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MAGAZINE



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MAGAZINE

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About the Cover: F-15Es from the 334th Fighter Squadron, 4th Wing, fly a training mission out of Seymour Johnson AFB, N. C. See "The Wizzos," p. 30. Staff photo by Guy Aceto.

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By John T. Correll, Editor in Chief

The Problem With the Strategy

June 6, Washington, D. C.
REP. Ike Skelton (D-Mo.) agrees "wholeheartedly" with the US defense strategy. He just doesn't believe it. In his opinion, the Pentagon does not have either the forces or the money to deliver on its plan.

The difficulty began in March 1993, when the first Clinton budget proposal cut defense spending—without calculating the effect—by roughly double the amount previously planned. Secretary of Defense Les Aspin found himself scrambling to devise a strategy to fit the budget promise. Midway through his Bottom-Up Review, Mr. Aspin floated a trial balloon for a hybrid strategy called "Win-Hold-Win," but that was shot down within weeks.

Mr. Aspin then fell back to the current strategy: that the armed forces will be prepared to fight and win two major regional conflicts, almost simultaneously. His March budget, however, would not cover that strategy or even the skimpy forces he proposed to go with it. The Air Force, for example, was to be left with only twenty fighter wings and "up to" 184 operational bombers.

Mr. Skelton said in October that "simple third-grade arithmetic" demonstrated that the Bottom-Up Review force cannot handle two conflicts. Others, including Sen. Sam Nunn (D-Ga.), chairman of the Senate Armed Services Committee, have also expressed doubts.

The next Clinton budget, sent to Congress in February 1994, made further adjustments, including a reduction in bombers. Questioned by the Senate Armed Services Committee, Gen. Merrill A. McPeak, Air Force Chief of Staff, said "the Bottom-Up Review force structure is an abstraction" whereas "the budget is a reality." He said the reduced bomber fleet should be able to cover the target set once it is equipped with enough precision guided munitions around the turn of the century, but he acknowledged that the Air Force "backed into bomber cuts" to meet the budget.

By the end of this year, the Air Force will have fewer than 1,000

fighters in the active-duty fleet. It is projected to have only 107 operational bombers for the long-range attack mission in 1995. Airlift, crucial to deployment of a force based primarily in the United States, is uncertain.

In a recent letter to the new Secretary of Defense, William J. Perry, Mr. Skelton said that without more forces and money, the armed forces cannot fight two simultaneous conflicts. "You can be sure that poten-

**The concept is sound,
but the force
structure lacks depth.
Its capability
to fight two regional
conflicts is
not convincing.**

tial adversaries will come to the same conclusion," he added. If the nation will not support the two-conflict strategy, it must consider a different strategy. A sequential "force generation" strategy, for example, would at least be honest and credible and might be something the armed forces could actually handle, provided they aren't cut any more, Mr. Skelton said.

He is dead right in his criticism. The Administration's budgets and force projections do shortchange the strategy. "I would be willing to bet," Mr. Skelton told Mr. Perry, "that if you were to poll the Joint Chiefs of Staff and the unified commanders, you would find total agreement about the stated policy but serious questions about being able to carry it out." He is probably right about that, too. It is not, however, time to give up on the strategy to accommodate a drifting budget. Instead, we need to flesh out the strategy with realistic forces

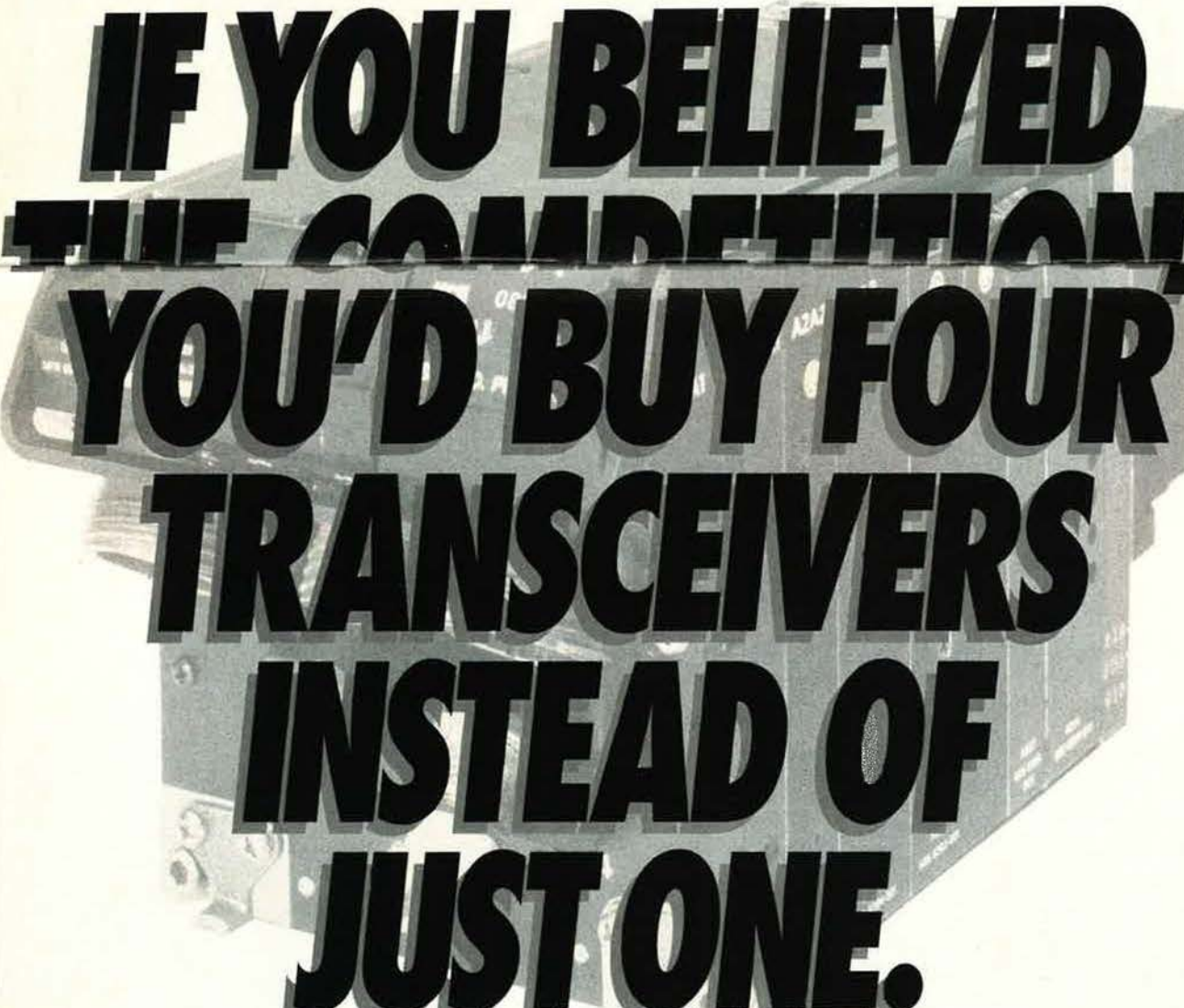
and funding. The tortured efforts over the past year to forge an accommodation are not convincing.

In 1992, before anyone ever heard of a Bottom-Up Review, the Joint Military Net Assessment said the Bush Administration's Base Force—which included 26.5 Air Force fighter wings—would be pushed to respond to more than one regional conflict at a time. (Before adjustments were made, the Bottom-Up team set the two-conflict requirement at twenty-four fighter wings.) The RAND Corp. concluded in 1993 that a single major regional conflict would take ten Air Force fighter wings, eighty heavy bombers, and ninety percent of the airlift fleet. RAND reminded us that US deployments to the Korean, Vietnam, and Persian Gulf conflicts exceeded the prewar expectations of planners, and by a factor of two in critical areas. The Gulf War ultimately required a third more fighter forces than the strategy had allocated for a regional conflict.

This year, the Congressional Budget Office, using a simulation model named "Mirkwood," struggled to validate the Administration's program. Mirkwood had to allow three months for full deployment to the first crisis, a month's separation between the crises, and two months for deployment to the second crisis. It presumed that airlift problems would be solved somehow and ignored such factors as attrition, which CBO admits could "influence the outcome of the war."

Almost everyone—Mr. Aspin, Mr. Perry, Mr. Skelton, and President Clinton—agrees that the nation cannot be left vulnerable on other fronts should it be engaged in a regional conflict elsewhere. All agree on power in reserve for the unexpected and the unknown.

The strategy hangs on too many optimistic assumptions about sufficiency of forces, timing, coordination of widely separated operations, and shuttling of critical assets between conflicts. Without more depth in the force structure, it is not convincing enough to be credible. ■



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Letters

Displaying the *Enola Gay*

Reading "War Stories at Air and Space" [April 1994, p. 24] and National Air and Space Museum Director Martin Harwit's response [May 1994 "Letters," p. 4] caused our previous communications with Dr. Harwit and his staff to resurface like an old injury.

We had been assured that the *Enola Gay* exhibit sought only to show a balanced view of the events of Hiroshima and Nagasaki—the horrors of war for all participants. Now comes Editor in Chief John T. Correll's finding that the same NASM curators hold to the position that casualty estimates for the invasion of Japan were inflated and therefore the two atomic bomb missions were unjustified.

Such revisionist estimates are arrived at by curators without qualifications to judge and apparently without facts to support their contention. Dr. Harwit's attempt to use Gen. Curtis LeMay as a crutch is also without merit. General LeMay felt that Japan could be defeated by conventional bombing and a blockade that would starve the Japanese into submission—hardly a humane alternative.

The estimates of Allied casualties that would have been incurred during an invasion of Kyushu were based on casualties suffered on Okinawa (65,630) with the known ratio of Allied vs. Japanese forces at three to one. The much higher ratio of Japanese combatants available on Kyushu (corroborated by Japanese data) translated into five Allied soldiers to eight Japanese. Kyushu contained defenses in depth and a hostile population fighting on its own ground.

What General MacArthur's planners could not know would have made the estimates of US losses even higher. Since the Japanese air forces had seemingly disappeared in the final weeks of the war, it was assumed that they had been largely destroyed. In fact, postwar surveys accounted for 12,725 concealed operational aircraft reserved for *kamikaze* attacks against the invasion fleet.

Japanese suicide planes had sunk twenty-eight ships of all types and

damaged 206, inflicting nearly 10,000 further casualties while contesting the invasion of distant Okinawa. The potential for destruction by consecutive waves of attackers against the Kyushu invasion fleet would have created awesome additional casualty figures.

Rather than a controversial exhibit of a hunk of the B-29, why not send the entire *Enola Gay* to the Air Force Museum or one of the privately funded museums where it can be displayed without any apology or attempt to recast history?

John W. Lambert
7th Fighter Command
Association
St. Paul, Minn.

John Correll has never been better. He hit a three-bagger in the April issue, and that's pretty good batting in anybody's league.

His editorial "Hawkish Moves, Dovish Means" [April 1994, p. 2] blew the whistle on a whole bevy of "dogooders" who are doing their best to send our military forces to the landfill. These are the same individuals who will yell the loudest when they want the military to do a job someday and the capability isn't there.

"The Decision That Launched the *Enola Gay*" [April 1994, p. 30] is a scholarly examination of the options available to President Truman to end the war quickly and save lives. During that time, I commanded a B-29 group on Tinian and, like General LeMay, I believed the war was won. We were just waiting for the Japanese to admit it. Paul Tibbets and I were flying-school

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

classmates, and, when he arrived on Tinian with his 509th Group, I visited him several times, but none of us knew what he was up to until he'd done it.

There is no question that the use of the bomb persuaded the Japanese to admit defeat months before they otherwise would have, sparing tens of thousands of lives, both Japanese and American. We were all proud of our President for having the courage to make a tough call and of Paul and his outfit for doing their part in such a professional manner. The "bleeding hearts" who have belabored us since with the message that it was immoral to drop the bomb and that those who did it were monsters are presenting a dishonest and distorted story.

Mr. Correll's article about the distortion of history at the Smithsonian's National Air and Space Museum is a masterpiece. As an American who was stationed at Hickam Field on December 7, 1941; who fought at such places as Midway, Tulagi, and Guadalcanal; who was returning from a strike on the Hikari Naval Arsenal on August 14, 1945, when the unconditional surrender was announced; and who led the formation of 500 B-29s that passed in review while the surrender was signed on the deck of USS *Missouri* on September 2, 1945, I deeply resent an agency of my government telling the American people that the war aims of the Japanese were more noble than those for which so many of my friends died.

I don't really blame the Secretary of the Smithsonian Institution for promoting anti-American exhibits. After all, he is the product of his environment and typical of some of the educated idiots who crawl out from under the wet rock of academia from time to time. The real blame rests on those responsible for placing him in a position where he could do so much damage. A big thank you to John Correll for bringing it out into the open.

Lt. Gen. James V. Edmundson,
USAF (Ret.)
Longboat Key, Fla.

Martin Harwit closes his response to John T. Correll's critique of the

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Letters

National Air and Space Museum with the hope that we readers better understand the museum's intentions. We understand all too well. His response only intensifies our comprehension of the lengths to which modern political correctness goes to deceive younger generations. Historical artifacts and events need to be placed in a context accurate to the prevalent contemporary social and political attitudes and then related to their impact on our lives in the long term.

An argument can be made that nuclear weapons are the most humane weapons ever invented. When scholars examine such data as war casualties per year from the beginning of recorded time, they will discover a precipitous drop starting in about 1950 when major nations adopted such weapons. No longer could aggressive war be initiated for profit or other gain.

Except for the existence of nuclear weapons, given the ideological differences between the Soviet Union and the West and the expansionist policies of the former, a major war would have occurred during the past fifty years.

More than fifty million died in World War II, less than 0.3 percent by nuclear weapons. On the other side of the ledger should not a credit be shown for the casualties subsequently avoided? Why is radiation sickness more heinous than a civilian being rendered a quadriplegic by a land mine or thousands being burned by the bombing at Cologne and Tokyo or sickness brought about through starvation? The uniqueness of nuclear weapons and the means of their delivery is the dramatic display . . . that major war as a rational option is completely obsolete. . . .

War is terrible. We all want less of it. The bomb has brought a discipline to the affairs of man previously lacking. . . . To focus on the consequences of the single event at Hiroshima in terms of individual casualties at the expense of illuminating the larger, more profound impact of the atomic bomb is irresponsible historical presentation. . . .

Maj. Gen. Kendall Russell,
USAF (Ret.)
Alexandria, Va.

The B-2's Abilities

"The Spirit of Missouri" [April 1994, p. 36] cites the B-2's ability to carry eighty Mk. 84 500-pound bombs. I would like to clarify that the Mk. 84 is a 2,000-pound bomb whereas the Mk. 82 is a 500-pound bomb. The B-2 can carry eighty of the latter.

As a targeteer, I take exception to Brig. Gen. Ronald C. Marcotte's assertion that a B-2 dropping "sixteen smart weapons in a single pass, within ten-meter accuracy . . . can take out an airfield." What criteria is he using to support this view? Only through nodal analysis of an airfield's infrastructure can we assess the criticality and vulnerability of components and then perform targeting and weaponing to support the air component commander's objectives.

Realistic targeting objectives would include command, control, and communications, aircraft (hangers, re-ventments, open parking), operations areas, maintenance facilities, and munitions, to name a few. This may be a semantic debate, but I believe General Marcotte will agree that the targeting objective is to ensure an airfield is shut down for its intended purpose (*i.e.*, launch and recovery of aircraft). Despite the B-2's stealth technology and large weapon loads, "taking out an airfield" in a single pass is an unrealistic expectation.

Maj. Mark T. Satterly,
USAF
Canberra, Australia

Omitted Simulators

"The Spirit of Missouri" compelled me to write. The article speaks highly of the Aircrew Training System components—the Cockpit Procedures Trainer, the Weapon System Trainer (WST), and the Mission Trainer (MT). These trainers are unparalleled in today's training environment for developing the most qualified aircrew members that the Air Force can produce. Yet you fail to mention other trainers just as important and just as much part of the total training system—the Weapon System Training Aid (WSTA) and the Computerized Maintenance Trainer (CMT).

The WSTA is a dual-screen, touch-sensitive academic trainer that gives the maintainer a two-dimensional introduction to the B-2. Students use the WSTA to become familiar with safety, use of AGE equipment, use of technical data, and other common academics taught in most field training detachments. When the basics are done and the students move on to the specifics of their particular system, the WSTA provides them with step-by-step instruction on their system's functions. This unique trainer allows students to "move about the aircraft to perform maintenance procedures" without touching the B-2.

The CMT duplicates the B-2 cockpit and allows students to work as a

A globe of the Earth is centered in the upper half of the advertisement. The globe is rendered with a grid of latitude and longitude lines and is set against a black background filled with numerous small white stars, suggesting a space environment. The globe's colors are muted, with greens, browns, and blues. The text 'ANYWHERE THE BALLOON GOES UP, SYBASE IS THERE.' is overlaid on the lower-left portion of the globe in a bold, white, sans-serif font.

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team to perform such procedures as powering up the aircraft and running operational checks.

Although not as exciting as the MT or the motion-based WST, the maintenance trainers are an important part of the B-2 weapon system and should have been included.

MSgt. Albert A. Weir,
USAF
Whiteman AFB, Mo.

A Level Field at Robins AFB

Regarding "Success at Warner Robins" [January 1994 "Letters," p. 6] and "Rules of Competition" [March 1994 "Letters," p. 5]: Warner Robins Air Logistics Center has underbid and outperformed civilian contractors and four other ALCs on most aircraft, missile, and electronics modification programs since 1967.

Contrary to Mr. Meyer's innuendo in "Rules of Competition" as to a level playing field for bidding, the ALCs have been forced to submit artificial bids to avoid being accused of bidding from a favored financial position. For example, when the Robins Directorate of Maintenance submitted bids on the AC-47 and AC-130 gunships, the C-141 landing gear swap-outs, the C-130 wing box beam mods, the WC-130 "Seek Cloud" program, and many others, the bookkeepers and politicians ensured that indirect labor, management and materials, and all base support fair-share costs were included.

With the possible exception of a profit percentage, the ALCs routinely include support costs for the Base Command Section, Contracting, Equal Opportunity Office, Legal, Accounting, Fire, Security, Inspection, and Base Operating personnel, just to name a few.

In addition to the level bidding field, the ALCs have one significant advantage over civilian contractors: the speed of reaction. If you think a colonel who is director of maintenance can't expedite a program with a brigadier general and major general leaning on him, take another look. Our reaction time was as fast as the next shift on a twenty-four-hour, seven-day schedule.

I had a fantastic five years at Robins—two years as chief of the Service Engineering Division and three years as director of maintenance. I would be there yet but for the fact that the Air Force suggested I retire at the ripe old age of fifty-one.

After explaining the seriousness of program requirements and the need to expedite operations to our 7,000

civilian and 200 military personnel, my primary objective was to get out of the way as they responded. It is time to stop belittling the ALCs and turn our attention to industry. I have worked in both, and it is obvious which I prefer.

Col. William R. Kelso,
USAF (Ret.)
San Diego, Calif.

Kill the C-17

"The Air Mobility Master Plan" [February 1994, p. 54] minimizes the many problems of the C-17 program. Why would the Air Force pay \$340 million for a transport that can't fly from the US to western Europe nonstop with a full payload unless it's air-to-air refueled? The C-17 will be at a greater disadvantage when it has to fly the longer distances in Asia, Africa, South America, and the Pacific. Now is the time to kill the C-17 program.

To meet the shortfall in our strategic airlift capability, Air Mobility Command should implement the following programs:

Buy fifty more C-5s. We can buy three C-5s for the price of one C-17.

Buy off-the-shelf aircraft. Because of the surplus of commercial jumbo jets on the market, we can buy nine 747s for the price of one C-17. Thirty-six 747s with swing-up nose doors could equip six AFRES or ANG squadrons with six aircraft each.

Stretch the newer C-130s so they can carry two more 463L pallets.

Forget about flying large aircraft, such as C-5s, KC-10s, C-17s, and 747s, into small, austere forward airfields. We all know that the Air Force is not going to expose these aircraft to enemy artillery and rocket fire.

Col. Harry P. Wilson,
USAF (Ret.)
Hampton, Va.

Alive and Well

The February 1994 issue of AIR FORCE Magazine contained "When the LZ Is Hot" [p. 28], which focused on the mission of special operations combat control teams. The article contained a quote from Col. Robert W. Neumann about the "old ground FAC [forward air controller] mission, primarily performed by TACPs [tactical air control parties]." The forward air controller mission is alive and well, performed daily by USAF Enlisted Terminal Attack Controllers (ETACs) and Tactical Air Command and Control Journeymen who are stationed at US Army posts worldwide.

We are dedicated, highly motivated NCOs and airmen who live, train,

and fight side by side with all Army maneuver forces. Armor, infantry, airborne, air assault, Ranger, and cavalry units have organic TACPs assigned to them. We have jumped, air assaulted, and ridden our way into Vietnam, Grenada, Panama, southwest Asia, Somalia, and on and on, to perform our mission: the effective coordination and delivery of USAF close air support, Army artillery and attack helicopter support, Navy gunfire, Marine close air support, and even tactical airlift support.

We must coordinate and control all air and ground fire in our area of responsibility while maintaining our survivability and avoiding fratricide. We must also be prepared to operate in any environment, with any type of Army unit, any time, any place. Most of us have a worldwide no-notice mobility commitment.

Also, while Army Special Forces do not have organic TACPs (yet), we work with them (USAF TACPs were attached to the 5th Special Forces Group during Operation Desert Storm) as well as with Delta Force and the JTF-6 antidrug task force, among other special operations forces.

We may not be the Air Force glory boys (we're usually so far from Air Force bases that most of the Air Force doesn't even know we exist), but I'll be damned if anybody is going to declare us dead. The terminal attack control mission is what we do, and we do it better than anyone else. So the next time you hear about the 82d Airborne, the 24th Mechanized Infantry Division, or any other Army unit being deployed to some hot spot, think of us, the Enlisted Terminal Attack Controllers and Tactical Air Command and Control Journeymen, who will jump into LZs every bit as hot as any combat control team has ever seen. With a smile.

SSgt. Micheal A. Fundaro,
USAF
Fort Bliss, Tex.

Mythical Actuators

"Fundamental Features for Future Fighters" [March 1994, p. 36] was interesting, but I would like to correct the author about one fact. On p. 39, he mentioned that the F-15 has seven inlet actuators. This is not true. The F-15 has four inlet actuators: the first ramp, the second ramp, the diffuse ramp, and the bypass door. The three nonexistent actuators may create the mystery leaks we can never find.

TSgt. Collin Roller,
USAF
Callaway, Fla.

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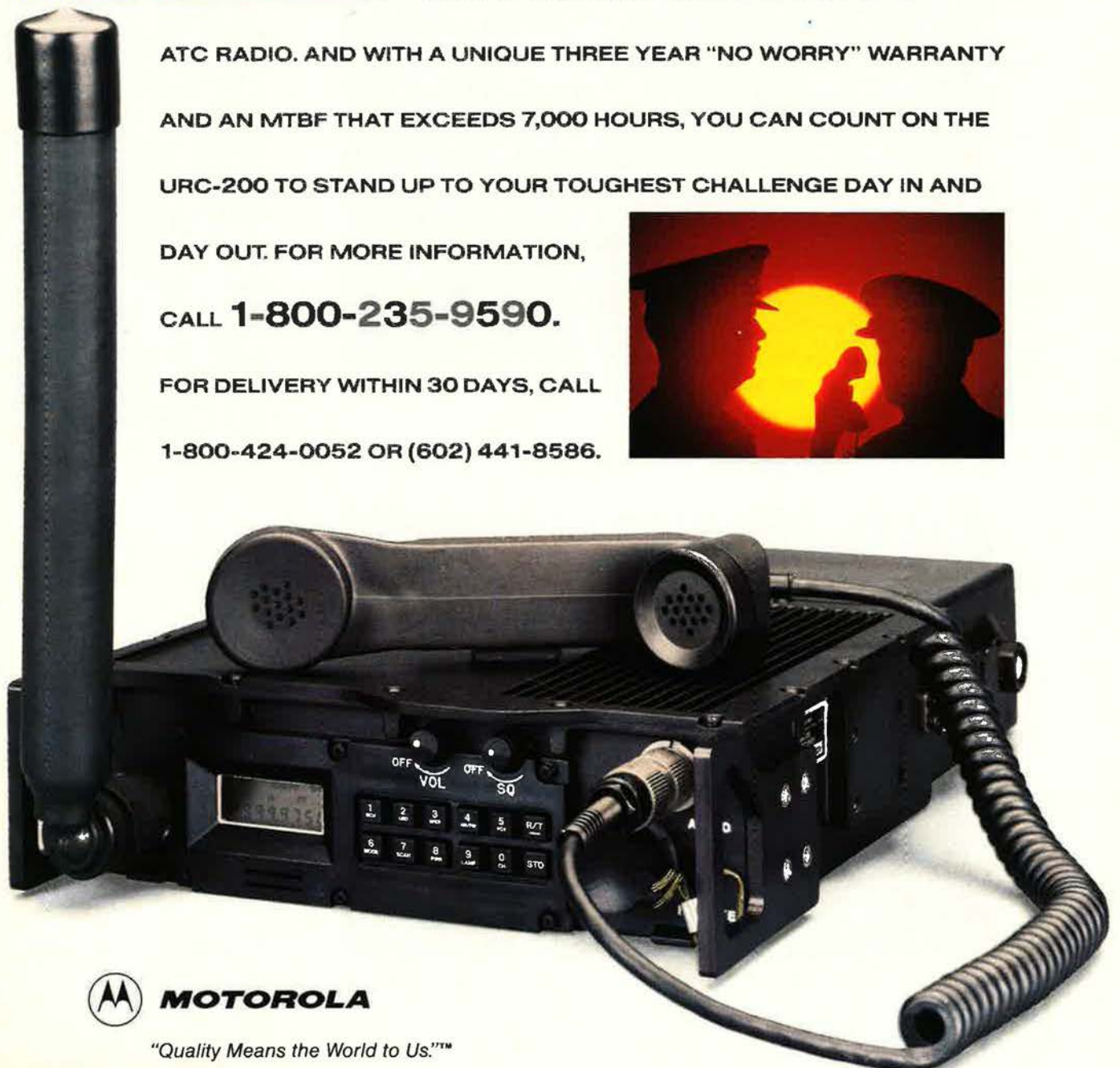
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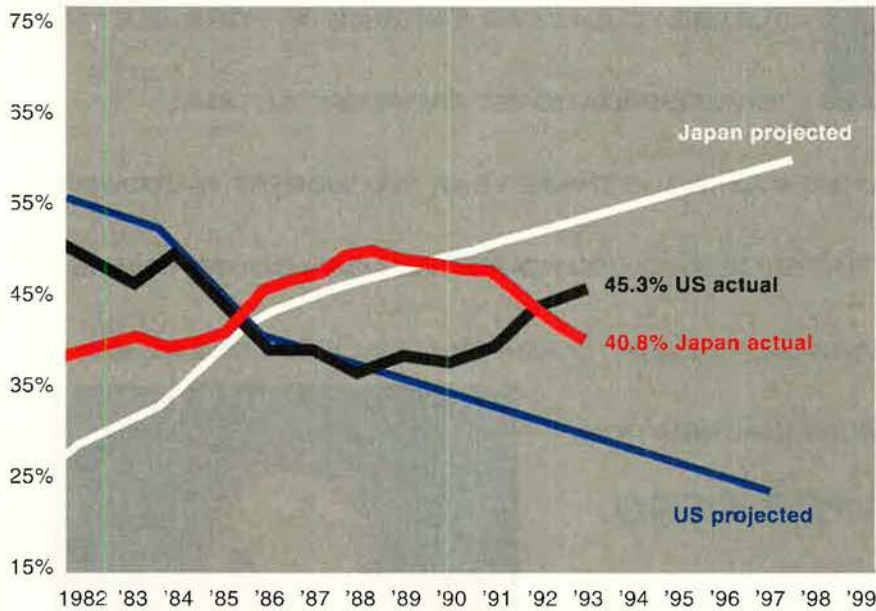
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The Chart Page

By Tamar A. Mehuron, Associate Editor

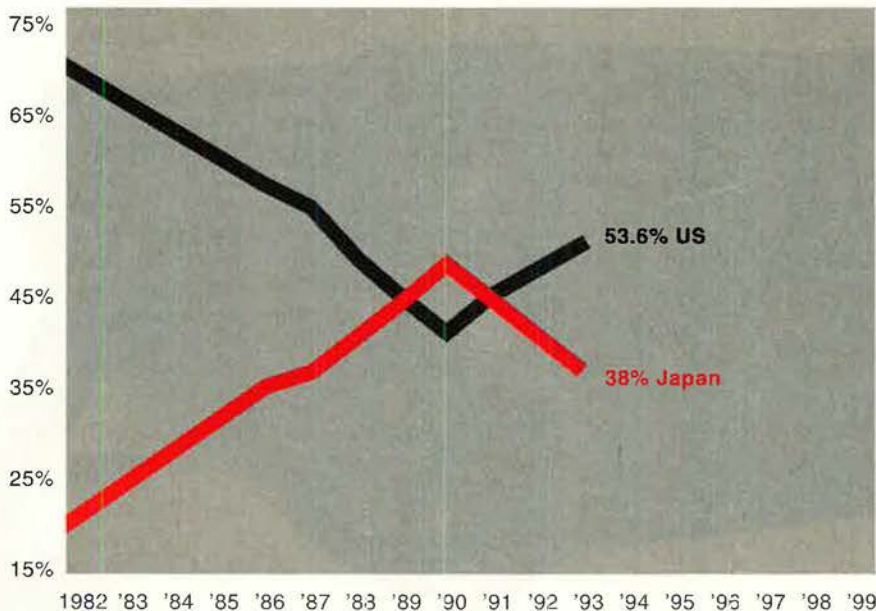
The Tide Turns in the Chip War

Semiconductors: Shares of World Market



Seldom have straight-line projections been so wildly inaccurate. In the 1980s, when Japan overtook the US in sales of semiconductors and chip-making equipment, many in Congress, the Pentagon, and elsewhere predicted that Japan would widen its lead dramatically while US performance would continue to sag in this defense-critical industry. This worst-case scenario never materialized. The US regained the lead in overall commercial chip sales in 1992 (top chart) and overtook Japan in equipment sales even earlier, in 1991 (bottom chart). The first chart shows that the US market share of semiconductor sales in 1993 was fifteen percent higher than the level that had been forecast in a 1987 government projection, while the Japanese share was 12.5 percent lower than expected.

Chip-Making Equipment: Shares of World Market



Source: SEMATECH, 1993 Annual Report



Our Pledge

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one nation
under God,
indivisible,
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and justice for all.



E-SYSTEMS

The science of systems.

By Brian Green, Congressional Editor

The Issues at Midyear

At the halfway mark, legislation tracked close to Administration proposals, but the budget could shrink further.

BY THE midpoint of the legislative year, the House had approved a Fiscal 1995 defense authorization bill that came close to meeting Administration plans in most respects, and the Senate had nearly completed work on a similar version.

Longer-range prospects for the defense budget remained uncertain. The uncertainty stemmed from congressional approval of a budget resolution reducing the Administration's five-year federal budget authority figure by \$30.8 billion. This cut was to come from so-called "discretionary accounts," of which defense accounts for half. ("Mandatory" spending—which includes many entitlement programs—was exempted.) Exactly where the cuts will occur has not been determined, but there is strong concern that the Defense Department will absorb the greatest share.

As matters stood in early June, the House defense bill provided a larger-than-expected pay raise and fully funded most USAF program requests. Here are some of the highlights.

Personnel

Pay raise. The House approved a 2.6 percent pay raise, one percent higher than the pay hike contained in the President's budget request. Money to pay for the larger raise will come from decreases in "nonreadiness" operations and maintenance, such as environmental cleanup. Several members expressed concern over the disparity between private sector and military pay, which would continue to grow under current plans.

Call-up authority. The House bill would allow the President to delegate to the Secretary of Defense authority to call up as many as 25,000 members of the reserve component for 180 days. The extension period was also lengthened to 180 days. Persian Gulf

War experience indicated that a ninety-day call-up with a ninety-day extension did not provide enough time for some units to train and deploy.

Gulf War syndrome. The House Armed Services Committee was critical of the "ineffective, uncoordinated, and inattentive treatment" of active-duty veterans suffering from a range of symptoms contracted during the Gulf War. The House bill orders the Pentagon to begin a formal program to inform Gulf War veterans about the illness and to expedite research.

Veterans COLA Caps

Last year, cost-of-living increases for military and civilian retirees were delayed. Military retirees would have had to wait seven months longer than civilians to get their COLAs in Fiscal Years 1995 through 1998. The House bill would correct that inequity for FY 1995 by moving the COLA payment date from October back to March.

Major Weapon Programs

Airlift. The House voted 330-100 to fund six C-17 airlifters, the number requested by the Administration. The vote overturned a House Armed Services Committee (HASC) decision to cut the buy to four aircraft and add funds for four nondevelopmental airlift aircraft. The vote came after a strong plea by Deputy Secretary of Defense John M. Deutch, who contended that six aircraft would be necessary to measure contractor progress in overcoming production difficulties.

The House withheld its approval of the Pentagon's C-17 financial agreement with its contractor, McDonnell Douglas. That issue will be addressed when House and Senate conferees meet to resolve differences between the versions of the authorization bill.

Bombers. The House bill would provide \$100 million for a Bomber Force Upgrade Program. The committee said it was skeptical that the number of long-range bombers in the Defense Department's force plan would be adequate to support requirements for two major regional wars, as called for in current national

strategy. The Air Force, according to the committee, can use the money to move bombers out of the attrition reserve and into flying status or to accelerate B-1 or B-52 upgrades.

Munitions. The House bill would terminate the Triservice Standoff Attack Missile (TSSAM) program. TSSAM is a stealthy, conventionally armed, precision guided missile that can deliver a variety of ordnance from different aircraft, including bombers. The TSSAM program has experienced technical difficulties that have not been completely resolved. The HASC argued that the program "continues to have cost and developmental problems" and may be unaffordable for the Air Force.

Fighters. The House measure would provide the \$2.5 billion requested for the F-22, the Air Force's next-generation air-superiority fighter. It would also provide the full \$201 million request for the Joint Advanced Strike Technology (JAST) program. JAST is a technology program to produce prototypes of next-generation multirole and strike aircraft for the Air Force, Navy, and Marine Corps.

Base Closures

The House decisively rejected, by a vote of 362-68, an amendment sponsored by Rep. James V. Hansen (R-Utah) to delay for two years the next round of base closures, now scheduled for 1995.

The defense budget as a whole is threatened by the congressional budget resolution, which cuts Fiscal 1995 total federal budget authority by \$7.3 billion. In defense budget authority, the resolution matches the Administration's long-term plans through 1999, but those figures do not reflect additional cuts that will have to be imposed. Sen. Pete V. Domenici (R-N. M.), ranking minority member of the Senate Budget Committee, and Sen. Sam Nunn (D-Ga.), chairman of the Senate Armed Services Committee, opposed the resolution.

"Under this budget resolution, our defense capabilities will face significant and—in my view—very harmful reductions," Senator Nunn said. ■



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Aerospace World

By Frank Oliveri, Associate Editor

McDonnell Douglas Still on Top

McDonnell Douglas held its position as the nation's largest defense contractor, receiving \$7.5 billion in awards in 1993, according to a Defense Department list of the top 100 defense contractors. The list, released in May, ranked contractors in terms of dollar volume.

McDonnell Douglas's total came mostly from work on the F/A-18, F-15E, and AV-8B fighters and the C-17 transport.

Lockheed rose from third in 1992 to second in 1993, with awards totaling \$6.9 billion, most for the Trident submarine-launched ballistic missile system, the F-22 and F-16 fighters, and the C-130 transport.

Martin Marietta jumped from tenth to third place, receiving \$4.7 billion for its Titan missile, ballistic missile defense systems, and Hellfire modular missile systems.

General Motors moved from sixth to fourth, with \$4.1 billion in contract awards. Raytheon jumped from seventh to fifth, with \$3.2 billion in contract awards.

Rounding out the top ten were United Technologies Corp., with \$3.1 billion; Northrop, \$3.0 billion; General Dynamics, \$2.1 billion; Loral, \$1.7 billion; and Grumman, \$1.7 billion.

Valor at Mogadishu

Army MSgt. Gary Gordon and SFC Randall Shughart, both killed in action in Mogadishu, Somalia, last October, posthumously received the Medal of Honor, the nation's highest military award. The medals, presented in May by President Clinton, were the first to be awarded for heroism in an action since the Vietnam War.

The President presented the medals to the soldiers' widows, Carmen Gordon and Stephanie Shughart, at a somber White House ceremony. The two men died October 3, 1993, during a battle in the Somali capital that resulted in eighteen US dead and numerous wounded.

During an operation to capture the top lieutenants of warlord Mohamed Farah Aideed, two US helicopters were shot down by ground fire. US



USAF photo by TSgt. David McLeod

In Mwanza, Tanzania, relief supplies are offloaded from a C-141 during a humanitarian airlift conducted in May. The StarLifters, from the 438th Airlift Wing, McGuire AFB, N. J., moved about 240 tons of supplies from Incirlik AB, Turkey, to Tanzania, where Rwandans have sought refuge from civil unrest.

Rangers and airmen established a defense perimeter around one helicopter but could not reach the second, which contained four injured crew members. Another helicopter, bearing Sergeants Gordon and Shughart, provided cover from the air. However, when the chopper came under heavy fire and could not remain on station, the two soldiers took a gallant stand.

"Immediately, Sergeants Gordon and Shughart volunteered to go," said President Clinton. "They were told, 'No, it's too dangerous.' They volunteered again. Again, they were told no. They volunteered a third time, and permission finally was granted."

After being inserted at the site, they found the pilot of the helicopter, CWO Michael E. Durant. He was still alive but badly injured. Under heavy fire from Somalis surrounding their position, the two extricated Chief Durant from the helicopter and held off attackers, but both ran out of ammunition and were killed. Chief Durant was captured and eventually released. He said later, "Without a

doubt, I owe my life to these two men and their bravery."

President Clinton said, "Sergeants Gordon and Shughart knew their own chances of survival were extremely bleak. The pilot of their helicopter said that anyone in their right mind would never have gone in. But they insisted on it because they were comrades in danger, because they believed passionately in the creed that says, 'I will not fail those with whom I serve.'"

Transport Readiness Threatened

The combination of extremely high operations tempo, aging equipment, and falling budgets poses a major threat to the nation's defense transportation system—especially airlift.

So warned Gen. Ronald R. Fogleman, the commander in chief of US Transportation Command and commander of the Air Force's Air Mobility Command, in April appearances before House appropriations and armed services subcommittees. "Our aging equipment, particularly in the airlift fleet, has . . . been pushed to the limit," he said.

The General warned that because of major structural problems and a depot backlog, the C-141 fleet's daily availability rate was thirty-five percent lower in 1993 than in 1992. In addition, nearly sixty percent of the Air Force's heavy aircraft loaders, the backbone of the materials-handling equipment fleet, have developed serious structural cracks and are in their second overhaul cycle.

General Fogleman went on to say that tight budgets have limited USAF's ability to maintain sufficient spares throughout the air mobility fleet, and "the reduction in forward deployed forces has reduced the en route infra-

structure needed to support major deployments."

ANG Unit Flies B-1B Sortie

In April, members of the 184th Fighter Group of the Kansas Air National Guard became the first all-Guard aircrew to fly a B-1B bomber on a low-level training sortie.

The five-and-a-half-hour flight with a B-1B crew from the 384th Bomb Group, McConnell AFB, Kan., marked a significant step in shifting a part of the Air Force's B-1B fleet to the National Guard. In July, the 184th received its first assigned B-1s from the 384th and was redesignated the

184th Bomb Group. It is the first operational B-1B Guard unit.

Goodbye to RIFs and SERBs

Lt. Gen. Billy J. Boles, Air Force deputy chief of staff for Personnel, told Congress in April that he does not foresee the need for any reduction in force (RIF) action in Fiscal 1995.

In addition, he said, USAF in the next year will conduct its last planned Selective Early Retirement Board (SERB). The SERB program has been in place since 1988, in the early stages of the defense drawdown.

"These two management actions—RIFs and SERBs—have done more

27th FW Tops Proud Shield

The 27th Fighter Wing from Cannon AFB, N. M., flying F-111F fighters, won the Fairchild Trophy in April as champions of Proud Shield '94, Air Combat Command's bombing competition.

The trophy, named for Gen. Muir S. Fairchild, a former Air Force Vice Chief of Staff, has been awarded for the past forty years to the outstanding unit of the competition.

Participating units flew simulated strategic missions from their home bases to a Utah test and training range for the two-day competition. Awards were presented at the Bombing and Navigation symposium at Barksdale AFB, La., in May.

Named Awards	Unit	Achievement
Maj. Wayne D. Whitlock Trophy	7th Wing, Dyess AFB, Tex.	B-1 unit with the highest point total for all electronic countermeasures
Maj. James F. Bartsch Memorial Electronic Warfare Award	2d Bomb Wing, Barksdale AFB, La.	B-52 unit with the most points in scored ECM activity
Koritz-Holland Electronic Countermeasures Award	27th FW, Cannon AFB, N. M.	Best fighter unit in ECM activity
Gen. Bennie L. Davis Trophy—Most Improved Unit Award	5th Bomb Wing, Minot AFB, N. D.	Greatest improvement since the last Fairchild Trophy competition
Curtis E. LeMay Bombing Trophy	Crew E-60, 410th Bomb Wing, K. I. Sawyer AFB, Mich.: Capts. Roger Forsyth, Michael Bank, and Scott Obeginski and 1st Lts. Thomas Bell and Carl Schuler	Top competitors in all bombing and timing control categories
John D. Ryan B-52 Trophy	5th BW	Best overall B-52 unit
Russell E. Dougherty Trophy	27th FW	Best fighter unit

Best Crew Awards	Unit
F-15E crew S-02: Capt. Vince Criscione and 1st Lt. John Bunnell	4th Wing, Seymour Johnson AFB, N. C.
F-111 crew C-02: Capts. Darrell Davis and Scott Selton	27th FW
B-1B crew R-26: Capts. Mark Schlichte and Karl Shawhan, 1st Lts. Mark Wheelhouse and Steven Ramer, and SSgt. Kenneth Kisner	7th Wing
B-52 crew E-45: Capts. Keith Schoenheit, Brian Stewart, Kenneth Kilmurray, David Hornyak, and Bradley Wahl	5th BW



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to damage morale and inject uncertainty into the force than any other personnel action I've encountered in more than thirty-two years of active military service," General Boles told the Senate Armed Services Committee's Subcommittee on Force Requirements and Personnel. "That's why we have always maintained they were options of last resort."

The active-duty force will drop to just over 400,000 troops by the end of Fiscal 1995.

USAF Moves Toward Voluntary Deployments

Recognizing that worldwide deployments have increased and that some are open-ended, the Air Force is attempting to lighten the burden on some support personnel by passing it to volunteers.

A new contingency computer bulletin board, which went on line in May, lists temporary duty assignments available to volunteers. Officers and enlisted personnel can call

Ambassador Albright noted that world expenditures on armaments have declined considerably since the end of the Cold War in the late 1980s. "I think that we have to realize what a good deal it is," she said. "If one looks, for instance, at the total US cost for all of the United Nations peacekeeping, the entire thing that we do through the specialized agencies, etc., it is \$7 per American—the cost of a ticket to the movies. . . . If one looks at all the various parts of this, this is still the best deal we can have."

The US will spend approximately \$1.6 billion during FY 1994 and \$1.2 billion in FY 1995 for peacekeeping. Despite concerns that the US is paying disproportionately more than its share of the UN peacekeeping bill, Ambassador Albright said the US must meet its current commitment.

IRS Rules PCS Allowances Not Income

The Pentagon announced in May that, under the Budget Reconciliation Act of 1993, allowances associated with military permanent change of station moves will remain nontaxable and do not have to be reported as part of gross income.

The Internal Revenue Service issued guidance clarifying the issue after senior Pentagon, service, Treasury, and congressional leaders expressed concern that the Reconciliation Act did not clearly state how PCS allowances would be affected.

As in past years, temporary lodging allowances, temporary lodging expenses, move-in housing allowances, and dislocation allowances do not have to be reported as income to the extent that they cover the expenses incurred. Excess funds not used to cover expenses continue to be taxable, however.

Until the IRS issued its ruling, the uncertainty of the tax situation had provoked considerable concern.

Moorman Tapped for Vice Chief of Staff

The President nominated Lt. Gen. Thomas S. Moorman, Jr., to be the Air Force's new vice chief of staff and to receive his fourth star, the Pentagon said in May.

General Moorman is currently vice commander of Air Force Space Command at Peterson AFB, Colo. He replaces Gen. Michael P. C. Carns, who retires as vice chief of staff this summer.

General Moorman is the former director of the Space and Strategic Defense Initiative programs. He as-



A McDonnell Douglas—USAF C-17 successfully made its first aerial delivery using the low-altitude parachute extraction system in May. In this test of combat delivery of heavy loads, a 6,700-pound test platform was extracted from the aircraft as it flew at 150 mph, two feet above the dry lake bed at Edwards AFB, Calif.

C-17 Reaches 1,000-Hour Mark

A Charleston AFB, S. C., aircrew took Air Force Secretary Sheila E. Widnall for a ride in a C-17 in May and in the process passed the plane's 1,000-flying-hour mark.

After seeing the cargo capacity and the short-field landing capability of the aircraft, the Secretary said she was encouraged and impressed with the aircraft: "I'm cautiously optimistic. Today, the C-17's biggest challenge is not so much one of technical or operational merit but one of affordability."

Speaking to the National Defense Transportation Association, Dr. Widnall said that a C-17 wing at Charleston would require the same number of people as a C-141 wing, but it would provide the equivalent long-range capability of two C-141 wings plus the small-field capability of a wing of C-130s.

up the listing for their major command and scan a particular Air Force Specialty Code to see what is needed. Anyone may volunteer, with the approval of his or her supervisor and commander.

The Air Force Military Personnel Center instituted the system. AFMPC officials said that the Air Force is unlikely to embrace a system based exclusively on voluntary deployments, but they hope the new setup will provide some relief to overworked troops.

US to Pay Lion's Share for Peacekeeping

The US will pay about thirty percent of the United Nations' peacekeeping costs in 1994, US Ambassador to the UN Madeleine K. Albright told the House Foreign Affairs Committee's Subcommittee on International Security, International Organizations, and Human Rights in May.

sumed his current position in March 1992.

Senate Confirms de Leon

The Senate confirmed Rudy de Leon in May as under secretary of the Air Force.

Mr. de Leon has held high-level staff positions on the House Armed Services Committee and, during the past eighteen months, at the Department of Defense. He will be the chief deputy to the Secretary of the Air Force.

During his confirmation hearings, Mr. de Leon set out his agenda for the Air Force: maintaining morale and readiness during the drawdown, right-sizing the force, and finding the right strategies for weapon modernization.

He said the Air Force needs the F-22 fighter, precision guided munitions, and airlift capability and must maintain the edge in communications, intelligence collection, and logistic support.

C-141s Aid Rwandan Refugees

In May, Air Force C-141 aircraft airlifted about 240 tons of humanitarian relief supplies to Rwandan refugees in Mwanza, Tanzania.

Civil unrest in the African nation has led to widespread slaughter and a vast movement of refugees. The Department of Defense, acting to assist the UN High Commissioner for Refugees (UNHCR), airlifted 100,000 blankets and 10,000 rolls of plastic sheeting from Incirlik, Turkey, to Mwanza.

Twelve missions were flown by C-141 aircraft from McGuire AFB, N. J. Air Force ground support personnel and cargo-handling equipment were moved.

At least 250,000 Rwandan refugees have fled to neighboring Tanzania and other countries.

Roving Sands Tests Joint Forces

Roving Sands '94, the military's largest annual joint air defense training exercise, was held on the desert ranges of west Texas and southern New Mexico in late April.

The eleven-day exercise brought together 15,000 active and reserve component airmen, sailors, soldiers, and Marines from about 100 units. The purpose was to evaluate joint integrated air defense capabilities in a high-intensity, realistic combat environment comparable to the Persian Gulf War.

An integrated network of Army Patriot, Hawk, and other weapon systems combined with Marine early warning systems, Stinger units, Air Force E-3 AWACS, F-16s, and F-15s was employed against an opposing force consisting of a wide variety of front-line Air Force and Navy aircraft. Approximately 300 aircraft flew about 150 sorties a day.

Malmstrom Units Win Omaha Trophy

The 43d Air Refueling Wing and 341st Missile Wing, both from Malmstrom AFB, Mont., were named in April as the 1993 winners of the US Strategic Command Omaha Trophy.

The award is presented to the top aircraft operations and ballistic missile units for outstanding support of STRATCOM's mission of strategic deterrence.

The nominees for outstanding ballistic missile unit were USS *Michigan*, USS *Tennessee*, and the 341st. Top aircraft operations unit nominees were the 2d Bomb Wing (8th Air Force), STRATCOM Wing One (Fleet Air Reconnaissance Three), 9th Reconnaissance Wing (12th Air Force), and 43d ARW, representing 15th Air Force.

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Spacelift as Strategic Lift

With the US increasingly dependent on military space systems, spacelift must be regarded as a part of the nation's strategic lift capability, said Gen. Charles A. Horner, commander in chief of US Space Command.

"Heavy lift is our toughest launch problem," General Horner told the Senate Armed Services Committee in April. "It often takes seven to twelve months, or even more, to launch a Titan IV" with a satellite aboard.

General Horner said that the US lacks the spacelift to win a modern war.

"Launch is now a national problem—too big for Air Force Space Command, the Air Force, DoD, NASA, or anyone to solve alone in today's budgetary environment," the General said. "Without decisive action, we will continue to see the Europeans, Chinese, Russians, and Japanese cap-

ture the dwindling US market share of spacelift."

A recently released spacelift study offers options ranging from the current baseline through evolutionary improvements to expendable launch vehicles, to a "clean sheet" approach, General Horner said. Overall, he said, he was encouraged by the wide recognition of the problem on Capitol Hill, in the White House, and within DoD. He said solutions were being sought.

742d MS Wins Blanchard Trophy

At the end of the 1994 Guardian Challenge competition in May, the 742d Missile Squadron, 91st Missile Wing, Minot AFB, N. D., had won the Blanchard Trophy, which goes to the best missile operations squadron.

The Air Force Space Command competition involved space operations and communications teams from 14th Air Force and missile opera-

tions, communications, and maintenance teams from 20th Air Force.

Sixty-one squadrons—about 240 team members—took part in Guardian Challenge. Other awards: Leffler Trophy to the 91st Organizational Missile Maintenance Squadron, 91st Missile Wing, as the best missile maintenance squadron in AFSPC; Chennault Trophy to the 3d Space Launch Squadron, 45th Space Wing, Patrick AFB, Fla., as the best individual space operations unit; Randsen Trophy to the 319th Communications Squadron, 321st Missile Wing, Grand Forks AFB, N. D., as the best individual missile communications organization; and Powers Trophy to the 21st Communications Squadron, 21st Space Wing, Peterson AFB, Colo., as the best individual space communications organization.

C-141s Support Provide Promise

Air Force C-141 aircraft flew into Sarajevo, Bosnia-Herzegovina, in May for the first time, delivering two forklifts and a pallet of flour as part of Operation Provide Promise, the Air Force said.

The humanitarian effort previously used C-130 aircraft from USAF bases as well as NATO C-130s. Five C-141s have been deployed to support the two-year-old operation. The C-141s will eventually replace a majority of C-130s currently supporting the UNHCR's operations, as the C-130s relocate to Ramstein AB, Germany, as part of the force drawdown.

USAF Evacuates Civilians From Yemen

The Air Force evacuated more than 600 US and foreign citizens from Yemen in May after the outbreak of civil war in that remote nation on the Arabian peninsula.

One C-21 and four C-130 airlifters assigned to the 4410th Airlift Squadron, 4404th Composite Wing (Provisional), flew to the capital city of San'a, Yemen, to pick up the civilians.

All missions were conducted without incident. Evacuees were examined by Air Force medical personnel; all were in good condition.

Minuteman IIs Leave South Dakota

Air Force personnel removed the last of 150 Minuteman II missiles from South Dakota in April and carried out the first Minuteman silo implosion test at Ellsworth AFB, S. D.

The deactivation process started September 27, 1991, when President George Bush announced he was tak-

Senior Staff Changes

RETIREMENTS: B/G Fredric N. Buckingham, M/G Robert S. Delligatti, B/G Ellwood P. Hinman III, Gen. Charles A. Horner, M/G Joseph K. Spiers.

PROMOTIONS: To be **General:** Thomas S. Moorman, Jr.
To be **Lieutenant General:** Edgar R. Anderson, Jr., Patrick P. Caruana, John P. Jumper.
To be **Major General:** Jeffrey G. Cliver.

To be **ANG Brigadier General:** William M. Guy.

CHANGES: M/G (L/G selectee) Edgar R. Anderson, Jr., from Cmdr., 59th Medical Wing, AETC, Lackland AFB, Tex., to Surgeon General of the Air Force, Bolling AFB, D. C., replacing L/G Alexander M. Sloan . . . M/G (L/G selectee) Patrick P. Caruana, from Cmdr., 14th AF, AFSPC, Vandenberg AFB, Calif., to Vice Cmdr., Hq. AFSPC, Peterson AFB, Colo., replacing L/G (Gen. selectee) Thomas S. Moorman, Jr. . . . B/G Bobby O. Floyd, from Cmdr., 23d Wing, ACC, Pope AFB, N. C., to Dir., P&P, Hq. AMC, Scott AFB, Ill., replacing Col. (B/G selectee) Robert J. Boots . . . Col. (B/G selectee) William T. Hobbins, from Dir., Ops., J-3, Hq. US Forces Japan, USPACOM, Yokota AB, Japan, to Cmdr., 18th Wing, PACAF, Kadena AB, Japan, replacing B/G (M/G selectee) Jeffrey G. Cliver . . . L/G Arlen D. Jameson, from Cmdr., 20th AF, AFSPC, and Cmdr., Intercontinental Ballistic Missile Task Force, STRATCOM, Francis E. Warren AFB, Wyo., to Dep. CINC, Hq. STRATCOM, Offutt AFB, Neb.

M/G (L/G selectee) John P. Jumper, from Senior Mil. Ass't, OSD, Washington, D. C., to Cmdr., 9th AF, ACC, and Cmdr., USCENAF, Shaw AFB, S. C., replacing L/G Michael A. Nelson . . . B/G Thomas J. Lennon, from Dep. Dir., Military-to-Military Contact Prgm., Hq. USEUCOM, Stuttgart-Vaihingen, Germany, to Dir., Weather, DCS/P&O, Hq. USAF, Washington, D. C., replacing B/G John J. Kelly, Jr. . . . L/G (Gen. selectee) Thomas S. Moorman, Jr., from Vice Cmdr., AFSPC, Peterson AFB, Colo., to Vice Chief of Staff, Hq. USAF, Washington, D. C., replacing Gen. Michael P. C. Carns . . . Col. (B/G selectee) Robert T. Osterthaler, from Air Force Crisis Mgmt. Planner, NATO Military Committee, Brussels, Belgium, to Vice Cmdr., AIA, Kelly AFB, Tex., replacing B/G David L. Vesely . . . Col. (B/G selectee) James E. Sandstrom, from Cmdr., 388th FW, ACC, Hill AFB, Utah, to Cmdr., 23d Wing, ACC, Pope AFB, N. C., replacing B/G Bobby O. Floyd.

SES CHANGES: Lowell Roger Stapleton, to Dir., Acquisition and Log. Directorate, AFSA, Wright-Patterson AFB, Ohio . . . James R. Speer, to Dir., Financial and Support Audit Directorate, AFSA, March AFB, Calif., replacing retired Kenneth E. Seifert. ■

ing the nation's bomber and Minuteman II systems off alert.

Following the announcement, the 44th Missile Wing at Ellsworth, the 341st Missile Wing at Malmstrom AFB, Mont., and the 351st Missile Wing at Whiteman AFB, Mo., began removing their Minuteman IIs. Whiteman and Malmstrom will complete removal of Minuteman IIs by mid-1995. At that time, Malmstrom will convert to Minuteman IIIs.

DoD Consolidates Financial Operations

The Department of Defense selected seven Air Force locations, among twenty-five sites, for the consolidation of the Department of Defense's financial operations, the Pentagon said in May.

The consolidation is considered a major step toward streamlining nearly 300 DoD finance and accounting offices.

Deputy Defense Secretary John M. Deutch said, "It will substantially help us to standardize DoD business practices, modernize support operations, improve customer service, and ensure the integrity of our financial and accounting systems."

The plan calls for maintaining five existing major centers and twenty

satellite offices. The existing sites are Denver, Indianapolis, Kansas City, Mo., Cleveland, and Columbus, Ohio.

The new sites are Norton AFB, Calif., Chanute AFB, Ill., Loring AFB, Me., Offutt AFB, Neb., Griffiss AFB, N. Y., Gentile AFS, Ohio, Newark AFB, Ohio, Fort Ord, Calif., Oakland Naval Supply Center, Calif., San Diego, Orlando Naval Training Center, Fla., Pensacola, Fla., Rock Island Arsenal, Ill., Blue Grass Army Depot, Ky., St. Louis, Fort Sill, Okla., Charleston Naval Shipyard, S. C., Memphis Naval Air Station, Tenn., San Antonio, and Norfolk.

T-3A Training Begins

The Air Force began training students in March in the new Northrop-Slingsby T-3A Enhanced Flight Screener aircraft. The T-3A replaces the Cessna T-41, which the Air Force has used since 1964 to screen prospective pilots for specialized undergraduate pilot training.

The initial flights took place at Air Education and Training Command's 1st Flight Screening Squadron at Hondo Airport, Tex. The US Air Force Academy, Colo., will begin student pilot training in January 1995.

T-3A training is conducted for 21.5 hours over about twenty-four days.

Once flight screening is completed, students move to the Cessna T-37. Since February, five of the fifty-seven T-3As on order have been delivered to AETC at Hondo Airport. Current plans call for a total production run of 113 aircraft if all contract options are exercised.

Open Skies Aircraft Upgraded

The Air Force is upgrading the second of three aircraft supporting the international Treaty on Open Skies, installing an infrared line scanner, synthetic aperture radar, and forward- and vertical-looking video cameras. The work is being carried out by Air Force Materiel Command's Aeronautical Systems Center's Developmental Manufacturing and Modification Facility, Wright-Patterson AFB, Ohio.

The WC-135B, from the 24th Reconnaissance Squadron at Offutt AFB, Neb., is being converted to meet the requirements of the treaty, which allows unarmed, aerial observation flights over the territories of its participants.

Modification of the first Open Skies aircraft, designated OC-135B, was completed in April 1993. The second aircraft will be modified by April 1995; the third is scheduled to arrive for upgrade in September 1994.

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3/94

DoD Sets Up School for Financial Management

Deputy Secretary of Defense Deutch announced in May that the Pentagon would establish a financial management education and training program to train DoD financial officials in newly developed business processes and automated systems procedures. The program will train 23,000 employees.

The Center for Financial Management Education and Training will provide education focusing on DoD-wide issues, processes, and systems, as opposed to the service-unique training courses offered by each service.

The center will also establish a career development center for all supervisory personnel, provide mobile teams to train at Defense Finance and Accounting Service sites, and perform analytical studies in support of future financial training needs.

The center and its curriculum will be formed by the Defense Business Management University. It will be located in Southbridge, Mass.

News Notes

■ In April, the US and Allied members of the Combined Task Force Provide Comfort marked the anniversary of the three-year-old humanitarian operation in northern Iraq and southern Turkey. Thousands of missions have been flown in support of the Kurdish refugees.

■ In April, construction of the Korean War Veterans Memorial began at the foot of the Lincoln Memorial on the National Mall in Washington, D. C. The monument will include nineteen statues created by Frank Gaylord of Barre, Vt., and images of various personnel from all the services sandblasted into eight-inch-thick, 164-foot-long polished granite panels. Dedication ceremonies are scheduled for July 27, 1995, the forty-second anniversary of the signing of the armistice.

■ Later this year, Phillips Laboratory, Kirtland AFB, N. M., will receive a fifteen-million-watt, self-contained, transportable Russian generator, which will be used for laboratory research and to explore potential non-defense uses. The magnetohydrodynamic generator can be used for seismic and geological exploration, as a source for high-energy systems, or for large-volume magnetic field generation, the Air Force said. It can also be used to reduce environmental toxicity or as a plasma source for atmospheric testing or space simulations. The system cost \$4 million.

■ NASA hopes to make helicopter blades quieter by converting a small area of a helicopter main rotor blade into a controllable flap, the agency said in May. Tests show that "blade slap" has been reduced by four decibels in certain flight conditions using

the concept. That translates into a forty percent reduction in noise. McDonnell Douglas Helicopter Systems is working on the active flap control concept. The project costs about \$2 million and is split between the government and the contractor.

■ The Defense Finance and Accounting Service is enhancing the retired pay system with an automated voice response system. It was added to a toll-free customer service phone line, (800) 321-1080, to assist retired service members and others. The system allows members to review specific information regarding their pay accounts. It also features a bulletin board that allows callers to hear information about retirement pay, payment dates, and the mailing address and fax number of the Defense Finance and Accounting Service's Cleveland Center. It will be available twenty-four hours daily, except Sundays.

■ The Fiscal 1995 NCO Retraining Program will move approximately 1,750 noncommissioned officers from career fields with NCO surpluses into career fields with NCO shortages, the Air Force said in May. There are three phases. Phases I and II are voluntary, and III is involuntary. Phase I runs through July 15. Retraining will be limited to staff and technical sergeants with fewer than sixteen years of active federal military service. Master sergeants may also retrain if they have fewer than eighteen years in service.

■ Lockheed said in April that its candidate for the Joint Primary Aircraft Training System (JPATS) program, the T-Bird II, recently completed tests of an engine noise hush kit. Results indicated that the hush kit enabled the aircraft to meet the FAA's Federal Air Regulations Part 36, Stage III, noise thresholds—a key requirement of the JPATS program.

Purchases

The Air Force awarded McDonnell Douglas a \$284 million fixed-price incentive firm contract for Lot VII advance buy/long lead for six C-17 aircraft. Expected completion: July 1997.

The Air Force awarded Rockwell an \$8.6 million face-value increase to a fixed-price incentive fee contract for a total of 452 miniaturized airborne Global Positioning System receivers. Expected completion: April 1995.

The Air Force awarded General Electric a \$188 million fixed-price contract for forty-eight F110-GE-129 engines and twenty-four engine monitoring system computers applicable to the F-16 aircraft. Expected completion: April 1998. ■

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The Air Force is betting on smart weapons and stealthy cruise missiles to compensate for the reduction in bombers and fighters.

In Search of Equalizers

By James W. Canan, Senior Editor

THE AIR Force is staking its future on the next generation of smart bombs and stealthy cruise missiles, now in the works. It sees these precision guided munitions as great equalizers, the means of ensuring that its shrinking force of bombers and attack fighters will remain a lethal force in years to come.

The pivotal PGMs in USAF's future are the Joint Direct Attack Munition (JDAM), a glide bomb with a warhead; the Joint Standoff Weapon (JSOW), a longer-range glide bomb with a warhead or submunitions; and the Triservice Standoff Attack Missile (TSSAM), a stealthy, powered cruise missile with extraordinarily long range.

The Air Force and the Navy are teamed in developing JDAM and JSOW, with the Air Force the lead service on JDAM and the Navy on JSOW. The Air Force also leads the TSSAM program, which the Army recently abandoned.

In a related effort, the Air Force will retrofit thousands of its standard tactical munition dispensers, designed for low-altitude drops, with a guidance kit to compensate for wind drift on downward flights from high



A Mk. 83 1,000-lb. bomb becomes a Joint Direct Attack Munition (shown in this mockup) when a JDAM guidance kit turns it into a precision guided munition. Like the new PGMs, new munition dispensers, such as the one opposite, on an F-16C at Eglin AFB, Fla., are expected to work wonders for airpower.



altitudes. The modified dispensers, capable of carrying mines, cluster bomblets, or antiarmor submunitions, are called wind-corrected munition dispensers (WCMDs).

PGMs developed in the past have made a big difference in the effectiveness of airpower. Those currently in development may make the biggest difference yet—and none too soon.

The national military strategy, predicated on US armed forces' fighting and winning two major regional contingencies (MRCs) nearly simultaneously, lays a heavy load on airpower. In pursuit of that strategy, the Air Force may find itself spread too thin and with all it can handle, relying on its PGMs to save the day.

Conceding as much, Air Force leaders convey a palpable sense of urgency about putting the new weapons into production and into operation as quickly as possible. Gen. Merrill A. McPeak, Air Force Chief of Staff, recently declared that equipping bombers with PGMs is "an overwhelming priority."

The Air Force plans to rig all bombers and strike fighters to carry and launch two or more types of the

PGMs for a variety of missions, such as suppressing enemy air defenses, destroying vital command centers and communications centers, taking out bridges, and attacking armored formations. In a regional war or two, Air Force squadrons would likely undertake all such missions first thing.

"Enormous Leverage"

Gen. John Michael Loh, commander of Air Combat Command, claimed in a recent interview that the all-weather PGMs now in the works "will give us enormous leverage in enabling us to take out high-value targets in the numbers that we'd need to take out early on." Thus the autonomously guided weapons would be "very important—not just on bombers but also on fighters—to our ability to win two MRCs," he said.

Bombers have the most pressing need for these PGMs and will be the first planes to get them. General Loh recently told a congressional committee that "the most important [force] enhancement we can make is to equip all of our bombers with precision guided munitions."

Unguided dumb bombs won't do

the job. It takes far too many of them to destroy too few targets, as the Air Force learned in the Persian Gulf War. Laser-guided bombs like those used in the Vietnam and Gulf wars also leave something to be desired.

What the Air Force badly needs are bombs that can find their way to targets through the overcast without benefit of laser spotting and at a safe distance for the planes that launch them. The PGMs in development are just such weapons.

Maj. Gen. Larry L. Henry, director of Operational Requirements in the office of the Air Force deputy chief of staff for Plans and Operations, noted that the need for autonomously guided PGMs was "one of the biggest lessons learned" from the Gulf War.

In that war, Air Force F-117s struck Iraqi command and communications centers near Baghdad with stunning accuracy, using laser-guided, 2,000-pound bombs. Other US attack aircraft also dropped laser-guided bombs on a variety of targets, with telling effect.

The planes required clear weather for laser designation of targets—and usually had it. Next time around, in

another clime, this might not be the case.

"In the future, we want to be able to drop accurately through the weather and not need an illuminator to do it," General Henry explained. "As we come down in force structure, the faster we put JDAM, JSOW, and TSSAM on our remaining aircraft, the better. We have to give our aircraft maximum leverage. Accuracy translates into leverage."

control kit attached at its tail. The kit includes an INS, a GPS satellite receiver, and airframe flight-control components. The satellite-based INS/GPS guidance unit makes the dumb bomb smart.

"JDAM is not technically challenging," said General Loh. "We know how to do it. It works."

A JDAM dropped at high altitude should be able to glide twelve miles or so. This allows launch aircraft to

500 guidance-and-control kits. The winning contractor will be well positioned for a multibillion-dollar contract to produce 74,000 JDAM kits—62,000 for Air Force general-purpose bombs and deep-penetration bombs and 12,000 for Navy general-purpose bombs.

It appears that JDAM's accuracy will exceed expectations. The Air Force requires the bombs to strike within forty feet of targets under all possible conditions. In flight tests at Eglin AFB, Fla., several JDAM prototypes dropped from altitudes of up to 30,000 feet, at least one in a fierce crosswind, and landed within thirty feet of their targets. Two landed within seven feet.

JDAM is also beginning to look like a bargain. "It will be a very good weapon," said General Henry, "and it just might not be as expensive as the \$40,000 target [price]."

The major reason for the relatively low cost is that JDAM gets along without the costly radar, infrared, and optical on-board seekers characteristic of most other types of autonomous PGMs.

JDAM bombs may incorporate such seekers later, should the services decide to make them pinpoint-accurate and if the price is right. Another possible approach to improving JDAM's accuracy is the establishment of data links between JDAM and target-locating surveillance satellites, aircraft, and drones.

Staff photo by Guy Aecht



Air Combat Command plans to arm B-2 bombers with new PGMs "as fast as possible," beginning with JDAM. All bombers and strike fighters, including the F-22, will carry JDAM, which may turn out to be less costly than anticipated.

Great Expectations

JDAM is front and center. "We're putting our emphasis on JDAM with INS/GPS [guidance, using an inertial navigation system and the Global Positioning System]," General Henry said.

Big things are expected of JDAM. General Loh called the glide bomb "critical to wringing maximum capability from our bomber force" and predicted that it will be "the backbone" of that force. JDAM is also expected to work wonders for strike fighters, including the attack variant of the stealthy, high-performance F-22.

"JDAM carried internally will give the F-22 significant air-to-ground capability without compromising its air-to-air capability," the ACC commander explained.

JDAM is nothing more than an existing 1,000-pound or 2,000-pound, free-fall bomb with a guidance-and-

stay out of range of anti-aircraft guns and shoulder-fired, heat-seeking missiles, the air-defense weapons commonly associated with ground forces protecting JDAM's probable targets, such as bridges.

The Air Force plans to equip all bombers and attack fighters with JDAM bombs by the end of this decade. Last April, the Air Force chose Martin Marietta Corp. and McDonnell Douglas Corp. as competitors in an eighteen-month JDAM engineering and manufacturing development program.

Each contractor will build and demonstrate a GPS-aided INS guidance kit for 1,000-pound and 2,000-pound general-purpose bombs and earth-penetrating bombs.

The Air Force will choose one of the contractors late next year to undertake the final phase of the JDAM development program, involving flight tests and production of

The Tailored B-2

Certain bombers will be tailor-made for JDAM. Nine Block 20 B-2s, scheduled for delivery from late 1995 through late 1997, will come equipped with the GPS Advanced Targeting System, dovetailing with the JDAM INS/GPS guidance system.

"Some of the things we're doing with GATS, which is synthetic aperture radar targeting, tighten up the [accuracy] of a JDAM pretty well," General Henry said.

B-2s are slated to receive the first JDAM production models. This can't happen soon enough to suit General Loh, who has insisted all along that "we need a precision or near-precision weapon for the B-2 as fast as possible."

In late spring, shortly before the Air Force selected its JDAM development contractors, the ACC com-

mander expressed in an interview his impatience with the pace of the JDAM program in an acquisition process that he called "ponderous."

"JDAM is not going to get there for B-2s and B-1s as soon as I would like," he asserted. "At best, we might have a very limited capability on the B-2 in 1996, with just a couple of [JDAM] weapons. It will be 1998 or 1999 at the earliest before we have JDAM [on bombers] in any numbers."

The AGM-154 JSOW is designed to complement JDAM, enabling a bomber formation equipped with both to attack many different kinds of targets—surface-to-air missile (SAM) sites, troop emplacements, command posts, and armored columns, for example—all at once or in sequence. JSOW uses the same INS/GPS guidance as JDAM uses, but it has wings and looks more like a glider than a bomb in flight. The wings extend when JSOW drops free of its host aircraft. They enable the weapon to glide thirty to forty miles, depending on altitude and other conditions.

Developed by Texas Instruments, JSOW can be armed with a unitary warhead or with a variety of submunitions in the 1,000-pound payload class. The Air Force and the Navy have earmarked combined effects bomblets (CEBs) as the first munitions to be incorporated in JSOW.

Those cluster bombs should make JSOW "an excellent defense suppression weapon, very good against SAM sites," General Henry declared. He also sees the combination of JSOWs and CEBs as highly effective against light armor, troops, and materiel.

JSOW is also designed to carry other area weapons, such as land mines, aquatic mines, and Sensor-Fuzed Weapons (SFWs) with Skeet antiarmor submunitions. The Air Force and the Navy together expect to procure about 22,000 JSOWs: 9,000 or so with CEBs, about 5,000 with antiarmor submunitions, and roughly 8,000 with unitary warheads. Warhead-bearing variants, of prime interest to the Navy, may incorporate terminal-guidance seekers later on.

The JSOW procurement program is expected to cost roughly \$6 billion, the research and development program about \$400,000.



The Navy F/A-18 fighter bristles with Joint Standoff Weapons, developed by Texas Instruments for the Navy and USAF. JSOW, which sprouts wings and flies forty miles, can carry munitions, mines, or warheads for various missions.

Knockout Puncher

The Air Force has high hopes that JSOW equipped with SFWs will become a knockout puncher against enemy armor. All bombers and strike fighters will be equipped to carry JSOW with munitions of choice.

The question is when. JSOW is not expected to come into play in significant numbers until the turn of the century—"a year or more later than JDAM," said General Loh. Meanwhile, the Air Force is embarking on a program to increase the accuracy of munition dispensers with combined-effects and antiarmor munitions.

Standard TMDs are designed for low-altitude drops by strike fighters in close proximity to target areas. They ordinarily do not have to fly very far, are virtually unaffected by wind, and are accurate enough under those conditions.

High-altitude drops are another matter. The dispensers tend to drift off course in the wind. This makes them dubious weapons for bombers flying high to avoid fire from shoulder-fired SAMs and antiaircraft guns usually associated with forward-deployed and mobile ground forces. B-52s in the Gulf War were examples.

The Air Force plans to modify 40,000 dispensers to compensate for windage, equipping each with an INS guidance unit, movable tailfins that pop out in flight, and a signal processor. These elements will form the wind-corrected munition dis-

penser kit. The hunt is on for contractors.

WCMD kits will not contain GPS receivers, but bombers that carry them will. The planes will bomb on GPS coordinates, dropping the dispensers at predetermined release points. Lacking GPS, WCMD-carrying aircraft could locate targets by other means, such as radar and laser tracking. It should be relatively easy and inexpensive to modify the munition dispensers. Each WCMD kit is expected to cost no more than \$30,000 and maybe as little as \$20,000.

"All [the WCMD] has to do is compensate for the difference between the estimated wind and actual wind. The tail flippers don't have to be real big," General Henry said.

He explained that course corrections for windage at high bombing altitudes—25,000 to 35,000 feet—are relatively minor.

"We won't be asking these [dispensers] to make ninety degree turns," said the Air Force requirements boss. "If the estimated wind at the release point is off by fifteen knots, and if the wind correction is thirty feet per knot, then the [course] correction is 450 feet. From 30,000 feet, that's imperceptible to the eye."

The INS guidance unit and the tailfins will adjust the flight path of the dispenser to position it at the right spot above an armored column, for example, to release its submunitions for maximum effect.

Radical Results

The dispenser retrofit may not be radical, but the results promise to be. The modified dispensers are expected to give high-flying bombers something they've never had—"precision antiarmor capability" and "the ability to stop an invasion by armor in the mass" with the SFWs they distribute, General Henry said.

Once dispensed, those sensor-fuzed Skeet submunitions—heat-seeking, copper slugs—are designed to home in on the emissions of tanks and smash their topsides and turrets.

Each dispenser carries forty submunitions, enough to just about guarantee the destruction of two enemy tanks per WCMD if precisely dispensed, the Air Force reckons.

Each B-1 is slated to carry thirty WCMDs, and each B-2 sixteen. The Air Force has begun modifying B-52H bombers to enable them to

ous formations, widespread in array or in single file, with multiple kills per dispenser," General Henry declared.

Each WCMD will have a range of roughly eight miles and, like JSOW, will be able to carry Gator land mines and CEBs as well as SFWs. The bomblets are expected to be effective against light armor, ground troops, and SAM sites, for example.

"They will be excellent defense suppression weapons," General Henry said. "I don't think there's a bomber or [an attack] fighter that we're not going to put them on."

SFWs developed by Textron are shaping up as tank smashers supreme. They have been flight-tested, are in low-rate initial production, and are scheduled to go into full-scale production in 1996.

"I consider the Sensor-Fuzed Weapon a critical part of the air in-

Northrop AGM-137 TSSAM before too long. The Air Force, which covets the stealthy cruise missile, seems to be the TSSAM program's only solid partner but has reservations about its long-term prospects. The Army dropped out of the program. The Navy, apparently favoring the McDonnell Douglas Standoff Land-Attack Missile, once planned to buy 2,250 TSSAMs but will now buy only 550.

The TSSAM program was partly declassified three years ago. Details are few and sketchy. The missile will have a range of roughly 100 nautical miles. The Air Force intends to put TSSAMs on all types of bombers and on one or more types of attack fighters, possibly including the F-22.

The warheads of Air Force TSSAMs are expected to contain CEBs. Navy variants will have unitary warheads. Air Force TSSAM prime targets are said to be SAM sites, airfields, aircraft shelters, bunkers, and, especially when launched by B-2s, mobile missiles.

At midyear, the estimated total cost of the TSSAM program—R&D and production—was \$15 billion. The Air Force hopes to begin arming aircraft with TSSAMs in about four years.

There have been reports now and then of major problems in the TSSAM program, and its critics predict the end of the program before long. General Henry disagreed. "I don't see any show-stoppers," he said. He acknowledged "quality control problems in the manufacturing process" but said "they have nothing to do with the capability of the weapon, with the technical [aspect]."

"We had very similar problems with AMRAAM [Advanced Medium-Range Air-to-Air Missile] and Maverick, and both came to be very good weapons," he said. "We're working hard with [Northrop] on the quality control problem."

Preparing the PGMs for operational service "isn't just a matter of developing the weapons," General Henry said. "It's also getting GPS into the airplanes, getting the software into all weapons' computers" so that the airplanes "release the weapons at the optimum drop points."

"We're directed to put GPS into all airplanes by the year 2000, and I think we'll be close," he said. ■

Photo © Michael Longe



A Mk. 82 500-lb. gravity bomb is loaded on an F-15E at Eglin AFB. As the Gulf War showed, it takes too many unguided dumb bombs to destroy too few targets. What USAF needs instead are autonomously guided, all-weather weapons.

carry eight dispensers under each wing. F-15E deep-attack fighters and Block 50 F-16s are built for TMD and WCMD carriage.

A single B-1, receiving GPS target coordinates from an E-8 Joint Surveillance and Target Attack Radar System aircraft, should be able to blanket an enemy armored column with 1,200 Skeet submunitions over a two-mile stretch of road.

"The [wind-corrected] dispensers will enable us to attack tanks in vari-

terdiction mission," General Loh declared at an AFA symposium in Florida early this year. "It gives us a very cost-effective means of blunting and countering enemy armor, but . . . only if we procure a sufficient quantity of them."

Will There Be Enough?

"We know precision guided weapons are important, but are we buying enough?" General Loh asked.

This question may apply to the



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When U.S. aircrews are called to protect our nation's interests, their survival is at stake. JSOW, the Joint Standoff Weapon system from Texas Instruments, will increase an aircrew's survivability by allowing them to standoff significant distances while accurately attacking area and point targets. JSOW, which will replace many older weapon systems, does not require a direct threat flyover.

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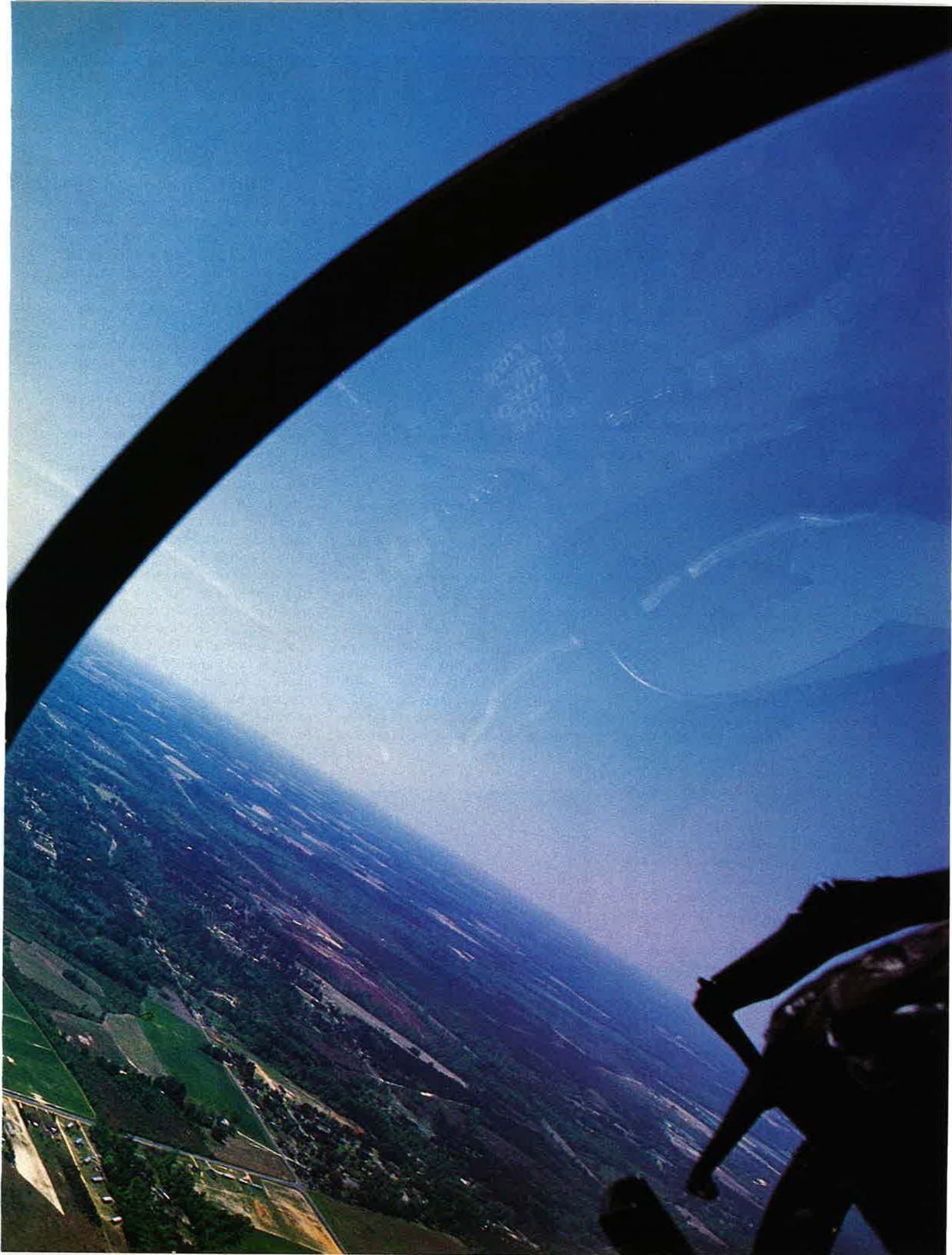


There are only 1,437 Weapon System Officers left, but time and technology have not eliminated the need for them.

The Wizzos

By Frank Oliveri, Associate Editor

Photography by Guy Aceto, Art Director





An F-15E from the 334th FS, 4th Wing, Seymour Johnson AFB, N. C., tucks its gear up as it begins a new training mission. Trust between pilot and WSO in the F-15E is as important as the fighter's sensors or armament.

IN TODAY'S Air Force, the Weapon System Officer is a rare breed—1,437 in all, compared to 14,842 pilots. One finds them only on board heavyweight attack aircraft. F-15Es, F-111Fs, and F-4Gs all have two-seat cockpits (the WSO is in the right seat of the F-111), and war planners tend to send these jets against the toughest targets at the longest ranges.

The pilot-“wizzo” team must execute its attack and survive a rough trip home. The edge that the WSO provides was on display in Operation Desert Storm, when F-15Es flew into the radar rings of Iraqi surface-to-air missile sites, the pilot jinking his fighter to avoid SAMs while the guy in back would identify the target, acquire it, and send a well-aimed bullet between its eyes.

“One man would have had a pretty hard time doing that—unless he was Superman,” said Lt. Col. Mark S. Ordess, deputy commander of the 4th Logistics Group, 4th Wing, Seymour Johnson AFB, N. C. His F-15E outfit, the 334th Fighter Squadron, flew many such missions in the Persian Gulf War.

The WSO might be a rare breed, but it is not a dying breed, as it once appeared to be. A decade or so ago, some predicted that advanced technology and greater information-processing power would soon permit a lone pilot to manage the work load of flying a fighter and carrying

out a difficult attack. That day never came. Colonel Ordess, one of the few WSOs who command a squadron, added, “Technology may get to that point, and we may someday be able to do it alone, but now it would be tough to do.”

Nor, apparently, does the traditional “back seat” put-down carry much force. Capt. Eugene McFeely, a WSO from the 4th Wing's 334th FS, said, “It's essential that [pilot and WSO] come together to get the job done. To employ us correctly

and to get the max use out of this aircraft, you need two people, and that's how it works. . . . Pilots are in a glamour position. There's always someone who gets glamorized more, but as far as getting the job done, you need both.”

As Colonel Ordess tells it, the pilots and WSOs who fly in his squadron have similar personalities. Both, he said, are highly focused, aggressive, “Type A” individuals. Capt. Steve Kwast, an F-15E pilot with the 336th FS, 4th Wing, contended that the WSO greatly increases a crew's survivability, lethality, precision, and ability to adapt to fast-changing circumstances, all the while reducing the potential for human error.

Captain Kwast said that although a WSO is not called a pilot, he has many of the same skills, including the ability to fly the aircraft. “He is just as valuable [as] if not more valuable than a good pilot,” said Captain Kwast. “A good pilot is probably easier to train than a good WSO. That may sound odd, but they require the same skills.”

For a crew to function as a unit, trust is essential. “If you've got the trust there, then I can trust [the pilot] to do a certain task and not share that task,” said one WSO. “I can go on to another task, and we don't need to overlap as much. When I fly with other people, I have a sixth sense of how much I trust an individual based on where I think he is. The less I



Three F-15Es move in travel formation over North Carolina's Outer Banks. Combat formations like the “box” or “fluid four” use technology to provide close mutual support. In each case, visual contact is minimal.

trust the front, the more I participate in his task. The total breakdown is when I have no trust in the front. Now I'm doing my task and trying to totally participate in his."

Building a WSO

Building a high-quality WSO takes a long time. Just as the pilot learns to fly his high-performance aircraft, the WSO learns how to manage the modern avionics and electronic systems at his command, interpret information provided by the sensors, make attack decisions, and, finally, operate most of the systems necessary to carry out the mission.

WSO training starts at Randolph AFB, Tex., where both fighter pilots and WSOs go for basic navigation training and then for training in certain aircraft specialties. Navigation and specialty training take nine months.



Visibility from the back seat of an F-15E is outstanding, and that comes in handy when looking for bandits or SAMs. However, a large part of the WSO's time is spent focusing on four displays—at any attitude.



After that, prospective F-15E WSOs head off to lead-in fighter training at Holloman AFB, N. M., where they train for another four weeks in basic fighter maneuvering and low-level navigation. Graduates of this course then go to the F-15E replacement training unit at Luke AFB, Ariz. (soon to be relocated to Seymour Johnson), where they take systems classes for six months.

Upon arrival at a new operational squadron, the WSO goes through a standardized mission qualification program and up to fifteen checkrides. Colonel Ordes said the typical WSO has to spend about 100 to

150 hours in the back seat before he becomes truly comfortable there. "There are a lot of switches and doodads," Colonel Ordes said. "It's a computer. It takes that [long] before they don't have to think about what they're doing. When they get good, they get in there and it just happens."

Part of the stress felt by new WSOs stems from the sheer speed with which things occur in the cockpit. "Fundamentally, we're teaching them to think nine miles a minute," Colonel Ordes explained. "Once they understand that, then we start them on a more intensive program. For instance, I don't

take an MQ [mission-qualified] guy and immediately put him in a two vs. four [air-to-air engagement]. We have an upgrade program."

Bears and Bengal Tigers

The two-man crews are trained in mock combat against the worst conceivable threat. "We figure if we can hack that, we can handle combat," Colonel Ordes declared. "We train to fight bears and Bengal tigers. If it turns out there's only a house cat out there, well, OK, fine."

Most pilots generally regard the work of the WSO as more art than science. Colonel Ordes conceded

that this is true in the case of operating the notoriously temperamental F-111 radar. However, said the Colonel, the highly reliable systems of the new F-15E make the WSO's job more like a science.

"The systems make life easier and make air-to-ground employment pretty easy," Colonel Ordess said. "You have the added dimension that, if you [an enemy] poke your nose around an F-15E, you're going to get shot out of the sky." The dual-role aircraft carries a full load of air-to-air weapons.

At the WSO's fingertips are cockpit video displays, on-board comput-

tion requires a special talent. Crew members must build a mental picture of the flight, which grows more complex with the number of participants. There is constant communication, both interaircraft and inter-flight. Some crews are competent, some are gifted, and some will never reach the desired level. "It's just beyond their capabilities," said Capt. Steve Popovich, a pilot from the 4th Wing's 335th FS.

Powers of Concentration

The back-seater works hard at cultivating his powers of concentration. Capt. Jay Kreighbaum, a WSO from

the 336th FS, was part of a twenty-two-ship fighter package that was dispatched on the opening night of Desert Storm to strike four fixed Iraqi Scud missile sites defended by plenty of SAMs.

"We went out on a moonless night," he said. "When we came in [to the target area], it was totally black, no RWR [radar warning receiver indication]. It was surreal in a way, so I had to physically force myself to think that [we were] in a war. It's like you are in somebody's back yard without permission. I had to keep reminding myself about it."

Trailing the lead F-15E by eight miles, Captain Kreighbaum watched the first bombs hit the target, followed by a staggering amount of anti-aircraft artillery (AAA) fire. Tracers crisscrossed the sky under and over his aircraft as the fire intensified. Even with all this going on outside, Captain Kreighbaum was almost totally focused on finding and destroying his target. His pilot was totally focused on avoiding AAA and avoiding flying into the ground, all the while monitoring his air-to-air radar for threats and approaching aircraft.

"Then, coming off target, we rolled out—putting out chaff and flares—and I was just mesmerized by the AAA," Captain Kreighbaum added. "I just watched it until we were over the horizon."

Without two crew members working together, sharing duties, and co-



ers, navigation radios, sensors, ground-mapping radar, forward-looking infrared systems, inertial navigation sets, integrated tactical electronic countermeasures devices, and programmable armament control sets.

Most WSOs find "overtaking" during training to be beneficial. In training, said Captain McFeely, "we do encounter awkward situations . . . so that when we encounter [them] for real," the reaction "becomes second nature. For example, [if you are] going into a target area and someone [in another fighter] jumps you, you have to change your mindset from air-to-ground to air-to-air and take care of the problem. You obviously can't flow into a target area fat, dumb, and happy and let someone roll in on you."

Many WSOs say that switching from air-to-ground to air-to-air operations in a highly fluid combat situa-



Four aircraft approach the tanker track of a KC-10 from the 344th ARS of the 4th Wing. Radar and forward-looking infrared are used to identify the tanker from afar. An F-15E (top) uses its airbrake to bleed off speed.

ordinating their actions, the mission likely would not have succeeded—nor even have been attempted. Pilots acknowledge that low-level, high-speed combat flight “consumes a lot of brain bytes,” said Captain Popovich, and they are happy to have help.

“The way the tasks are divided . . . I always maintain and keep the aircraft survivable,” said Captain Kwast. “I am watching what is going on [outside the cockpit]. As my task load increases, I rely more and more on Jay [Captain Kreighbaum] to be directive. Cross-checking and scanning, I never let my eyes sit on one thing for more than about three seconds. If I do, I risk death because I’m not checking something that could kill me.

“He [the WSO] has the luxury—and this is something that every avia-



Much of the communication between pilot and WSO is nonverbal. Crews are well briefed, so if they follow the script, each will know the other's lines. Here's a view from the WSO's office.



tor would like—to dwell on one thing for a longer amount of time. That’s what creates the precision, the survivability, and the lethality of the jet. We can go into a very complicated mission—in a very-high-threat environment—and I can keep us alive while he does the detailed work required to get the bombs on target. That is something you cannot do in a single-seat jet when the threat is that high.”

Such operations require an extraordinary amount of coordination between the WSO and his pilot. For example, in the F-15E, the pilot and WSO share all the sensors on board,

and each has an intimate knowledge of the other’s job. Before flying a mission, the crew must discuss the engagement in excruciating detail, from ground targets and ground-threat reaction to ways to deal with air-to-air threats.

Wordless Communication

In an actual engagement, the hand-off of sensors from one officer to the other is subtle, often occurring without a word. For example, the pilot might know that, at a preset distance from the target area, he must bank thirty degrees to the left or right to allow the WSO to operate the fighter’s

synthetic aperture radar, which maps the target area. Then, while the pilot looks out for threats, the WSO makes the “patch map” and identifies the target inside the map. Then he must cue the LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) pod to the area and find the target. This activity requires intensive effort, especially if the target is small.

At a certain range, the WSO fires his laser designator at the target. The designation must be updated constantly. At that point, the pilot is concentrating on steering the aircraft to the precise course needed to release the laser-guided bomb. The WSO, with his thumb on a hand controller, keeps the laser designator pointed at the center of the target while he monitors the RWR and air-to-air radar sensors. Then the computer figures out the release point, and the pilot releases the bomb.

After release, the pilot makes a forty- or fifty-degree turn and takes over the air-to-air radar to check for fighter threats while the back-seater concentrates on keeping the laser spot on the designated mean point of impact.

“Probably the best thing to do is not to stare at the target,” said Capt. Joe Justice, a WSO instructor from the 335th FS. “That’s probably when you get the most jittery. The last fifteen seconds are the most critical. At that point, you are totally



On the ground, the aircraft belongs to the crew chief. Fighter crews are very much aware that while they depend on each other in the air, they also depend on those who get the aircraft in shape on the ground.

two people who don't. If you get a dynamic that doesn't work, then you have to stop and talk about the division."

A WSO also increases a fighter's versatility and adaptability. A single-seat jet is supported to a great degree by what is preplanned on the ground. The aircraft's pilot "is caged into a mission," Captain Kreighbaum said. "After he gets airborne and things change, his adaptability is limited, whereas we can change a lot more. I can totally reprogram a jet or do whatever we need to do while the pilot flies."

The close work required of the aircrew demands an understanding between the two of what each is prepared to do. Captain Kreighbaum said that during the war, crew members were told nothing was worth dying for; any target could be hit



focused on the scope. He can say anything up front, and you're not going to hear it. You are going to focus on that target. That's what you are paid to do. The front-seater is working to make sure nobody hits us. My tendency is, the closer I get [to the target], the closer I get to the scope."

Once the bomb strikes the target, the WSO is looking outside the cockpit, calling out threats. In addition, the WSO must monitor communication lines: interaircraft, interelement, and with orbiting E-3 Airborne Warning and Control System aircraft. Pilot and WSO scan their instruments.

All of this usually takes place in silence.

"You need to keep as quiet as possible so you can listen up on the radios, so you know what's going on outside the cockpit," explained Captain McFeely. "If you are talking [to] each other in the cockpit, someone might call out 'Break right!' You might miss that."

Captain Kreighbaum said, "The better the crew—the more they've flown together—the less has to be said, and the more they can anticipate what's going on. Crew coordination is such a dynamic. It's just like two people who hit it off and

another day. However, aversion to personal risk varies. Captain Kreighbaum said that it was important to establish where each stood, so that they could work together.

Positioning the fighter in space for the employment of its weapons is the pilot's concern. "The final authority to engage rests in the front cockpit," Captain Kreighbaum said. "He is the commander, and I'm the Weapon System Officer. While I may be senior on the ground, when I get in the air there can only be one captain on the ship. Obviously, I can vote in the back, but he has veto power." ■



FRANCE



UNITED KINGDOM

**THERE ARE
7 JPATS
CONTENDERS
TO CHOOSE
FROM. BUT
WE CAN PIN
DOWN MORE
REASONS TO
BUY OURS.**



ARGENTINA



EGYPT



BRAZIL



LET'S START WITH THE MOST OBVIOUS. NORTHROP GRUMMAN'S SUPER TUCANO IS THE ADVANCED VERSION OF THE MOST WIDELY DEPLOYED TRAINER IN THE WORLD. OVER 570 EMBRAER-312 TUCANOS HAVE LOGGED MORE THAN 400,000 HOURS FOR THE RAF, THE FRENCH AIR FORCE AND THE AIR FORCES OF TWELVE OTHER NATIONS. THIS IMPRESSIVE REPUTATION IS ENHANCED BY TWO COMPELLING FACTS. FOR ONE, THE SUPER TUCANO OFFERS LOWER ACQUISITION, OPERATION AND SUPPORT COSTS, SO TRAINING BUDGETS GO FURTHER. COMPARED WITH ANY CONTENDING JET, IT COSTS LESS, USES 35% LESS FUEL AND REQUIRES LESS THAN TWO MAINTENANCE HOURS PER FLYING HOUR. THE BOTTOM LINE IS 25% LOWER LIFE-CYCLE COSTS THAN ANY JET. SECONDLY, OUR TRAINER PERFORMS AS SMOOTHLY INSIDE THE TRAINING ENVELOPE AS IT DOES IN THE BUDGET. IT MEETS OR EXCEEDS EVERY SINGLE JPATS REQUIREMENT. AND, ITS STATE-OF-THE-ART DIGITAL DISPLAYS LINK STUDENT PILOTS TO A SAFE, FORGIVING MACHINE. ALL OF WHICH MAKES THE SUPER TUCANO EVERYTHING IT WAS DESIGNED TO BE. THE PERFECT PLANE FOR THIS PRIMARY TRAINING MISSION AND THE BEST VALUE FOR JPATS. **NORTHROP GRUMMAN**

AETC intends to send "mission ready" graduates to the using commands.

Smarter Troops for a Smaller Force

AIR EDUCATION and Training Command, headquartered at Randolph AFB, Tex., has become the command center for what might prove to be a revolution in Air Force personnel.

If AETC's plans hold up, everyone in the Air Force—from fighter pilot to forklift operator, from senior noncommissioned officer to wing commander—will prepare for work in a radically new way. The result: a different breed of airman and officer who not only shines on the flight line or in the cockpit but has received heavy and regular doses of formal education.

"I like to say that if our Air Force of the future is going to be half the size it was, we're all going to have to be twice as smart," remarked AETC Commander Gen. Henry Viccellio, Jr., only partly in jest.

Knowledge is being imparted in a far more disciplined, formal way. Gone forever will be the airman who, after initial skill training, shows up for the first job unprepared to perform it. Gone, too, will be troops who use self-selected methods to climb the skills ladder and add stripes to their sleeves. Gone will be the

By Robert F. Dorr

grizzled NCO with horse sense but little classroom training. No longer will pilots learn to fly on aircraft vastly different from those they will fly in operational units.

AETC's creation on July 1, 1993, merged Air University (AU), at Maxwell AFB, Ala., with the job-skills instruction centers long administered by Air Training Command (ATC), which lowered its flag on that date. AETC also took over follow-on training of pilots in aircraft that they will fly in their first operational assignments.

AETC consists of AU and two newly organized numbered air forces: 2d Air Force at Keesler AFB, Miss., and 19th Air Force at Randolph AFB, Tex., which handle technical and flying training, respectively. AETC's 2,800-person recruit-

Under AETC's plan, officers and enlisted personnel like SrA Daniel Hardin (opposite, consulting an aircraft maintenance training manual at Sheppard AFB, Tex.) will receive more frequent formal education throughout their careers.



USAF photo by MSGI. Fernando Serna

ing service, spread over twenty-nine locations, is charged with all personnel accessions except cadets of the US Air Force Academy, lawyers, and chaplains.

The Hub of Tech Training

AETC's 2d Air Force, under Maj. Gen. John C. Griffith, is responsible for both basic training and technical school. Each year 235,000 airmen graduate from 2,200 formal courses taught at four training wings—the 81st at Keesler, the 17th at Goodfellow AFB, Tex., the 37th at Lackland AFB, Tex., and the 82d at Sheppard AFB, Tex.—and at Lowry Training Center, Lowry AFB, Colo. Though Lowry AFB will close in September, the training wings are putting new muscle into courses that include supply services, personnel, medical services, missile and aircraft systems operations and maintenance, communications, and computer systems. Enlisted missile and space skills are taught at Vandenberg AFB, Calif.

The development program for the enlisted force is getting a complete face-lift, beginning with the six weeks of basic training at Lackland

AFB and the tech schools that confer initial job skills in 245 career specialties. "We have just graduated our last directed-duty assignee," General Viccellio said last spring. "That's the Air Force's last person, ever, to go directly from boot camp to an operational assignment."

In the past, he added, "We were just bringing people out of boot camp at Lackland, 'issuing' them out into the Air Force, and hoping that there would be an NCO out there who'd take time to let this new person learn what the Air Force needed them to know. That was a lousy way of doing business."

AETC has developed what it calls "three-level," or "apprentice-level," schools for every specialty in the Air Force. Airmen from now on are going to start their careers on a level playing field, said General Viccellio.

Though it seems a small measure, sending every airman to tech school is a significant change. It was common for airmen to arrive at first duty assignments, as General Viccellio put it, "quite a ways from being ready for their jobs."

"Many of them, especially in our most critical sortie-producing skills,

arrived having never even set their eyeballs on the equipment they were going to operate. They'd never seen the airplane, the part of it for which they would be responsible, nor—in too many cases—the specific test equipment they were expected to use on the job."

That is all changing, and what has been passable up until now is no longer considered tolerable. The Air Force wants every new airman to arrive at his or her first assignment ready to pitch in and do a professional job.

"'Mission ready' is our term," said General Viccellio. "That's our vision. Whether you're talking about teaching someone to be a dental hygienist or perhaps a jet engine repairman, the old ATC taught how to operate but never got into the mission application of the job."

No More Hand-Me-Downs

During the Cold War years, the Air Force put all its new equipment on the front lines—in operational units—rather than in the training command. "We were always using hand-me-down equipment to familiarize people with the skills they



At Hondo Airport, Tex., and the Air Force Academy, Colo., AETC uses the Northrop-Slingsby T-3A Firefly pilot candidate screener to weed out those who lack the touch to become aviators.

were going to need," recalled General Viccellio. "So when they got to their operational assignment, there was this tremendous . . . burden on the operational commander to bring them up to speed on the equipment they were supposed to operate."

Maintenance trainees at Sheppard AFB, Tex., received "a smidgen of hands-on training on something like an F-89" (a fighter-interceptor that went out of active-duty service in 1962), said the General. To plug gaps, the Air Force dispatched no fewer than 160 field training detachments (FTDs) to operational locations to bring apprentice airmen up to speed, but it was awkward locating extra training sites on the turf of busy commanders.

Sheppard AFB never seemed to get its slice of the pie when equipment was handed out. That situation is now over. General Viccellio pointed out that, in the past year, AETC has brought to Sheppard fourteen F-16s, eight F-15s, two C-141s, and more than forty other current, front-line aircraft on which students can receive realistic, hands-on, effective training.

Similar modernization is progressing at Keesler and Lackland and, in the flying world, at Luke AFB, Ariz., Tyndall AFB, Fla., and Altus AFB, Okla., where trainees will receive instruction while working in an active flying environment.

Improvements at these and other

schoolhouses have made it possible to reduce the number of FTDs to fifty-nine, as of April 1994. The eventual goal is twenty-one.

With its cradle-to-grave system of nurturing Air Force talent, AETC is making a complete break from the old practice, which General Viccellio described as "training our people in an initial tech school, then entrusting ten, twenty, or thirty years of career-level and performance growth [solely] to the OJT [on-the-job train-

ing] environment." Now "a new recruit will follow a career path from day one through retirement, including upgrade training, continuation training, and professional military education."

This is big stuff, as the troops themselves understand. SSgt. Frederick Newman, an F-16 crew chief at Luke, said he now knows that as soon as the money is there, the details are worked out, and the facility is in place, he will have to go to class again if he wants a seven-level, or craftsman, rating that will take him into the senior NCO ranks.

"It used to be you tried to fit in your development and do the job at the same time," said Sergeant Newman. "You pretty much decided, yourself, how much you were going to improve and how fast. Now they've said, 'No school, no tech sergeant stripes.'"

A "Mini-Sabbatical"

When will seven-level training start? "The majority of our seven-level courses will come into existence in 1995 and 1996," said General Viccellio. "We're talking about many, many career fields here, and we're building essentially from scratch. We're excited about it because it will give a real opportunity to our people who are on the verge of becoming supervisors, and they'll serve us better having been through this.

Training Crosses Service Lines

Joint training is getting more attention, on and off the flight line. Primary training of Air Force helicopter pilots is performed by the Army at Fort Rucker, Ala. The law enforcement school at Lackland AFB, Tex., last year graduated more Navy cops than Air Force Security Police. The Army teaches welding for all services at Aberdeen Proving Ground, Md., and USAF's water survival school is being merged with the Navy's at Pensacola, Fla.

Some of this jointness results from new vitality in the Interservice Training Review Organization and some of it from the last Pentagon Roles and Missions Report, submitted in 1992 by Chairman of the Joint Chiefs of Staff Gen. Colin L. Powell. In addition, there is pressure from the Base Realignment and Closure Commission effort.

"When one service had a capability that was outstanding," said Gen. Henry Viccellio, Jr., AETC's commander, "and another service had a requirement that came up, often the decision was made to just go and train with that service." It is an ongoing process. "The vehicle operators' course will probably go to the Army's Fort Leonard Wood in Missouri; for vehicle mechanics, we will come together with the Navy either at Port Hueneme in California or at Lackland."

Jointness is also contributing to rapid changes in pilot and navigator training. Even in a command where dramatic change is becoming commonplace, nobody wants to go too far. General Viccellio said none of the services wants jointness expanded into a Defense Training Agency or creation of a "CINCTRAINING" or a commander in chief "over an organization that's totally joint."

We want to make it special. We want to make it . . . sort of a rite of passage as you move from the journeyman, the day-to-day worker, into the craftsman, or supervisory, level."

AETC determined that such a move was necessary to keep enlisted personnel up to speed.

"We said to ourselves, there's probably a smart point in every person's career where a return to a formal training environment—a chance to get off the flight line, to come out of the shop, out of the office—would allow him or her to think about some things that are important," said General Viccellio. "I use the term 'mini-sabbatical.' . . . This way, we'll give our people a technical update. What are the new technologies that are coming . . . in your career field? What kind of equipment is the Air Force purchasing? What's going on out there in your career field in the years ahead?"

"We want them to back away from the job perspective and take on the function perspective. They're at that point in their career where they have to look at that function and see how it contributes to the squadron, base, and wing mission, to the whole Air Force mission. So we're going to talk about 'How do we use automated data processing in your career field? What are the finances of carpentry? What are the management issues in jet engine repair? How is your career field organized?'"

At Randolph, 19th Air Force, under Maj. Gen. Everett H. Pratt, Jr., manages all flying training, with control over fourteen active-duty units and oversight of two Air National Guard units. The time-honored undergraduate pilot training (UPT) program is being replaced by specialized undergraduate pilot training (SUPT). Joint flight training, especially with the Navy, is being sharply increased [see box on p. 40].

UPT, which dominated the post-war era, will not fade from the scene without some grumbling. Under the UPT scheme, every pilot pinned on wings after advanced flying in the T-38 Talon. The T-38 is much like a fighter, and the common experience of piloting this sleek, fast jet was a bond among aviators, many of whom never again found themselves in a "hot rod."

Under SUPT, however, aviators destined for fighters and bombers



USAF photo by Carlos Baker

For a seven-level, or craftsman, rating that opens the door to the senior NCO ranks, enlisted personnel will have to return to the formal training environment. AETC Commander Gen. Henry Viccellio, Jr., calls it a "mini-sabbatical."

stick with the T-38 while airlifter and tanker pilots take advanced flight training in the T-1A Jayhawk. SUPT began when the first Jayhawk squadron revved up at Reese AFB, Tex., in January 1993. The scheme will be phased in at Laughlin AFB, Tex., Vance AFB, Okla., and Columbus AFB, Miss., by early 1997.

After primary and advanced flight training, AETC handles, as its newest responsibility, follow-on training of pilots in the aircraft types they will fly in service.

Changing Commands

Tyndall (F-15s), Luke (F-16s), and Altus (C-141s, C-5s, and soon KC-135s) broke their ties with other commands and joined AETC when it was founded. As a result, training for the F-15E dual-role fighter is relocating from Luke to Tyndall. Training in the MC-130, HC-130, UH-1, H-53, and H-60 aircraft is now in the purview of Kirtland AFB, N. M. Plans call for commencing C-12 and C-21 type training at Keesler soon.

Among major aircraft, only the C-130 Hercules transport has not transferred to AETC for type training, though such a shift still is being considered. Pilots of the Air Force's less numerous flying machines (U-2, B-52, F-4G Wild Weasel) will not meet their aircraft in AETC but will be trained, as before, in the using command.

AETC's lineup of new-production

hardware starts with the Northrop-Slingsby T-3A Firefly pilot candidate screener, which is replacing the Cessna T-41 at Hondo Airport, Tex., and at the Air Force Academy. The last of 113 Fireflies will be delivered by Fiscal 1996, with roughly half going to each location. The fully aerobatic T-3A Firefly will save much-needed dollars by more effectively weeding out, up front, those who lack the touch to become aviators.

AETC is a key player in the vetting of seven candidate airplanes competing for a 1995 pick as the JPATS (Joint Primary Aircraft Training System) to replace the Air Force T-37 and Navy T-34C. The Pentagon has instructed the services to use one aircraft, one syllabus, and a joint squadron environment for the first sixty-six hours of primary flight training.

General Viccellio said AETC now has some Navy instructor pilots (IPs) at Reese AFB and some Air Force IPs at NAS Whiting Field, Fla., flying the T-34. "In other words, we're not going to wait for JPATS to come along," said General Viccellio. "We're going to move into [joint primary flight training] so we can learn how to do it properly and be ready for the new airplane when it comes later in the 1990s."

As part of this joint effort, a Navy training squadron at Whiting Field already has an Air Force executive officer, while an Air Force squadron at Reese has a naval officer handling

operations. In due course, the squadron at the all-Navy base will have an Air Force commander and vice versa.

The Air Force keeps its primary student aviators for a long time, compared to the Navy, before moving them to the next stage. AETC's course in the T-37 and the future JPATS runs for eighty-nine hours. After this, student pilots select the bomber-fighter, tanker-transport, or helicopter track. In keeping with tradition, student pilots are rank-ordered according to performance and are allowed to choose, in this order, from available assignments.

Next on the roster of factory-fresh airplanes comes AETC's new advanced trainer, the Beech T-1A Jayhawk, for those who have chosen the tanker-transport track. Configured to train two students at a time, the Jayhawk offers realism in multiengine procedures and crew coordination. Aviators training in the needle-nosed T-38 learned nothing about either.

The 180th and last Jayhawk will be delivered in late 1997. AETC is pleased with how ready new pilots are when they step from the Jayhawk into StarLifters, Stratotankers, and the like—"mission ready," to use General Viccellio's favorite term.

The T-38 Problem

Student pilots bound for bombers and fighters will still get there by way of the T-38 Talon, which causes a bit of a problem.

Before the First Command

AETC often calls itself "The First Command" because it is the first seen by airmen and officers when they formally enter the service. In fact, many Americans run into AETC much earlier than that. The command operates junior ROTC programs in the nation's high schools as well as the Civil Air Patrol, which includes a successful cadet scheme.

Junior ROTC programs are often found in the inner city. Many programs target disadvantaged youth who lack other job opportunities. They reach nearly 58,000 youngsters in 426 high schools where the courses—often taught by retired Air Force personnel—emphasize self-discipline, citizenship, family and social values, and the work ethic.

For young people who sign up with the Air Force, their first contact is usually with AETC's recruiting service, headquartered at Randolph AFB, Tex., and commanded by Brig. Gen. (Maj. Gen. selectee) John M. McBroom. One of General McBroom's problems, as he put it, is that "people don't know we're hiring."

At a time when staff sergeants and majors are getting pink slips, the Air Force wants to hire 65,000 new people next year but isn't getting that message out. Another challenge is to maintain high standards. General McBroom has about a thousand recruiters (one-quarter as many as the Army has), many of them working in one-person offices, often an hour or more from their nearest supervisor. These recruiters are "chosen from the best in their career fields," said General McBroom, "but we're having a hard time keeping it a volunteer assignment."

The good news is that the Air Force is an attractive choice for anyone pondering a military hitch. "We have a high-tech image, and it works for us," said General McBroom. "OTS [Officer Training School] is not a problem for us. In fact, we have a surplus of people who want to come in." Last year, AETC filled the Air Force's quota for new physicians for the first time since 1986.

Nevertheless, problems lie just ahead. In terms of recruiting the right mix of people, "we're OK for 1994," said General McBroom, "but after that, we're struggling."

"With the acquisition of JPATS and the T-1, our primary and [tanker-transport] flying training programs will be in great shape," General Viccellio reported to Gen. Merrill A. McPeak, Air Force Chief of Staff,

in a 1994 update on training programs. "However, in the bomber-fighter track, a mission needs analysis spotlights some T-38 deficiencies that need to be remedied."

In the report, General Viccellio noted, "We have a growing conviction that the best replacement for the T-38 is—the T-38. We are now planning a Pacer Classic II program to sustain and equip the T-38 well beyond 2020—a phased, prioritized approach to modernizing the aircraft beginning with a full avionics upgrade in FY 1996. Improvements that should follow include new ejection seats and sequencing, bird-resistant canopies, and improved icing resistance for the J85 engine."

General Viccellio said that by upgrading the T-38 rather than buying a new aircraft, the Air Force can save \$5 billion.

The transfer of forty-five armed AT-38B Talons is under way as AETC takes over lead-in fighter training. In some form, such training has been a staple for years, but in its current incarnation as Introduction to Fighter Fundamentals (IFF), it is a short, difficult course that, once completed,

USAF photo by MSgt. Fernando Serna



AETC's Introduction to Fighter Fundamentals is a short, difficult course using AT-38 Talons equipped with gunsights and practice bomb dispensers. This AT-38B is at Columbus AFB, Miss., where AETC's first IFF class graduated in 1993.

allows pilots to easily step into an F-15, F-15E, or F-16. AETC's first IFF class was graduated at Columbus in 1993. Since it took over type training in mid-1993, AETC has graduated 180 F-15 pilots, 173 F-15E aircrew, and 800 F-16 pilots.

Innovations in jointness will become part of pilot training soon. The Air Force uses a jet (T-1A) to train pilots of large aircraft while the Navy uses a turboprop, its Beech T-44 Pegasus. With changes being explored by General Viccellio and his staff, Air Force pilots heading for a turboprop aircraft (the C-130) will undergo advanced training in a Navy T-44 squadron. Navy flyers heading for large pure jets (such as the Boeing E-6 Mercury, a strategic communications aircraft based on the 707) will be trained by an Air Force Jayhawk squadron.

AETC now carries out Air Force navigator training at Randolph in the T-43, a modified Boeing 737. Some Air Force navigators can benefit, the command believes, from training in the Navy's T-39, or North American Sabreliner, equipped with APG-66 radar. The T-39 is "far more suitable for training a specific kind of navigator, namely the Weapon System Officer who'll fly in the back seat of an F-15E," says General Viccellio.

"We're going to train like we'll fight," summarizes Col. Donald Feld, chief of AETC's Flying Training Division.

Learning to Think

Air University runs professional military education centers for Air Force personnel and civilians to prepare them for command, staff, and leadership responsibilities. AU's commander, Lt. Gen. Jay W. Kelley, also serves as AETC's director of education. General Kelley prepares the education portion of the command's annual budget proposal.

Education at AU "teaches us how to think, to understand the principles that enable us to do our job better," said General Kelley. "Education also gives us the analytical tools to apply those principles creatively in new and unfamiliar situations, situations



A T-43A navigation trainer, a modified Boeing 737, flies above AETC's headquarters at Randolph AFB, Tex. Randolph is the command center for what could be a revolution in training Air Force personnel.

where the stakes may be high and the outcome far from certain." He added that in light of the rapid changes in the current defense environment, such skills will be critical for an officer, "in every facet of his or her job, no matter what that job is."

Best known of AU's education centers is the Air War College, where colonels and above-the-zone lieutenant colonels take a ten-month course for senior leaders. Also at AU is Air Command and Staff College, another ten-month course for midgrade officers. Then there is Squadron Officer School, where captains take a seven-week class.

"Getting your ticket punched at Maxwell is a must," says Capt. Michael P. Curphey, a recent SOS graduate. "It's a way to sharpen your knowledge and develop the ties for whatever comes next."

Col. Rodney H. Payne, AU's vice commander, acknowledges that some officers once went to Maxwell to take a little time off with the family; it was viewed by some as "education and golf." No longer. The relaxed mood is gone, said Colonel Payne, and "every course and school at AU has been refocused and rebuilt."

AU is responsible for the Air Force's NCO academies as well as

education programs operated by the Air Force Institute of Technology and the Community College of the Air Force.

Also under AU is the business of Air Force precommissioning services. AU oversees the Reserve Officers Training Corps, which has 138 detachments at colleges and universities and will produce 1,490 new officers next year. In a significant change, AU now runs the Officer Training School (OTS), which was moved to Maxwell AFB and now will produce 2,160 new second lieutenants in the year ahead.

"One of our challenges is to enable OTS to have its distinct identity," says Colonel Payne. "We never had this institution at Maxwell before, and there's a tremendous pride on the part of its staff, instructors, and students."

The merger initially ruffled some feathers at AU, but that seems to have been smoothed over. General Viccellio noted, "I tried very hard to make it very visible that I considered [reorganization] not one command [taking over] the other but, rather, standing down two commands that had separate but related missions and bringing up a new one that had responsibilities across the spectrum." He appears to have succeeded. The merger of AU and the ATC is "wired right," reported Colonel Payne. He added, "It was not a hostile take-over at all." ■

Robert F. Dorr, an Air Force veteran, is a free-lance writer in the Washington, D. C., area. His most recent article for AIR FORCE Magazine, "Lifeline to the Sky," appeared in the March 1994 issue.

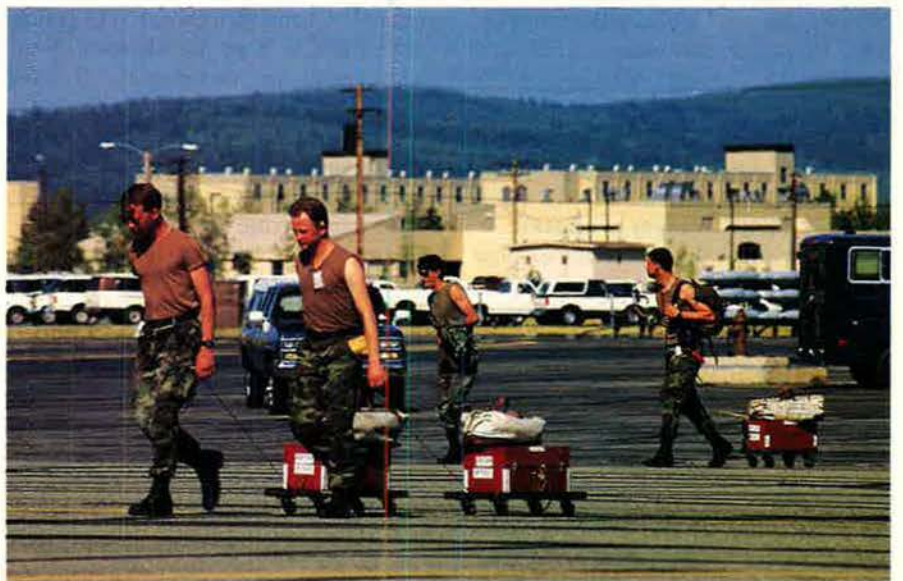
The supreme training test for Pacific Air Forces moved from the Philippines to Alaska without missing a beat.

Thunder in the North

Photographs by Dana Bell



Three years ago, the eruption of Mount P:inatubo and political differences with the government of the Philippines led the Air Force to move Cope Thunder from its longtime venue near Clark AB, the Philippines, to Eielson AFB, Alaska. The location has changed, but the commitment to realistic combat training remains. Above and above right, F-15s from PACAF's 3d Wing, Elmendorf AFB, Alaska, don't have to travel far to take part in the continual training and evaluation at Cope Thunder, which includes units from all over PACAF and members of other services, such as these Marine maintainers (right) on their way to work on their F/A-18s on the flight line at Eielson.





Above, an F-16 from the 354th Fighter Wing, Eielson AFB, Alaska, zips past Mount McKinley, North America's tallest peak. Right, a ground crew loads practice bombs on one of the F-16's seven external stores stations. Note the Low-Altitude Navigation and Targeting Infrared for Night navigation pod and electronic countermeasures pod on the underside of the aircraft.



The pilots of Cope Thunder share the sky with Alaska's many bush pilots, who provide much of the transportation over the vast terrain of the state. Here, a de Havilland Beaver takes off near Anchorage.





Marine F/A-18 Hornet crews and EA-6B Prowler crews benefit from Cope Thunder training as well, taking part in integrated strike packages, flying as aggressors, and—most important—sharing information and tactics with their counterparts from other services. Naval aviators also take advantage of the unique opportunities provided here.



F-15Es, such as these from the 3d Wing's 90th Fighter Squadron, have become an important part of Cope Thunder, capable of putting awesome amounts of ordnance on ground targets and performing air-to-air missions. F-15s, at right and below, undergo meticulous preflights before they are cleared for takeoff. Safety is always a major concern, particularly at Cope Thunder because of Alaska's volatile weather and forbidding terrain. The 3d Wing also benefits from having its own E-3 Sentry Airborne Warning and Control System aircraft.





Aircraft and personnel cross continents and oceans to take part in Cope Thunder. Top, a vivid example of the Total Force nature of the exercise—an ANG KC-135 from the 108th Air Refueling Wing, McGuire AFB, N. J., refuels AFRES F-16s from the 89th Fighter Squadron, Wright-Patterson AFB, Ohio. Arctic Traveler (above) is an aptly named refueler, as its Arabic markings, denoting service in the Persian Gulf, attest. Alaska ANG KC-135s (right) from Eielson's 168th ARG helped host the exercise. Security Police, here setting up a perimeter around an E-3 AWACS, train at Cope Thunder too.



With scores of aircraft in the air simultaneously, the E-3 AWACS, which makes sure that everybody is where he's supposed to be, doing what he's supposed to do, is an invaluable asset, especially since many of the units in Cope Thunder have never flown together before.



Future plans for Cope Thunder include the participation of OA-10s, such as these from the 354th FW, in the role of forward air controllers and the installation of new range instrumentation to better facilitate air-to-ground evaluation. Other new systems will allow widely separated ranges to gauge the air-to-air skills of participants and the effectiveness of various strike packages. Cope Thunder training is constantly being expanded and refined to provide the experience that can mean the difference between life and death in combat.





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USAF's next attack aircraft will likely grow out of the Joint Advanced Strike Technology program.

Fighters for the Twenty-First Century

SIX YEARS ago, at the close of the Reagan defense era, the Pentagon's plans for 1994 included having sixty new B-2 bombers in service, with many more coming. The first production model of USAF's F-22 fighter was to roll off the line in 1994, and a naval variant was to have been well along in development. Joining them in 1994 would be several carrier wings of stealthy Navy A-12 attack jets and their land-based Air Force cousins. The Multirole Fighter (MRF), a replacement for the F-16, would be moving from drawing board to prototype.

That was then. The end of the Cold War caused Washington to clamp the brakes down, hard, on the Pentagon's quest for ever-more-powerful warplanes. In real-world 1994, only two B-2s are on the ramp; the Air Force agreed to halt production at twenty, down from the 132 originally planned. F-22 production has been pushed back a few years, and the Navy's F-22 is out of the picture, canceled some years ago. The A-12 program was killed, as was its successor, the A/F-X; Air Force variants went down the tube, too. The MRF has been shelved.

By John Tirpak

The decisions that caused such a drastic transformation in aircraft modernization plans were not easy to make. Secretary of Defense William J. Perry, unveiling his Fiscal Year 1995 defense budget on February 7, said he had been forced to conclude that in the wake of heavy combat aircraft investment in the 1980s, "we have an inventory that we can live on for a few years."

This is merely an expedient. The Air Force's rugged F-16 fighters, built in annual lots of up to 150, will "age out" of the inventory—reach the end of their service lives—in equally large batches. USAF will need something to replace them beginning in 2005. The Navy still needs an aircraft like the A-12 or A/F-X—a fighter that can pierce enemy air defenses, attack with a lethal pay-

The Air Force, Navy, and Marine Corps fighters that emerge from the JAST effort will be developed from a "parts catalog" of advanced components. The aircraft need not look alike, since they will need different capabilities. Northrop Grumman Corp.'s notional fighter (opposite) includes twin-engine propulsion, canards, and features that would enhance stealthiness.



load, and survive the trip home. For the Navy, the matter will turn into a crisis by 2010, when all possible work-arounds will have been exhausted.

Ends Against the Middle?

Secretary Perry and other top officials labored over the problem in last year's Bottom-Up Review of defense requirements. They knew that the services would eventually need new aircraft. Experience pointed to long lead times. Work had to begin soon. They had little money to spend. Further complicating the issue, the two required airplanes—a “high-end,” stealthy strike jet and a “low-end” multirole fighter—seemed to have mutually exclusive requirements. Multiple multibillion-dollar development programs were out of the question, however.

A new way would have to be found, and the new way was the Joint Advanced Strike Technology (JAST) program. The concept was simple: Develop a “parts catalog” of non-platform-specific components, such as radars, engines, weapons, avionics, and other expensive items, from which aircraft designers could se-

lect basic materials to outfit aircraft for diverse missions. The Pentagon set a goal of eighty percent commonality between the airplanes.

Planners reasoned that the JAST-derived airplanes need not look alike, since they would have different missions and would require different systems and levels of durability. With JAST, the Navy could have its stealthy strike airplane, the Air Force its multirole fighter, and, as a bonus, the Marine Corps could get a replacement for the aging AV-8B Harrier jump jet. Their development costs could be largely held in common.

For six months after DoD unveiled it, the JAST program went underground as officials sketched out its goals and sought skilled managers to run it. During the news blackout, rumors swirled about what JAST would be. One worry was that the JAST airplane—a misconception, as JAST is a program and not an aircraft—would become a disastrous one-size-fits-all weapon system forced into the service of too many interests, a jack-of-all-trades and master of none.

It was not an idle worry. A concept sounding similar to the JAST program had been tried in the early

1960s when Secretary of Defense Robert S. McNamara pressed ahead with the troubled TFX (Tactical Fighter, Experimental) program. Its goal was to make a USAF-Navy interceptor-fighter-bomber out of the F-111. The Air Force ultimately got a first-rate interdiction airplane out of it, but the Navy dropped out.

An even bigger concern—voiced by many in the aerospace industry, on Capitol Hill, and at senior levels of the Air Force—was that the JAST program would become simply a “hobby shop,” a collection of well-financed tinkerers who would putter around with interesting new technologies and spend a great deal of research money but never focus on a real-world mission and thus produce no airplanes.

Behind Everything, Cost

One thing was clear. Whereas every combat airplane previously had been developed with performance as its number one consideration, the driving factor in JAST would be cost.

Air Force Brig. Gen. (Maj. Gen. selectee) George K. Muellner, head of the JAST program, brushed off the hobby shop criticism. “We’re

not technology-focused," he said. "We're not spending any money developing technology. We're transitioning it, which means we're totally product-focused." JAST, General Muellner insisted, was under a deadline to launch several new aircraft projects. These systems must, without fail, be on the ramp or on the carrier deck by 2010. To do that, his program must turn over a concept—or several concepts—to a platform program office by 2000. He must have most of his program laid out before this time next year.

General Muellner admitted that neither he nor his deputy, Rear Adm. Craig Steidle, formerly the program manager of the Navy's F/A-18 strike fighter, were "volunteers" to run JAST. Both had heard the hobby shop story and thought it might be true. The two officers were brought around by John M. Deutch, then the Pentagon acquisition chief and now the deputy secretary of Defense, who made a convincing case that he wanted real airplanes, not paper ones.

General Muellner said Mr. Deutch made two persuasive arguments. One was that, come what may, the Pentagon had to meet the services' aircraft needs. "We were basically taking \$2 billion of the services' money," said General Muellner, "and if we didn't deliver a product, those warfighters were going to be hurting in 2010." The other factor was "the clear message from the Hill that a technology hobby shop was not going to be supported," he said.

General Muellner has his work cut out for him. Over the next year or so, he will consult with numerous advisory groups—ranging from pilots and maintainers to fleet admirals—on what operational capability JAST should produce. He will simultaneously fund various concept exploration studies by contractors to pinpoint the highest state of stealth, avionics, computers, materials, and manufacturing and determine how they can work for the program. Meantime he will keep tabs on an Advanced Research Projects Agency program to develop an advanced short takeoff, vertical landing (ASTOVL) aircraft. If it works, it might become a JAST aircraft.

The General's top-level advisory group includes just about the entire Pentagon leadership, military and civilian. He admitted it was a "full

The First JAST Contracts

On May 6, the first twelve JAST contracts were awarded to private aerospace contractors. The concept exploration contracts had a total value of nearly \$10.5 million.

Concept/Contractor	Value
Modular Multiservice Airframe Boeing Defense and Space Group Seattle, Wash.	\$2,230,000
Leveraging Affordability Concept Lockheed Fort Worth Co. Fort Worth, Tex.	1,990,000
Joint Strike Warfare Concept McDonnell Douglas Aerospace Co. St. Louis, Mo.	1,690,000
Virtual Strike Environment Architecture Cambridge Research McLean, Va.	825,605
Affordable Weapon Integration Study McDonnell Douglas Aerospace Co. St. Louis, Mo.	720,000
Joint Strike Aircraft Concept Exploration Northrop Grumman Corp. Hawthorne, Calif.	688,756
Affordable Off-Board Architecture McDonnell Douglas Aerospace Co. St. Louis, Mo.	575,000
Sensor Integration Trades and Architecture Litton Amecom College Park, Md.	530,000
Virtual Strike Environment Northrop Grumman Corp. Hawthorne, Calif.	495,291
JAST Affordability Studies Northrop Grumman Corp. Hawthorne, Calif.	330,111
Cost-Effective Weapon Carriage Options Hughes Missile Systems Co. Canoga Park, Calif.	291,678
Affordable Next-Generation Avionics Honeywell, Inc. Minneapolis, Minn.	99,936

table" but said that when JAST is firmed up, everyone will have agreed that it meets a particular need and will be affordable. "This really represents all the different agendas, if you will, that might come to the table," he explained. "The operational agenda, the development agenda, the money side, and the more pragmatic."

In the late 1990s, the JAST office will explore flying prototypes. Gen-

eral Muellner made an analogy to the Have Blue airplanes of the 1970s, which were technology demonstrators and not operational prototypes. The Have Blue program led to the F-117 Stealth fighter.

When the Mission Ends

If all goes well, around 2000, the JAST office will turn over everything it learned, along with top-choice candidate aircraft concepts, to Sys-

tem Program Offices to carry out engineering and manufacturing development on them. At that point, the JAST program, having fulfilled its mission, might be dissolved.

Though the JAST program is modest compared to most other start-up aircraft programs, the Pentagon has fenced off a sizable amount of money for it—\$2.3 billion over five years. In this first year—Fiscal 1994—it has just \$30 million to spend, but the figure ramps up dramatically to \$200 million next year.

The initial emphasis will not be on airplanes but on rethinking the entire strike warfare mission, General Muellner said. “We are not [yet] focusing on the platforms,” he said, because “we are absolutely convinced that one of the ways of driving down the cost of the platforms is by making better use of the rest of the hardware capability that’s out there.”

In other words, he is considering using such “off-board” sensors as those on satellites, Joint Surveillance and Target Attack Radar System (Joint STARS) aircraft, Airborne Warning and Control System aircraft, and a host of other sources of intelligence, from manned and unmanned aircraft to imagery obtained from troops on the ground. Piped into the cockpit, these outside sources of “scope dope” could be “synergized” to give the pilot real-time information on the target.

Besides the practical value of such data—particularly useful in going after such fast-moving targets as Scud missile launchers—relying on outside sources might save the cost of building some sensors into the strike aircraft itself.

The Talon Sword and Talon Zebra programs are demonstrating the concept, General Muellner said. In Talon Sword in April 1993, an Air Force F-16 and a Navy A-6 shot AGM-88 High-Speed Antiradiation Missiles at emitting radars, with the missile targeting based solely on data from intelligence satellites. Neither airplane detected the radar itself, but both scored hits.

General Muellner said he was highly confident that such precious data collection platforms would be safe in wartime and not an Achilles’ heel. “We’re not totally dependent upon just Joint STARS,” he said. “We’re talking about a multiplicity of other sensors on the battlefield.



Until a JAST-derived fighter comes on line, the F/A-18E/F—a bigger, faster, more powerful cousin of today’s Hornet—will be the multimission workhorse of the fleet. The Navy still needs a new strike aircraft like the A-12 or A/F-X.

It’s getting the information in what they call the ‘infosphere,’ a common picture of the battlefield, all the way down to the shooters. We see a lot of leverage in doing that.”

Besides the possibility of relying on off-board sensors, the JAST office is looking at mission-oriented ways to keep costs down.

“We do not have to be able to take out every target with every platform,” General Muellner said. Depending on the target, Tomahawk land-attack missiles (TLAMs), Standoff Land-Attack Missiles, Triservice Standoff Attack Missiles, or superstealthy airplanes, like B-2s or F-117s, with laser-guided bombs might be the best weapon to use. An alternative would be an old-style package of strike airplanes and support aircraft that rains dumb bombs on a site.

Think “Campaign”

The key, he noted, is to think in terms of the campaign, rather than to design each airplane to fight as if it were the only one involved. Before a JAST-derived aircraft even launches against a target, it may be preceded by B-2 and TLAM attacks that will have brought down an enemy’s air defense network, reducing its need for expensive jammers, for instance.

“Our intent, early on, is to . . . understand what tasks these airplanes and these weapon systems really have to be able to perform” and what are true requirements, “as opposed to

‘What did [the warfighters] desire?’ ” said the General. “That area in between is what we will play with.”

General Muellner, a former head of requirements for Air Combat Command, said that without this discipline of looking for alternative techniques, the new systems could suffer from an overload of requirements. He confessed that he once wrote a requirement for a weapon intended to solve a problem for which there already existed an “eighty percent solution”: an existing weapon could have done most of the job most of the time.

In short, said the General, any mission that a warfighter wants to assign to JAST will face rigorous questioning and will “have to earn its way onto the airplane.”

General Muellner said it is not a given that JAST aircraft will be superstealthy. He said that effective jamming and Suppression of Enemy Air Defenses also provide penetration capability, but he added, “You could argue that stealth has become the affordable solution to dealing with a lot of the penetration problems we’ve had in the past.”

When it comes to building a close air support airplane for the Marines, stealth is almost pointless because, “at that range, the enemy can see you,” said the General. However, “in the case of the Navy, which is really looking at a leading-edge penetrator, much like the F-117 is for the



JAST officials are watching DoD's Advanced Short Takeoff, Vertical Landing program and hope to develop a replacement for the Marines' AV-8B Harrier. Shown above is one of McDonnell Douglas's notional JAST fighters.

Air Force, then probably a little more stealth is going to be necessary.”

General Muellner estimates that it will take six to twelve months to determine just how much stealth will be necessary for a twenty-first-century combat airplane. All of this initial work is critical to keeping the aircraft affordable. “If you want to drive down cost, you need to make cost vs. performance trades early in a program,” General Muellner observed. “It doesn’t take very far into a program when you’ve already locked in about ninety percent of your costs.”

On the Back of A/F-X

The JAST program is not starting from scratch. Years of work went into refining concepts and doing trade studies on the Navy’s next-generation carrier attack aircraft before the A/F-X programs went under last fall. All of the product of this work will feed back into JAST. The Air Force and its contractors had done considerable work on the Multirole Fighter before it, too, was canceled last year.

Insiders say the results of the ASTOVL program could have profound effects on the direction of the JAST effort. By 1996, it will be possible to determine whether the ASTOVL aircraft can meet all the requirements not only of the Marine Corps and Navy but also of the Air Force. All three lead contractors—Lockheed, McDonnell Douglas, and

Boeing—insist that they can develop a conventional takeoff and landing variant.

If an ASTOVL aircraft can meet all the services’ needs, JAST will adopt it, General Muellner said.

If not, the Navy will have to decide whether to fund it on its own. JAST leadership, meanwhile, will press on with “one or two” new concepts to take into flying demonstration programs, said General Muellner. The number of conceptual aircraft that will fly will depend on how different they are. They will carry the notional names Project X and Project Y.

One area needing close attention is avionics. Since computer technology turns over every two years or so, General Muellner will strive to keep the architecture open as long as possible to avoid adopting a system that will be obsolete before the first airplane flies. The JAST program can keep up with the state of the art if its airplanes are designed from the start to accept whatever new microprocessors come along as direct chip replacements.

For the next two years, the JAST program’s technology focus will be chiefly on powerplants, since development of an aircraft engine generally requires the longest lead time

and the system must be tested and certified well in advance of other components, General Muellner said. He also will emphasize automated manufacturing, formation of composite materials, and other producibility aspects aimed at making airplanes less expensive.

The goal is to “use technology to drive down the cost,” General Muellner asserted. “In the past, we’ve always challenged the technologists with performance upgrades: . . . ‘I want more thrust; I want better fuels specifics.’ But we never asked them to build us a cheaper engine.”

Contractors say it is “an interesting challenge,” and they are eager to show what they can do, he reported.

The jointness of the JAST program is hard to miss. Its prominence is deliberate. General Muellner’s boss is Nora Slatkin, the Navy’s service acquisition executive, and his deputy is a Navy admiral. The General’s office lies in the heart of Navy country—a complex of high-rise Navy offices in Arlington, Va., hard by the Pentagon. He inherited his workplace, in fact, from the A/F-X program manager.

When General Muellner moves on, the arrangement will turn inside out. Admiral Steidle will become program manager, and his deputy will be an Air Force brigadier general. Admiral Steidle will report to the Air Force service acquisition executive.

JAST is funded as two separate line items in the Defense Department budget—one Navy and one Air Force. Both services retain control over the money they have committed to JAST, and if either feels it is not getting what it needs, it can withdraw its funding. “That’s as it should be,” General Muellner said.

When asked if the JAST aircraft will represent a noticeable step back from the heights of performance achieved in the 1980s and 1990s, General Muellner said no. “In all honesty,” he stated, “I think you’re going to see that the aircraft that will come out of this will indeed have—where necessary—more performance than today’s aircraft. It still has to meet the warfighter’s need, or it’s not affordable at any price.” ■

John Tirpak is the senior military editor of Aerospace Daily, a Washington, D. C., defense and commercial aviation periodical. His most recent article for AIR FORCE Magazine, “The Secret Squirrels,” appeared in the April 1994 issue.

War and Peace

"Peacekeeping is a part of our national security policy, but it is not the centerpiece. The primary purpose of our military forces is to fight and win wars. . . . If peacekeeping operations ever conflicted with our ability to carry out those operations, we would pull out of the peace operations."

National Security Advisor Anthony Lake, at a May 5, 1994, briefing on Presidential Decision Directive 25, the Clinton Administration's new blueprint for reforming US forces' participation in multinational peacekeeping operations.

The President on the C-17

"The C-17's capabilities are crucial to the Air Force's ability to deliver and sustain forces in support of theater commanders."

President Bill Clinton, in a May 23, 1994, letter to members of the House of Representatives urging them to authorize procurement of six C-17s in Fiscal 1995.

They Will Bury Us

"The Russian Far East—with its dying industry, enfeebled army, and tiny population—receives a stab in the back in the form of [Russo-Chinese] agreements that work in favor of [Chinese seeking] to enter Russia. . . . The Russian Far East has been flooded by commercial people, overnight traders, the unemployed, Mafia types, and . . . a rabble that makes our bums and beggars seem to be aristocrats. . . . China's official ideology still regards the Russian Far East as Chinese territory seized under the czarist-imposed unequal treaties. The population of the Russian Far East is little more than seven million, while China's north-east is inhabited by over 100 million. On some bright morning, our people will wake up to the realization that our guests outnumber us."

From an article in the Moscow weekly Literaturnaya Gazeta, as translated and quoted by Brophy O'Donnell in the May 13, 1994, Baltimore Sun.

What's That Cracking Sound?

"The ability to maintain a worldwide intelligence community that gets the job done for national decision-makers and for all commanders is very much on thin ice right now."

CIA Director R. James Woolsey, in April 28, 1994, remarks to the Defense Writers Group in Washington, D. C., regarding the effect of the Administration's plan for a five-year, \$14 billion cut in the national intelligence budget and pressure in Congress for even greater reductions.

"Environmental Security"

"To ensure [that] US military installations do not create environmental devastation [of the kind] that plagues Russia, the former Soviet Union, and eastern Europe, the US must anticipate new, more comprehensive regulations and more rigorous enforcement of all regulations."
Sherri W. Goodman, deputy under secretary of defense for Environmental Security, in March 1, 1994, testimony to the Military Installations and Facilities Subcommittee, House Armed Services Committee.

Where Are the Bombers?

"The committee remains concerned that the number of long-range bombers programmed in the [Defense] Department's force plan [is] inadequate to support requirements for two major regional contingencies."

A House Armed Services Committee statement, May 6, 1994, summarizing conclusions underlying the Fiscal 1995 Defense Authorization Act.

Maybe, Maybe Not

"The military services have averaged more than 1,500 sexual harassment complaints annually during the past couple of years. Most of them—about 800 a year in 1992 and 1993—have been substantiated. . . . Do these numbers suggest a pervasive problem? Frankly, I do not know. On the one hand, only a small pro-

portion of the 200,000 women on active duty have registered formal complaints. On the other hand, survey data suggest that a very high percentage of military women have experienced sexual harassment."
Edwin Dorn, assistant secretary of defense for Personnel and Readiness, in March 9, 1994, testimony to the House Armed Services Committee regarding sexual harassment in the armed forces.

The Wages of Sin

\$8,500.00 on 10/08/92
1,700.00 on 10/13/92
7,000.00 on 10/13/92
9,600.00 on 10/18/92
8,600.00 on 10/22/92
8,700.00 on 10/30/92
9,400.00 on 11/10/92
5,000.00 on 11/16/92
Total: \$58,500. . . .
\$8,500.00 on 10/08/92
9,200.00 on 10/13/92
7,300.00 on 10/30/92
3,200.00 on 11/16/92
Total: \$28,200. . . .

FBI Agent Leslie G. Wiser, Jr., in the February 21, 1994, arrest warrant for CIA turncoat Aldrich H. Ames. The figures show amounts "exclusive of his salary deposits" deposited over a six-week period into two accounts held by Ames and his wife.

From Here to Paternity

"At the time I was appointed secretary, there were some media articles proclaiming that I was the 'father of stealth.' . . . I did play a very important role [in the 1970s] in energizing the government to move vigorously forward in this field, but I believed then and I believe now that Ben Rich provided the intellectual and the spiritual leadership and that the title 'father of stealth' really belongs to Ben."

Secretary of Defense William J. Perry, referring to former Lockheed executive and F-117 program manager Ben Rich, in a May 5, 1994, speech to the Global Air and Space 1994 International Forum, Arlington, Va. ■

Gallery of South Asian Airpower

By John W. R. Taylor and Kenneth Munson

Attack Aircraft

A-5

Under the domestic designation Q-5, China scaled up and extensively redesigned the J-6 (license MiG-19) fighter-bomber into a dedicated attack aircraft, 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, produced to meet an April 1981 order from the Pakistan Air Force, has a Martin-Baker zero/zero seat, upgraded avionics, and is adapted to carry weapons and drop tanks already standard on other PAF aircraft, including Sidewinder air-to-air missiles (AAMs). Nanchang delivered 52 to Nos. 7, 16, and 26 Squadrons at Peshawar and Masroor, although numbers are now reportedly down to little more than 40. Bangladesh ordered 20 similar aircraft, which now equip No. 8 Squadron at Chittagong and No. 21 at Dhaka. The 24 recently ordered by Myanmar are reportedly of the improved A-5M version, with uprated engines, 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 (incl 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-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 T-37B, enables the relatively small A-37B to carry up to 4,100 lb of weapons and other stores on eight underwing hardpoints. 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.

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 Industries for counterinsurgency and border-control duties. Fifteen were acquired by USAF for evaluation under the Credible Chase program, and 13 were later transferred to the Royal Thai Air Force in the early 1970s under the Pave Coin program. Twenty more were acquired by Thailand from 1975, and about



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



G-4 Super Galeb, Myanmar Air Force (Paul Jackson)

20 Peacemakers remain in service with Nos. 202, 213, and 712 Squadrons 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 freight carrying. Hatch in floor for dropping supplies or leaflets or for a camera installation.

Armament: four underwing hardpoints for total load of 1,400 lb and one underfuselage hardpoint for 590 lb. Armament and equipment can include gun or rocket pods, bombs, napalm, smoke grenades, a loudspeaker pod, cameras, etc. One side-firing 20-mm M197 gun or two 7.62-mm Miniguns in cabin.

G-4 Super Galeb

Before aircraft production was terminated at the former Soko factory in Mostar, at least 12 and possibly 20 Super Galebs were delivered to the Air Force of Myanmar. Intended for dual-role advanced training/light attack duties, they represented the first stage of a planned restructuring of the nation's air defense forces to cope with unrest on its borders and internally.

The Super Galeb is a far more formidable, sweptwing development of the straight-winged G-2A Galeb, which has served with air forces of the former Yugoslavia for some thirty years. In addition to a 23-mm gun, it can carry up to 2,822 lb of weapons underwing and has seen frequent combat service during the civil war in its fractured homeland. There are plans to resume manufacture of advanced versions of the G-4 at the Utva

plant in Pančevo, Serbia, to which some Soko plant and machinery were transferred in 1992.

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, stalling speed (gear and flaps down) 112 mph, service ceiling 42,160 ft, T-O run 1,877 ft, landing run 2,674 ft, range with two drop tanks (with reserves) 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

This twin-turboprop close-support aircraft was used in action against the British forces during the brief Argentine occupation of the Falkland Islands in 1982. A total of 108 were delivered to the Fuerza Aérea Argentina, and others to Uruguay and Colombia. The first operator outside South America is Sri Lanka, which took delivery of the first of four in December 1993, for operations against Tamil separatists. The Pucarás are based with No. 1 Wing at Anuradhapura. Sri Lanka has an option on six more.

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 6 3/4 in, length 46 ft 9 1/4 in, height 17 ft 7 1/4 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 according to fuel and weapon load.

Accommodation: two crew in tandem, on 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 lbs 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 important DPSA (deep penetration strike aircraft) requirement in 1978, after evaluating the type in competition with the Swedish Viggen and French Mirage F1. The IAF has ordered a total of 131 to date: 116 single-seaters and 15 tandem two-seaters. Twelve of the single-seaters are being equipped for maritime attack duties. The IAF name is **Shamsher** ("Assault Sword"). The first 40 for the IAF had Mk 804 Adour engines and were built by British Aerospace. On March 31, 1982, Hindustan Aeronautics Ltd flew the first of 45 more powerful Mk 811—engine Jaguars assembled from component kits manufactured in Europe. The remaining 46 aircraft have been manufactured almost entirely in India, and production is approaching an end.

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. The Indian-built Jaguars have provision for carrying two Magic self-defense missiles on overwing pylons. The maritime version has Thomson-CSF Agave radar in a modified nose, a new nav/attack system known as DARIN (display attack and ranging inertial navigation) 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 is equipped with BAe Sea Eagle antiship missiles. (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 1,044 mph, 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 max external stores 310 miles (lo-lo-lo), 432 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 for 10,000 lb of stores, including eight 1,000-lb bombs, BL755 or Belouga cluster bombs, packs of 68-mm rockets, or a reconnaissance camera pack. Two Sea Eagle antiship missiles in maritime version.

MiG-23/27 (NATO "Flogger")

Compared with the MiG-23M interceptor, the basic MiG-23B light attack aircraft has a redesigned forward fuselage, with the nose sharply tapered in side elevation to house a 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; and the type of turbojet is changed to a Lyulka AL-21F-300, more suited to low-level operation at high speed. In 1980, India ordered 95

MiG-23BNs (Flogger-F), with a similarly rated Soyuz/Khachaturov R-29B-300 turbojet and Sokol-23N nav/attack system. These aircraft fly with Nos. 10 (Winged Dagger), 220 (Desert Tigers), and 221 Squadrons, in which they replaced Maruts and Su-7BMKs. The Indian name is **Vijay**.

When Mikoyan developed a more specialized tactical strike variant of the MiG-23 as the MiG-27, the Indian government obtained license rights, and Hindustan Aeronautics Ltd began assembly of the most advanced version under the designation **MiG-27M** (Flogger-J). Known by the Indian name **Bahadur**, this has fixed engine air intakes instead of the variable-geometry type of the MiG-23; 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 many other refinements. It replaced Su-7BMKs

and Ajeits in 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.

The Afghan Republican Air Force had one squadron of MiG-27s. (Data for MiG-27M.)

Design Bureau: Mikoyan OKB, Russia.

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

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-kbombs, 57-mm rockets, two Kh-23 ("Kerry") ASMs, four R-60 ("Aphid") AAMs, or other stores.

Mirage 5

The Mirage 5 began life as a specialized ground-attack development of the Mirage III fighter. Originally, 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 options later made available led to a narrowing of the differences between the equipment standards of the III and 5. Pakistan, the only south Asia operator of the Mirage 5, placed an initial order for 28 single-seat **5PA2s** 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 PAs and PA2s as well as the two-seat DPA2s. (Data generally as for Mirage III.)



Jaguar, Indian Air Force
(Peter Steinemann)



MiG-27M, Indian Air Force
(Peter Steinemann)



Su-22M-4, Afghan Republican Air Force
(Peter Steinemann)

O2-337 Sentry

The Royal Thai Navy acquired 10 of Summit Aviation's O2-337 armed conversions of the Cessna T337 "push and pull" light twin in 1980–83 for counterinsurgency and antipiracy missions with its No. 3 Squadron; about half of them are thought to remain available. 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 a variety of weapons and other stores. No. 3 Maritime Squadron of the Sri Lanka Air Force uses six basic Cessna 337 Skymasters 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 more aggressive purposes. 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.

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

Sea Harrier

The Indian Navy has taken delivery of 23 single-seat **Sea Harrier FRS Mk 51** V/STOL combat aircraft since January 1983 for operation from its two carriers, *INS Vikrant* and *Viraat*. Similar to the Royal Navy's 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-22 (NATO "Fitter")

When the Soviet forces quit Afghanistan, the large numbers of aircraft that they passed to the Afghan Republican Air Force included a squadron of single-seat, variable-geometry Su-22M-4 (Fitter-K) attack fighters. This first became known when the pilot of one of them defected to the Pakistan Air Force Base at Peshawar July 6, 1989. The current status of the others is unknown, as the sites of major airfields in Afghanistan became controlled by different warring factions and many aircraft were destroyed.

The Su-22M-4 was 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. Its outer wings offer manually set sweep angles of 30°, 45°, and 63°. Other features

compared with early swingwing 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 10 1/2 in spread, 32 ft 10 in swept, length incl probes 62 ft 5 in, height 16 ft 0 1/2 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").

Su-25 (NATO "Frogfoot")

Up to 50 of these single-seat close-support aircraft are reported to have been dispersed among Afghan Republican Air Force units at Bagram, Mazar-e-Sharif, and Shindand before these bases fell into the hands of opposing warlords. The *mujahideen* had earlier destroyed 23 Soviet Su-25s, mostly with shoulder-fired SA-7 surface-to-air missiles (SAMs), casting doubts on the aircraft's effectiveness in such an environment. Structural survivability features, heavy cockpit armor, fireproof fuel tanks, and up to 256 infrared countermeasures (IRCM) flares are intended to ensure ability to penetrate a battlefield at low level with a heavy weapon load. More reassuring is that an efficient laser guidance system is claimed to place ordnance within 16 ft of a target over a standoff range of 12.5 miles.

Design Bureau: Sukhoi OKB, Russia.

Power Plant: two Soyuz/Tumansky R-195 turbojets, each 9,921 lb thrust.

Dimensions: span 47 ft 1 1/2 in, length 50 ft 11 1/2 in, height 15 ft 9 in.

Weights: empty 20,950 lb, gross 32,187-38,800 lb.

Performance: max speed at S/L Mach 0.8, max attack speed with airbrakes open 428 mph, ceiling 22,965 ft, T-O run 1,970-3,935 ft, landing run with brakechutes 1,312 ft, range with max weapon load at S/L 466 miles, at height 776 miles.

Accommodation: pilot only, on ejection seat.

Armament: one twin-barrel 30-mm gun, with 250 rds (sufficient for one-second burst during each of five attack runs) in nose. Eight large underwing pylons for up to 9,700 lb of air-to-surface weapons, including SPPU-22 pods containing 23-mm guns with barrels that pivot downward; 57-mm to 330-mm rockets; laser-guided, rocket-boosted 772-lb to 1,477-lb bombs; and 1,100-lb incendiary, antipersonnel, and chemical cluster bombs. Two small outboard pylons for R-3S ("Atoll") or R-60 ("Aphid") self-defense AAMs.

Bombers and Maritime Aircraft

BN-2 Maritime Defender

About 1,200 of these small STOL utility transports have been built since the late 1960s, a substantial proportion of them sold worldwide as **Defenders** or military **Islanders**, with either 260 hp O-540 or 300 hp IO-540 piston engines or 320 shp turboprops. Maritime Defenders are characterized by a "thimble" nose fairing for their search radar. Major regional operator is the Indian Navy, which received 12 Maritime Defenders with Bendix RDR 1400 radar in the early 1980s, 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 has recently formed a new squadron, No. 93, to operate two Maritime Defenders delivered to the Maritime Security Agency for 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 example may be in service with the Seychelles Navy. (Data refer to 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, 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 auxiliary fuel tanks.

Br 1150 Atlantic 1

In 1975-76, the French Navy sold three of its original Atlantic maritime patrol aircraft to Pakistan; 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. The "double-bubble" fuselage has a pressurized upper deck roomy enough



Canberra PR.67 and B(I).58, Indian Air Force (Peter Steinemann)



Dornier 228-212, Royal Thai Navy



F27 Maritime, Pakistan Navy (Peter Steinemann)

for 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 fintip. Sonobuoys and marker flares are stowed in the rear fuselage. Thomson-CSF of France is to upgrade two of the 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 52,900 lb, gross 95,900 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

Since being replaced by Jaguars in the low-level strike role, surviving Indian Air Force Canberra B(I).58s have been flown by No. 6 Squadron for antiship strikes, together with B.66s (refurbished ex-RAF B.15s and 16s), ex-RNZAF B(I).12s, a few TT.18 target tugs modified by HAL from ex-RAF T.4s, and Jaguars. 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, range 3,400 miles.

Accommodation: pilot and navigator, side by side, 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 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 duties, 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, loud-speaker, marine markers, a sliding cabin door to permit airdropping a 20-man life raft, and provisions for underwing antipollution spraypods.

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 are planned) is also the 228-201, equipped for maritime surveillance and antisurface vessel (ASV) missions with Super Marec radar and antiship missiles. Deliveries, initially replacing the few remaining Breguet Alizés, 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 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 F27 Maritime is unarmed and configured primarily for coastal surveillance or search and rescue, although a **Maritime Enforcer** variant can be equipped by the operator for antisubmarine warfare (ASW), ASV, 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 in EW configuration. Three or more Mk 200s, some of which have been converted and up-

graded to F27 Maritime configuration, 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 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 turbo-prop; 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.

II-38 (NATO "May")

This intermediate-range, shore-based, antisubmarine/maritime patrol aircraft was developed from the Il-18 turboprop airliner. Its operational avionics include nav/weather radar in the nose, search radar (NATO "Wet Eye") in an undernose radome, and an MAD tail-sting. Weapons and other stores are carried in two internal bays in the fuselage, forward and aft of the wing carry-through structure.

The only unit operating II-38s outside the Commonwealth of Independent States (CIS) is INAS 315 (Winged Stallions) of the Indian Navy, which has flown five refurbished examples from Dabolim, Goa, since 1977.

Design Bureau: Ilyushin OKB, Russia.

Power Plant: four Ivchenko AI-20M turboprops; each 4,250 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 twelve.

Armament: attack weapons and sonobuoys in weapons bays.

N24A Searchmaster/N22B Missionmaster

Thailand is the only operator of this Australian short/medium-range STOL utility twin on the south Asian mainland. Its Navy's No. 2 Squadron has five of the N24A Searchmaster L maritime patrol and surveillance version, 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. At least one has 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 with 45 min reserves 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

Nearly 650 P-3 landbased maritime patrol and antisubmarine aircraft have been delivered for worldwide service, but none is yet operated in its primary role by a south Asian air force. Five former US Navy P-3As were delivered to the Royal Thai Navy in 1993-94. With their ASW equipment deleted, two are being converted into P-3T patrol aircraft; one will become a UP-3T utility/trainer; 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 8 1/2 in.



Il-38, Indian Navy



Tu-142M, Indian Navy (BAe/Chris Riding)



F-5A, Royal Thai Air Force (Paul Jackson)

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) 1,550 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")

Russia's giant Tu-95/142 turboprop combat aircraft have spearheaded its strategic attack and maritime air forces for four decades. The only export customer 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 over-water search-and-surveillance radar is housed in a large radome under the center-fuselage. A fairing that projects rearward 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 signaler, 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

The only operator of F-5s in the region covered by this Gallery is the Royal Thai Air Force, which has reassigned them to surface-attack roles, including antiship missions, since receiving F-16s. It is reported to have nine of the original single-seat F-5A fighters and two two-seat F-5B combat trainer counterparts, serving alongside 38 improved F-5E single-seaters and six two-seat F-5Fs. The F-5Es are being updated with Litton LN-39 INS, AN/ALR-46 radar warning receivers, ALE-40 chaff/flare dispensers, and HUDWACS, plus provision for carrying a podded GPU-5/A 30-mm gun of the kind fitted to the A-10A Thunderbolt II. A few RF-5 reconnaissance variants are also in service, and the RTAF is believed to be considering the purchase of more F-5A/Bs from South Korea. (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 1 1/4 in over wingtip AAMs), length (incl nose-probe) 47 ft 4 3/4 in, height 13 ft 4 1/4 in.

Weights: empty 9,723 lb, gross 24,722 lb.

Performance: max speed at 36,000 ft Mach 1.64, ceiling 51,800 ft, T-O run 2,000-5,700 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, on 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")

Most of the Mikoyan MiG-19s license-built and later developed in China were produced by Nanchang 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 JJ-6 (export FT-6) tandem two-seat trainers designed and produced by Shenyang between 1973 and 1986.

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 Bangladesh to offset heavy losses sustained during that country's disastrous floods. Bangladesh had previously received 24 F-6s directly from China, but only No. 25 Squadron at Chittagong is now thought to be 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 Guizhou Aircraft Industrial Corporation, People's Republic of China.

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

Dimensions: span 30 ft 2 1/4 in, length incl probe 48 ft 10 1/2 in, height 12 ft 8 3/4 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 71 (54 As and 17 Bs) were embargoed by the US government as a result of Pakistan's refusal to sign the nuclear nonproliferation treaty. Attrition has reduced the original 40 to about 35, but since 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, if and when delivery is approved, will be 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 of this batch had been completed before the October 1990 embargo; Pakistan Air Force plans are for an eventual five F-16 squadrons.



F-6, Pakistan Air Force
(Peter Steinemann)



F-16A Fighting Falcons, Pakistan Air Force (Peter Steinemann)

Deliveries of 12 Block 15 OCU F-16As and six 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 in mid-1996, will be to a new and unique Block 20 standard, with color displays and AN/APX-111 IFF (identification, friend or foe) similar to that of the midlife update now being introduced on European F-16s. (Data for F-16A.)

Contractor: General Dynamics Corporation, USA.
Power Plant: one Pratt & Whitney F100-PW-220 turbofan; 23,450 lb thrust with afterburning.
Dimensions: span 31 ft 0 in, length 49 ft 5 1/2 in, height 16 ft 8 1/2 in.
Weights: empty 15,586 lb, gross 23,810-35,400 lb.
Performance: max speed at 40,000 ft more than Mach 2.0, ceiling more than 50,000 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 under-fuselage 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.

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

The Afghan Republican Air Force was one of the last combat services to retain MiG-17s as front-line fighter-bombers, in its 393d Regiment at Mazar-e-Sharif. Whether they 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 now form part of 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 9,220 lb, gross 13,955 lb.
Performance: max speed at 13,125 ft 696 mph, ceiling 52,000 ft, T-O run 2,400 ft, landing run 3,000 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.



F-7M Airguards, FT-7, and FT-5s, Sri Lanka Air Force (Peter Steinemann)

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

By far the largest south Asian operator of MiG-21s is the Indian Air Force, for which several hundred were assembled and later built under license 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 four M/MF squadrons (Nos. 17, 18, 101, and 108). Various foreign bids to upgrade their avionics and weapon systems are currently being considered. 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 former USSR. 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 the 322d Fighter-Interceptor Regiment.

Virtually all other MiG-21 variants in the region are F-7M Airguards, an export version of the domestic J-7 II developed in China from the original J-7 (license-built MiG-21F-13). Production of the F-7M was authorized in December 1984 and brought an early order in 1985 from the Pakistan Air Force for 20 aircraft, deliveries of which, to No. 20 Squadron at Rafiqi, began in July 1988; they achieved initial operational capability some 16 months later. Designated F-7P by the PAF, they incorporate modifications to meet Pakistani require-

ments. The initial 20 have since been supplemented by a further 60 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 outstanding order for F-16s. Other recent recipients of the F-7 include the air forces of Bangladesh and Sri Lanka. Bangladesh has 16 F-7Ms in service with No. 5 Squadron (Supersonics) at Dhaka and No. 35 (Thundercats) at Chittagong. A couple of 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 designated F-7BS, with an early-model F-7B fuselage and the four-pylon wings of the F-7M. A reported Myanmar order for 11 F-7Ms has yet to be confirmed. (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) is equipped with MiG-23MF (NATO Flogger-B) variable-geometry single-seat interceptors 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 less powerful (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 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 70 MiG-29 (Fulcrum-A) single-seaters and 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. 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.

India is reported to have ordered, for immediate delivery, 20 advanced MiG-29Ms (Fulcrum-E), with quadruplex fly-by-wire controls, a "glass" cockpit with two multifunction cathode-ray tubes and HOTAS (hands on throttle and stick) controls, 19,400 lb thrust RD-33K engines, new terrain-following and ground-mapping radar, new IRST, and other improvements. (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 3/4 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 1.06, ceiling 55,775 ft, T-O run 820 ft, landing run with brake-chute 1,970 ft, range 932–1,800 miles.

Accommodation: pilot only, on ejection seat (two seats in tandem in MiG-29UB).

Armament: six close-range R-60T ("Aphid") or four R-60T and two medium-range R-27R ("Alamo-A") AAMs on six underwing pylons; provision for carrying R-73A ("Archer") close-range AAMs; able to carry bombs, submunitions dispensers, 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

Survivors of the original 36 Mirage IIIs ordered for the Pakistan Air Force between 1967 and 1975 now equip the service's No. 5 Squadron at Rafiqui. The 18 **Mirage IIIEP** all-weather low-altitude attack fighters and five **Mirage IIIDP** tandem two-seat trainers are now reduced to a combined total of about 18, plus three of the original reconnaissance **Mirage IIIRPs** (which see). 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 late last year of a new SAGEM weapon delivery, navigation, and reconnaissance system known as Maestro, aimed at extending their air-to-air performance and providing also an air-to-ground attack capability. A new multimode pulse-Doppler radar is also expected. The 43 **Mirage IIIOs** and seven two-seat **DOs** acquired when Australia replaced them with Hornets are being reworked by the Pakistan Aeronautical Complex'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, at the rate of one to two per month, to equip two further squadrons; the remainder are expected to be cannibalized for spares. (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 1 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-to-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 a total of 42 single-seat **Mirage 2000Hs** and seven two-seat **2000THs** 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. Plans to acquire substantially more were shelved in favor of an order for Russian MiG-29s. The IAF's current 2000Hs are generally similar to French Air Force **Mirage 2000Cs**, with RDM (Radar Doppler Multimode) (range 62 miles), Ullis 52 INS, head-up and head-down cockpit displays, ECM jammers and chaff/flare dispenser, Spirale passive countermeasures, and Servat 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 2 1/2 min of leaving the runway. Indian name for the **Mirage 2000H** is **Vajra** ("Divine Thunder"). (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 1 1/2 in, length 47 ft 1 1/4 in, height 17 ft 0 3/4 in.

Weights: empty 16,534 lb, gross 37,480 lb.

Performance: max speed at height Mach 2.26, ceiling 59,000 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 Durandal 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.

Helicopters

AH-1 HueyCobra

Pakistan and Thailand have both been customers for Bell's HueyCobra gunship during the past decade. The Pakistan Army's first HueyCobras (10 aircraft) were followed by a further 10 received in 1985. They equip Nos. 31 and 32 Squadrons, both based at Multan. A more recent order was embargoed by the US government. The Royal Thai Army operates four AH-1s, delivered in November 1990. All are to standards comparable with the US Army's AH-1F full-capability TOW (tube-launched, optically tracked, wire-guided) missile-carrying version, with a Hughes laser rangefinder/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 Textron Lycoming T53-L-703 turbo-shaft; 1,800 shp.

Dimensions: rotor diameter 44 ft 0 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 stub-wing; outer stations can each carry four TOW antitank missiles, inboard stations each a launch tube for seven to nineteen 2.75-in rockets. GE undernose turret for M197 20-mm three-barrel gun with 750 rds.

AS 330 Puma and AS 332 Super Puma

The prototype of the Puma multipurpose helicopter first flew April 15, 1965, and by 1989 Anglo-French production had totaled 697 for delivery to 46 countries, 34 of which have used them for military duties. Production continues in Romania. Major user in south Asia is the Pakistan Army, which has about 30 of the **AS 330L** final production model for miscellaneous transport du-



Mirage 2000H, Indian Air Force
(Press-Office Sturzenegger)



AS 330 Puma, Royal Nepalese Air Force
(Peter Steinemann)



Bell 212s, Bangladesh Air Force
(Peter Steinemann)

ties; 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-model 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, along with a single **AS 332L Super Puma** (new power plant, updated transmission, and airframe improvements). (Data for *AS 330L*.)

Contractors: Aerospaziale, France; Westland Helicopters, UK.

Power Plant: two Turbomeca Turmo IVC turboshafts; each 1,575 shp.

Dimensions: rotor diameter 49 ft 2 1/2 in, fuselage length 46 ft 1 1/2 in, height 16 ft 10 1/2 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 80 of these twin-turbine helicopters are in military service or on order by south Asian countries, consisting of about 70 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 eleven 212s serve with No. 31 (VIP) Squadron of the Bangladesh Air Force at Dhaka and 12 (of which nine have been converted locally to gunship configuration) with No. 4 Wing of the Sri Lanka Air Force. The latter has also converted its four 412s to a similar configuration.

Largest regional user is Thailand, whose army has 25 or more 212s and four 412s, border police thirteen 212s, and navy eight 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 2 1/4 in (46 ft 0 in), fuselage length (both) 42 ft 4 3/4 in, height 12 ft 10 in (10 ft 9 1/2 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")

The Indian Navy continues to operate about five of the seven Ka-25PL antisubmarine helicopters that it purchased for service on board its *Kashin II*-class destroyers. Their prime mission is ASW, with secondary surveillance and search-and-rescue (SAR) duties. They are being superseded by Ka-28s.

The Ka-25PL is a typical Kamov design, with contra-rotating 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 7 3/4 in, fuselage length 32 ft 0 in, height 17 ft 7 1/2 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")

As replacements for Ka-25PLs on its new and upgraded *Kashin*-class ships, the Indian Navy has procured at least 13 Ka-28 ASW helicopters, of which three are assigned to training duties. Generally similar to the CIS Navy's Ka-27PL, each new aircraft 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 contra-rotating 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, 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. 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 155 mph, ceiling 12,000 ft, range 310 miles.

Accommodation: crew of three; up to 16 persons on folding seats in cabin.

Armament: two torpedoes or four depth bombs, plus sonobuoys, in ventral weapons bay.

Mi-8/17 (NATO "Hip")

Around 170 of these general-purpose helicopters are in military service in south Asia. All use virtually the same airframe and share the NATO reporting name Hip. The Mi-8 is the original version, produced with two TV2 turboshaft engines and a starboard-side tail rotor. Since the beginning of the 1980s, customers wanting higher performance have been able to buy the Mi-17 (Hip-H), with 1,950 shp TV3-117MT engines in shorter nacelles and with the tail rotor on the port side.

The basic Mi-8 Hip-C is the standard heavily armed assault transport, able to put down troops, equipment, and supplies behind enemy lines within 15–20 min of a nuclear or conventional bombardment/air strike. The Mi-8 Hip-F is even more heavily armed, with a 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 100, Pakistan Army 10, and Sri Lanka three. The Mi-8MT and Mi-8MTV are Hip-Cs and Fs updated to Mi-17 standard. (Data for 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-25/35 (NATO "Hind")

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 stub-wings, 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 mountings. 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. Mi-25s and -35s or -35Ps are known to have been delivered to Afghanistan (about 55) and India (32 in two squadrons). (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 5½ 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; 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 rock-



Ka-28, Indian Navy (Denis Hughes)



Mi-17, Bangladesh Air Force (Peter Steinemann)



SA 315B Lama, Pakistan Army Aviation (Peter Steinemann)

ets, 20-rd packs of 80-mm rockets, UPK-23 pods each containing a GSh-23 twin-barrel 23-mm gun, up to 3,300 lb of bombs, mine dispensers, or other stores. Provisions for firing AK-47 guns from cabin windows.

Mi-26 (NATO "Halo")

The prototype of the Mi-26, the world's largest production helicopter, flew for the first time December 14, 1977, and production models became fully operational with air forces of the former Soviet Union in 1983. The 10 Mi-26s of No.126 (Feather Weight) Helicopter Unit of the Indian Air Force represent the only known military export deliveries. 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 five; 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 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

First flown in 1969, by Aerospatiale in France, the Lama was developed from the Alouette II to meet an

Indian forces' requirement for a helicopter capable of efficient operation in the Himalayas. In 1972, one was flown to a height of 40,820 ft, which remains unbeaten as an altitude record for helicopters. When manufacture ended in France, it was taken over by HAL, which had delivered 222 by the beginning of April 1993, 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 Siachan 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 with slung cargo 4,078 lb.

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 2,204 lb.

Armament: none.

SA 316/319 Alouette III and Chetak

French production of the original SE 3160 was superseded in 1969 by the SA 316B with uprated Artouste engine, built also by Romania (200) and Switzerland (60). Final French version was the SA 319B, with a 600 shp Astazou XIV turboshaft, which remained in production until 1985. 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 Coast Guard (CGAS 800). With the smaller Cheetah, the Chetak is one of the types destined for replacement by HAL's new advanced light helicopter now undergoing flight testing. 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 Army Force has about a dozen (average of two each with six squadrons) for SAR and light duties; that country's army has about the same number for liaison; its Navy's No. 333 Squadron has four equipped with depth charges for ASW. (Data for HAL-316B Chetak.)

Contractors: Aerospatiale, France; Hindustan Aeronautics Ltd, India.

Power Plant: one 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 Helicopters of the UK was licensed to build the Sikorsky SH-3 antisubmarine helicopter, with extensive power plant and equipment changes, to meet a Royal Navy requirement. In addition, it produced similar Sea Kings for various customers, including the navies of India and Pakistan, which continue to 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 INAS 336 and six Mk 42Cs, the last-named variant being an assault and transport version similar to the Westland Commando. About three dozen of India's original 41 remain in service; typical equipment on the ASW Mk 42B includes MEL Super Searcher radar, Doppler navigation, GEC Avionics 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 to carry 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, 2 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 ten 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 Textron Lycoming T53-L-13 turboshaft; 1,400 shp.

Dimensions: rotor diameter 48 ft 0 in, fuselage length 41 ft 10 3/4 in, height 11 ft 9 3/4 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, with US collaboration, it attempted to find a follow-on type that could compete in Western markets. This aircraft, the Kania, had 420 shp Allison 250-C20B turboshafts and was certificated in Poland two years later. It 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 two and a half times the payload. It first flew November 16, 1979, production began in 1985, and the 50 or more delivered by early 1994 included 12 for the Myanmar Air Force, primarily for SAR and liaison missions. (Data for W-3A.)

Contractor: PZL Swidnik, Poland.

Power Plant: two PZL Rzeszów PZL-10W turboshafts; each 888 shp.

Dimensions: rotor diameter 51 ft 6 in, fuselage length 46 ft 7 in, height 12 ft 5 1/2 in.

Weights: empty 8,488 lb, gross 14,110 lb.

Performance: max cruising speed at 3,280 ft 148 mph, max cruising speed at 1,640 ft 146 mph, ceiling 19,685 ft, range (no reserves) 472 miles (internal fuel), 801 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 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. **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-round rocket pod.



IAI-201 Arava



MiG-25R, Indian Air Force (Peter Steinemann)

MiG-25R (NATO "Foxbat-B")

No. 102 (Trisonics) Squadron of the Indian Air Force has four MiG-25R (Foxbat-B) single-seat reconnaissance aircraft and two two-seat MiG-25RU (Foxbat-C) trainers. Since their delivery in 1981, these Mach 2.83 aircraft have given India a capability unmatched in Asia outside the CIS. They are strictly "straight and level" aircraft, with no concessions to agility. Construction is 80 percent 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. Tanks in each fin provide an additional 185 gallons of fuel compared with the MiG-25 interceptor. 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 aft of the small dielectric nosecone that replaces the interceptor's Smerch fire-control radar.

Design Bureau: Mikoyan OKB, Russia.

Power Plant: two Soyuz/Tumansky R-15BD-300 turbojets; each 24,700 lb thrust with afterburning.

Dimensions: span 44 ft 0 1/4 in, length 78 ft 1 3/4 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/81 mph ejection seat.

Armament: none.

Mirage IIIR

Pakistan's first purchase of photoreconnaissance Mirages from France was a trio of Mirage IIIRPs, delivered in 1969 and basically similar to the IIIE fighter except for replacement of the latter's Cyrano fire-control radar by an extended nose section containing a battery of five Omera Type 31 cameras. 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 weap-

only 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")

The Indian Air Force has retired the last of its veteran An-12BP paratroop and medium-range cargo transports during the past year; but some of the 12 that equipped the Afghan Republican Air Force in the early 1990s are believed to survive, despite frequent use by the various 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 upstair rear fuselage, but the An-12BP lacks an integral ramp for vehicles.

Except for its more pointed nose transparencies, the Chinese Y-8 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. The first Y-8 flew at Xian December 25, 1974. Subsequent deliveries include two Y-8Ds for 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; one lost in 1992 is being replaced. (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")

When Oleg Antonov introduced the prototype of his 50-passenger An-24 in 1960, he could hardly have imagined that it would evolve into a family of transports that would continue in large-scale production 34 years later. The status of the single 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 based at Kabul at the time of the Soviet withdrawal from Afghanistan are still serviceable.

Except for its 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 on to the floor of the hold, or when the cargo is to be airdropped. (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 airdropping. Provision for carrying 40 paratroops 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.

Current production rate of the An-32 is 40 aircraft a year, mostly for CIS military use. India took delivery of 123, and these are named *Sutlej*, 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.

Design Bureau: Antonov OKB, Ukraine.

Power Plant: two ZMKB Progress/Ivchenko AI-20D Series 5 turboprops; each 5,042 ehp.

Dimensions: span 95 ft 9½ in, length 78 ft 0¼ in, height 28 ft 8½ 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 parachutists 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 it is the Royal Thai Air Force, whose No. 603 Squadron at Don Muang has about 15, including one camera-equipped RC-47 for photographic reconnaissance. (Data for RC-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 appropriateness of the Hercules name 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-100-20; the L-100-20 has a slightly longer (106 ft 1 in) fuselage. The 11 C-130s have recently been upgraded by Singapore Aerospace. 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 2,356 miles.

Accommodation: crew of four, plus loadmaster; up to 92 troops, 64 paratroops, 74 litters and two medical attendants, or equivalent weight of vehicles, artillery pieces, or cargo in main cabin.

Armament: none.

C-212 Aviocar

Two of these small Spanish STOL utility transports were ordered late last year by the Myanmar Air Force. Eight others, mostly Indonesian-built NC-212-200s, already serve with the Royal Thai Air Force, the only other Aviocar operator in the south Asia region. The -200 series has been the main production version of



Il-76MD Gajaraj, Indian Air Force
(Paul Jackson)



Y-12, Sri Lanka Air Force
(Peter Steinemann)

this useful aircraft, accounting for nearly 250 of the 400-plus delivered from separate production lines in Spain and Indonesia for both civil and military customers. Spanish production now concentrates on the improved C-212-300, with winglets and other improvements, but the -200 continues as the current Indonesian-built version. (Data for C/NC-212-200.)

Contractors: Construcciones Aeronauticas SA (CASA), Spain; Industri Pesawat Terbang Nusantara (IPTN), Indonesia.

Power Plant: Two Garrett TPE331-10R-511C turboprops; each 900 shp (flat rated).

Dimensions: span 62 ft 4 in, length 49 ft 8½ 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 paratroops 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.

HS 748

British-built Hawker Siddeley 748s serve in south Asia 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). Most numerous in the region, however, are those of 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 Squadron at Palam. Most of these continue in service, the freighters with No. 11 (Rhinos) Squadron at Gwalior and the trainers with either the Navigation and Signals School at Begumpet or the Transport Training Wing at Yelahanka. Two civil-registered 748s serve, under military control, with India's Border Security Force. A prototype 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 1993. (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 ehp.

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 paratroops 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.

Il-76 (NATO "Candid")

Russia's counterpart of USAF's C-141, the Il-76 (NATO Candid-B) first flew March 25, 1971, and set 25 international records four years later, lifting a payload of more than 70 metric tons to a height of 38,960 ft and carrying this load around a 1,000-km circuit at a speed of 532.923 mph. More than 800 Il-76s have since been built, with production continuing at the Chkalov Plant in Tashkent, Uzbekistan. Twenty-four Il-76MDs equip Nos. 25 and 44 (Mountain Geese) Squadrons of the Indian Air Force, with the name *Gajaraj*. Compared with the original military Il-76M, the MD has D-30KP-2 uprated engines that maintain full power up to ISA + 23°C, against ISA + 15°C for earlier D-30KPs. 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 Il-76 can carry troops as an alternative to freight. (Data for Il-76MD.)

Design Bureau: Ilyushin OKB, Russia.

Power Plant: four Soloviev D-30KP-2 turboprops; each 26,455 lb thrust.

Dimensions: span 165 ft 8 in, length 152 ft 10¼ 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 paratroops, 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/Shorts 330

The Skyvan is a small but versatile transport, with a 6 ft 6 in square interior cross section that 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 upswep rear fuselage gives unrestricted access to the hold. Two examples in service with the Royal Nepalese Air Force are *Skyvan Srs 3Ms*, suitable 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. The Royal Thai Border Police operate three *Skyvan Srs 3Ms* and three *Shorts 330-UTTs*. The latter are essentially stretched *Skyvans*, with 1,198 shp Pratt & Whitney Canada PT6A-45R turboprops and an 8,000-lb payload that can comprise 33 troops, 30 paratroops, 15 litters and four seated casualties, or freight. (Data for *Skyvan Srs 3M*.)

Contractor: Short Brothers plc, UK.

Power Plant: two Garrett 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: max cruising speed 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 paratroops 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 have been delivered to the Sri Lanka Air Force. Although nominally they belong to the 2d Transport Wing at Ratmalana, they have provided positive proof of the "general purpose" part of their type description. 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.

Contractor: Harbin Aircraft Manufacturing Corporation, People's Republic of China.

Power Plant: Two Pratt & Whitney Canada PT6A-27 turboprops; each 680 shp (flat rated).

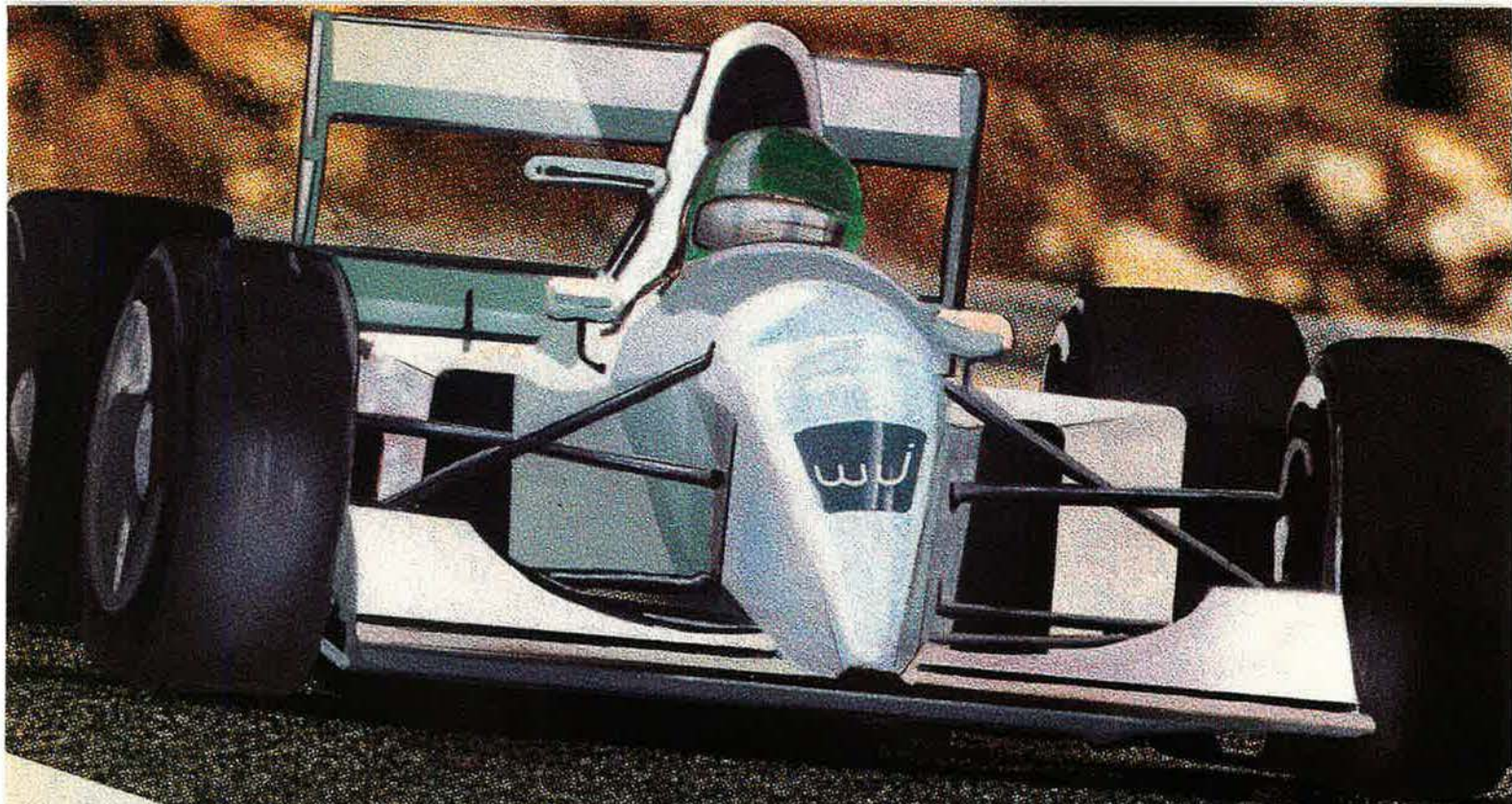
Dimensions: span 56 ft 6½ in, length 48 ft 9 in, height 18 ft 3½ in.

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, 16 paratroops, or 3,748 lb of cargo.

Armament: normally none.



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With maintenance business down, the question is how the remaining work should be allocated among the services and industry.

Depots in Dispute

By Peter Grier

AIR FORCE depots are facing an uncertain future. With a smaller force structure to fix and private contractors hungry for maintenance business, the question is not whether depot capacity will get smaller in the next few years but how great the reduction will be. Some depot supporters are concerned that the next round of major base closings, currently set for 1995, could cause the demise of entire facilities.

Industry, Defense Department civilians, and all the services agree that military depots must retain a core minimum of skills and capacity to support force readiness. Determining the specifics of what is and is not core repair work could prove difficult, however, as US forces continue to adapt to the changing environment of the post-Cold War era.

One significant casualty of the coming maintenance shakeout may be the competition for work loads between depots and private firms and between service depots themselves. The recent report of the Defense Science Board's blue-ribbon Task Force on Depot Maintenance Management recommended that the Pentagon do away with these contests, saying they



USAF photos by Kenneth Hackman

At Warner Robins Air Logistics Center, Robins AFB, Ga., a sheet metal worker builds a C-130 part. The large and diverse ALC supports many aircraft, missiles, and systems. San Antonio ALC at Kelly AFB, Tex., which modernizes and maintains all USAF C-5s (like that opposite), also manages most of the USAF engine inventory, USAF and NASA fuel and lubricants, and nuclear weapons.

can lead to "friction and even suppressed hostility" between contractors and depots. Air Force members of the Defense Science Board (DSB) panel registered a strong dissent to this conclusion, insisting that public-private competitions produce substantially lower costs for the taxpayer, whichever side wins.

Though the costs had not been fully tallied, the Air Force predicted the final figures would show that competitions saved \$353 million between 1991 and 1993, says Ron Baty, chief



of the depot maintenance division of Air Force Materiel Command.

The Pentagon accepted the DSB's recommendations. Deputy Secretary of Defense John M. Deutch, in a May 4 memo to USAF and Navy leaders, "discontinued" both public-private and public-public competitions and instructed the military departments to find new procedures.

Congress may yet reverse the Pentagon's action. After completing its work on the 1995 defense budget, the House Armed Services Committee served notice that it "disagreed with [DoD's] definition of work load that should remain in government facilities" and also with the assertion that all work above this level should be performed by private companies without competition from the depots.

"The committee feels this is unwise, as there is no incentive for the private sector to provide maintenance at the lowest possible cost," the panel claimed in a statement.

Seeking a Balance

Figuring out how to manage the coming depot drawdown has proved one of DoD's more difficult man-

agement tasks of recent years. It not only involves establishing what maintenance work the military will need to continue into the next century but also calls for determining the proper balance between private and public sector capacity for repair work.

The Air Force and other services have built up a massive depot system over the years to ensure that repair and maintenance work could be surged in time of emergency. Today it is no secret that defense firms are eyeing depot jobs with envy. Many contractors, as well as some Pentagon officials and outside experts, think that shifting more maintenance work away from the government could be a cheap and effective way of bolstering the struggling US defense industrial base.

Meanwhile, Pentagon officials wonder if cuts in depot overhead could help offset budget reductions. A 1992 Joint Chiefs of Staff study estimated that the Department of Defense had twenty-five to fifty percent more depot capacity than it would need in the future.

The congressional delegations of states with depots are preparing to vigorously defend their facilities,

which are often the largest employers for hundreds of miles around. "The depot maintenance environment has been particularly dynamic" this year, noted Deputy Under Secretary of Defense for Logistics James R. Klugh at a congressional hearing April 12.

To help sort out the depot tangle, Congress last year ordered a DSB study. The board brought together service depot experts with a wide range of industry counterparts and issued a figure-laden report this year. Among other things, the DSB task force concluded that the Pentagon's depot business has totaled about \$15 billion annually in recent years—some \$2 billion more than the level stated in previous estimates. The report also asserted that about seventy percent of this work is now carried out in the Defense Department's own depots and that this percentage is increasing. (When subcontracts for parts and services are considered, about fifty percent of depot maintenance funding actually flows to the private sector, according to a General Accounting Office estimate.)

Aviation—both fixed-wing aircraft and helicopters—accounts for thirty-

seven percent of all Pentagon depot work, according to the DSB report. Ships take up another thirty-eight percent. All other categories, including missiles, tanks, and other vehicles, make up the remaining twenty-five percent. The Navy is by far the biggest spender of depot dollars, and the Air Force is second, with \$4.2 billion spent annually.

The DSB study strongly endorsed the Pentagon's approach of retaining a core capability in DoD depots. "Core," said the DSB, should be judged in terms of skills and facilities rather than work on particular weapon systems. According to the report, results now emerging from service calculations show that only about forty to fifty percent of current depot work load fits in the core category.

Not Level

Current law requires that at least sixty percent of the Pentagon's maintenance work be done by federal employees. This law should be revoked, said the DSB study. The report further recommended that major modifications be carried out largely by the private sector, with DoD depots focusing on routine repair and readiness work loads.

Over Air Force representatives' objections, the DSB task force concluded that competition for jobs between industry and depots is counterproductive. The playing field can never be level, and thus contractors will always be suspicious when they

lose, said the DSB study. In addition, the hostility generated by these competitions "may be undermining the government-industry teamwork so critical to the nation's defense," said the DSB report.

The DSB panel also urged that competition between depots be replaced with less-acrimonious inter-service agreements similar to those under which Air Force helicopters receive depot maintenance from other military services.

Industry has applauded the DSB findings, but the high-visibility task force is unlikely to have the final word on the depot issue. Top DoD officials have already rejected a DSB proposal that "core" be determined service by service, as opposed to Pentagon-wide. DSB's recommendations have widened the split between the Air Force and other services over depot competition.

Most involved now believe that leadership on the issue of depot capacity simply must surface next year in the third round of the Base Realignment and Closure (BRAC) process. With thousands of jobs at stake, the issue is too big to resolve in any way except politically.

"This is what we created the BRAC [Commission] for," says Dr. Loren B. Thompson, Georgetown University's deputy director of the National Security Studies Program and executive director of the Industry Depot Task Force Support Group.

Air Force logistics officials say

they fully recognize the need to shrink depot resources in an era when there are fewer aircraft to service and more force reductions are down the road. Indeed, Air Force depots are already downsizing: During Fiscal Year 1994 the service will eliminate 386,000 square feet of depot industrial space. Current plans call for 1.7 million square feet to be scrapped by the end of Fiscal 1999. Measured in production capacity, that translates into a reduction in depot muscle of nineteen percent.

The focus on retention of core abilities is proper, in the Air Force's view. The service would need about seventy-three percent of its current organic depot resources to carry out core and "last-source-of-repair" activities, Gen. Ronald W. Yates, commander of Air Force Materiel Command, told Congress.

The ability to perform major modifications is not an Air Force core requirement, say service officials, though depots might be the best places to do such work when aircraft are already in the shop for routine extensive overhauls. The Air Force agrees with civilian Pentagon leadership that the term "core" should be used as a measure by the Pentagon, not by each service. That way the services can rid themselves of unnecessary duplication.

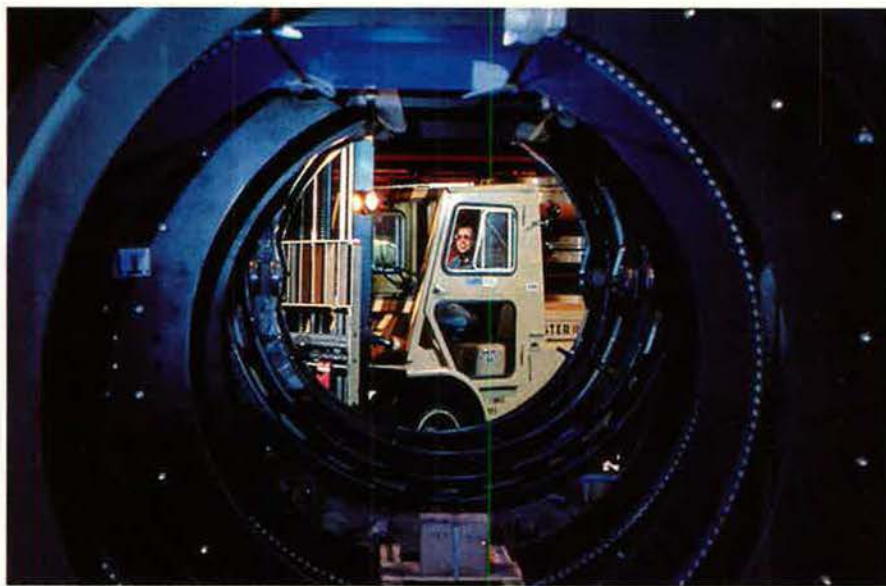
"It makes economic sense," says AFMC's Mr. Baty. "The Air Force does none of its own helicopters. We're doing Navy C-130s out at Ogden [Air Logistics Center, Hill AFB, Utah]."

Sharper Skills, Lower Cost

The Pentagon move to do away with depot competition bothers many USAF logisticians. To them, an occasional scrap for work between depots and the private sector sharpens depot management skills. It forces depot leaders to scrutinize their costs and force structure, resulting in eventual savings for taxpayers no matter who triumphs in the competition at hand. "We absolutely do believe it saves money," says Mr. Baty.

Firms that specialize in repair work are often highly competitive with depots on work load bids. The big original equipment manufacturers are not, points out Mr. Baty, since they must figure engineering teams and other design overhead into their cost structure. Thus, if depot work is

USAF photo by Kenneth Hackman



At Ogden ALC, Hill AFB, Utah, Peacekeeper missile parts are prepared for shipment. Ogden fixes Navy C-130s and USAF F-4s, F-16s, conventional munitions, and other components, such as landing gear and reconnaissance equipment.

shifted to the Lockheeds and Northrops of the world, it will be in essence a backdoor subsidy, he charges.

"Why should the DoD subsidize the contractors?" asks Mr. Baty. "If the US government decides such a subsidy is critical, those appropriations ought to be made up front."

Many defense experts involved with this issue outside Air Force logistics do not subscribe to this view. To begin with, there is a flat disagreement about numbers. Many of those who worked on the DSB study just did not believe the Air Force's claim of savings, says Dr. Thompson.

The DSB depot study, without concurrence of the Air Force, was skeptical that a truly fair public-private competition could ever be conducted because of the inherent difference in cost and revenue allocation and organizational structure between the two economic spheres. Many who participated said they had a philosophical objection to the government's competing for work that the private sector was ready and willing to provide.

"Most of the task force members were of the opinion that competition in a conventional economic sense is not achievable here," says Dr. Thompson.

In addition, Navy and Army representatives were suspicious of the Air Force's intentions in promoting interservice depot work contests. Their perception was that USAF officials merely wanted to shut the other services' depots.

The DSB found no conclusive data to prove that either the public or private sector is inherently less expensive when it comes to maintenance work, but the study said the competition savings claimed by the Air Force should be considered in a larger context. Shifting work to the private sector and cutting organic depot capacity would surely save overhead funds, and it would provide a significant boost for the embattled defense industrial base.

DSB task force members recognized that original equipment makers might not win a strict dollars-and-cents contest with the smaller



USAF photo by Kenneth Heckman

Painters at Oklahoma City ALC, Tinker AFB, Okla., coat aircraft parts with aluminum to prevent corrosion. The ALC repairs about 400 bomber, tanker, and AWACS aircraft parts per month in a two-level avionics maintenance program.

maintenance houses. However, Dr. Thompson says, "increasingly you're going to see them making these awards not on a cost basis but on a best-value basis," which would take into account industrial base concerns.

No Official Plan

Pentagon leadership told Congress in April that the DSB study was a "constructive contribution." Deputy Defense Secretary Deutch indicated sympathy with contractors who feel it is difficult to make the contests fair.

Mr. Deutch said in a recent interview that "for items where there is a small production run, such as [the E-8] JSTARS or the B-2, the original equipment manufacturer probably should continue the maintenance."

Decisions taken in past years mean the Defense Department is already reducing its 1990 total of thirty-five big maintenance depots to twenty-four. The congressionally mandated round of base closings in 1991 fingered the Sacramento Army Depot and the Philadelphia Naval Shipyard. The 1993 BRAC round cut seven more depots, including USAF's Aerospace Guidance and Metrology Center at Newark AFB, Ohio, and the Pensacola, Fla., Norfolk, Va., and Alameda, Calif., naval aviation depots.

Three more fixed-wing depots are thought likely to be on the BRAC hit list for 1995. Since naval aviation took a larger blow last time, the Air Force risks losing two facilities. Early congressional handicapping judges Sacramento ALC at McClellan AFB, Calif., to be the most vulnerable, since it was considered in the last round of base closings. Ogden ALC is also considered vulnerable, since it works largely on only one aircraft, the F-16. The large and diverse Warner Robins ALC, at Robins AFB, Ga., is probably the depot least likely to fall under the knife. The other two depots are Oklahoma City ALC at Tinker AFB, Okla., and San Antonio ALC at Kelly AFB, Tex.

Whatever happens, cries of outrage are certain to be heard from members of Congress whose districts will be affected. Air Force depots are huge employers; closing one will likely be little easier than shutting the Philadelphia Naval Shipyard, which was bitterly defended to the end by the Pennsylvania congressional delegation.

Lawmakers may also have their own philosophical concerns about turning depot work over to the private sector. Rep. Earl Hutto (D-Fla.), chairman of the Readiness Subcommittee of the House Armed Services Committee, told a hearing this spring, "We need to be careful not to dismantle a capability that will risk readiness and cost billions to reconstruct." ■

Peter Grier is the Washington, D. C., defense correspondent for the Christian Science Monitor and a regular contributor to AIR FORCE Magazine. His most recent article, "New World NATO," appeared in the June 1994 issue.

Retirees are worried about the two benefits that matter most to them: retirement pay and medical care.

Shakedown on Veterans Benefits

By John T. Correll, Editor in Chief

WHEN the federal government starts looking for ways to save money, alarm bells go off for veterans. As they are well aware, the government tends to regard their benefits as more touchable than other people's benefits.

The nation's 1,555,877 military retirees are especially vulnerable. Their benefits are regularly targeted because the military retirement package is widely seen—as the Congressional Budget Office (CBO) puts it—as “more generous than typically offered by firms in the private sector.”

Military retirees point out that during their service years, they accepted less than equitable pay in order to qualify for deferred compensation when they retired. That argument, however, sometimes cuts little ice. Military retirees find themselves singled out for reduction of benefits. Congress delivered a reminder of that last year, when it imposed stiff delays—four times as severe as those for other federal retirees—on cost-of-living adjustments (COLAs) to military retirement pay between now and 1998.

Veterans fear that this is a sign of

things to come. At present, their concern centers on the two major benefits—retirement pay and medical care—they deem most important. They feel, with some reason, that these benefits are in jeopardy.

The concern is most acute among older veterans living on fixed incomes. They planned their retirement years on what they thought were assurances that their retired pay would keep pace with inflation and that health care would be provided to them and their families without cost or at minimal cost.

Those assumptions no longer look as solid as they once did.

The COLA Two-Step

As a usual thing, federal annuities are adjusted for inflation at the beginning of each year. As part of last

Months of Retirement COLA Delay

Year	Military	Other Federal
1994	3	3
1995	9	3
1996	9	3
1997	9	0
1998	9	0
Total	39	9

year's Omnibus Budget Reconciliation Act, however, Congress decided to delay 1994 retirement COLAs for three months. The adjustment that would normally have been effective December 1 (showing up in January paychecks) was moved forward to March 1. The 1994 postponement applied to all federal retirees. After that, the equity ends.

For the next four years, through 1998, military retirees will continue to wait until October for their COLAs to begin. By contrast, COLAs for other federal retirees take effect March 1 in 1995 and 1996, with no delays whatsoever in the following two years. (Annual COLAs for disabled military retirees and survivor benefit recipients will not be delayed in 1994 or any other year.)

"For the average retired officer, the cumulative cost of the delay will be \$2,270, while his civilian counterpart will give up only \$603," says Rep. Jon Kyl (R-Ariz.). "The average enlisted retiree will lose \$1,451, while his equivalent federal civilian retiree sacrifices \$322."

The House Armed Services Committee passed a measure May 5 that would put military retiree COLAs on the same schedule as other federal civilian retirees in 1995. The Committee also promised to work toward establishing equity in 1996, 1997, and 1998.

The past year has seen four proposals in Congress that were eventually defeated—several of them by narrow margins—that would have severely cut or capped COLAs for military retirees. One recurring feature of such proposals has been the attempt to either limit or abolish COLAs for military retirees under age sixty-two.

Another retirement equity issue is "concurrent receipt" of benefits. Military members who retire with a disability must forfeit an amount of their retired pay equal to any compensation they get from the Department of Veterans Affairs (VA) for service-connected disabilities.

Kenneth A. Goss, Air Force Association Director for National Defense Issues, explains that no other retirees are forced to surrender part of their pension to receive VA disability compensation. "There's no comparable offset for veterans with service-connected disabilities if they spent four years rather than twenty

in the armed forces," Mr. Goss says. "Those veterans can go to work in private industry or in some other part of the federal government when they leave service and later on receive full retirement pay from their employers plus their VA disability compensation."

According to the General Accounting Office, fewer than eight percent of those in the overall veteran population have compensable service-connected disabilities, but more than twenty-six percent of military retirees have such disabilities.

Health-Care "Reform"

Retirees and their dependents currently receive health care in two main ways: in military hospitals and clinics, where the treatment is free or nearly so, and through the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), in which the care is from private providers with patients paying part of the cost.

Retirees worry that this system may be swept up and changed in unfavorable ways by the drive toward a national health-care program. Earlier this year, the Department of Defense said that retirees would have a choice of three options: a military health-care plan to be known as Tri-care, a private-sector fee-for-service plan, or care through a network of civilian providers. Then as now, retirees over age sixty-five could transfer to the Medicare program.

"Those military members on active duty will experience no change in the method or quality of health-care delivery, but health care for the remainder of DoD eligibles is more complex," says Mr. Goss.

The Clinton Administration's health-care proposal would not establish a new military health system but would give the Secretary of Defense wide latitude in designing it once the national health plan was implemented. The Pentagon proposes merging military hospitals and clinics into managed-care networks called "military health plans." Retirees age sixty-five and under could join one of these plans or a civilian health plan.

There would be an annual enrollment fee of \$50 per person, up to \$100 per family, for those choosing a military health plan, Mr. Goss says. Retirees would be subject to a co-payment of \$15 per visit when they

received care from a nonmilitary provider. For those choosing a civilian plan, the government would probably pay eighty percent of the costs. Out-of-pocket cost would be capped at \$1,500 per year for individuals and \$3,000 per year for families.

Several other health-care reform plans have been proposed, but, as with the Administration plan, the provisions for military retirees would be a by-product of the larger plan.

"In the hundreds of calls to AFA headquarters, retirees express concern that any health-care reform take their well-being into consideration," Mr. Goss says. "Among the issues of major interest are provision for long-term nursing care, prescription drug coverage for Medicare eligibles, portability of benefits, no exclusion for preexisting conditions, no catastrophic cap, and reasonable fees and copayments."

In March, CBO published a thick study on possible ways to reduce federal spending. One of the options explored would revise the cost-sharing for military health benefits.

"When beneficiaries receive care in military facilities, they pay very little," CBO noted. "Hospital care costs are between \$4.75 and \$9.30 a day for most beneficiaries. Retired enlisted personnel pay nothing. Out-patient visits and prescriptions are free for all beneficiaries."

Those using CHAMPUS pay more. "For inpatient care, for example, retirees must pay the lesser of \$265 per day for inpatient care or twenty-five percent of hospital charges," CBO said. "For outpatient care, all users face both a deductible and copayments. Such low charges for military facilities lead to inefficiently high use of health care and are inequitable to beneficiaries who must rely on civilian providers."

CBO said the government could save \$1.7 billion over the next five years by "equalizing" the cost-sharing requirements for outpatient care in military hospitals and through CHAMPUS. There is not much doubt which direction the "equalizing" would take, since the envisioned savings could not be achieved by lowering the cost of care through CHAMPUS.

VA Squints to the Future

There is another huge element in the military health-care system, al-

though retirees are not the prime users. The VA operates 171 hospitals, 131 nursing homes, and 371 outpatient clinics.

By law, in theory at least, VA care is available to any veteran with at least two years of service. (There is no minimum service requirement for those who served earlier than 1980.) In fact, the potentially enormous caseload—some 28.2 million veterans are eligible—leads to a system of priorities that limits care to a smaller constituency, concentrating on veterans with service-connected disabilities or low incomes. At present, more than half of those getting care from VA earn less than \$10,000 a year.

Evaluations of VA health-care quality vary, but most people agree that the best thing about it is the price. It is free for those who get through the waiting lines. Under President Clinton's health-care reform proposal, veterans would be able to choose between the VA and a number of private providers for medical treatment. According to some estimates, the VA could lose up to half of its patient base overnight if users had an alternative.

Veterans' advocates worry about the VA's ability to compete if the Administration's plan is enacted. Some contend that health-care reform could lead to the dismantlement of the current veterans' health system. If VA facilities should close, a new way must be found to provide for low-income veterans with service-connected disabilities. It would also mean the loss of the VA's special expertise in such areas as care for the blind, prosthetics, special rehabilitation programs, and war-related health-care services.

The Clinton Administration's "Reinventing Government" proposal would have cut the VA by about 27,500 employees as part of an overall effort to reduce the federal work force. The Veterans Health Administration (VHA) would absorb the bulk of the VA cuts, losing about 25,000 employees. A bill passed April 28 by the House of Representatives would exempt the VHA from these reductions. Supporters of the measure argue that the VHA could not function with such cuts.

On May 5, the VA published a sixty-five-page "strategy" for its role in national health-care reform. The

document pledges improvement in areas ranging from quality of care to customer service, but it deals mainly with concepts of management and philosophy.

Gulf War Syndrome

The newest medical-care concern for younger veterans and retirees is the mystery illness known as "Gulf War syndrome." The symptoms include headaches, memory loss, fatigue, nausea, and joint pain.

Rep. G. V. "Sonny" Montgomery (D-Miss.), chairman of the House Veterans' Affairs Committee, has been among those criticizing the Department of Defense for giving insufficient attention to veterans complaining of the syndrome. Congress voted last year to give Persian Gulf War veterans with the symptoms priority to be seen in VA hospitals. That authorization expires December 31, but Congress is expected to extend it for at least another year.

Comparatively few Air Force members or veterans report having Gulf War syndrome. Most of those exhibiting signs of it so far are from the Army and the Marine Corps or from a particular group of Navy Seabees. The ailment seems to be induced by exposure to hydrocarbon compounds, but nobody is sure what causes it. Among the sources on the speculation list are smoke from the Persian Gulf oil fires, desert parasites, and depleted uranium used in ammunition during the war.

The Air Force Association, like most veterans' organizations, believes that study of the problem should continue and that in the meantime, the authorization for priority care in VA hospitals should be extended. Where a relevant instance of disability cannot be traced to other causes, Mr. Goss says, "there should be a presumption of service connection until it's proved that there isn't."

Stephen C. Joseph, the assistant secretary of defense for Health Affairs, promised that the Pentagon would conduct a "no-holds-barred, chips-fall-where-they-may" investigation.

A bill introduced by Representative Montgomery in May would require the VA to pay compensation benefits to Persian Gulf War veterans who have chronic disabilities resulting from undiagnosed illnesses.

The State Tax Battle

In years past, more than twenty states gave tax relief to local and state government retirees while requiring federal retirees to pay their full share of taxes on pension income. This approach was challenged by a 1989 lawsuit against the state of Michigan. It eventually reached the US Supreme Court, which said in 1991 that a state cannot tax federal retirement income if state and local retirees are exempt. The Court did not, however, make its ruling retroactive, which cut off, for the time being, any possibility of refunds.

That part of the decision was subsequently challenged in a 1992 Virginia case. (AFA and the Military Coalition filed supporting *amicus curiae*—"friend of the court"—briefs in both suits.) In June 1993, the Supreme Court reversed itself and said the ruling had a "retroactive effect."

Some states continue to resist. The most spectacular instance is Virginia, notable because of the large number of retirees who live there and the amounts of money involved. Between 1985 and 1989, the years covered by the ruling, Virginia collected \$469 million in excess taxes from civil service and military retirees. With interest (the Court determined that interest calculation must be based on the rate the state charges those who owe the state money), Virginia's liability is \$707 million. The refunds owed vary, but they range from \$600 to \$6,000 per person.

Citing an "accusatory relief statute" and backed by a state court decision, Virginia said it did not have to pay refunds because the retirees who were overcharged did not complain about it at the time. Virginia Governor George Allen—who promised during his campaign that federal retirees would get their refunds—has since endorsed a plan to offer retirees a compromise: Settle for fifty cents on the dollar—with no interest, spread over four years—and do it by September 15 or take your chances in court.

Many retirees may elect to do just that. The Supreme Court has now agreed to hear arguments in yet another case—with AFA and the Military Coalition again filing briefs in support—that could require the states of Georgia, Virginia, New York, Kansas, Wisconsin, and Arizona to pay retirees their refunds. ■



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By John L. Frisbee, Contributing Editor

Beating a Stacked Deck

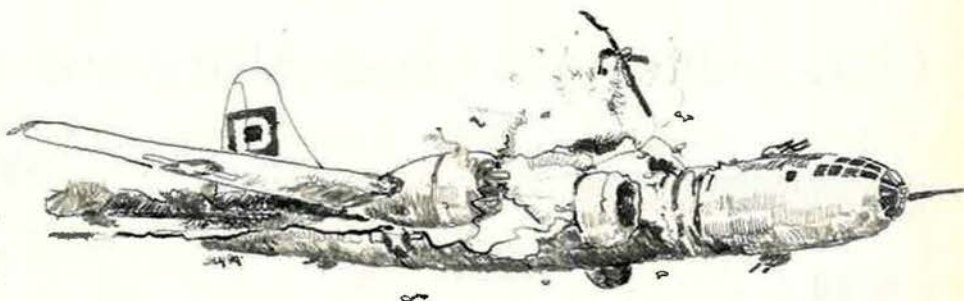
With a jagged slash halfway through the fuselage, Lt. Bill Orr's B-29 was in imminent danger of breaking up in midair.

ON JUNE 1, 1945, Twentieth Air Force launched 521 B-29s in a daylight incendiary attack against Osaka, Japan's second city in both population and industrial production. One of the bombers from the 61st Bomb Squadron, 39th Bomb Group, based at North Field, Guam, was commanded by Lt. William F. Orr. Lt. Bill Costa, Orr's navigator, remembers his aircraft commander as a superb pilot who had been a crop duster before the war. He was older than most of his crew "a father to all of us." Before that mission—the crew's fourteenth—ended, Bill Orr would call on all his skills as a pilot and on his character as a leader.

Moments after bombs-away, the B-29's number three engine was hit by flak, and the propeller feathered. It wouldn't stay feathered but began spinning at an increasing rate. Lieutenant Orr knew the oil line operating the feathering mechanism had been cut. There was only one way to slow the speed of the windmilling prop and prevent a friction-induced fire in the engine: reduce the bomber's speed to just above a stall. Orr throttled back the three good engines to minimum essential power.

As they crossed the coastline of Japan at about 20,000 feet, the windmilling prop separated from its shaft, slicing halfway through the right side of the fuselage about three feet inside the bomb bay. It then flew back, damaging the right horizontal stabilizer. The impact of the separated propeller knocked out the B-29's Loran system, damaged the radio equipment, and, as Lieutenant Orr soon was to learn, did other critical damage.

When power was applied to the three functioning engines, the B-29 immediately began to roll to the right. It took the combined strength of Orr



and copilot Flight Officer Monte Frodsham to bring it under marginal control. The flying propeller had destroyed power controls for the number four engine, which had been running at reduced power. Unable to increase power on that engine and with drag induced by the huge gash in the fuselage and the torn-up stabilizer, Orr and Frodsham could not keep enough power on the number one and number two engines to hold altitude. To make matters worse, they now were on instruments, penetrating a turbulent front. The B-29 was in danger of breaking up or, if the pilots lost control, of spinning into the sea.

Orr had the crew throw out everything they could to lighten the plane. With only as much power on the two left engines as Orr and Frodsham could handle physically, the bomber continued to lose altitude. They finally broke out of the front at 3,500 feet, about 500 miles south of Osaka. Navigator Costa recognized an uninhabited island, Sofu Gan. Then the number three engine caught fire.

It was clear they couldn't make it to Guam. The radio operator, Sgt. Jim Schwoegler, sent out a Mayday, not knowing if his transmitter was working.

Lieutenant Orr decided not to ditch the plane in its damaged condition. He ordered the crew to bail out while he and Frodsham maneuvered the B-29 far enough away so it would not endanger the men in the water when it crashed. Seconds after Orr and Frodsham bailed out, the bomber

exploded. Flight engineer MSgt. Edward Kanick's parachute did not open. All other members of the crew splashed down safely.

About two hours after their midday bailout, it appeared that Sergeant Schwoegler's transmitter had worked. A Navy PBV amphibious seaplane showed up, but the sea was too rough for it to land. Soon a B-17 appeared and dropped a Higgins boat by parachute. It landed near radar officer Lt. Art Swanberg, who climbed aboard, started the engine, and, directed by the B-17, picked up the rest of the crew. The boat was stocked with dry clothing and food to see them through a reasonably comfortable night.

The following day the survivors were taken aboard the submarine USS *Tinosa*. They were transferred two days later to another sub, USS *Scabbardfish*, and returned to Guam on June 10. The crew flew eight more missions before their war ended.

For his "magnificent airmanship and gallant leadership," Lt. William F. Orr was awarded the Distinguished Service Cross. Today, almost a half-century after that 1945 mission, the surviving members of his crew remember him with respect and affection as a great pilot and leader who was "always concerned with our welfare." He remained on active duty until 1966, when he retired at Sacramento, Calif., where he lived until his death. ■

Thanks to Bill Costa and Bob Weiler, members of Bill Orr's crew.

Stardusters



Photo courtesy Joe Patrick

Shortly after its birth at the end of the Korean War, USAF's 3600th Aerial Demonstration Flight was dubbed "Stardusters." The name, SSgt. Fred Cesena's entry in a contest at Luke AFB, Ariz., was short-lived. Within a month of the team's first official performance—June 16, 1953, in honor of USAF Chief of Staff Gen. Hoyt S. Van-

denberg's impending retirement—the name was changed to the now-familiar "Thunderbirds." The Stardusters are shown with General Vandenberg at Williams AFB, Ariz.: (counterclockwise, from left) Capt. Buck Pattillo, Maj. Dick Catledge, Capt. Bob McCormick (alternate), Capt. Bob Kanaga, and Capt. Bill Pattillo (Buck's twin).

Checklist of Major Electronic Systems

Edited by Tamar A. Mehuron, Associate Editor

Electronics work in progress at USAF's major program offices; Electronic Systems Center, Hanscom AFB, Mass.; and Rome Laboratory, Griffiss AFB, N. Y.

Airborne Warning and Control System Program Office

Airborne Warning and Control System

Major upgrade program for the AWACS surveillance and battle management aircraft. Includes additional sensors, antijam communications, and radar systems upgrades to keep the aircraft in service into the next century. **Contractors:** Boeing, Westinghouse. **Status:** Engineering and manufacturing development (EMD), production.

Japanese 767 AWACS

Program to provide the Japanese government with four 767 AWACS E-3 aircraft. **Contractor:** Boeing. **Status:** Production.

NATO AWACS Program

Development, production, and enhancement of NATO's 18 AWACS E-3 Sentry planes. Installation of a major upgrade, electronic support measures, to provide a passive sensor system as a complement to active radar sensors. **Contractor:** Boeing. **Status:** EMD, production.

Saudi Arabian AWACS

Program to acquire and outfit five US-built AWACS E-3s for the Royal Saudi Air Force. **Contractor:** Boeing. **Status:** Deployment.

United Kingdom/France Acquisition Coordination Team

Program to support the enhancement of UK and French AWACS aircraft. **Contractor:** N/A. **Status:** N/A.

United Kingdom Radar System Improvement Program

Program to provide acquisition support for radar improvements of E-3D aircraft. **Contractor:** N/A. **Status:** N/A.

Command and Control System Program Office

Air Force Shelter Technology Office

Program to provide management and engineering support for shelter programs throughout the Air Force and to improve design, manufacturing techniques, and materials. **Contractors:** Spectrum 39, Advanced Composite Tech. **Status:** EMD.

Air Force Wing Command and Control Systems

Program to provide the wing commander and wing decision-makers with information from around the base and to effectively and efficiently allocate resources to launch missions on time and put bombs on target. **Contractor:** SAIC. **Status:** Development, implementation.

AMC C² Information Processing System

Provides automated support for performing C² functions at fixed and deployable units representing the lower command-and-control echelons. **Contractor:** Computer Sciences Corp. (CSC). **Status:** EMD, production.

AN/TPS-75 Radar

Program modification to improve electronic counter-countermeasures and performance of the AN/TPS-43E Tactical Radar System. **Contractor:** Westinghouse. **Status:** Production.

Arm Decoy

Program to build a decoy protecting the AN/TPS-75 radar from destruc-

tion by incoming antiradiation missiles. **Contractor:** ITT Corp., Gilfillan Division. **Status:** EMD.

Automated Weather Distribution System P³I

Preplanned Product Improvement to AWDS, focused on improved graphics, interoperability, and communications. **Contractors:** GTE, Contel Government Corp. **Status:** Production.

Avionics Intermediate Shop Mobile Facility

Provides for developing shelter systems for F-15, F-16, A-10, and F/EF-111 avionics maintenance. **Contractor:** American Development Corp., Sacramento Air Logistics Center (ALC). **Status:** Production.

Base Recovery Communications System

System to integrate communications equipment and computer hardware and software that will provide effective command and control of recovery efforts after attack. **Contractor:** Sumaria Systems. **Status:** EMD.

Combat Air Forces Weather Software Package

Program to support the Combat Air Forces and AMC wherever infrared, laser, TV, low-light-level TV, and millimeter-wave weapons and targeting systems are used. **Contractor:** None. **Status:** Development, rapid prototyping.

Combat Weather Systems

Program to provide automated access to near real-time weather observations, climatology, satellite, tactical decision aids, and mesoscale model forecast databases. **Contractor:** To be determined (TBD). **Status:** Development.

Contingency Theater Air Control Automated Planning System

Provides the umbrella architecture for the Air Force Theater Battle Management C⁴I systems. **Contractor:** SAIC. **Status:** Conceptual, EMD, production.

Deployable Strategic Mission Data Preparation Shelter

Program to provide USAF capability to transport a computer system able to create Mission Planning Data Transfer Unit Cartridges for B-52s, B-1s, B-2s, ALCMs, and ACMs. **Contractor:** Sacramento ALC. **Status:** EMD, production.

DoD Base and Installation Security System

Research, development, test, and evaluation program to develop physical security equipment for DoD sites worldwide. **Contractor:** None. **Status:** EMD.

Integrated Weapon System Management/Management Information System

Program to acquire communications products and services to assist in Air Force implementation of IWSM operations. **Contractor:** I-Net. **Status:** Conceptual, development.

Joint Future Air Model

Program to develop an air combat resolution model to meet the operations needs of the USAF Majcoms and the unified/specified command air components for the training of commanders and their battle staffs. **Contractor:** N/A. **Status:** Development.

Joint-Service Database Management Machines

Program to acquire hardware, software, maintenance, and services to perform relational database management functions for the Army, Navy, Air Force, Defense Logistics Agency, Defense Communications Agency, Internal Revenue Service, and other federal agencies. **Contractor:** TBD. **Status:** Proposal evaluation.

Modular Control Equipment P³

Program to design, fabricate, integrate, and test improvements to MCE components. **Contractor:** Litton Data Systems. **Status:** EMD.

Primary Simulation Trainer

Program to enable AETC to prepare and conduct training exercises for USAF and ANG introductory courses in Air Weapons Control. **Contractor:** TBD. **Status:** Production.

Super-Minicomputer Systems

Program to provide the services and other agencies with a multiuser super-minicomputer system that will support up to 256 concurrent interactive users. **Contractor:** Planning Research Corp., Inc. (PRC). **Status:** Acceptance testing.

Undergraduate Controller Training Automation

Provides AETC with twelve MCE operator consoles and hardware for Undergraduate Air Weapons Controller School at Tyndall AFB, Fla. **Contractor:** Litton Data Systems. **Status:** Production, deployment.

Wargaming

Program to present a coordinated approach for joint wargaming and simulation efforts. Projects include Distributed Wargaming System II, Future Air Model, Video Teleconferencing Command and Control System, Defense Simulation Internet, Warrior Preparation Center Improvement Program, and Blue Flag Improvement Program. **Contractors:** Many. **Status:** Acquisition.

Weapons Storage and Security System

Research effort to determine new ways to provide dispersed, unattended tactical weapons storage using hardened vaults beneath the floors of aircraft shelters. **Contractor:** Bechtel. **Status:** Deployment.

Communications and Airspace Management Systems Program Office

Adaptive Array Processor

Program to improve tactical air forces' air-to-air and air-to-ground UHF voice jam-resistant communications. The AAP will provide the TAF with an electronic nullification of the interfering/jamming signal. **Contractors:** Hazeltine, MITRE Corp. **Status:** Conceptual.

Advanced VLF/LF Receiver

Program to provide B-2 bomber force with highly survivable capability to receive directives from the national command authorities (NCA). **Contractor:** Rockwell. **Status:** EMD.

Air Force Airborne SINGARS

Program to develop and procure airborne Single-Channel Ground and Airborne Radio Subsystems for jam-resistant, secure, voice tactical VHF, FM, and AM communications. **Contractor:** Magnavox. **Status:** Production.

Deployable Communications-Circuit Switches

Family of automatic central office telephone switches providing analog and digital voice and data traffic. Part of the Triservice Tactical Communications joint program. **Contractors:** GTE, ITT. **Status:** Deployment.

Dual-Frequency Minimum Essential Emergency Communications Network Receiver

Program to build a receiver that will allow command, control, and communications (C³) reception in VLF/LF bands to strategic launch-control centers, despite high-altitude nuclear detonations. **Contractor:** Westinghouse. **Status:** EMD.

Have Quick II/IIA

Program to upgrade the Have Quick antijam UHF voice communications radio. **Contractors:** Many. **Status:** Production.

High-Power Transmitter Set

Program to provide the NCA with a VLF, survivable, reliable capability to transmit emergency Action Messages worldwide to nuclear forces. **Contractor:** Rockwell International. **Status:** EMD.

Microwave Landing System

Five-part program to replace the current instrument landing system with a precision approach and landing system. **Contractors:** Many. **Status:** EMD, production.

Miniature Receive Terminal

Program to develop survivable, low-frequency terminals to upgrade com-

munications among NCA, STRATCOM, and ACC bombers. Terminals will be designed to work even in a nuclear environment. **Contractor:** Rockwell. **Status:** Production.

National Airspace Systems

Upgrade program to ensure compatibility of the DoD Air Traffic Control System with the FAA Capital Investment Plan through 2017. Replacement of analog systems with digital systems. **Contractors:** Many. **Status:** Demonstration and validation (dem/val).

Rapid Execution and Combat Targeting

Program to modify Minuteman and Peacekeeper launch-control centers. **Contractor:** GTE. **Status:** EMD.

Scope Shield Phase II

Program to improve communications for USAF Security Police and other forces. **Contractor:** Racal. **Status:** Production.

Theater Deployable Communications

Program to provide lightweight, modular communications packages to Air Force units needing deployable ground-to-ground communications capabilities. **Contractor:** TBD. **Status:** Dem/val.

Intelligence, C³ Countermeasures System Program Office

Automated Message Handling System

Program to provide intelligence analysts with capabilities for local electronic message handling and access to databases. **Contractor:** McDonnell Douglas Electronic Systems Co. **Status:** Production.

Chariot

Joint-service program to develop a man-portable, tactical, S-band secondary imagery receiving system. Giving the system the ability to process weather data is also under consideration. **Contractor:** Harris Corp. **Status:** Dem/val.

Constant Source-Airborne

Program to receive and correlate timely intelligence information to update order of battle data providing threat warning aboard airborne, ground mobile, and sea-going platforms. **Contractor:** TBD. **Status:** Production.

Constant Source-Ground

Development of means to correlate and display intelligence information to unit-level forces. **Contractors:** Assurance Technology Corp., BTG, Inc. **Status:** Production.

Eagle Vision

Program to develop a deployable ground station for processing imagery received directly from commercial satellite platforms. **Contractor:** Matra MS2i. **Status:** Dem/val.

Joint Intelligence Center

Program to develop and implement a wartime protected theater intelligence system to support unified and specified commands. **Contractors:** Many. **Status:** Concept definition.

Joint Services Imagery Processing System (JSIPS)

Development of a ground station to receive, process, and disseminate national, strategic, or tactical imagery to combat commanders. **Contractor:** E-Systems. **Status:** EMD.

Multispectral Input Segment

Program to provide an additional source of sensor input to the JSIPS. The system will receive direct downlinks of multispectral sensor data (via SPOT or Landsat) for processing into imagery for exploitation and dissemination through the JSIPS. **Contractor:** Matra MS2i. **Status:** Concept development.

Sentinel II

Three-contract program to modernize cryptologic and general intelligence training for Goodfellow Training Center, Goodfellow AFB, Tex. The first contract upgrades computer-based training capabilities already at Goodfellow; the second provides instructor monitoring capability; the third integrates developed software on Sentinel Bright II and Sentinel Aspen II workstations. **Contractors:** Global Information Systems Technology (first contract), TBD (second, third contracts). **Status:** EMD, production.

Sentinel II Computer-Based Training Upgrade

Program to improve commercial off-the-shelf software training products currently at Goodfellow AFB, Tex. **Contractor:** Global Information Systems Technology. **Status:** Production.

Sentinel Aspen Phase II

Program to modernize the air intelligence, targeting indications, and warning and fusion training conducted by Goodfellow Training Center. **Contractor:** Network Solutions, Inc. **Status:** Production.

Sentinel Byte

Program to provide a unit-level intelligence support system focused on automated use of data in TAF units. **Contractor:** Infotec Development, Inc. **Status:** Production, deployment.

Tactical Air Forces Linked Ops/Intel Centers, Europe

Program to develop an intelligence software application linked to other Contingency Tactical Air Control System Automated Planning System units. **Contractors:** NASA, Jet Propulsion Lab. **Status:** EMD.

International System Program Office

AWACS Interface System

Program to provide the Royal Saudi Air Force with an interface to its E-3 Sentry AWACS aircraft. **Contractor:** Whittaker Electronic Systems. **Status:** Operations and support.

Base Air Defense Ground Environment

Program to provide engineering technical support to the Japan Air Self-Defense Force for a BADGE upgrade. **Contractor:** MITRE Corp. **Status:** Operational deployment.

Egyptian E-2C/776 Interoperability

Technical assistance to Egypt for methods to coordinate the E-2C Hawk-eye aircraft and the 776 Ground System. **Contractor:** Hughes. **Status:** Deployment.

Peace Panorama

Program to provide Colombia with an air surveillance system to establish and maintain control of Colombian airspace, control military operations, and identify radar targets. **Contractor:** BDM. **Status:** EMD.

Peace Shield

Development and acquisition of a groundbased C³ system for the Royal Saudi Air Force. Includes equipment, facilities, and support units that will link with existing Saudi tactical radars, Saudi AWACS aircraft, and other elements of Saudi military forces. **Contractor:** Hughes. **Status:** EMD, deployment.

Royal Thai Air Defense System

Program to upgrade and automate the existing Royal Thai Air Defense System and expand its long-haul communications network. **Contractors:** Unisys, Paramax. **Status:** Deployment.

United Arab Emirates Modified AN/TRC-170

Program to develop and modify an AN/TRC-170 troposcatter radio set with support equipment for the UAE Hawk missile program. **Contractor:** Raytheon. **Status:** Production.

Joint STARS System Program Office

Joint Surveillance and Target Attack Radar System

Joint USAF-Army program to develop the primary sensor needed to carry out the AirLand Battle Doctrine; integrates a sensitive, side-looking, multimode radar into an E-8A platform to create a targeting system able to detect groundbased objects. **Contractor:** Northrop Grumman. **Status:** EMD.

Joint Tactical Information Distribution System (JTIDS) Program Office

Air Force JINTACCS

USAF input to a program for joint interoperability of tactical C² systems, designed to ensure that Air Force standards are included in the program. **Contractors:** JTC³A, Martin Marietta. **Status:** EMD.

JTIDS

Program to develop a high-capacity, jam-resistant, secure digital information system that will permit the distribution of intelligence data among fighter aircraft, surveillance aircraft, ground air defense units, and naval vessels. **Contractors:** GEC, Rockwell Collins. **Status:** EMD, low-rate initial production.

Military Satellite Communications (MILSATCOM) Terminals System Program Office

AFSATCOM Terminal Upgrades

Program to upgrade Air Force satellite communications system terminals to improve teletype data communications service used for command and control of peacetime, crisis, contingency, strategic, and special operations missions. **Contractors:** Titan Linkabit, Rockwell. **Status:** Production.

Ground Mobile Forces Satellite Communications Terminal Program

Program to produce highly mobile satellite communications terminals for the tactical air forces and others. **Contractors:** GE, Harris Corp. **Status:** Deployment.

Lightweight Multiband Satellite Terminal

Multiband satellite terminal operating at C, X, and Ku bands designed for rapid deployment and operations. **Contractor:** TBD. **Status:** Demonstration.

Low-Cost Terminal

Program to provide full Military Strategic and Tactical Relay (Milstar) low data rate communication capabilities at minimum cost. The terminal will be small and inexpensive enough to be used in both airborne and groundbased platforms. Current platforms include B-1, B-2, VC-25, VC-137, and EC-135A/G aircraft, and Weapon System Launch Control Facilities. **Contractors:** Raytheon, E-Systems, Stanford Telecommunications. **Status:** Demonstration.

Milstar Satellite Communication System

Development of reliable, antijam, and survivable extremely high frequency (EHF) satellite communications terminals for strategic and tactical use by all services. **Contractors:** Raytheon, Rockwell. **Status:** EMD.

NATO Air Base SATCOM Terminal Program

Program to enhance the survivability of critical wartime communications among NATO Air Operations Centers and Allied airfields where USAF elements will deploy in their NATO wartime role. **Contractors:** Harris Corp., Loral Western Development Labs. **Status:** Production, deployment.

Portable Terminal System

Program to provide a super-high frequency manpack capability for rapid deployment and contingency operations. **Contractors:** Harris Corp., GE. **Status:** Demonstration.

UHF Satellite Terminal System

Development of a deployable, multiple-access communications system based on a single UHF satellite channel for Air Force and DoD users. **Contractor:** Titan Linkabit. **Status:** EMD.

Mission Planning System Program Office

Air Force Mission Support System

Program to broaden automated support to mission planning and execution and permit upgrades to aircraft, weapon, and electronic systems. Mission planning systems are to connect with C³I at unit, wing, and theater levels. **Contractor:** Lockheed Sanders. **Status:** Production.

Common Mapping Production System

Program to provide a standardized government-owned and USAF-validated cartographic database of mapping, charting, geodesy, and imagery products used in mission planning systems. **Contractor:** N/A. **Status:** EMD.

Computer-Aided Mission Planning at Air Base Level

Program to provide automated mission planning through the use of digital mapping data, weather information, threat data, and aircraft performance data. **Contractor:** General Dynamics. **Status:** EMD.

Conventional Mission Planning Preparation Software

Program to provide software for conventional mission planning for B-52 weapons. **Contractors:** Boeing Military Airplane, McDonnell Douglas Missile Systems Co. **Status:** EMD.

Mission Data Preparation System

Program to develop, test, and acquire mission planning systems to support AMC aircraft while providing software maintenance of the currently fielded ACC mission planning system. **Contractor:** Boeing Defense & Space Group. **Status:** EMD.

Mission Support Systems II Upgrade and Modification

Program to provide near-term upgrade to keep pace with steadily growing requirements demanding greater processing speed and storage capacity. **Contractor:** Lockheed Sanders. **Status:** EMD, production.

Special Operations Forces Planning and Rehearsal System

Joint program for US Special Operations Command to develop and procure a management information system to support SOF aircrews and ground/maritime teams. Major areas requiring automated support include mission planning and mission preview/rehearsal. **Contractor:** TBD. **Status:** EMD.

Space and Missile Warning System Program Office

Alternate Processing and Correlation Center

Program to provide an alternate correlation center to Cheyenne Mountain AFS, Colo., and to provide missile warning data to STRATCOM for force and survival management. **Contractor:** N/A. **Status:** EMD.

Antisatellite Battle Management/C³

Program to develop a battle management/C³ system to control all ASAT capability, provide a surveillance support network, and integrate these

elements with current and future ASAT weapons. **Contractor:** TRW. **Status:** Conceptual, dem/val.

Cheyenne Mountain Upgrade Programs

Integrated management of five existing upgrades to the integrated tactical warning and attack assessment (ITWAA) system. **Contractors:** Many. **Status:** EMD, production.

Command Center Processing and Display System Replacement

Replacement system, part of the ballistic missile warning network, to receive warning information from sensors and produce ITWAA displays for Cheyenne Mountain AFS and STRATCOM headquarters. **Contractor:** TRW. **Status:** EMD.

Communications System Segment Replacement

Replacement system to improve the reliability, capacity, and flexibility of Cheyenne Mountain communications processing. **Contractor:** GTE. **Status:** EMD.

Granite Sentry

Program to replace the current NORAD computer system and modular display system and to upgrade the command post, air defense operations center, battle staff support center, and weather support unit at Cheyenne Mountain. **Contractors:** AFSPC, Digital Equipment Corp. **Status:** EMD.

Space Defense Operations Center

Program to develop a new SPADOC at Cheyenne Mountain; central C³ element of the Space Defense Command and Control System will be used to collect and distribute information on space status and warning. **Contractor:** Loral Command & Control. **Status:** EMD.

Survivable Communications Integration System

Development of a multimedia management and control system for sending missile warning data between sensor sites and command authorities. **Contractor:** E-Systems. **Status:** EMD.

Surveillance and Control Systems

BMEWS Modernization Program

Program to upgrade the Ballistic Missile Early Warning System radars in Greenland and the UK, plus modernization of BMEWS radar in Alaska. **Contractor:** Raytheon. **Status:** EMD.

Caribbean Basin Radar Network

Program to upgrade US air surveillance in the Caribbean via transmission of radar data by satellite and land links to US C³ centers. **Contractor:** Westinghouse. **Status:** Production.

Cobra Dane System Modernization

Upgrade to replace aging computers and software and improve processing of landbased, phased-array radar at Eareckson AFS, Alaska. **Contractor:** Raytheon. **Status:** Production.

FAA/Air Force Radar Replacement

Joint effort to replace 1950s-vintage surveillance and height-finding radars with modern, three-dimensional radars. **Contractor:** Westinghouse. **Status:** Production.

Joint Surveillance System-Connectivity

Program to modify the Region and Sector Operations Control Centers to task, monitor, accept, and employ data from new sensor systems via the Advanced Interface Control Unit. **Contractor:** TRW. **Status:** Production.

North Atlantic Defense System

Program to provide four long-range radars to enhance ability of Air Forces Iceland to perform NATO missions. **Contractors:** Many. **Status:** Production, deployment.

North Warning System

Program to develop new long- and short-range radars to replace the aging Distant Early Warning Line and provide continuous coverage from the northern slopes of Alaska across Canada and down the east coast of Labrador. **Contractors:** Unisys, GE. **Status:** EMD, production.

Puerto Rico Operations Center

Program to establish performance, integration, and verification requirements for Puerto Rico Operations Center, to be procured by the Puerto Rico ANG. **Contractor:** Litton Data Systems. **Status:** Production.

RADIL/RADIC Systems

Program to provide two-way, secure, data buffering, translation and communications connectivity between AWACS and Region and Sector Operations Control Centers. **Contractor:** Whittaker Electronic Systems. **Status:** Production.

Southern Region Operations Center Upgrade

Program to provide secure voice and data communications and Tactical Data Information Link-A/B processing and display for USSOUTHCOM

and USACOM air surveillance and counternarcotics operations. **Contractor:** Westinghouse. **Status:** Production.

Space Surveillance Network Improvement Program

Program to evaluate AFSPC's spacetrack capabilities for detecting and cataloging space objects. Future upgrades will be recommended to improve this global network of sensor sites, which detect, track, and identify satellites in Earth's orbit. **Contractors:** Many. **Status:** EMD.

Rome Laboratory

Adaptive Fault Tolerance

Program to make software more resistant to system faults, including developing the ability to self-diagnose and repair problems. Uses artificial intelligence techniques and distributed computing technologies. **Contractors:** BBN Systems & Technology, Inc., SRI. **Status:** Ongoing.

Advanced Microwave Technology

Program to develop microwave electronics for C⁴I systems, including an aperture radar that performs both air traffic control and weather detection functions. **Contractors:** Many. **Status:** Ongoing.

Analog Fiber-Optic Links for RF Waveguide Replacement

Program to demonstrate a cost-effective, optical method to replace conventional radio frequency antenna waveguide with analog fiber-optic links. **Contractors:** Many. **Status:** Ongoing.

Analytical Tools

Program to develop advanced techniques to flag important events and information, supplementing expert systems with other, more flexible technologies such as causal modeling. **Contractors:** Many. **Status:** Ongoing.

Applied Electromagnetics

Program to investigate new techniques for designing, measuring, and controlling array antennas for counter-low-observable radar. **Contractors:** Many. **Status:** Ongoing.

Ballistic Missile Defense

Program to develop communications technology to support TMD, GBI, and strategic defense. **Contractors:** Many. **Status:** Ongoing.

Computational Electromagnetics

Program to develop computer-based tools to perform electromagnetic simulation of antenna-aircraft EM interaction, antenna patterns, and EM capability. **Contractor:** In-house. **Status:** Ongoing.

Computer-Aided Tactical Information System

Program to support joint-service and theater-level imagery exploitation, reporting, and dissemination management. **Contractor:** GTE. **Status:** Ongoing.

Defense Automated Warning System

DoD Intelligence Information System Core Indications and Warning System to automate the indicator-monitoring function and provide automated tools to aid the analyst. **Contractor:** PRC. **Status:** Ongoing.

Distributed Air Operations Center

Program to apply distributed computing environments to the Air Operations Center architecture to enhance operations, extend data access, and provide geographical deployments on wide area networks. **Contractor:** TBD. **Status:** Conceptual.

EM Materials

Development of materials for advanced fiber-optics telecommunications devices and opto-electronic integrated circuits. **Contractors:** Many. **Status:** Ongoing.

Engineering of Knowledge-Based Systems

Program to develop and demonstrate technology and tools for the design and implementation of large knowledge-based systems. **Contractors:** Many. **Status:** Ongoing.

Gigabit Optical ATM Packet Switch

Program to develop multiple gigabit-per-second data rate, optically transparent, asynchronous transfer mode (ATM) packet switch nodes. **Contractors:** Princeton U., U. of Arizona, Washington U., Syracuse U. **Status:** Ongoing.

Hostile Target Identification

Program to develop advanced techniques and concepts to positively identify hostile aircraft. Technologies include multisource fusion, advanced signal processing, and passive surveillance techniques. **Contractors:** Many. **Status:** Ongoing.

Human-Computer Interface

Program to improve exchange of information between people and computers through innovative methods, including the Data Wall, three-

dimensional displays, and virtual reality techniques. **Contractors:** Many. **Status:** Ongoing.

Imagery Exploitation

Program to develop techniques to automate the soft-copy reconnaissance imagery exploitation process through the fusion of cartographic information, known intelligence information, and multimedia sensor inputs. **Contractors:** Many. **Status:** Ongoing.

Intelligent Multichip Module Analyzer

Program to develop a finite-element-based software tool for the reliability assessment of multichip modules that have no historical reliability data. **Contractor:** U. of Massachusetts. **Status:** Ongoing.

Joint STARS Cuing and Correlation

Program to develop a capability for enhanced Joint STARS surveillance by capitalizing on off-board augmented theater intelligence and surveillance information to localize and prioritize the detection and identification of regions containing time-critical targets. **Contractor:** Northrop Grumman. **Status:** Ongoing.

Knowledge-Based Planning and Scheduling Initiative

Program to develop and demonstrate the next generation of generic AI planning, resource allocation, and scheduling technology for DoD operational employment and deployment crisis action planning systems at USTRANSCOM, USPACOM, and USACOM. **Contractors:** Many. **Status:** Ongoing.

Local Attack Controller

Program to develop a prototype Local Attack Controller for delivery to ARPA for integration into War Breaker. The LAC is the forward-execution control element in the War Breaker concept for prosecuting time-critical targets. **Contractors:** TBD. **Status:** Ongoing.

Long-Range Imagery Networked Communications System

Program to develop communication architectures and implement hardware and software solutions to resolve Secondary Imagery Dissemination System shortfalls within existing command structure. **Contractor:** SAIC. **Status:** Ongoing.

Message Processing

Program investigates techniques for passing free text information with which to update databases and extract critical information for further processing. **Contractors:** Many. **Status:** Ongoing.

Military Satellite Communications

Program to develop advanced, super-high frequency/EHF technology for Bloc Change and next-generation Military Communications Satellites. **Contractors:** Many. **Status:** Ongoing.

Multichannel Airborne Radar Measurements

Program to develop an airborne test-bed and collect multichannel, phased-array measurements for evaluating and validating space-time adaptive processing algorithms projected for use in upgrades and next-generation airborne surveillance sensor platforms. **Contractors:** Westinghouse, Northrop Grumman, Honeywell. **Status:** Ongoing.

NYNet

Program to develop and implement a high-speed research test-bed network that uses state-of-the-art ATM switching and fiber-optic technology to support the sharing of research and technology. **Contractors:** Many. **Status:** Ongoing.

Off-Board Bistatics

Program to demonstrate the utility of advanced off-board bistatic technology to provide improved coverage and targeting data for interception of airborne targets. **Contractors:** Many. **Status:** Ongoing.

Operations/Intelligence Integration

Program to view the Theater Air Operations Center as a single entity rather than four divisions and to develop and demonstrate an information management system for the AOC. **Contractor:** TBD. **Status:** Contract to start in late Fiscal 1994.

Optical Control of Phased Arrays for Multifrequency/Multibeam Systems

Program to demonstrate a cost-effective optical method to implement and control large, high-density, multibeam/multifrequency, shared-aperture, phased-array antennas. **Contractors:** Many. **Status:** Ongoing.

Optical Memory

Program to develop high-capacity optical disk storage devices. Work will continue to develop multiple three-dimensional optical memory concepts to improve storage capacity, access times, and throughput rates. **Contractors:** Many. **Status:** Ongoing.

Portable C² for the JTF

Rome Laboratory-ARPA program to develop deployable planning sup-

port for the joint task force commander, including system architecture development and information management techniques. **Contractors:** Many. **Status:** Ongoing.

Process-Oriented Software Life-Cycle Support Environment

Program to develop and provide an integrated life-cycle software engineering environment and framework for both product and process implementation and postdeployment support. **Contractors:** Many. **Status:** Ongoing.

Rapid Application of Airpower

Program to develop an automated C³I knowledge-based tool providing situation and target analyses for the decisive application of airpower against fixed and mobile ground targets. **Contractor:** Merit Corp. **Status:** Ongoing.

Requirements Engineering Workstation

Program to integrate a suite of requirements analysis, specification, and validation tools on a Sun4/Unix platform. **Contractor:** International Software Systems, Inc. **Status:** EMD.

Secure Survivable Communications Network

Program to develop advanced deployable capabilities in ATM switching, intelligence network management, survivable protocols and signaling, and multilevel security technology for transition into the next-generation DoD information infrastructure. **Contractors:** GTE, STEL. **Status:** Ongoing.

Signals Exploitation

Program explores new technologies specifically associated with the detection, correlation, analysis, and identification of emitters, aircraft, and missiles. **Contractors:** Many. **Status:** Ongoing.

Space-Time Adaptive Processing

Program to develop technology for adaptive processing algorithms and signal processing architectures for airborne radars to detect small targets in severe clutter and jamming. **Contractors:** Technology Services Corp., Kaman Sciences, Syracuse U. **Status:** Ongoing.

Speakeasy

Program to develop a joint-service, multiband, programmable radio, backward-compatible with existing fielded systems and capable of adding new functionality through software. **Contractors:** Many. **Status:** Ongoing.

Speech Processing

Program to develop speech representations, robust classifiers for speech and speaker recognition, and normalization techniques for speaker and channel variability. **Contractors:** Many. **Status:** Ongoing.

Superconducting Electronics

Program to develop superconducting technologies in advanced MILSATCOM, radar, and signal processing. Work includes development of high-temperature superconductor materials and research on their use in microwave and millimeter applications. **Contractors:** Many. **Status:** Ongoing.

Target Mission Nominator

Rome Laboratory-ARPA program to design, implement, validate, and demonstrate upgrades to the Rapid Application of Airpower regarding combined-arms, time-critical target mission nomination. **Contractor:** TBD. **Status:** To start in Fiscal 1994.

Tester Independent Support Software System

Program to develop a set of standard product data formats and an archival database that enables computer-aided generation, as well as capture and maintenance, of design, test, and product specifications. **Contractor:** In-house. **Status:** Ongoing.

Theater Missile Defense

Program in support of Air Force TMD offices at ACC and Electronic Systems Center to address the adaptation of Force Level Execution to provide attack operations decision-aiding functionalities to identify and assign appropriate assets within the extremely stringent TMD time lines while maintaining consistency with USAF's tactical ballistic missile architecture. **Contractor:** TBD. **Status:** To start in Fiscal 1994.

Time Stress Measurement Device Technology

Program to develop a device to measure and record temperature, humidity, vibration, shock, corrosion, and power quality in a time-sequence manner, keeping a complete record of the surrounding environment. **Contractor:** Westinghouse. **Status:** Ongoing.

Within-Computer Optical Interconnects

Program to enhance high-speed computer development by designing, fabricating, and integrating high-speed optical data transmission systems that will replace slower electronic methods in addition to reducing overall computer power consumption. **Contractors:** GE, Cornell U., Syracuse U. **Status:** Ongoing. ■

Sheraton Washington Hotel • September 12-14, 1994

- ▶ **Opening ceremonies**
- ▶ **Aerospace Education Foundation Luncheon** featuring the 1994 AEF contest-winning AFJROTC unit; Doolittle, Eaker, and Goldwater Fellowships; The Christa McAuliffe Teacher of the Year Award; and the Sam E. Keith, Jr., Excellence in Education Award
- ▶ **Business sessions**
- ▶ **Membership awards;** national awards to Air Force, government, and AFA leaders
- ▶ **Annual Reception** in exhibit halls
- ▶ **Salute** to the twelve Outstanding Airmen of the Air Force; address by Lt. Gen. (Gen. selectee) Thomas S. Moorman, Jr., USAF Vice Chief of Staff. Toastmaster: CMSAF Gary R. Pfingston
- ▶ **Secretary's Luncheon;** address by Hon. Sheila E. Widnall, Secretary of the Air Force
- ▶ **Air Force Anniversary Reception and Dinner**
- ▶ **Chief's Luncheon;** address by Gen. Merrill A. McPeak, USAF Chief of Staff
- ▶ **Aerospace Technology Exposition** with more than 52,000 square feet of technology displayed by companies from all over the world. Exhibit halls open Monday, Tuesday, and Wednesday

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National Report

Enola Gay Update

In May, we reported on the Smithsonian Institution's Air and Space Museum and its plans to display the *Enola Gay*, the B-29 that dropped the first atomic bomb, in a 1995 exhibit that lacked balance and context.

Since then, the actions of the elected leaders of AFA and its Aerospace Education Foundation, the AFA Executive Director, and AFA members from around the country have helped bring the issue to the attention of the public and the Congress, where interest has been shown in both the House and the Senate. AFA's National Defense Issues and Communications departments have worked closely with *AIR FORCE Magazine* to increase awareness of this important issue. As a result, letters have poured in to the Air and Space Museum, to congressional offices and to AFA. Media from around the country, including *Time* magazine, have also sought comment from Magazine Editor in Chief John Correll, who authored AFA's report, "The Smithsonian and the *Enola Gay*."

To date, a new committee has been formed by the Smithsonian to review and revise the original draft script for the 1995 exhibit. AFA will continue to closely monitor developments and to keep its members informed.

Photo by Susan Kennedy



(From left) AFA President Jim McCoy poses with Team of the Year members MSgt. Brian D. Vander Wilt, MSgt. Robin L. Garza, TSgt. Hector R. Carrion, TSgt. Marvita D. Franklin, and MSgt. Suzanne N. Smithey.

Team of the Year Honored

The Air Force Association recently honored the Air Force's Team of the Year during ceremonies in Washington, D.C., including an AFA-hosted dinner attended by CMSAF Gary Pfingston and Vice Chief of Staff Gen. Michael P.C. Carns. Each year, AFA pays tribute to five outstanding enlisted personnel from a career field, selected by the Air Force, that is either difficult to retain and recruit for or is worthy of distinction.

This year's Team of the Year is from the Professional Military

Education (PME) career field. Team members and their spouses came to Washington from as far away as Germany and Hawaii. During its visit, the Team was hosted for a day on Capitol Hill by AFA's National Defense Issues Department and the Air Force Office of Legislative Liaison. Accompanied by AFA President Jim McCoy, the Team received a full tour of the Capitol, including an opportunity to be on the floor of the House. Team members also called on congressional representatives from their home districts.

Where We Stand

"The Air Force Association believes that a dangerous gap is developing in our national security posture. We do not believe that the projected defense program is adequate, either to carry out the declared strategy or to secure the nation's interests."

—Air Force Association 1994 Statement of Policy



Edited by Daniel M. Sheehan, Assistant Managing Editor



Maxwell A. Kriendler Award winner Rep. Dave McCurdy (D-Okla.) (second from right) stands with (from left) National President James M. McCoy, Iron Gate Chapter President Robert H. Batta, and Aerospace Education Foundation President Thomas J. McKee during the Iron Gate Chapter's annual National Air Force Salute.

Iron Gate Focuses on Space

The **Iron Gate (N. Y.) Chapter's** National Air Force Salute entered its fourth decade by concentrating on an important and growing part of the Air Force's mission: space. The chapter's highest honor, the Kriendler Award, went to Rep. Dave McCurdy (D-Okla.), who serves on the Space Subcommittee of the House Science, Space, and Technology Committee. Representative McCurdy, a member of the Air Force Reserve, was hailed as an "acknowledged expert on defense, intelligence, and technology policy" whose "thoughtful counsel and innovative initiatives in these areas have led to well-grounded policy changes." The citation for the Kriendler Award also praised his "vision of an America that embraces a strong national defense while remaining engaged internationally." Representative McCurdy, whose district includes Tinker

AFB and Altus AFB, is one of the most respected members of the House of Representatives with regard to defense matters.

Also honored at the black-tie event were two of the Air Force's major space figures, Maj. Gen. Garry A. Schnelzer, Program Executive Officer for Space Systems, and Lt. Gen. (Gen. selectee) Thomas S. Moorman, Jr., vice commander of Air Force Space Command, who has since been named to be USAF's vice chief of staff.

General Moorman came to the USAF space program in 1975 at the Office of Space Systems. He subsequently served at AFSPC headquarters and with the Strategic Defense Initiative program. General Schnelzer has been involved in the Air Force space program since 1980, first at Air Force Space Division (now Space and Missile Systems Center) then at the SDI Organization.

Chapter President Robert H. Batta presented the two Generals with Ira C. Eaker Fellowships, representing \$1,000 contributions to the Aerospace Education Foundation.

In addition to supporting AEF, Iron Gate's National Air Force Salute also raises money for the Air Force Assistance Fund and the Falcon Foundation.

The audience at the salute felt the absence of longtime stalwart and Chapter Secretary Dorothy L. Welker, who died last year. Mr. Batta called for a moment of remembrance to honor the "first lady of the National Air Force Salute." He then announced that henceforward a Falcon Foundation scholarship would be awarded annually in her name. Amy Petrina, currently enrolled in the Wentworth Military Academy, picked up her award as the first recipient.

—James A. McDonnell, Jr.



Former Air Force Systems Command Commander Gen. Bernard P. Randolph, USAF (Ret.) (left), was the guest speaker at the Louisiana State Convention at Barksdale AFB. Here, he presents Kathy Hebert with her Louisiana Angel Flight Cadet of the Year plaque as State President Ivan McKinney looks on.

congratulate the Shiloh High School (Lithonia, Ga.) AFJROTC Drill Team II for its fine performance in a state-wide competition. Mr. Steed awarded the state championship trophy to team captain Jason Welch, whose squad had finished in the top three in five categories at the AFA-sponsored event, which drew 900 competitors from twenty-six schools. Incoming Arkansas State President Marleen Eddlemon presented an AFA Award to cadet James Greer during ceremonies at Cabot High School in Cabot, Ark.

At the chapter level, **Thunderbird (Nev.) Chapter** President Albert S. Dodd honored cadet CMSgt. Walter T. Childs with an AFA Award. **Eglin (Fla.) Chapter** Vice President Col. Joe Harrison presented a series of awards at Hurlburt Field, Fla., to students of Choctawhatchee Senior High School in Fort Walton Beach, Fla. Cadet Lt. Col. Pat Taylor received the National Medal, cadet Lt. Col. Mike Madrid was awarded a \$1,500 schol-

“Youth Will Be Served”

AFA chapters around the US put nineteenth century British author George Borrow’s words into action, honoring the achievements of students at both the high school and college levels.

In Nebraska, **Ak-Sar-Ben Chapter** President Densel K. Acheson presented AFROTC cadet Burton M. Massey with AFA’s Silver Medal Award at the Awards Convocation at the University of Nebraska at Omaha. **Eastern Carolina (N. C.) Chapter** President Bob Chin did the honors at a National Awards Ceremony, presenting an AFA Award to AFROTC cadet Melissa Stewart of Det. 600 at East Carolina University. Also in the Carolinas, **Strom Thurmond (S. C.) Chapter** President Col. Alton C. Whitley, a professor of aerospace studies at Clemson University, honored outstanding cadet Ronald K. Hall with an AFA Award at a joint Army and Air Force Honors and Awards Day at Clemson.

Cadet Kenneth R. Noojin was recognized with an AFA Award for his achievements as an AFROTC cadet at Indiana State University. **Terre Haute-Wabash Valley (Ind.) Chapter** President Howard Smith gave Mr. Noojin his award. Further south in the Hoosier State, cadet Kendra Goodpaster received her AFA Award from **Southern Indiana Chapter** President Marcus R. Oliphant during ceremonies at Indiana University, Bloomington. Jennifer



National Board Chairman O. R. Crawford (left) went to Capitol Hill to discuss taxation of permanent change of station moving allowances for members of the armed forces with Rep. J. J. “Jake” Pickle (D-Tex.), chairman of the House Ways and Means Committee’s Oversight Subcommittee.

L. Dvorak of AFROTC Det. 90 at Colorado State University garnered an AFA Award during the detachment’s annual Sunset Salute. **Long’s Peak (Colo.) Chapter** President Jim Strickland made the presentation.

Some students prepare for an Air Force career even before college, and AFA chapters nationwide support them as well. Georgia State President Jack H. Steed was on hand to

arship, four students received leadership awards, and four students were honored for academic achievement.

Without outstanding teachers, there would be no outstanding students. Recognizing this, the **Central Florida Chapter** sought to honor both sides of the educational equation. Chapter President Richard A. Ortega credits chapter member Tommy G. Harrison with running the successful program,



Dallas Chapter President Winston Williams (second from right) thanks USAF Chief of Staff Gen. Merrill McPeak for his speech to the aerospace/defense industry CEO breakfast, held in conjunction with the Dallas Military Ball. Flanking the two are State President Larry Miller and Vietnam War ace AFRES Brig. Gen. Steve Ritchie.

which recognized twenty-five students and twenty-five teachers for their accomplishments in math, science, and science technology. Each received a framed citation and a one-year membership in AFA. Three students were singled out for additional honors, receiving a \$100 US savings bond and a special citation. Three teachers were likewise honored, receiving special citations and \$300 apiece.

Chapter News

Orange County/General Curtis E. LeMay (Calif.) Chapter President Carl G. Bureman welcomed two special guests at a recent chapter meeting. Walter D. Ehlers, who as an Army staff sergeant received the Medal of Honor for "conspicuous gallantry and intrepidity" during the D-Day invasion, and William E. Barber, who received his Medal of Honor for valor as a Marine captain in defending a critical pass during the withdrawal from the Crossin Reservoir in the Korean War, attended the dinner and reception at the MCAS Tustin Officers Club. The two guests and chapter members heard guest speaker Jeffrey R. Laube of McDonnell Douglas give the inside word on the "Delta Clipper"—the single-stage-to-orbit system that may revolutionize space flight. Mr. Laube, McDonnell Douglas's principal engineer/scientist, described recent successful tests and gave an overview of the future of the system. National Vice President (Far West Region) John W. Lynch also attended the meeting.

Outstanding civilian and military performers were the honored guests

at a recent meeting of the **Sacramento (Calif.) Chapter**. Joseph Pace, lead computer specialist in the Automated Review Management Systems Technical Center of Expertise of the Army Corps of Engineers, walked off with an AFA Exceptional Performer Award for his work troubleshooting for the computer networks between the Air Force and the Army Corps of Engineers worldwide. Maj. Gen. John F. Phillips, commander of the Sacramento Air Logistics Center (ALC), McClellan AFB, Calif., presented the award. Chapter President Richard

Taubinger assisted General Phillips in honoring nineteen other top performers, including Sacramento Mayor Joseph Serna, Jr., Teacher of the Year Barbara Alden, and SMSgt. Marcella Burks of 4th Air Force at McClellan.

The **Carl Vinson Memorial (Ga.) Chapter** kicked off its membership drive by signing up aircraft enthusiast Will Callahan to a Life Membership in a ceremony attended by Chap-

Coming Events

July 8-9, **Virginia State Convention**, McLean, Va.; July 15-17, **Oregon State Convention**, Portland, Ore.; July 15-18, **Pennsylvania State Convention**, Pittsburgh, Pa.; July 22-24, **Texas State Convention**, Fort Worth, Tex.; July 23-24, **Iowa State Convention**, Des Moines, Iowa; July 29-31, **Florida State Convention**, Melbourne, Fla.; August 5-6, **New Mexico State Convention**, Albuquerque, N. M.; August 6, **Montana State Convention**, Three Forks, Mont.; August 12-13, **Arkansas State Convention**, Hot Springs, Ark.; August 12-14, **California State Convention**, Vandenberg AFB, Calif.; August 18-21, **Washington State Convention**, Seattle, Wash.; August 19-21, **Kansas State Convention**, Wichita, Kan.; August 20, **Indiana State Convention**, Indianapolis, Ind.; September 12-14, **AFA National Convention and Aerospace Technology Exhibition**, Washington, D. C.



More than 200 chapter members and guests attended an AFA awards reception at Dover AFB, Del., hosted by the Delaware Galaxy Chapter. Among the honorees was Audrey Doberstein, president of Wilmington College, who received her Premiere Salute Award from State President Robert M. Berglund.

ter President Jane Channell and 653d Communications-Computer Group Commander Lt. Col. Joseph E. Jaremko. Mr. Callahan, a handicapped employee of Warner Robins ALC, Robins AFB, Ga., is the son of National Vice President (Southeast Region) Dr. Dan Callahan. The mem-

bership drive culminated with a successful golf tournament in May.

In Maryland, **Thomas W. Anthony** Chapter Vice President (Aerospace Education) Charles X. Suraci, Jr., received letters of congratulations during Volunteer Week from President Bill Clinton and Governor William

Donald Schaefer for his "distinguished record of service."

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

AAF/USAF Crash Rescue Boat Ass'n

AAF and USAF Crash Rescue Boat personnel will hold a reunion October 13-15, 1994, in Orlando, Fla. **Contact:** AAF/USAF Crash Rescue Boat Association, P. O. Box 6004, MacDill AFB, FL 33608. Phone: (813) 527-8671 or (407) 588-5504 (Wayne Mellesmoen).

Air Weather Ass'n

Air Weather Service veterans and former meteorology cadets (World War II) will hold a reunion October 26-30, 1994, in Tucson, Ariz. **Contact:** Air Weather Association, 5301 Reservation Rd., Placerville, CA 95667.

CAP

The Civil Air Patrol will hold a reunion for Spaatz Award recipients in conjunction with its national meeting August 11-13, 1994, at the Sheraton Hotel in New Orleans, La. **Contact:** Lt. Col. Leonard Blascovich, CAP, 100-30 Elgar Pl., Apt. 30-H, Bronx, NY 10475-5048. Phone: (718) 379-8666.

"Coconut Heads"

Veterans who served on Christmas Island (World War II) will hold a reunion in September 1994 in Cincinnati, Ohio. **Contact:** Ernest Garrels, P. O. Box 343, 402 Linn St., Benson, IL 61516. Phone: (309) 394-2273.

Deming Army Airfield

Personnel who served at Deming AAF, N. M., will hold a reunion September 16-18, 1994, in Deming, N. M. **Contact:** Reunion Committee, 402 S. Tin, Deming, NM 88030. Phone: (505) 546-9535.

P-51 Mustang Pilots Ass'n

P-51 Mustang pilots will hold a reunion September 22-25, 1994, in Seattle, Wash. **Contacts:** Col. Frank J. Grenon, USAF (Ret.), 81 Park St., Wilmington, MA 01887. Phone: (508) 658-9846 or (206) 525-1224 (William M. Holloman).

RAAF/WAFB Veterans Ass'n

Veterans stationed at Roswell Army Airfield/Walker AFB, N. M., between 1941 and 1967 will hold a reunion September 16-18, 1994, at the Roswell Inn in Roswell, N. M. **Contact:** TSgt. Alfred H. Wilbur, USAF (Ret.), P. O. Box 2744, Roswell, NM 88202.

1st Fighter Squadron

Members of the 1st Fighter/Fighter-Day/Tactical Fighter/Tactical Fighter Training Squadrons who served at Seymour Johnson AFB, N. C., Bluethenthal Field, N. C., George AFB, Calif., and Tyndall AFB, Fla., will hold a fiftieth-anniversary reunion September 30-October 2, 1994, in Panama City, Fla. **Contact:** Capt. Robert M. Weesner, USAF, 1st Fighter Squadron, 157 Alabama Ave., Suite 1, Tyndall AFB, FL 32404-5020. Phone: (904) 283-4327/4328 or (904) 874-8588.

2d Aerial Port Squadron

Veterans of the 2d Aerial Port Squadron who served at Sewart AFB, Tenn., will hold a reunion September 23-25, 1994, in Smyrna, Tenn. **Contact:** Richard E. Vaught, 2399 Old Plank Rd., Newburgh, IN 47630. Phone: (812) 853-5679.

2d Photo Mapping Squadron

The 2d Photo Mapping Squadron will hold a reunion October 10-14, 1994, at the Executive Inn in Paducah, Ky. **Contact:** Harley J. Haegelin, 173 Lafayette Hts., Marion, KY 42064. Phone: (502) 965-3889.

3d Emergency Rescue Squadron

Members of the 3d Emergency Rescue Squadron will hold a reunion September 20-23, 1994, at the Biloxi Beach Resort Inn in Biloxi, Miss. **Contact:** Joseph A. Horvath, 515 Paine Ave., Toledo, OH 43605. Phone: (419) 693-6422.

9th Photorecon Squadron

Veterans of the 9th Photoreconnaissance Squadron (CBI, World War II) will hold a reunion August 31-September 3, 1994, in San Diego, Calif. **Contact:** Robert Becktel, 24161 Paseo Del Campo, Laguna Niguel, CA 92677. Phone: (714) 495-1784.

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.

15th Troop Carrier Squadron

Veterans of the 15th Troop Carrier Squadron, 61st Troop Carrier Group, will hold a reunion August 31-September 3, 1994, at the Marriott Hotel in Salt Lake City, Utah. **Contact:** Joseph J. Yuhasz, 983 Ridge Hill Ln., Apt. 31, Midvale, UT 84047-4422. Phone: (801) 566-5752.

19th Bomb Group Ass'n

Veterans of the 19th Bomb Group will hold a reunion September 21-25, 1994, in Wichita, Kan. **Contact:** Robert E. Ley, 3574 Wellston Ct., Simi Valley, CA 93063. Phone: (818) 703-7717.

25th Bomb Group Ass'n

Veterans of the 25th Bomb Group (World War II) will hold a reunion October 19-23, 1994, in Orlando, Fla. **Contact:** Jack W. Sheen, 13003 N. 12th Ave., Phoenix, AZ 85029-1755. Phone: (602) 863-3142.

27th Bomb Group

Veterans of the 27th Bomb Group (World War II) will hold a reunion September 27-29, 1994, at the Ramada Beach Resort in Fort Walton Beach, Fla. **Contact:** Paul H. Lankford, 105 Hummingbird Dr., Maryville, TN 37801. Phone: (615) 982-1189 (home) or (615) 984-7004 (work).

39th Fighter Squadron Ass'n

Veterans of the 39th Fighter Squadron will hold a reunion September 8-11, 1994, at the Holiday Inn-Riverwalk North in San Antonio, Tex. Members of the 40th and 41st Squadrons, 35th Fighter Group, 18th Fighter-Bomber Wing, and 35th and 51st Fighter-Interceptor Wings are welcome. **Contact:** Roy Seher, P. O. Box 352, Hydesville, CA 95547. Phone: (707) 768-3573.

Class 41-H

Members of Pilot Class 41-H will hold a reunion November 7-11, 1994, in Williamsburg, Va. **Contact:** Bob Sheeks, 145-A Treasure Way, San Antonio, TX 78209. Phone: (210) 826-8842.

57th Bomb Wing Ass'n

Veterans of the 57th Bomb Wing and assigned groups and squadrons, which included the 310th, 319th, 321st, and 340th Bomb Groups; 379th, 380th, 381st, 428th, 437th, 438th, 439th, 440th, 445th, 446th, 447th, 448th, 486th, 487th, 488th, and 489th Bomb Squadrons, and 308th Signal Wing, will hold a reunion September 5-12, 1994, at the Marriott

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Hotel in Overland Park, Kan. **Contact:** Robert E. Evans, 1950 Cunningham Dr., Speedway, IN 46224-5341. Phone: (317) 247-7507.

66th Troop Carrier Squadron

Veterans of the 66th Troop Carrier Squadron will hold a reunion September 8-10, 1994, in Fort Worth, Tex. **Contact:** J. M. O'Donnell, 7324 Yolanda Dr., Fort Worth, TX 76112. Phone: (817) 451-6398.

68th Fighter-Interceptor Squadron

Veterans of the 68th Fighter-Interceptor Squadron will hold a reunion September 16-18, 1994, at the Best Western-Grosvenor Resort in Orlando, Fla. **Contact:** Bob Kronebusch, 675 Mark & Randy Dr., Satellite Beach, FL 32937. Phone: (407) 777-2492.

306th Bomb Group Ass'n

Veterans of the 306th Bomb Group, 8th Air Force (World War II), will hold a reunion September 15-18, 1994, at the Crystal Inn in Des Moines, Iowa. **Contact:** Russell A. Strong, 5323 Cheval Pl., Charlotte, NC 28205. Phone: (704) 568-0153 or (704) 568-3803.

315th/943d Airlift Wing

Members of the 315th/943d Airlift Wing (Associate) will hold a twenty-fifth-anniversary reunion September 10, 1994, at the Omar Temple in Charleston, S. C. **Contact:** Maj. Christopher B. King, AFRES, Hq. 315th Airlift Wing (Associate), Charleston AFB, SC 29404-4917. Phone: (803) 566-2034 or (803) 566-3338.

357th Fighter Group Ass'n

Veterans of the 357th Fighter Group, 8th Air Force (World War II), and support groups will hold a reunion September 29-October 2, 1994, at the Holiday Inn-Downtown in Myrtle Beach, S. C. **Contact:** William B. Overstreet, 3387 Pasley Ave., Roanoke, VA 24015-4423. Phone: (703) 343-3133.

367th Fighter Group Ass'n

Veterans of the 367th Fighter Group, 9th Air Force (World War II), will hold a reunion in conjunction with a homecoming for the Minnesota Air National Guard's 148th Fighter Group September 15-18, 1994, at the Holiday Inn in Duluth, Minn. **Contacts:** Col. Allen J. Diefendorf, USAF (Ret.), 25985 Holly Vista Blvd., San Bernardino, CA 92404-3514. Maj. Penny Diercyck, 148th Fighter Group MSO, 4860 Viper St., Duluth, MN 55811-6031.

368th Fighter Group Ass'n

Veterans of the 368th Fighter Group (World War II) will hold a reunion October 13-16, 1994, at the Campbell House Inn in Lexington, Ky. **Contact:** Randolph Goulding, 2000 Clearview Ave., N.E., Atlanta, GA 30340. Phone: (404) 455-8555.

375th Troop Carrier Group

Veterans of the 375th Troop Carrier Group (World War II), which included the 55th, 56th, 57th, and 58th Squadrons, will hold a reunion October 6-9, 1994, at the Radisson Hotel in Hampton, Va. **Contact:** Lt. Col. Eugene A. Diemand, USAF (Ret.), 625 S. Wheaton Ave., Wheaton, IL 60187. Phone: (708) 668-9575.

384th Bomb Group

Veterans of the 384th Bomb Group will hold a reunion October 20-23, 1994, in Sarasota, Fla. **Contact:** Theodore Rothschild, 650 Snug Harbor Dr., Apt. G-402, Boynton Beach, FL 33435.

414th Bomb Squadron Ass'n

Veterans of the 414th Bomb Squadron, 97th Bomb Group, will hold a reunion September 28-October 1, 1994, in St. Augustine, Fla. **Contact:** Irving S. Schurmer, 441 Falconrock Ln., Agoura, CA 91301.

454th Bomb Squadron Ass'n

Veterans of the 454th Bomb Squadron, 323d Bomb Group, 9th Air Force (World War II), will hold a reunion September 7-11, 1994, at the Holiday Inn Crowne Plaza in Natick, Mass. **Contact:** Joe Havrilla, 1208 Margaret St., Munhall, PA 15120-2048. Phone: (412) 461-6373.

456th Fighter Squadron

Veterans of the 456th Fighter Squadron, 414th

Fighter Group (World War II), will hold a reunion September 29-October 2, 1994, at the Holiday Inn-Surfside in Clearwater Beach, Fla. Members of the 413th and 437th Fighter Squadrons are invited. **Contact:** James H. Baird, 1645 Plummer Dr., Rockwall, TX 75087. Phone: (214) 771-8529.

461st Bomb Group

Veterans of the 461st Bomb Group who served between 1943 and 1945 will hold a reunion October 12-16, 1994, at the Holiday Inn-Hampton Coliseum in Hampton, Va. **Contact:** Frank C. O'Bannon, P. O. Box 36600, Tucson, AZ 85740-6600. Phone: (602) 797-1439 or (800) 292-1490 (Marimac Corporation).

467th Bomb Group Ass'n

Veterans of the 467th Bomb Group and attached units will hold a reunion September 15-19, 1994, in Minneapolis, Minn. **Contact:** Lloyd Haug, 3115 Benjamin St., N. E., Minneapolis, MN 55418. Phone: (612) 789-6122.

468th Bomb Group

Veterans of the 468th Bomb Group will hold a reunion September 15-18, 1994, in Dayton, Ohio. **Contacts:** Harold E. Mufford, 57-N Hartland St., Middleport, NY 14105. Phone: (716) 735-7317 or (216) 732-8083 (Mike Drensek).

1708th Ferrying Group/Wing

Veterans of the 1708th Ferrying Group, 1708th Ferrying Wing, will hold a reunion September 15-18, 1994, at the Holiday Inn Resort in Cocoa Beach, Fla. **Contact:** Maj. Ernest D. Davis, Sr., USAF (Ret.), 17881 S.W. 113th Ct., Miami, FL 33157. Phone: (305) 238-3792.

6147th Tactical Control Group/Squadron

Veterans of the 6147th Tactical Control Group/Squadron, 5th Air Force, who served in Korea will hold a reunion November 2-6, 1994, at the Sandestin Resort in Destin, Fla. **Contact:** Guy Smith, P. O. Box 27, Niceville, FL 32588. Phone: (904) 897-4849. ■

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