledging a funding shortage of as much as \$49 billion in its projected Defense Department budgets for Fiscal Years 1996–2001. When the President announced December 1 that he would add \$25 billion to the six-year plan-

ning total, Pentagon officials said that two other factors would combine with the add-on to eliminate the shortfall. First, new economic estimates predicted lower inflation—and lower prices—in the outyears of the budget plan. Second, the services would absorb about \$12 billion in unbudgeted costs by canceling or delaying some of the major weapons programs that had been targeted for review by Deputy Secretary of Defense John M. Deutch.

Republicans—many of whom believe that the Clinton team understated the long-term funding shortfall—probably can make modest additions to the amount the President projects to pay for his two-



Staff photo by Guy Aceio

regional-war force. If they can pressure him to reduce overseas deployments on humanitarian and peacekeeping missions, they can cut the unanticipated costs that have played havoc with the services' program execution during the last two years.

Several senior members of the Senate Armed Services Committee have called for freezing the defense budget at its current level—a move that would produce \$90 billion in unanticipated funds through Fiscal 1999.

There is the problem of where to find the money needed to buy a force measurably more robust than the one President Clinton promised to support during his term in office. Even during the Reagan era, congressional Republicans, when forced to choose between cutting the federal budget or increasing the funds for defense, chose federal budget-cutting every time.

It is true that a new breed of Republican dominates the GOP caucuses on Capitol Hill, particularly in the House, where fifty-two percent of all Republicans were first elected in either 1992 or 1994. However, one sees evidence that the new group, too, considers its sovereign goal to

be the reduction of federal government and federal expenditures.

Major Changes

Though the election campaign did not produce specific proposals for dramatic, immediate change in the defense program, it did set in motion a number of major changes in the way Congress will deal with defense policy questions, at least for the next two years.

The most glaring effect is that the party turnover displaced four powerful defense committee chairmen, each of whom had imposed a personal stamp on his panel. The four new Republican chairmen are no greenhorns, but each will bring to his job a distinctive style of leadership and a new set of priorities for the national defense establishment.

Nowhere is the shift of chairman more stark than in what once was known as the House Armed Services Committee but now is called the House National Security Committee. Rep. Floyd D. Spence (R-S. C.) succeeds former chairman Rep. Ronald V. Dellums (D-Calif.), one of Capitol Hill's strongest advocates of radical reductions in the size and

cost of the defense establishment.

The panel's Democratic membership long has been dominated by conservatives who are generally pro-defense, if not always pro-Defense Department. Representative Dellums has been content to raise probing questions and to argue his case while scrupulously avoiding any use of his prerogatives as chairman to impose his will on the committee's hawkish majority. Moreover, he was willing to lose in the short term because he was confident that fiscal and international realities ultimately would drive the House toward his vision of defense.

Representative Spence is a low-key, amiable man who ascended the committee's GOP seniority ladder without acquiring a high national profile in the process. Much of his work focused on the old Seapower Subcommittee, on which he served for years as senior Republican. Through the 1980s, he was afflicted by a lung disease that nearly crippled him. His health was restored in 1989 by a rare double lung transplant.

When he became senior Armed Services Republican in 1993, Representative Spence rose to the occa-

sion, emerging as an advocate of the Republican critique of Clinton's defense program: too little money, too many funds diverted to nondefense programs, and too much wear and tear on the troops in such noncritical places as Somalia and Haiti.

When the election put him in line to take over the House committee, Representative Spence came out of the starting blocks quickly, taking the fight to the Clinton Administration on the question of why—and how badly—the near-term readiness of US forces had slipped.

In a November 9 statement, the new chairman asserted, "It is clear to me that the Administration's dismal record on defense contributed to the electorate's overwhelming rejection of the Clinton agenda." He added, "I will be working to reverse the past two years of neglect of our nation's military."

He had dispatched the committee's Republican staff in October to make spot checks of the combat readiness of units deployed around the world. On December 5, he released a compilation of their findings, in which he warned that US armed forces were suffering through "the early stages of a long-term, systemic readiness problem that is not confined to any one quarter of the fiscal year or portion of the force."

The intent of this statement was to challenge the Administration's contention that only certain types of units were experiencing readiness slumps and that the declines were driven largely by the need to find ready money in the last quarter of the fiscal year to pay for unanticipated operations in Haiti, Bosnia-Herzegovina, and elsewhere.

Representative Spence has bench strength on his committee—a phalanx of combative conservatives eager to put a hard edge on their criticism of Clinton's defense program. Ohio's Rep. John R. Kasich, an aggressive committee Republican, may be preoccupied as chairman of the House Budget Committee, but Reps. Curt Weldon (R-Pa.), James V. Hansen (R-Utah), and Robert K. Dornan (R-Calif.)—to name three—will be there to pull their weight.

The Thurmond Factor

On the other side of Capitol Hill, Sen. Strom Thurmond took command of the Armed Services Committee.

In his long public career, the incident that may be most eloquent of the South Carolina Republican's perspective is this: In 1942, when he was thirty-nine years old and exempt from the draft (he was a state judge), Thurmond joined the Army. Two years later, in June 1944, he rode a glider into Normandy with

The new leadership in the House has been critical of the Clinton defense program.

the 82d Airborne Division at the beginning of Operation Overlord.

Some fifty years after that glider landing (during which he was injured), Senator Thurmond brings to the chairmanship of the Republican-controlled Armed Services Committee a profound esteem for the military profession and an old-fashioned, straightforward patriotism.

In no other sphere of public policy is Senator Thurmond's bedrock conservatism more evident than in defense policy, where his views are anchored in the twin convictions that the world is a dangerous place for US interests and that it is better for the country to err on the side of safety—*i.e.*, better too much defense than not enough.

His perspective both predated the Cold War and outlasted it, as illustrated by his hard-line approach to internal security issues. In 1993, as senior minority member of Senate Armed Services, he helped spike the nomination of Morton H. Halperin to a top Pentagon job in part, he said, because the nominee's civil libertarian views unduly discounted the continuing need for official secrets and internal safeguards against terrorist threats.

Former chairman Sen. Sam Nunn (D-Ga.) dominated Senate defense

debates with his mastery of detail, his sure instinct for when and how far to push an issue, and his keen aptitude for steering innovative policies through the legislative mill. By contrast, Senator Thurmond has never been a detail man nor one to trim his sails to the prevailing political winds. In the great national debates of the last five decades, he typically has been neither policy innovator nor political tactician. Senator Thurmond's forte, rather, has been advocacy—dogged, plainspoken statement of his case, hammering at a few key themes in a way that forces his issues onto the agenda and energizes his political allies.

An exercise buff, Senator Thurmond remains physically vigorous. Shortly before the Senate recessed in October for the election, he was on his feet late one night reading a lengthy speech supporting the Air Force's hotly contested nomination of Lt. Gen. Buster C. Glosson, the Desert Storm air war figure, to retire in grade.

A Strong Lineup

As he has moved into leadership roles in the past fifteen years—as chairman of the Senate Judiciary Committee in the period 1981–87 and senior Armed Services Republican in 1993–94—Senator Thurmond has demonstrated a knack for delegating detail work to fellow GOP members of those panels. On Armed Services, he has a strong lineup with which to continue that pattern. The next three senior Republicans—Sens. John W. Warner (R-Va.), William S. Cohen (R-Me.), and John McCain (R-Ariz.)—all are committee veterans of many years' standing.

Some of the junior Republicans also have carved out niches for themselves. Indiana's Sen. Dan Coats, for instance, has bird-dogged readiness issues, and New Hampshire's Sen. Robert C. Smith has become the leading advocate of ballistic missile defense as well as a central figure in the most recent congressional probe of the POW/MIA issue.

Senator Thurmond's high regard for military professionals underpins a significant reshaping of the Armed Services Committee's GOP staff in his two years as senior Republican. A number of retired officers have been hired, reflecting Senator Thurmond's respect for their hands-on

experience. Richard L. Reynard, a retired Army brigadier general, has been the director of the Republican staff since 1993. George W. Lauffer, a retired Army lieutenant colonel, has been Senator Thurmond's legislative assistant for Military Affairs since 1989. Even Senator Thurmond's personal chief of staff, Robert J. Short, who has worked with him for twenty years, most of that time on the staff of the Judiciary Committee, served a four-year hitch in the 82d Airborne Division. Mr. Short moved to his current position in 1989.

On the House Appropriations Committee, the defense establishment has progressed from having one friend at the top of the ladder to having two. Pennsylvania Rep. Joseph M. McDade, who was senior Republican on both the full committee and the defense subcommittee, is under federal indictment on bribery charges and so was dropped from the GOP leadership ladder when the party took control of the House this year. Two wheelhorses of the Defense Appropriations Subcommittee have taken those two jobs instead: Rep. Bob Livingston of Louisiana is chairman of the full committee, and Rep. C. W. "Bill" Young of Florida heads the defense panel.

Solidly Mainstream

Representative Young—like his predecessor Rep. John P. Murtha (D-Pa.)—is a strong hawk and a believer in the Appropriations Committee's collegially bipartisan way of doing business. He is also a veteran of more than three decades of battles to establish the Republican party as a competitive force in the South. He served in the state Senate for a decade—including a stint as Minority Leader—before coming to the House in 1971. His early service on the Appropriations Committee was on the Foreign Operations Subcommittee, where he took a skeptical approach to foreign aid and was a tough critic of such multinational funding agencies as the World Bank.

Since he moved to the Defense panel, Representative Young has been

solidly in the mainstream of the center-right bipartisan coalition that dominates that subcommittee. He is perhaps best known for an initiative that illustrates that members' personal priorities are not always limited to the delivery of pork back home. Since 1987, he has been the leading advocate of Pentagon funding for bone-

A new breed of Republican dominates GOP caucuses on Capitol Hill.

marrow research and for the development of a National Bone-Marrow Registry to catalog potential marrow donors for victims of leukemia. The Fiscal 1995 defense appropriations bill included more money for this work, at Representative Young's insistence. Ironically, after years of championing this work, Representative Young learned late in 1990 that his daughter had developed a form of leukemia treatable only through a marrow transplant. She received the treatment and is in remission.

Even under the chairmanship of Representative Murtha—whose political style is more muscular than Representative Young's—the House Defense Subcommittee typically operated within bounds of the authorization legislation drafted by the House Armed Services Committee, at least so far as major issues were concerned. The relatively rare, dramatic departures from the outlines of Armed Services bills often are intended merely as legislative two-by-fours to whack the Pentagon's snout. They are administered to un-

derscore congressional concern about an issue, but they are not expected to survive conference with the Senate.

There is no reason to anticipate any change in the basic comity between the two House defense panels with Representatives Spence and Young in charge.

An Unabashed Hawk

At the Senate Defense Appropriations Subcommittee, Alaska's Republican Sen. Ted Stevens is settling in for a second stint as chairman, a job he held when Republicans last ran the Senate. Senator Stevens is an unabashed hawk. However, a generation of witnesses before the Senate defense panel can attest that his sharp tongue, short fuse, and fierce determination make him a formidable interrogator and that he is perfectly willing to use his talents against Pentagon witnesses if he is unconvinced by their arguments.

Relatively early in the Reagan Administration, for instance, it was Senator Stevens, not House liberals, who was the driving force behind setting a cap on the number of US personnel deployed in Europe. More recently, he has been a vigorous advocate of paring the size of Federally Funded Research and Development Centers, such as RAND Corp. It makes no sense to keep increasing the budgets for consultants, Senator Stevens argues, while the budget for procurement keeps dropping through the floor.

In his first tour as subcommittee chair, Senator Stevens was determined to make the panel an independent voice on defense issues rather than continue as a disbursing agent for program decisions made by Senate Armed Services. That effort generated some memorable clashes between Stevens and Sen. John Tower, the Texas Republican who served as chairman of the Senate Armed Services Committee. Senator Tower was determined that his panel would be the Senate's arbiter of defense issues.

At the level of principle, the division of labor between the two Senate panels remains murky. As a practical matter, most major disagreements have been worked out. Most appropriations panel initiatives involve relatively minor amounts that—if they are large enough to require explicit authorization at all—the Armed Services panel routinely authorizes retroactively. ■

Pat Towell, a senior writer for Congressional Quarterly, has covered defense issues on Capitol Hill for nearly twenty years. His most recent article for AIR FORCE Magazine, "Behind the Scenes in Congress," appeared in the November 1994 issue.

By John L. Frisbee, Contributing Editor

Thanks, Luftwaffe

Downed far behind enemy lines, an American P-51 pilot made a dramatic escape with the unintended help of the Luftwaffe.

BRUCE Carr ended World War II as a lieutenant with fourteen victories confirmed and the Distinguished Service Cross. Despite all that, he denies any claim to heroism—a doubtful assertion—but he can't disclaim his role in a daring experience, to our knowledge unique in the history of that war.

Bruce Carr was a P-51 pilot with the 354th Fighter Group. At the time of this adventure, the group was based in France. In October 1944, while on a mission over Czechoslovakia, he was downed by flak. After days of evading—cold, hungry, and physically exhausted—he decided it was better to turn himself in to the Luftwaffe than to risk capture by the locals. He knew from the surrounding air activity that there was a German airfield not far away.

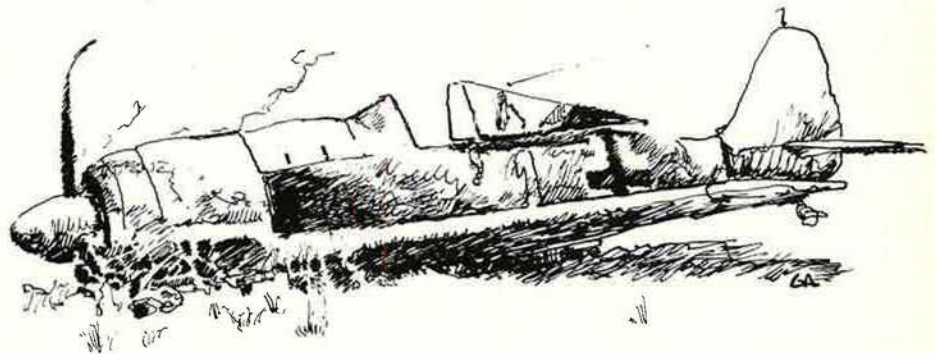
Lieutenant Carr found his way to the field and hid in the forest outside a fence surrounding a revetment in the woods. An FW-190 was parked there; its ground crew was completing servicing the aircraft. It was full of fuel and ready to go.

Carr's plan of surrender took a 180° turn to the positive side. Maybe he could "borrow" the enemy fighter and fly back to his base in France. If he were caught tinkering with the bird, things would not go well, but it was worth a shot.

As dusk fell, Carr slipped through the fence and climbed into the FW-190. In the failing light, he did his best to familiarize himself with the cockpit and get ready for a takeoff at dawn. All switches and gauges were labeled in German, hence of no help. Then by the gray light of dawn, the young lieutenant found the switches for gear and flaps. Now to start the engine and get on his way before the ground crew arrived to preflight the bird.

To the right of the seat was a handle that he guessed might have something to do with starting the engine. Already there were sounds of activity on the field, so he didn't have much time for experimenting. Cautiously, Carr pulled the handle. Nothing happened. He tried pushing it. He was rewarded by the sound of an inertial starter winding up. Pull-

ing down. As he pulled up for another try, he could see the AA crews uncovering their 40-mm guns. With no parachute, his only option for avoiding another encounter with flak was to belly in. This he did without injury.



ing the handle must engage the starter, he guessed. He cracked the throttle, wound up the starter, and pulled. The engine came to life with a roar.

Taxiing through the woods with no parachute, helmet, or radio, he could see a green field ahead and no signs of unfriendly reaction. Carr firewalled the throttle, then roared across the field and into the air, leveling off at treetop altitude. He saw no sign of pursuit as he headed for home. Flying the fighter was no problem. An airplane is an airplane, as they say. He didn't have time to consider what would happen at the field when the Germans discovered one of their planes was missing.

All went well until he reached the front lines. Every armed Allied soldier in range opened fire on him. There was little Lieutenant Carr could do in the way of evasive action since he was blowing leaves off the tops of trees, but his luck held. No hits.

Another problem lay ahead: the likelihood of being shot down by his own airfield defenses. Without a ra-

dio, he had no way of assuring them that this was a friendly FW-190. It was best to get on the ground as fast as possible. He came screaming in on the deck, pulled up, rolled over on his back, reefed it in for a short approach, dropped flaps, and pushed the button he thought would lower the landing gear. There was no reassuring thump of gear com-

ing down. As he pulled up for another try, he could see the AA crews uncovering their 40-mm guns. With no parachute, his only option for avoiding another encounter with flak was to belly in. This he did without injury.

As the FW-190 ground to a stop, Lieutenant Carr was surrounded by MPs, whom he could not convince that he was a 354th pilot on a delayed return from a mission. Things grew more and more tense until the group commander, Col. George Bickell, arrived and stuck his head into the cockpit. His first words were, "Carr, where in hell have you been?" After his extraordinary experience, Bruce Carr was back on operations in a few days. By April 15, he was credited with 7.5 more victories, five on one mission, putting him among the top fifty World War II AAF fighter aces. Today, retired Colonel Carr flies a P-51 owned by Dr. Joseph Newsome—but, he says, a little more conservatively than in years gone by. And with the consent of the owner. ■

Books

Compiled by Frances McKenney, Editorial Associate

Aeronautical Systems Center, History Office, Air Force Materiel Command. *Against the Wind: 90 Years of Flight Test in the Miami Valley.* Government Printing Office, Superintendent of Documents, P. O. Box 371 954, Pittsburgh, PA 15250-7954. 1994. Including photos, appendices, and index, 215 pages. \$19.00.

Alford, Kenneth D. *The Spoils of World War II: The American Military's Role in Stealing Europe's Treasures.* Carol Publishing Group, 600 Madison Ave., New York, NY 10022. 1994. Including photos, notes, and index, 292 pages. \$19.95.

Berezhkov, Valentin M. *At Stalin's Side: His Interpreter's Memoirs From the October Revolution to the Fall of the Dictator's Empire.* Carol Publishing Group, 600 Madison Ave., New York, NY 10022. 1994. Including photos and index, 400 pages. \$24.95.

Budahn, P. J. *Veteran's Guide to Benefits.* Stackpole Books, 5067 Ritter Rd., Mechanicsburg, PA 17055. 1994. Including index, 264 pages. \$10.95.

Burt, Col. William R., AFRES (Ret.). *Adventures With Warlords: Insight Into Key Events of World War II.* Vantage Press, Inc., 516 W. 34th St., New York, NY 10001. 1994. Including appendices and index, 283 pages. \$17.95.

Cammermeyer, Margarethe, with Chris Fisher. *Serving in Silence.* Penguin Group, Penguin Books USA, Inc., 375 Hudson St., New York, NY 10014. 1994. Including photos, 308 pages. \$22.95.

Clancy, Tom. *Armored Cav: A Guided Tour of an Armored Cavalry Regiment.* Berkley Publishing Group, 200 Madison Ave., New York, NY 10016. 1994. Including photos, diagrams, glossary, and bibliography, 325 pages. \$15.00.

Costello, John. *Days of Infamy: MacArthur, Roosevelt, Churchill—The Shocking Truth Revealed.* Simon and Schuster, Inc., 1230 Avenue of the Americas, New York, NY 10020. 1994. Including photos, appendices, sources and notes, selected bibliography, and index, 448 pages. \$24.00.

Cragg, Dan. *Guide to Military Installations.* 4th ed. Stackpole

Books, 5067 Ritter Rd., Mechanicsburg, PA 17055. 1994. Including maps, appendix, and index, 461 pages. \$18.95.

Crost, Lyn. *Honor by Fire: Japanese Americans at War in Europe and the Pacific.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340. 1994. Including appendix, endnotes, photos, and bibliography, 368 pages. \$24.95.

Delk, Maj. Gen. James D., ArNG (Ret.). *Fires & Furies: The L.A. Riots.* ETC Publications, 700 E. Vereda del Sur, Palm Springs, CA 92262-4816. 1995. Including photos, appendices, bibliography, and index, 376 pages. \$28.95.

Drendel, Lou. *A-6 Intruder: Walk Around.* Squadron/Signal Publications, Inc. 115 Crowley Dr., Carrollton, TX 75011-5010. 1994. 80 pages. \$14.95.

Ethell, Jeffrey, and Alfred Price. *World War II Fighting Jets.* Naval Institute Press, 2062 Generals Hwy., Annapolis, MD 21401. 1994. Including photos, glossary, and index, 211 pages. \$39.95.

Flanagan, Lt. Gen. Edward M., Jr., USA (Ret.). *Lightning: The 101st in the Gulf War.* Brassey's, Inc. 8000 Westpark Dr., First Floor, McLean, VA 22102. 1994. Including photos, appendix, notes, sources, and index, 255 pages. \$25.00.

Hallahan, William H. *Misfire: The History of How America's Small Arms Have Failed Our Military.* Charles Scribner's Sons, 866 Third Ave., New York, NY 10022. 1994. Including photos, notes, bibliography, and index, 580 pages. \$30.00.

Harahan, Joseph P. *On-Site Inspections Under the INF Treaty.* Government Printing Office, Superintendent of Documents, P. O. Box 371 954, Pittsburgh, PA 15250-7954. 1993. Including photos, appendices, bibliography, and index, 256 pages. \$29.00.

Hoffman, Jon T. *Once a Legend: "Red Mike" Edson of the Marine Raiders.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340. 1994. Including photos, notes, and index, 434 pages. \$24.95.

Holm, Maj. Gen. Jeanne, USAF (Ret.). *Women in the Military: An Unfinished Revolution.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340. 1994. Including photos, appendices, selected bibliography, and index, 544 pages. \$16.95.

Keating, Susan Katz. *Prisoners of Hope: Exploiting the POW/MIA Myth in America.* Random House, 201 E. 50th St., New York, NY 10022. 1994. Including photos, notes, bibliography, and index, 276 pages. \$23.00.

Kelly, Orr. *Never Fight Fair! Navy SEALs' Stories of Combat and Adventure.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340. 1995. Including glossary, 368 pages. \$22.95.

Kitfield, James. *Prodigal Soldiers: How the Generation of Officers Born of Vietnam Revolutionized the American Style of War.* Simon & Schuster Consumer Group, 1230 Avenue of the Americas, New York, NY 10020. 1995. Including notes and index, 480 pages. \$25.00.

Lewis, John Wilson, and Litali Xue. *China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age.* Stanford University Press, Stanford, CA 94305-2235. 1994. Including photos, notes, references, and index, 393 pages. \$45.00.

McDougall, Walter A. *Let the Sea Make a Noise: Four Hundred Years of Cataclysm, Conquest, War, and Folly in the North Pacific.* HarperCollins Publishers, Inc., 10 E. 53d St., New York, NY 10022-5299. 1993. Including photos, sources, glossary, and index, 793 pages. \$17.50.

Melchior, Ib, and Frank Brandenburg. *Quest: Searching for the Truth of Germany's Nazi Past, A Young Man's Story.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340. 1994. Including photos and index, 330 pages. \$12.95.

Noggle, Anne. *A Dance with Death: Soviet Airwomen in World War II.* Texas A&M University Press, Drawer C, College Station, TX 77843-4354. 1994. Including photos, 318 pages. \$29.95.

Przemieniecki, J. S. *Mathematical Methods in Defense Analysis.* 2d ed. American Institute of Aeronautics and Astronautics, Inc., 370 L'Enfant Promenade, S. W., Washington, D. C., 20024-2518. 1994. Including appendices, disk, and index, 425 pages. \$74.95.

Scott, Lawrence P., and William M. Womack, Sr. *Double V: The Civil Rights Struggle of the Tuskegee Airmen.* Michigan State University Press, 1405 S. Harrison Rd., Suite 25, Manly Miles Building, East Lansing, MI 48823-5202. 1994. Including photos, bibliography, and index, 322 pages. \$35.00.

Skaar, Steven B., and Carl F. Ruoff, eds. *Teleoperation and Robotics in Space.* American Institute of Aeronautics and Astronautics, Inc., 370 L'Enfant Promenade, S. W., Washington, D. C., 20024-2518. 1994. Including photos and figures, 502 pages. \$99.95.

Stillwell, Paul, ed. *The Golden Thirteen: Recollections of the First Black Naval Officers.* Berkeley Publishing Group, 200 Madison Ave., New York, NY 10016. 1993. With photos, appendices, and index, 304 pages. \$15.00.

Swayze, Jack. *Sporty Course: Memoirs of a World War II Bomber Pilot.* Sunflower University Press, 1531 Yuma (Box 1009), Manhattan, KS 66502-4228. 1993. With photos and index, 152 pages. \$16.95.

Venter, Al J. *The Chopper Boys: Helicopter Warfare in Africa.* Stackpole Books, P. O. Box 1831, Cameron and Kelker Sts., Harrisburg, PA 17105. 1994. Including photos, 240 pages. \$39.95.

Waller, J. Michael. *Secret Empire: The KGB in Russia Today.* Westview Press, 5500 Central Ave., Boulder, CO 80301-2847. 1994. Including notes, bibliography, and index, 390 pages. \$19.95.

Wohl, Robert. *A Passion for Wings: Aviation and the Western Imagination 1909-1918.* Yale University Press, P. O. Box 209040, New Haven, CT 06520-9040. 1994. Including photos, notes, and index, 320 pages. \$35.00. ■

Gunning for History



Photo courtesy C. V. Gilres

Today it's a 30-mm GAU-8/A gun on an A-10 Thunderbolt II, capable of knocking out a tank. On June 7, 1912, it was a hand-held Lewis machine gun on a Wright Model B. At College Park, Md., Capt. Charles deForest Chandler (left) became the first to fire an automatic weapon from an airplane. (Lt. Roy C. Kirtland, namesake of

Kirtland AFB, N. M., is shown at the controls.) Captain Chandler's success in hitting a ground target from 250 feet in the air prompted newspaper reporters to write that one day airmen would fire machine guns at enemy flyers. The War Department, however, would concede only that airplanes were good for reconnaissance.

Seven For B-2s

"We are writing you to express our concern about the impending termination of the B-2 bomber production line. After spending over \$20 billion to develop this revolutionary aircraft, current plans call for closing out the program with a purchase of only twenty bombers. . . . Even after all twenty B-2s are delivered, the inventory of long-range bombers will total barely 200 aircraft. This is not enough to meet future requirements. . . . The logic of continuing low-rate production of the B-2 thus is both fiscal and operational. It is already apparent that the end of the Cold War was neither the end of history nor the end of danger. We hope it also will not be the end of the B-2."

Open letter to President Bill Clinton, issued January 5, 1995, and signed by seven former Secretaries of Defense—Harold Brown, Frank C. Carlucci, Dick Cheney, Melvin R. Laird, Donald H. Rumsfeld, James R. Schlesinger, and Caspar W. Weinberger.

Operating at High Tempo

"I agree that some [US military] units and some specialties have been overextended. The operating tempo has been too high, either for the unit or for the individuals involved. . . .

Five years ago, when units went over to Europe, they went over there and just hunkered down and stayed there for their tour. Now they go over, and that is a base from which they are forward deployed. They go from there to Provide Promise or Southern Watch or Vigilant Warrior, and some of those units . . . are doing it at a very high risk factor—some of them as high as sixty percent. That's too high. Not only is there a lot of stress on the people involved because they're away from their families . . . but it takes them out of their training cycle. . . . So some part of their proficiency is going downhill."

Secretary of Defense William J. Perry, in a December 21, 1994, Pentagon press briefing.

Answer in Haste . . .

"I think that the record shows that the readiness of the forces [is] as high as they have ever been—higher, in my judgment, than they were in . . . 1990, when we were worrying about Iraq the first time."

John M. Deutch, deputy secretary of Defense, in an October 13, 1994, Pentagon press briefing on US military readiness.

. . . Repent at Leisure

"You know, there are times when you wish you could take a sentence back. That's one of the sentences I wish I could take back."

Secretary Deutch in a December 1, 1994, White House press briefing, referring to his October statement about force readiness—a claim that was soon undercut by evidence of readiness problems within the armed services.

No Russian Veto

"We must not allow the Iron Curtain to be replaced by a veil of indifference. We must not consign new [east European] democracies to a gray zone. . . . NATO remains the bedrock of security in Europe, but its role is changing as the continent changes. . . . New members will join, country by country, gradually and openly. Each must be committed to democracy and free markets and be able to contribute to Europe's security. NATO will not automatically exclude any nation from joining. At the same time, no country outside will be allowed . . . to veto expansion."

President Clinton, in December 5, 1994, remarks in Budapest, Hungary, to the Conference on Security and Cooperation in Europe. His statement was aimed at Russia, which opposed NATO membership for Poland, Hungary, the Czech Republic, Slovakia, or any other former member of the Warsaw Pact.

Moscow's Zbig Problems

"Nearly half a century ago, the Soviet Union spurned participation

in the Marshall Plan and chose to go it alone—until it collapsed from historical fatigue. Tormented by domestic conflict, troubled by the rise of the new Muslim states to the south, and facing a possible future challenge from a powerful China in the east, today's Russia is in no position to engage in a conflict with the West as well. Moscow can perhaps delay the enlargement of NATO, but it can neither halt Europe's growth nor prevent the extension of the Euro-Atlantic security umbrella over the wider Europe. It can merely isolate itself again."

Zbigniew Brzezinski, former White House special assistant for national security affairs, writing in the December 28, 1994, New York Times.

Noam Chomsky's America

"True, Japan had committed many horrendous crimes before the US entered the war, but that's hardly relevant, since the US had little objection to them, as long as it was permitted freely to share in the spoils. . . . Also true, Japan did commit a crime [the surprise attacks on Hawaii and the Philippines] on December 7–8, 1941, bombing military bases in two US colonies that had been stolen from their inhabitants—in one case by deceit and treachery, in another by slaughter of hundreds of thousands of defenseless people in the traditional style. But these Japanese crimes, though real enough, rank so low in the scale of those we [the United States] have regularly committed, before and since, that no honest person could take them very seriously as a justification for [a US] invasion [of Japan]."

MIT Professor Noam Chomsky, in a December 12, 1994, letter to AFA member Burr Bennett. Professor Chomsky was one of forty-eight "historians and scholars" who signed a letter demanding a more critical tone to the National Air and Space Museum's exhibition of the Enola Gay, the B-29 that dropped an atomic bomb on Hiroshima. ■



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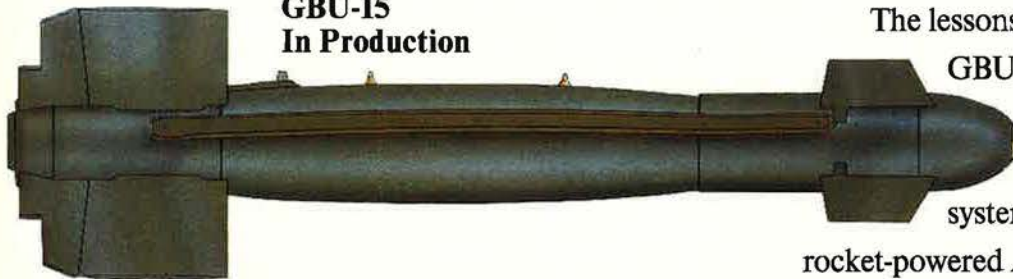
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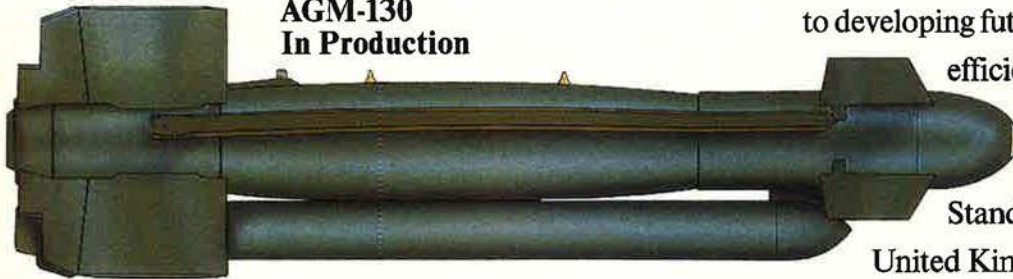
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National Report

National Security and Veterans' Issues House Under New Management in the 104th Congress

A number of newly elected members of Congress took their seats next to some old hands on two committees that deal with issues of keen interest to AFA: the House National Security Committee (formerly Armed Services) and the House Veterans' Affairs Committee.

Out of 55 members of the National Security Committee, there are 12 newly elected members. On Veterans' Affairs, 10 out of 33

are newcomers to Congress (newcomers are noted below with asterisks).

Listed below are the lineups of these two important committees as they were released in early January. AFA national and chapter contact with members of Congress will continue to be critical. Take the opportunity to express your views on national defense and key veterans issues as soon as possible.

National Security (party ratio 30R/25D)

Majority Members Proposed:

1. Floyd Spence (R-SC)
2. Bob Stump (R-AZ)
3. Duncan Hunter (R-CA)
4. John Kasich (R-OH)
5. Herb Bateman (R-VA)
6. Jim Hansen (R-UT)
7. Curt Weldon (R-PA)
8. Bob Dornan (R-CA)
9. Joel Hefley (R-CO)
10. Jim Saxton (R-NJ)
11. Duke Cunningham (R-CA)
12. Steve Buyer (R-IN)
13. Peter Torkildsen (R-MA)
14. Tillie Fowler (R-FL)
15. John McHugh (R-NY)
16. Jim Talent (R-MO)
17. Terry Everett (R-AL)
18. Roscoe Bartlett (R-MD)
19. Howard "Buck" McKeon (R-CA)
20. Ron Lewis (R-KY)
21. J.C. Watts (R-OK)*
22. William Thornberry (R-TX)*
23. John Hostettler (R-IN)*
24. Saxby Chambliss (R-GA)*
25. Van Hilleary (R-TN)*
26. Joe Scarborough (R-FL)*
27. Walter B. Jones, Jr. (R-NC)*
28. James B. Longley, Jr. (R-ME)*
29. Todd Tiahrt (R-KS)*
30. Richard "Doc" Hastings (R-WA)*

Minority Members Proposed:

1. Ron Dellums (D-CA)
2. G.V. "Sonny" Montgomery (D-MS)
3. Patricia Schroeder (D-CO)
4. Ike Skelton (D-MO)
5. Norman Sisisky (D-VA)
6. John M. Spratt, Jr. (D-SC)
7. Solomon P. Ortiz (D-TX)
8. Owen Pickett (D-VA)
9. Lane Evans (D-IL)
10. John S. Tanner (D-TN)
11. Glen Browder (D-AL)
12. Gene Taylor (D-MS)
13. Neil Abercrombie (D-HI)
14. Chet Edwards (D-TX)
15. Frank Tejeda (D-TX)
16. Martin T. Meehan (D-MA)
17. Robert A. Underwood (D-Guam)
18. Jane Harman (D-CA)
19. Paul McHale (D-PA)
20. Pete Geren (D-TX)
21. Pete Peterson (D-FL)
22. Bill Jefferson (D-LA)
23. Rosa DeLauro (D-CT)
24. Mike Ward (D-KY)*
25. Patrick Kennedy (D-RI)*

Veterans' Affairs (party ratio 18R/15D)

Majority Members Proposed:

1. Bob Stump (R-AZ)
2. Chris Smith (R-NJ)
3. Mike Bilirakis (R-FL)
4. Floyd Spence (R-SC)
5. Tim Hutchinson (R-AR)
6. Terry Everett (R-AL)
7. Steve Buyer (R-IN)
8. Jack Quinn (R-NY)
9. Spencer Bachus (R-AL)
10. Cliff Stearns (R-FL)
11. Bob Ney (R-OH)*
12. John D. Fox (R-PA)*
13. Michael P. Flanagan (R-IL)*
14. Bob Barr (R-GA)*
15. Steve Stockman (R-TX)*
16. Gerald Weller (R-IL)*
17. J.D. Hayworth (R-AZ)*
18. Wes Cooley (R-OR)*

Minority Members Proposed:

1. G.V. "Sonny" Montgomery (D-MS)
2. Lane Evans (D-IL)
3. Joseph P. Kennedy II (D-MA)
4. Chet Edwards (D-TX)
5. Maxine Waters (D-CA)
6. Bob Clement (D-TN)
7. Bob Filner (D-CA)
8. Frank Tejeda (D-TX)
9. Luis V. Gutierrez (D-IL)
10. Scotty Baesler (D-KY)
11. Sanford Bishop (D-GA)
12. James Clyburn (D-SC)
13. Corrine Brown (D-FL)
14. Mike Doyle (D-PA)*
15. Frank Mascara (D-PA)*

**Congressional
Military
Experience
Continues to
Decline**

104th Congress	
Military Experience	210 of 535 or 39.26%
Combat Experience	49 of 535 or 9.16%
Freshmen Military Experience	21 of 97 or 21.65%
103rd Congress	
Military Experience	237 of 535 or 44.3%
Combat Experience	55 of 535 or 10.28%
Freshmen Military Experience	25 of 135 or 18.52%

Senate committees will be profiled next month.



Edited by Daniel M. Sheehan, Assistant Managing Editor

Twenty-Third L. A. Ball

Coping with change and persevering in the face of loss were the twin themes of 1994's Los Angeles Air Force Ball. In recent years, the Air Force has changed everything from its major commands to its uniforms, so the first theme struck a familiar chord with the audience at the ball. Regarding the second theme, the unwavering support behind this charity event manifests itself in the ball's continuing strength despite the loss of Edward A. Stearn, AEF board member and former National Chairman of the Board, who died last July, and the late Martin M. Ostrow, former AFA National President. Mr. Stearn and Mr. Ostrow were instrumental in the success of the L. A. Ball and its main beneficiaries, Scholarships for Children of American Military Personnel (SCAMP), which has raised more than \$1 million for scholarships since its inception in 1971, and the Aerospace Education Foundation.

Air Force Secretary Sheila E. Widnall and Los Angeles City Council President John Ferraro presided at the event, assisted by master of ceremonies Richard Anderson, the film and television actor. Mr. Anderson emphasized the necessity of maintaining strong national defenses despite the sweeping changes that have transformed the Air Force and the other services in the 1990s. Noting the Air Force's diminished resources and increased commitments, Mr. Anderson called for a reaffirmation of the national will to maintain a strong armed forces and the industrial capacity necessary to carry out US commitments in the world today.

USAF Chief of Staff Gen. Ronald R. Fogleman, Assistant Secretary of the Air Force for Acquisition Clark G. Fiester, Assistant Secretary of the Air Force for Space Jeffrey K. Harris, and former Air Force Secretary Edward C. "Pete" Aldridge attended the black-tie event, which was co-hosted by Lt. Gen. Edward P. Barry, Jr., commander of the Space and Missile Systems Center, and Lt. Gen. Bruce L. Fister, commander of 15th Air Force. Entertainer Billy Davis, Jr.,



Chief of Staff Gen. Ronald R. Fogleman (right) accepts the plaque acknowledging recipients of the Brig. Gen. Ross G. Hoyt Award from National President R. E. Smith. AFA's newest award will go to USAF's outstanding air refueling crew.

sang the National Anthem, and the Air Mobility Command Band of the Golden West provided a program of patriotic music. Also taking part were honor guards from Edwards, March, and Los Angeles AFBs.

SCAMP was begun during the Vietnam War to honor US servicemen killed, missing in action, or held prisoner during that conflict, offering scholarships to the children of those men. It has since been extended, and children of casualties of subsequent wars and the US space program are now eligible. The SCAMP program has funded 381 scholarships for 130 students. Initial grants are \$5,000 each. Renewals are \$3,500 per year for those maintaining eligibility.

The following students received the 1994 SCAMP awards.

Michael T. Avolese, son of Air Force Maj. Paul A. Avolese, who was killed in southeast Asia in 1967. He attends the Denver Institute of Technology.

Mandy Gardner, daughter of Air Force MSgt. Samuel M. Gardner, Jr., who was killed in the Persian Gulf region in 1990. She studies mathe-

matics at West Texas A&M University.

Heather Michelle Holland, daughter of Air Force Lt. Col. Donnie R. Holland, who was killed during Operation Desert Storm in 1991. She attends Baylor University and plans to major in psychology.

Michael Patrick McNellis, son of Marine Corps Sgt. James P. McNellis, who was killed in southeast Asia in 1973. He is pursuing courses at the University of California at Santa Barbara with an aim to become a professor of religious studies and philosophy.

This year's ball will be held October 27, 1995.

—James A. McDonnell, Jr.

Chapter News

Though the area surrounding Dobbins ARB, Ga., can safely be termed Air Force Reserve territory (Dobbins is the site of 22d Air Force headquarters), it is also home to a substantial Air National Guard presence. The **Dobbins (Ga.) Chapter** took advantage of this presence, paying a call on the 116th Fighter Wing and af-

fording seventy-five chapter members a close look at the unit's F-15 Eagles. Chapter President Al Pruden explained some of the finer points of the fighter to chapter members and compared its capabilities to those of the F-22, for which he is program manager for Lockheed. Wing Commander Col. Bruce MacLane briefed the attendees, who got a firsthand look at the F-15 cockpit and a chance to operate the unit's F-15 simulator.

The annual fall meeting was a farewell of sorts. The Air Force recently announced that the 116th FW would be moving to Robins AFB, Ga., and making the transition to the B-1 bomber, becoming only the second unit in the ANG to fly the long-range combat aircraft.

Colorado Springs/Lance Sijan (Colo.) Chapter Vice President Chuck Zimkas made sure to include spouses in a recent Eagle Scholarships award ceremony. Recognizing that family support makes academic excellence



Present at the ceremony renaming the San Bernardino Area (Calif.) Chapter after AFA stalwart Edward A. Stearn were (from left) Chapter President James T. Thomas, Mr. Stearn's daughters Patty Hart and Frances Trautloff, his widow Patricia, and State Board Chairman Cheryl L. Waller.



Nation's Capital Chapter President Patrick A. Briggs (left) and his wife Ann Marie welcomed General Fogleman and his wife Miss Jane shortly after the General took over as Chief of Staff. At another event, former Secretary of State Lawrence S. Eagleburger accepted the Distinguished Award for International Achievement from Mr. Briggs.



possible, he called on Leigh Ann Jones, Marlene Schmidt, and Deb Palmer to join their husbands, SSgt. Ronald I. Jones, SSgt. Robert W. Schmidt, Jr., and TSgt. Matthew W. Palmer, respectively, in accepting the \$250 scholarships, which go to outstanding graduates of the Community College of the Air Force. TSgt. Sandra Wright and MSgt. Donald E. Derby also accepted Eagle Scholarships from Col. John S. Paul, vice

commander of the 21st Space Wing at Peterson AFB, Colc.

In 1995, the **Northeast Texas Chapter** will be concentrating heavily on garnering new Community Partners. Chapter Vice President (Community Partners) David W. Fruchtey got a jump on this new effort in late 1994 signing up E-Systems subsidiary Serv-Air, Inc., during a late November meeting.

The **John W. DeMilly, Jr. (Fla.)**,

Chapter and the **Miami (Fla.) Chapter** got together for a brainstorming session at the Weeks Air Museum. Members of the two chapters exchanged ideas about increasing membership and finding better ways to accomplish AFA's mission. The setting was particularly inspiring. The Weeks Museum, dedicated to preserving aeronautical heritage from the beginnings of manned flight through World War II, recently reopened after

undergoing extensive repairs made necessary by the devastation of Hurricane Andrew in 1992.

Also in Florida, the **Colonel H. M. "Bud" West Chapter** installed its new leadership at a recent chapter meeting. President John E. Schmidt, Jr., Vice President Yalda Clegg, Secretary Edwin Mims, and Treasurer M. F. "Buck" Caruthers will now lead

the chapter along with board members Mayer Littman, Stephen Sullivan, John Brennan, Art Wimer, and Norm Mears. Mr. Schmidt had nothing but praise for his predecessor, outgoing President Brig. Gen. Bill Webb, USAF (Ret.). In addition to the election of officers, chapter members received a briefing from Capt. Lowell McDonald of the Leon County

Sheriff's Department, who discussed the efficacy of the new boot camp operation for juvenile offenders in Tallahassee.

Have AFA/AEF News?

Contributions to "AFA/AEF Report" should be sent to Dave Noerr, AFA National Headquarters, 1501 Lee Highway, Arlington, VA 22209-1198. ■

Unit Reunions

Aeromedical Evacuation Ass'n. June 21-25, 1995, at the Holiday Inn Riverfront in St. Louis, Mo. **Contact:** John H. Stephens, 3910 E. Palfrey Dr., San Antonio, TX 78223-3456.

B-29 Veterans, Alamogordo Army Airfield, N. M., 1943-45. September 2-5, 1995. **Contact:** Maj. Otto K. Mueller, USAF (Ret.), 1145 Florian Way, Spring Hill, FL 34609. Phone: (904) 688-9395.

RAF Station Manston Units. Reunion Alaska cruise starting June 5, 1995. **Contact:** Milton J. Torres, 11200 S. W. 99th Ct., Miami, FL 33176. Phone: (305) 238-3342.

U-2 Pilots/Squadron Navigators. October 27-29, 1995, in Tucson, Ariz. **Contact:** Lt. Col. James E. Cain, USAF (Ret.), 11361 E. Hash Knife Cir., Tucson, AZ 85749. Phone: (602) 749-9746.

4th Fighter-Interceptor Wing, Korean War era. June 12-14, 1995, at the Quality Inn and Suites

in Hampton, Va. **Contact:** John David, Rte. 2, Box 2543, Quitman, TX 75783. Phone: (903) 967-2569.

5th Bomb Group, 13th Air Force, Pacific (World War II). May 18-22, 1995, at the Holiday Inn in Hampton, Va. **Contact:** Dag Larsen, 410 Church Rd., Ojai, CA 93023. Phone: (805) 646-8761.

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.

8th Fighter Group (World War II). September 7-9, 1995, in Dayton, Ohio. **Contact:** Robert H. Davis, 8726 Elmwood Ln., Tampa, FL 33615. Phone: (813) 886-1396.

13th Bomb Squadron, Korea. July 25-29, 1995, at the Sheraton National Hotel in Arlington, Va. **Contact:** Robert B. Ennis, 2502 Central Ave., Alexandria, VA 22302. Phone: (703) 549-6428.

27th Fighter Wing (1947-58). September 1-4, 1995, in Seattle, Wash. **Contact:** Lee Gomes, 428 Harbor View Dr., S. E., #118, Bainbridge Island, WA 98110-2436. Phone: (206) 842-1824.

37th Fighter Squadron, 14th Fighter Group. September 14-17, 1995, in Seattle, Wash. **Contact:** M. A. Tomlin, 2835 Ruddell Loop, S. E., Lacey, WA 98503. Phone: (206) 491-2406.

Cadet Class 42-D. June 27-30, 1995, in Lompoc, Calif. **Contact:** Lorin Trubschenck, 442 St.



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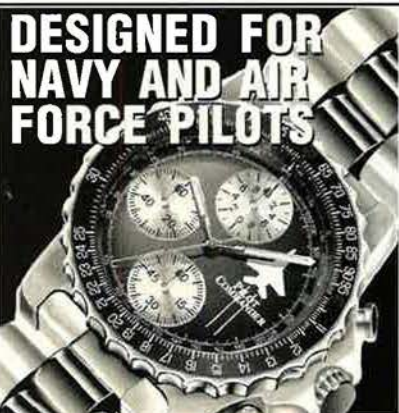
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Unit Reunions

Andrews Way, Lompoc, CA 93436. Phone: (805) 733-2765.

47th/48th Troop Carrier Squadrons, Forbes AFB, Kan. August 11–12, 1995, in Solon Springs, Wis. **Contact:** Greg Bugni, P. O. Box 321, Montreal, WI 54550. Phone: (715) 561-2029.

55th Strategic Reconnaissance Wing, September 27–30, 1995, in Fort Walton Beach, Fla. **Contact:** Charlie Waters, 151 Calhoun Dr., #507, Destin, FL 32541-1562. Phone: (904) 837-6891.

57th Bomb Wing (World War II), including the 310th, 319th, 321st, 340th Bomb Groups, plus the 308th Signal Wing and attached squadrons, September 12–17, 1995, at the Hilton Hotel in Valley Forge, Pa. **Contact:** Robert E. Evans, 1950 Cunningham Rd., Indianapolis, IN 46224-5341. Phone: (317) 247-7507.

58th Fighter Ass'n, which includes the 58th Pursuit and Fighter Groups (World War II), 58th Fighter-Bomber Wing, 58th Fighter Wing, and assigned squadrons, June 15–18, 1995, in Charleston, S. C. **Contact:** Anthony J. Kupferer, 2025 Bono Rd., New Albany, IN 47150. Phone: (812) 945-7649.

95th Bomb Group, September 12–16, 1995, in San Antonio, Tex. **Contact:** David Dorsey, 125 Clark St., Clarks Green, PA 18411. Phone: (717) 587-2290.

97th Fighter Squadron, Wright-Patterson AFB, Ohio (1950–55). September 7–9, 1995, at the Hope Hotel at Wright-Patterson AFB, Ohio. **Contact:** Lt. Col. James D. Smith, USAF (Ret.), 2408 N. W. 112th Terr., Oklahoma City, OK 73120-7204. Phone: (405) 752-9097.

335th Airlift Squadron, Air Force Reserve (1949–95). April 1, 1995, at McGuire AFB, N. J. **Contact:** CMSgt. Mike Wysong, AFRES, 3 Holly Hill Dr., New Egypt, NJ 08533. Phone: (609) 724-3080 or (800) 782-6760 (press 6).

456th Bomb Group Ass'n, June 14–19, 1995, in Seattle, Wash. **Contact:** James Watkins, 501 Hedgerow Cir., Kearney, MO 64060. Phone: (816) 628-5566.

530th Fighter Squadron, 311th Fighter Group, CBI (World War II). September 14–16, 1995, in Killington, Vt. Members of the 528th and 529th Squadrons are invited. **Contact:** F. H. Wilbourne, 4118 Keagy Rd., Salem, VA 24153. Phone: (703) 387-0562.

820th Bomb Squadron, 41st Bomb Group, 7th Air Force (World War II). April 27–30, 1995, at the Arlington Hotel in Hot Springs, Ark. **Contact:** William W. Childs, 3637 Patsy Ann Dr., Richmond, VA 23234-2951. Phone: (804) 275-6012.

OCS Class 58-D. Seeking contact with former members of USAF Officer Candidate School Class 58-D interested in planning a reunion. **Contact:** Lt. Col. Wendall L. Lasher, USAF (Ret.), 2504 Lakeside Woods Dr., Bumpass, VA 23024. Phone: (804) 448-3170.

Bulletin Board

Seeking contact with **Kennerly Davis**, originally from St. Louis, Mo., who was stationed at Aldershot AB, UK, in 1964 before being reassigned to Peshawar, Pakistan. **Contact:** Lavern Davis, 2 Saint Mark's Grove, Clondalkin, Dublin 22, Ireland.

For a radiation exposure study, seeking contact with veterans who served from 1940 to the present who have **cancer**. **Contact:** Stephen J. Fiala, 2221 N. 58th St., Lincoln, NE 68505.

Seeking contact with former **FB-111 aircrews** for information and photos. Also seeking videotape on FB-111 flight operations and an FB-111 flight manual. **Contact:** Curt Lenz, 32 June St., Nashua, NH 03060-5345.

Seeking information on or photos of RB-17G/F-9C #44-85497 **Arctic Queen** and crew, 1947–49. **Contact:** Maj. Gen. H. P. Smith, USAF (Ret.), 1454 Oakmont Pl., Niceville, FL 32578.

Seeking contact with Allied military members, especially paratroopers, who passed through or helped liberate the **Valence to Bourg-de-Péage** area of France in August and September 1944. **Contact:** Elsa Zilberbogen-Chapdelaine, Casier Postal 1473, Succursale "B," Hull (P. Q.) J8X 3Y3, Canada.

Seeking contact with **Col. Frank Tipton Benson**, **Capt. Robert Williams**, and **Lt. Virgil W. Rhoades**, who were stationed at Great Bend AAF, Kan., during World War II. **Contact:** Edward R. Hood, 2670 Rosehill, Escondido, CA 92025.

Seeking the whereabouts of **Arlene F. Hunt**, who was at the DoD Dependents' School, Harmon AFB, Newfoundland, 1965–67, and Taipei,

Taiwan, 1967–68. **Contact:** Lt. Col. R. J. Arbes, AFRES (Ret.), 1413 Lola Dr., Tallahassee, FL 32301-6712.

For a unit history of the 64th Bomb Squadron, 43d Bomb Group, seeking the whereabouts of **John Y. Barbee**, **Jack L. Matisoff**, and **Sidney Schwimmer**. **Contact:** Janice Olson, 15100 Tuscola Rd., Apple Valley, CA 92307-4863.

Seeking contact with participants in **Project Blue Straw/Blue Shield (JTG 4)**, September–December 1965, and enlisted personnel who participated in SAC's **Project Power Flight**, January 1957. **Contact:** MSgt. Thomas W. Young, Sr., USAF (Ret.), 830 W. Amsden St., Denison, TX 75020-7929.

Seeking a Vietnam War-era **humorous tape recording** featuring a public affairs officer at a press conference retelling a fighter pilot's version of events. Gen. Creighton Abrams played this tape to Secretary of Defense Melvin Laird. **Contact:** Lewis Sorley, 9429 Garden Ct., Potomac, MD 20854.

Seeking information on **Kenneth E. Richardson**, who was with the 321st Bomb Wing, Pinecastle AFB, Fla., 1953–55. **Contact:** Norman F. Jones, Rte. 3, Box 370, Fort Valley, GA 31030.

Collector seeks to trade or swap an **F-16 memorabilia** collection, including solid-cast planes, photos, and books. **Contact:** Tom Herdman, 8010 Raymond Ave., Fort Worth, TX 76108.

Seeking photos of **B-25s** at production and modification facilities from June to December 1943; VII Bomber Command Combat Crew Replacement Center crews; and B-25s/A-26s from Tinian,

June to August 1945. **Contact:** Philip Marchese, 3318 Applegate Ct., Annandale, VA 22003.

Seeking **military memorabilia** from around the world. **Contact:** SSgt. Vulance Briggs, USAF (Ret.), 2950 Clifford St., #B-3, Las Vegas, NV 89115.

Seeking the whereabouts of **James and Mary Saunders**, who were stationed at Chanute AFB, Ill., in the 1950s. **Contact:** Brenda Joyce Current McCue, 1307 Veerman St., Pekin, IL 61554-2445.

Seeking **patches** from the 9th Special Operations Squadron and 14th Special Operations Wing, Nha Trang AB, Vietnam, 1968-69. **Contact:** Maj. Donald T. Duke, USAF (Ret.), 3935 Tanglewood Dr., Hopkinsville, KY 42240.

Seeking contact with anyone who knew German **Maj. Bernhard Jope**, who flew FW-200-3s and Do-217-2s during World War II. **Contact:** Maj. Hugh Fred Jope, USAF (Ret.), 1047 Broadway, Haverhill, MA 01832.

Seeking contact with anyone who knew **Eddy Ray Colbert**, a crew chief/mechanic from 1955 to 1975. **Contact:** Douglas Colbert, 196 Esmeyer Dr., San Rafael, CA 94903.

Seeking 4520th Combat Crew Training Wing, Harvest Reaper, 474th Road Runner, F-111 River Rats, SEA, and SAC "Proud Shield" cloth **patches**. **Contact:** TSgt. Robert E. Styger, USAF, 15 Genesee Lane, Willingboro, NJ 08046-3319.

Seeking contact with **2d Bomb Group** or **2d Bomb Wing** veterans who are not already members of the 2d Bombardment Association. **Contact:** Kemp F. Martin, 806 Oak Valley Dr., Houston, TX 77024.

To obtain his autograph, seeking contact with F-117 pilot **Col. Al Whitley**, formerly with the 37th Tactical Fighter Wing, Tonopah, Nev. **Contact:** Norman E. Gaines, Jr., 28 Fieldstone Dr., #11C, Hartsdale, NY 10530-1523.

Seeking information on why, in the documentary "The Memphis Belle," the woman painted on the right side of the aircraft's nose wears a red

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

bathing suit, while the one on the left wears a blue bathing suit. **Contact:** J. R. Bailey, 1541 Eastwood Dr., Slidell, LA 70458.

Seeking the whereabouts of **Captain Preley** and **Karen Saraum Preley**, whose last known assignment was at Clark AB, the Philippines, in 1985. **Contact:** B. J. Ashcroft, 61 Arbory St., Castletown, Isle of Man IM9 1LL, UK.

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rica, Ltd., who operated the airline from Liberia to Kunming, China, through Khartoum, Sudan, and Cairo, Egypt, 1941-42. **Contact:** Parker C. Wiseman, Box 62, Chatham, MA 02633.

Seeking contact with those who knew of or worked with a B-29 at **Walker AFB, N. M.**, in 1952, that was contaminated by radioactivity. **Contact:** Bernard Tschoner, Rte. 1, Box 236A, Bartlett, TX 76511.

Seeking contact with **Clarence Leffingwell, Wilbur Belshaw**, or other crew members from the **869th Bomb Squadron**, 497th Bomb Group, 73d Bomb Wing. **Contact:** L. Ramer, 5312B Lakefront Blvd., Delray Beach, FL 33484.

Seeking **patches** from all services, all time periods. **Contact:** Capt. Stephen M. Vinica, USAF, 3694 Del Mar Dr., Dale City, VA 22193-1718.

Seeking contact with anyone who has seen a meteorological phenomenon known as the "airman's cross"—a circular rainbow on a cloud, with a cross in its middle, and the shadow of an aircraft on the horizontal part of the cross. **Contact:** Edgar A. Walsh, 851 Springfield Ave., #11A, Summit, NJ 07901-1115.

For free, a card for **World War II bomber command** veterans featuring a poem on aircrew thoughts and Noel Coward's poem on civilians. **Contact:** Dave Barry, 24 Tinakori Rd., Wellington, New Zealand.

For a **Baseball Hall of Fame** and Museum exhibit, seeking uniforms, equipment, programs, score books, photos, and memorabilia used by military units for their ballgames during World War II. **Contact:** Ted Spencer, National Baseball Hall of Fame, 25 Main St., Cooperstown, NY 13326. ■

Pieces of History

Photography by Paul Kennedy

Name, Rank, and Serial Number



Memorabilia courtesy US Air Force Museum, Wright-Patterson AFB, Ohio

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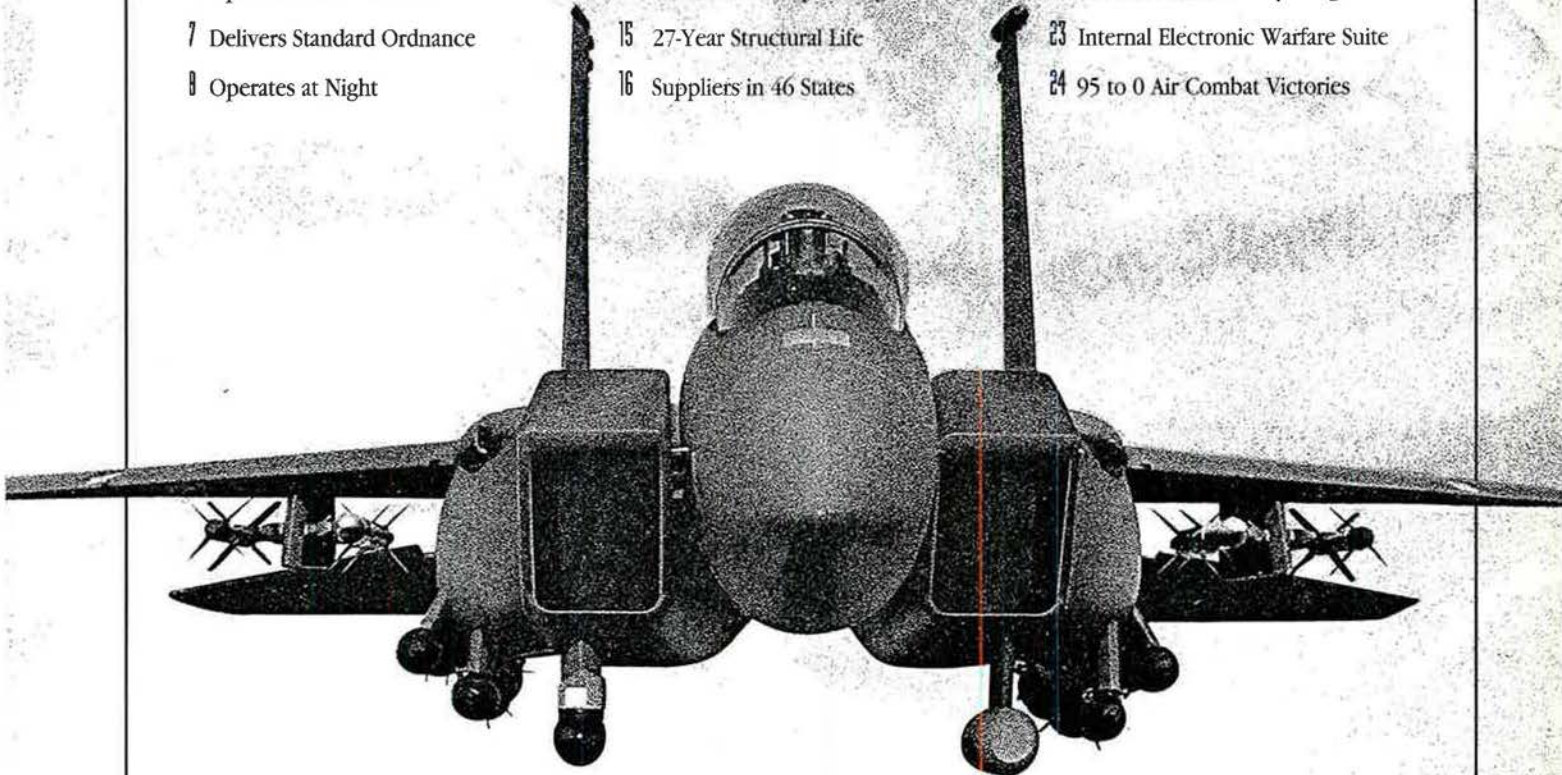
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Here are twenty-four good reasons to fund the F-15E. Start with the fact that this is America's only fighter capable of performing long-range, air-to-ground missions while providing its own air defense. That fact alone not only makes this aircraft a smart strategic choice, it makes it the most prudent choice for the Air Force.

And that's something you can count on.

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