

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE

Vietnam War Scrapbook

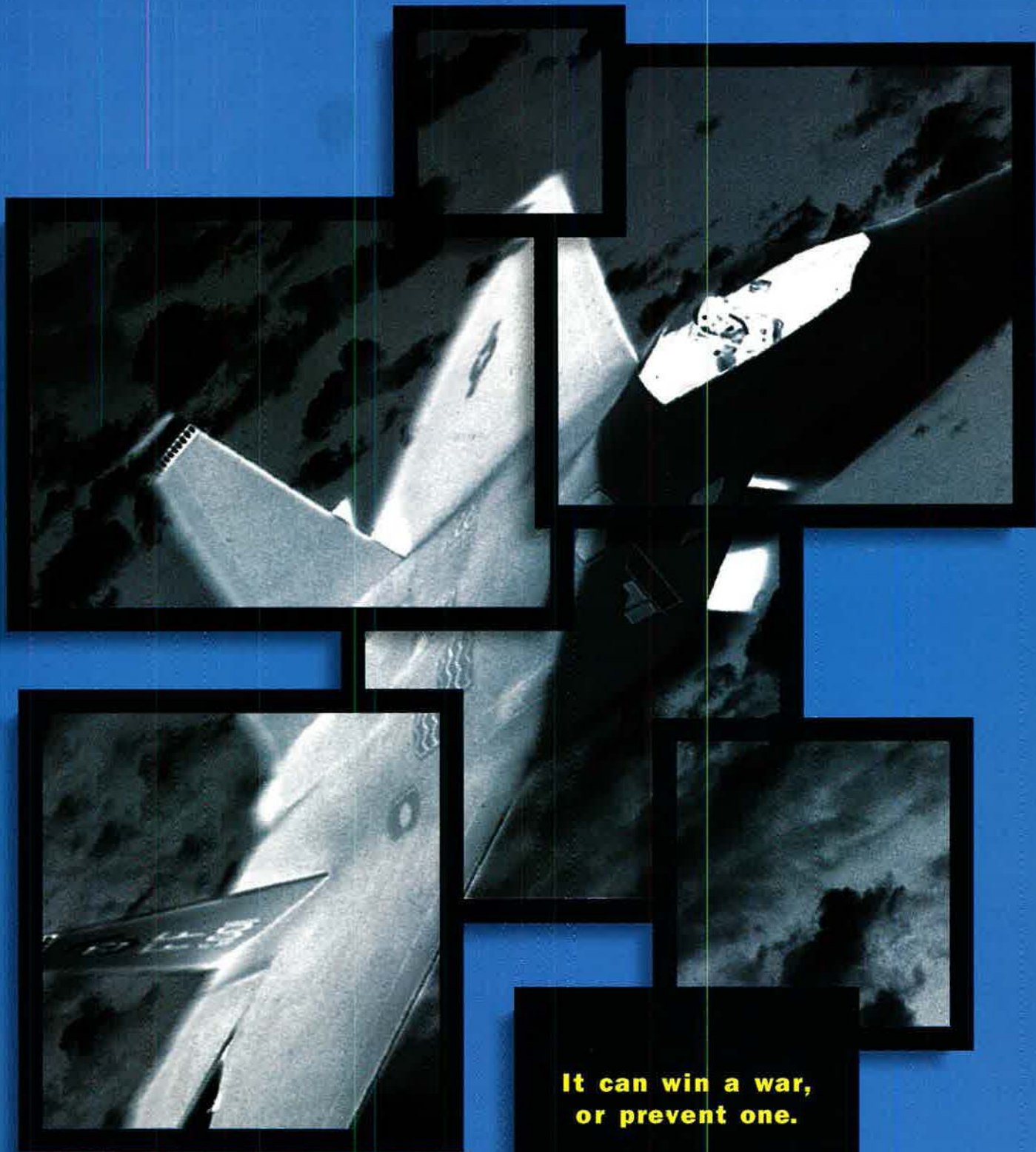


THAILAND
KORAT
STRIPES
AIR EDITION
Saturday, March 14, 1964

Soviet Balks
**RETURN FLIERS,
U.S. DEMANDS**

THE SAIGOPOST
Tuesday, March 24,

**Phom Penh Talk
Postponed**



**It can win a war,
or prevent one.**

WHEN THE FIRST F-22 ROLLS OFF THE ASSEMBLY LINE IT WILL SEND AN UNMISTAKABLE SIGNAL TO THE REST OF THE WORLD. AMERICA WILL NEVER RELINQUISH OUR DOMINANCE OF THE SKY. THAT SAME SIGNAL WAS HEARD LOUD AND CLEAR IN THE GULF WAR. SIMPLY BY FLEXING OUR MUSCLES, AMERICA FORCED THE IRAQI AIR FORCE TO TAKE COVER. AS A RESULT, THE WAR WAS SHORTENED AND ALLIED LIVES WERE SAVED. BUT THE AIR SUPERIORITY FIGHTER THAT FLEW IN IRAQ WILL BE 30 YEARS OLD BY THE TIME THE FIRST F-22 SQUADRON IS READY. WHICH IS WHY AMERICA NEEDS THE F-22 AS MUCH AS POTENTIAL ENEMIES FEAR IT.



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About the cover: This collection of Vietnam War-era artifacts introduces our "Vietnam War Scrapbook," a series of photographs from AFA members who served during the war. See p. 38. Photograph by Paul Kennedy.

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A hostile missile.
As seen through the sights
of the Airborne Laser.



A missile rises from an enemy launch site. It's still accelerating when a searing beam of energy bursts from the horizon, destroying the weapon in an instant, while still over the territory of those who launched it.

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ABL is the outgrowth of a quarter-century of technical progress—mature, and ready to report for duty. It promises America a true 21st-century defense. And the Rockwell team is directing all its energy to ensure ABL's success.



By John T. Correll, Editor in Chief

The Command of Space

REVERSING decades of tradition and doctrine, the Air Force announced in 1988 that it would regard space as a mission, not just a place. In the military scheme of things, space had long been seen as interesting and exotic but essentially peripheral. The announcement gave space some added clout in planning, programming, and budgeting, but it did not change attitudes overnight.

More than anything else, it was the Persian Gulf War that finally brought recognition and respect. Satellites were everywhere, doing almost everything. They provided target intelligence, spotted Scud launches, and carried eighty percent of the communications. Navstar GPS became a legend as it fed navigation signals to aircraft, tanks, and trucks. Space moved from marginal status to a position of indispensable support.

The next phase of the metamorphosis is under way. Space is becoming truly operational. One of the main predictions of "Air Force 2025," a speculative analysis just completed by Air University, is that "the medium for Air Force operations will move from the air and space toward space and air."

The Air Force has begun to prepare carefully for the eventuality that military operations—and probably combat—are going to occur in space. Some twenty nations will have space-based capabilities by 2000, with others in line to join the throng. As dependencies and threats in space intensify, the clash of interests is inevitable.

Missions of the joint-service US Space Command are performed largely by Air Force Space Command, which provides most of the money and most of the force structure and which launches and operates more than ninety percent of all Department of Defense space assets. However, efforts to get the space mission assigned to the Air Force have failed. The other services perceive the importance of space and want to keep their seats at the table. Joint command with the Air Force first among equals seems acceptable, though,

and that is where the organizational arrangement stands.

There are two "old" missions in space, neither of them inherently controversial:

■ **Space forces support** is the launching and operation of satellites and spacecraft. Cost and delay problems still exist, but there has been some progress, and more is on the way when the Evolved Expendable Launch Vehicle, now in development, is ready.

■ **Spacebased force enhancement** provides surveillance, navigation, communications, and weather information to fighting forces for threat

The Air Force is preparing for the eventuality that military operations—and probably combat—will occur in space.

warning, battle management, command and control, and other purposes.

It is two "new" military missions in space that bid to drive doctrinal change over the next ten to twenty-five years:

■ **Space force application** is military action in space with a direct effect on Earth. It includes exploring of technology for global precision strikes from or through space. Force-application missions might also be flown by a transatmospheric "aerospace plane," manned or unmanned, that could take off on demand, overfly any location in the world, and return to its base. There are no force-application assets in space today, but groundbased ICBMs—which follow a suborbital trajectory through space and which are now part of Space Command—can be seen as a bridge toward this mission.

■ **Space control** means protecting our ability to use space, preventing adversaries from interfering with that use, and negating an adversary's ability to exploit its own space forces.

"Undoubtedly, the most provocative subject in any discussion of the future of space is the subject of weapons and the likelihood of their use," says Gen. Thomas S. Moorman, Jr., Air Force vice chief of staff, a distinguished veteran of the space campaigns. "Here, I am referring to the broadest categories: spacebased lasers to shoot down hostile ICBMs, space weapons that attack other satellites, or weapons released from space platforms that destroy terrestrial targets. Today, these kinds of systems clearly break the current thresholds of acceptability and introduce Antiballistic Missile Treaty issues and social and political reservations. But the twenty-first century could well see a change."

That might happen because the necessities of everyday life and our economic and commercial interests have become so linked to space that we cannot allow an adversary to control it. It might also be that perspectives on space control will change as the ballistic missile threat proliferates and worsens or as other threats appear.

In preparation against that day, an operational culture permeates the Space Command complex at Colorado Springs. Its representatives attend the semiannual coordination meetings of the combat air forces. The firmly rooted view is that the Air Force of the future will be instantly aware, globally dominant in air and space, and omnipresent with spacebased sensors and weapons.

It is ironic that this would probably mean the redesignation of space as a place—specifically as an "area of responsibility" or operational combat theater in the lexicon of the unified command structure. Space Command would thereby gain a "supported" role rather than being constrained to a "supporting" one, as now.

The Air Force has been the lead service in space since the 1950s, and it must continue to lead the way as the United States moves toward the command of space in the opening years of the next century. ■

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NORTHROP GRUMMAN



Letters

Vital and Unmatched

I was delighted to see the 20th Fighter Wing highlighted in the August 1996 issue [*"Multirole," p. 58*]. As you illustrated, Shaw AFB, S. C., provides vital and unmatched capabilities to the nation. You couldn't have made a better choice for your article.

The men and women who serve at Shaw and the proud citizens of Sumter have not only produced a premier combat unit, they have also created a model of cooperation and mutual support that is second to none. I look forward to reading more good things about the Shaw community in future editions.

Rep. John M. Spratt, Jr.
(D-S. C.)
Washington, D. C.

Jesse Brown's Watch

For more than a year, Secretary of Veterans Affairs Jesse Brown has bashed Republicans in Congress with a barrage of fraudulent and deceptive attacks about the Republican budget's impact on veterans' programs [*"On Watch With Jesse Brown," August 1996, p. 70*].

Secretary Brown has misled veterans to believe that the Republican budget would impose a means test on service-connected benefits, tax veterans' benefits, remove disabled veterans from compensation rolls, and cut compensation for other disabled veterans. The Balanced Budget Act contained none of those proposals, and Secretary Brown knows it. He has also widely claimed that he would be forced to close numerous VA hospitals because of the budget.

With the apparent approval of President Clinton and clear knowledge of the facts, Secretary Brown continues spreading misinformation. He goes so far as to suggest that "veterans are under attack by hostile forces within this nation. Those forces are members of Congress. . . . We must stay alert because we have hypocrites in the land."

Yes, there are hypocrites in Washington. They are creating a pattern of deception, purposely telling half-

truths to scare veterans for political advantage. But, they are not the Republican members of Congress.

In the 1994 budget, the Office of Management and Budget planned to cut VA employees as part of the Clinton Administration's "heralded" re-inventing government effort to reduce the federal work force by 252,000 positions by 2000. Congress, at that time controlled by the Democrats, blocked the proposal, which would have cut 27,000 VA positions, and worked out a compromise limiting the VA cuts to 10,051 employees.

In the 1995 budget, President Clinton proposed the first installment of these personnel reductions. Secretary Brown presented it to Congress and defended the President's budget, which included cutting VA medical-care staffing by 3,400. Congress refused to accept the budget, allocating \$100 million more than Secretary Brown had requested for VA medical care. Despite this increase, the VA eliminated 3,436 medical-care positions and closed 2,300 hospital beds. Clearly, these staff reductions and bed closures were not budget driven. They were part of a plan to move the VA's health-care system in line with private-sector models, emphasizing outpatient and primary care.

For 1996, Congress increased VA medical-care spending by \$400 million above 1995. Secretary Brown shrieked for months that veterans would suffer because of the cuts. He forecast catastrophe and called Congress "meanspirited." Republican leaders assured veterans that funding

would remain sufficient to provide well-managed, high-quality care. In testimony before the House Committee on Veterans' Affairs, the Secretary stated that his dire predictions "did not happen because of increased efficiencies and consolidations of service." He did not explain why his previous predictions failed to reflect the VA's planned efficiencies and consolidations. This raises the question of whether he was out of the loop or was scaring veterans for political purposes.

Testimony from Under Secretary for Health Dr. Kenneth W. Kizer confirmed that the previous reductions did not result from budget cuts but were part of the VA's initial efforts to reform. He said, "We are fundamentally reengineering and reinventing the health-care system so that it goes from a hospital-based system to an ambulatory care-based system . . . rooted in primary care." He added that the VA would "continue to emphasize improved and increased accessibility and quality of VA health care." . . .

Secretary Brown has a responsibility to tell veterans the truth about VA health care and the President's budget. He blames Congress for cutting VA spending by \$915 million for 1996. Congress has increased veterans' medical-care spending by more than \$400 million between 1995 and 1996—from \$16.2 billion to \$16.6 billion—and it has increased veterans' compensatory benefits spending by more than \$550 million—from \$19.5 billion to \$20.1 billion. . . .

The Secretary should be honest and tell veterans that the President's budget takes VA medical care from a high of \$17 billion in Fiscal Year 1997 to a low of \$13 billion in Fiscal Year 2000 without one word about how this would be accomplished. When asked about this at a hearing, Secretary Brown told the obvious truth, saying, "The President's outyear numbers would devastate the VA."

As a self-proclaimed "advocate" for veterans, Secretary Brown should have the courage to tell the truth—that the House Republican budget is better for veterans than the Pres-

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

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Letters

ident's budget is. The House VA/HUD appropriations bill for FY 1997 would spend \$60 million more on VA health care and \$20 million more on VA medical research in 1997 than President Clinton proposed and \$10.6 billion more on VA health care during the next six years. The House budget requires less in savings from veterans' programs to balance the budget and provides for nearly \$230 million in benefit improvements not contained in the Clinton budget plan.

Rep. Bob Stump (R-Ariz.)
Chairman, House Committee
on Veterans' Affairs
Washington, D. C.

As a retired veteran with a permanent disability, I receive a portion of my retired military pay and some health care from the VA, so I was more than casually interested in "On Watch With Jesse Brown."

I was particularly pleased to see VA Secretary Brown's staunch position on the need to take care of those who bore the nation's burden in wars and pseudo-wars since World War II. I applaud his efforts to fight for adequate funding for this vital program but must disagree with his pronouncements on who the VA's enemies are.

Secretary Brown warned that VA programs like the GI Bill are constantly under attack by Republicans in Congress. That's not quite true. A quick historical review will show that the most effective attacks against veterans are mounted during liberal Democratic administrations when liberals also control Congress. The GI Bill expired during President Carter's Administration but was reinstated under President Reagan. . . .

Last November, the Clinton Administration launched an all-out media blitz on the Congressional budget, designed to terrify the electorate with deceptive rhetoric. They called the Congressional budget "radical" and "meanspirited" and said it would cause children to starve, schools to close, and the elderly to be put out in the street. Senior Administration officials, with their well-established hostility toward the military, didn't dare to address the nation's veterans, so they assigned Secretary Brown to do it.

He visited as many veteran associations as he could—especially in California and Florida—with the same alarming message: The Congressional budget would devastate the VA. It would cost the VA 61,000 jobs and cause it to close forty-one facilities. The same message went to Secretary Brown's 240,000 employees.

All the while, Secretary Brown knew that the seven-year Congressional budget had almost \$7 billion more in it than President Clinton's did. . . .

As Secretary Brown says, some people would shred the hard-won veterans' benefits, often bought with blood. But let's be honest about who is likely to do the shredding. It's not the Republican-led Senate and House Committees on Veterans' Affairs. It's certainly not Bob Dole, who instructed Sen. Pete V. Domenici (R-N. M.), chairman of the Senate Budget Committee, to "include in our Senate bill the House-approved Department of Veterans Affairs substantially improved eligibility reform measures" and "not cause the veterans to pay thirty percent more each month for GI Bill benefits." Hardly sounds anti-veteran to me. . . .

Victor R. Kregel
Colorado Springs, Colo.

The Proud ANG

I'm disappointed that the photo of Taszar, Hungary [*"RED HORSE of the Balkans," April 1996, p. 34*], is used without any reference to the ANG MPN-14K Radar Approach Control system in the article. The MPN-14K in the photo was deployed by the 235th Air Traffic Control Flight (ATCF) of the Indiana ANG. Some of our personnel (114th ATCF, Pennsylvania ANG) augmented the initial 235th ATCF deployment, along with other ANG air traffic units, and personnel continue to rotate through Taszar.

I know it's difficult to recognize every unit's contributions, but we in the ANG air traffic community are proud of our contribution to the operation at Taszar. The bad weather there would have prevented most airlifters from landing without the aid of our mobile equipment and personnel.

MSgt. Steven E. Anslinger,
Pennsylvania ANG
State College, Pa.

Fond Phantom Memories

In reference to "The Last Phantom" [*July 1996, p. 46*], it was good for the heart of this old crew chief to see an old friend eulogized the way you paid respect to the last G model F-4 sortie.

During eight years of service, I crewed every model of this bird in the USAF inventory. The experience was not all colorful and glorious; the F-4 was at times an experience in exasperation to keep operationally ready. . . .

Thanks for paying tribute in such an honorable manner to an old friend.
Scott E. Cooper
Lancaster, Calif.

Bismarck Sea Triumph

After reading "Victory in the Bismarck Sea" [August 1996, p. 88], I believe additional details need to be reported. I know—I was Maj. Ed Larner's copilot in that Japanese military disaster of fifty-three years ago.

On that last day of airpower triumph, we came upon a still-floating damaged Japanese destroyer off the north New Guinea coast. No crew members could be seen, one gun was bent like a horseshoe, and a lot of lines trailed in the water. Major Larner radioed other B-25s of our 90th Bomb Squadron in the area: "You guys go somewhere else! This one's all mine!"

Major Larner decided we would make several runs at masthead level from stern to bow of the destroyer. I was to toggle out the four 500-pound bombs with five-second delay fuzes, one bomb per run. We made four runs. Three of the bombs hit the water off the stern alongside the destroyer. The fourth struck the deck.

Larner did not wait around for the sinking but instead swung the B-25 to a sighting to the northwest. As far as the eye could see extended a line of lifeboats, rafts, and ship debris containing or covered with scores of ship crewmen and Japanese infantry (an entire Japanese division had been aboard the sunken convoy).

Larner put me to work pulling the cockpit gun charging cable handle and opened up on the survivors with our eight forward-firing .50-calibers. . . . Other B-25s, A-20s, and Australian Beaufighters now joined the strafing. No Japanese fighters were anywhere in sight.

Was this carnage justified? Probably so, because, as C. V. Glines reports, Japanese fighters on the previous day strafed B-17 crew members as they floated down in their parachutes. . . .

The final chapter of the Ed Larner story occurred in early May 1943. Ed was no respecter of aircraft and flew every bird as if it were a fighter. On this day in May, Ed pulled a B-25 apart in a sharp pullup at Dobodura airstrip on New Guinea's north coast. We buried Ed, his entire crew, and Australian observer John White in the Port Moresby cemetery.

Lt. Col. H. Ross Miller,
USAF (Ret.)
Corona Del Mar, Calif.

"Victory in the Bismarck Sea" recognized the part played in the battle by Royal Australian Air Force Beaufighter crews. Other participating RAAF units flew Boston and Beaufort

light bombers and Catalina flying boats.

A major contribution also came from the senior RAAF commander in the theater at the time, Group Capt. W. H. "Bull" Garing, who, Gen. George C. Kenney later wrote, made it easy for Gen. Douglas MacArthur "to put four stars on my shoulders."

Alan Stephens
RAAF Historian
RAAF Fairbairn, Australia

"Victory in the Bismarck Sea" relies heavily on Gen. George C. Kenney's memory of that battle as covered in *General Kenney Reports* and is in error by omission.

C. V. Glines and General Kenney state that "Sixteen P-38s provided top cover." Not so. As I convinced General Kenney after he retired, twenty-eight P-38 Lightnings provided cover that morning. Sixteen P-38s from the 39th Fighter Squadron, 35th Fighter Group, were to provide medium-altitude (15,000 feet) cover for the twelve P-38s from 9th Fighter Squadron, 49th Fighter Group, that I was leading to provide close cover for the bombers at 7,000 to 8,000 feet.

When the newly equipped, experienced "Cherry Blossom" Group of Japanese fighters arrived at their usual 20,000 feet, the 39th P-38s left their assigned altitude and climbed up to meet the Zeros, a tactic not in good favor at that time. When the 39th engaged the more than thirty Zeros, approximately half the Japanese dove down on the 9th Fighter Squadron, which fought to keep them off the bombers. . . .

I also question the claim "Of the thirty Japanese fighters . . . twenty-two were definitely destroyed, two were probables, and four were damaged." The 9th shot down four or five, as I recall, of which I shot down one, with no losses. I doubt that the 39th shot down many more than that number. During my tour in Australia and New Guinea in 1942-43, I knew of no victories on such a lopsided scale.

Col. Clay Tice, Jr.,
USAF (Ret.)
Palm Desert, Calif.

Budget Disputes

Your flippant report on the new group of business executives who advocate lower defense spending [*New Priorities, Funny Figures, August 1996 "Aerospace World," p. 18*] did not uphold your normally high standards of editorial accuracy and fairness. In trying to debunk their knowledge of the subject, you took

some liberties with the facts yourself.

You nitpicked the group's statement that DoD spends "more today in inflation-adjusted dollars than President Nixon spent in the 1970s at the Cold War's height" by noting that the peak Nixon year, 1969, saw defense spending of \$363.9 billion, about \$100 billion higher than President Clinton's request for FY 1997. Unfortunately, you neglected to inform your readers that by 1974 President Nixon had reduced the defense budget to \$261 billion and that President Ford continued to cut the budget to a low of \$246.3 billion in 1976.

The Business Executives for New Priorities are right. We are spending as much on national defense today—\$270 billion in 1996 and \$265.6 billion in 1997—as we did during the Cold War years of the 1970s. Even if you disagree with the group's goals, you cannot deny their facts.

Brian P. Moran
Legislative Assistant to
Sen. Dale Bumpers (D-Ark.)
Washington, D. C.

■ *The Nixon presidency spanned all or much of six fiscal years. National defense outlays, as calculated in 1997 dollars, were as follows:*

1969—\$363.9 billion; 1970—\$340.9 billion; 1971—\$315.0 billion; 1972—\$306.4 billion; 1973—\$280.4 billion; 1974—\$264.5 billion.

For the upcoming year (1997), President Clinton proposed \$259.4 billion. Congress raised it to \$264.1 billion, but that amount is still lower than any Nixon year. The defense figure for this year (1996) was \$274.5 billion. That level of spending exceeds Nixon's last and smallest outlay but no other. Neither outlay figure approaches the Nixon average: \$312 billion.

Not everyone would call the last Nixon years (and Ford's) the "height" of the Cold War. After 1972, the centerpiece of superpower ties was détente. By comparison, the Reagan era featured clashes over Euromissiles, Nicaragua, strategic nuclear weapons, Afghanistan, and more, and defense spending rose to \$403 billion in 1986.

President Nixon did not willingly "reduce" the defense budget. Henry Kissinger noted that the President waged "a desperate, continuing battle" with Congress over budget cuts. He wrote, "The cumulative impact of these stringencies and of changes in military technology had, by the beginning of Nixon's second term, brought about worrisome deficiencies in our military posture."—THE EDITORS

By John L. Frisbee, Contributing Editor

Pardo's Push

Uncommon courage, ingenuity, and skill were combined in a unique experience of the Vietnam War.

THERE are pilots who fly fighters, and there are fighter pilots. Retired Lt. Col. Bob Pardo is one of the latter. When he's not flying corporate jets in Colorado, he's doing aerobatics in single-engine planes with fighter pilot friends.

Of the 132 missions he flew in Vietnam with the 8th Tactical Fighter Wing, the most memorable is that of March 10, 1967, when he and his weapon system officer, Lt. Steve Wayne, went against steel mills near Hanoi. In their flight was Capt. Earl Aman and his "Guy in Back," Lt. Bob Houghton. The Hanoi area was the most heavily defended in the history of air warfare, and on that day enemy ground fire was the heaviest Captain Pardo had seen in his many trips downtown.

Before they reached the target, Captain Aman's F-4 was hit, but he was able to stay with the formation. As they were rolling in on the target, anti-aircraft gunners found Aman again. His aircraft began to leak fuel rapidly. Pardo also was hit but was able to continue with the strike, though his F-4, too, was leaking fuel. By the time they were above 20,000 feet on their way out, it was obvious that Aman did not have enough fuel to reach Laos, where he and Houghton could bail out with a reasonable chance of being rescued. If they punched out over North Vietnam, they were almost certain to be captured and either killed or sent to reserved accommodations at the Hanoi Hilton.

Bob Pardo, on the other hand, probably had enough fuel, with careful management, to reach a tanker, leaving Aman and Houghton to an uncertain fate. That was not Pardo's way. "How can you fly off and leave someone you just fought a battle with?" asks Pardo. "The thought never occurred to me." He would stay as long as Aman's fuel lasted, then

think of some way to get the two men to safety.

Pardo didn't have long to think about it. While they were still over North Vietnam, Aman flamed out. What to do now? Desperate situations demand desperate measures. Pardo decided to do something that, to his knowledge, had not been done before. He would push Aman's F-4 to Laos. (In 1952, during the Korean War while Pardo was still in high school, fighter ace Robbie Risner had pushed his wingman out of North Korea in an F-86. Pilots then were ordered to refrain from attempting the hazardous act again, and the event, which Risner hardly ever mentioned, faded from memory.)

With delicate touch, Pardo brought the nose of his damaged aircraft into contact with Aman's F-4, now plunging toward the Laotian jungle at 250 knots. He soon found that the pointed nose of an F-4 was not designed for pushing anything more solid than air. After several failed attempts, Bob Pardo came up with a brilliant idea. He told Aman to drop his tailhook. He then maneuvered his windscreen against the tailhook. It worked, but about every thirty seconds Pardo would lose contact because of turbulence, then back off and come in again. It was an extraordinary job of flying. Aman's rate of descent was reduced to 1,500 feet per minute.

Their problems were not over. Pardo's left engine caught fire. He shut it down, then restarted it, and again it caught fire. Never mind that. He would be at zero fuel in ten minutes anyway. It was time for everyone to hit the silk. Aman and Houghton bailed out at 6,000 feet, followed shortly by Wayne and Pardo. Once on the ground, Aman and Houghton were pursued by the enemy but managed to elude them. All four men were picked up by rescue helicopters—Pardo, who bailed out last, was rescued forty-five minutes after the others—and returned to their base at Udorn RTAB, Thailand.

Bob Pardo was an instant hero to the other pilots but not to some higher-



Twenty-two years after the "push," Lt. Col. Bob Pardo, USAF (Ret.) (left), and Col. Steve Wayne (right) received their Silver Stars from Lt. Gen. Chuck Horner during ceremonies at Shaw AFB, S. C.

echelon accountants, who threatened to bring charges against him for losing an expensive airplane. Good judgment prevailed, and the charges were dropped. Two decades later, he and Steve Wayne each were awarded the Silver Star for what came to be known as Pardo's Push, immortalized in a striking painting by aviation artist Steve Ferguson.

Bob Pardo still is concerned for the well-being of his fellow airmen. When he learned that Earl Aman, now a retired lieutenant colonel, is suffering from Lou Gehrig's disease and had lost his voice and mobility, he founded the Earl Aman Foundation, which has raised enough money to buy Aman a voice synthesizer, a motorized wheelchair, and a computer. The foundation now is working to buy a van for Aman and has expanded its work to include members of the Red River Valley Fighter Pilots Association. In peace or war, says Bob Pardo, "if one of us gets in trouble, everyone else gets together to help." ■



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The Chart Page

By Tamar A. Mehuron, Associate Editor

Trading Places: Defense and Entitlements

KEY

- National Defense Outlays
- Payment to Individuals

Figure 1 shows that, in 1962, defense spending as a percent of GDP was substantially higher than payments to individuals for such entitlements as Social Security, Medicare, and retirement pay. By 1995, the situation was reversed. Spending for individual entitlements had far outpaced defense outlays, which were continuing to decline.

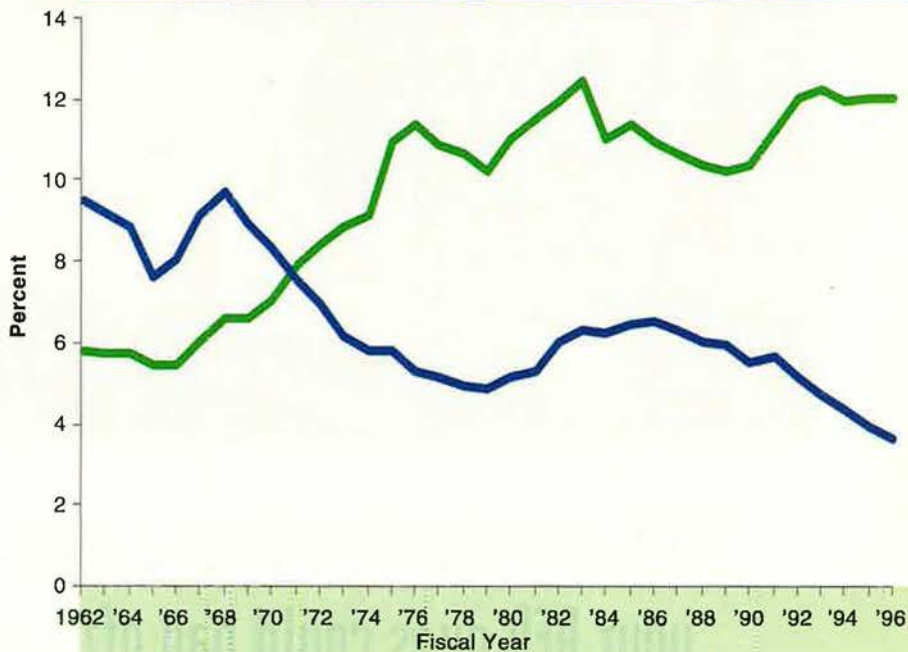
When calculated as a percentage of federal outlays, this trend is even more pronounced. Figure 2 shows that in 1995, payments to individuals were more than triple the percentage of outlays going to defense.

Figures for FY 1996 are estimates.

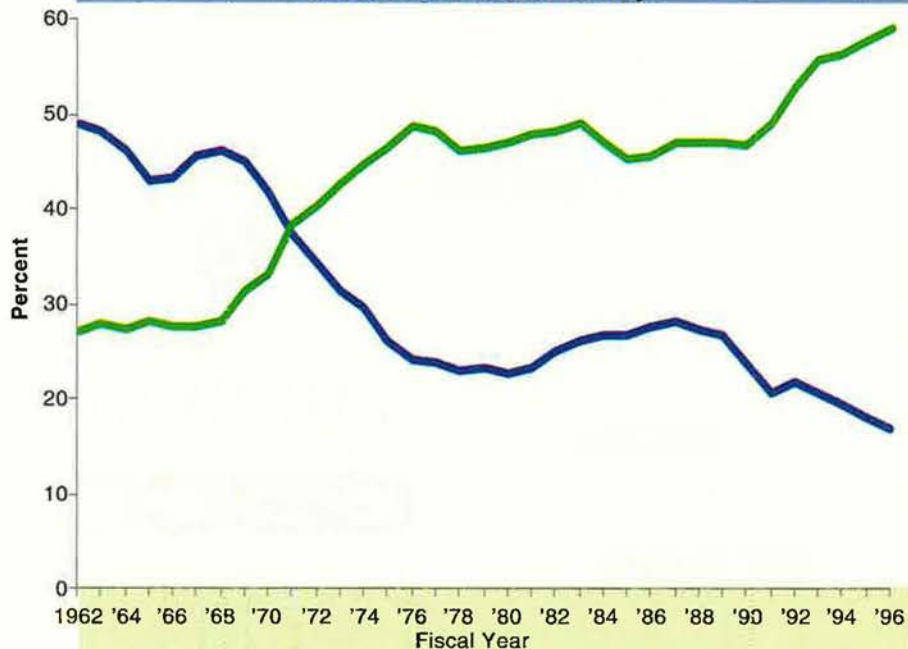
Source: USAF Statistical Digest, FY 1995.

Defense Outlays vs. Payments to Individuals

Percent of US Gross Domestic Product



Percent of Federal Outlays



Aerospace World

By Suzann Chapman, Associate Editor

"Desert Strike" Opens Confrontation

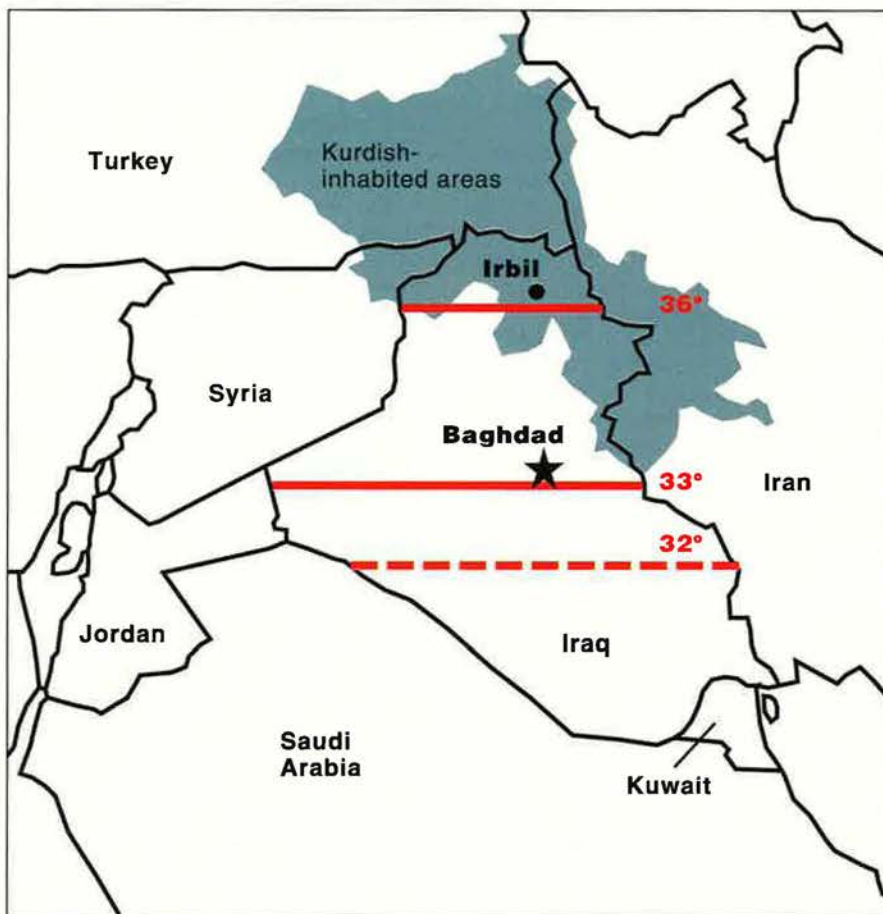
In a new face-off with Iraqi leader Saddam Hussein, US forces launched two cruise missile attacks against fourteen air defense targets in southern Iraq. Defense Department officials said the attacks, carried out by USAF heavy bombers and US Navy warships on September 3 and 4 (local time), reduced the risks to Allied pilots patrolling in the area and therefore permitted Washington to expand its existing no-fly zone over southern Iraq.

Extending the no-fly zone to the north and thus further constricting the military capability of Saddam was described as a prime goal of the raids, known as Operation Desert Strike. The US did this in response to Baghdad's sudden attack on Kurdish areas in northern Iraq, currently under UN protection.

Defense Department officials said US and British fighter aircraft began patrolling the expanded southern no-fly zone on September 4. Defense Secretary William J. Perry said that coalition pilots encountered two challenges on that day. Two Iraqi MiG aircraft approached Allied aircraft but turned back before they reached the edge of the new zone. In a second move, the radar operator of an Iraqi SA-8 "Gecko" mobile surface-to-air missile system illuminated a USAF F-16, possibly as a prelude to an attack. The F-16 fired an AGM-88 High-Speed Antiradiation Missile at the radar, which then went off the air.

On September 11, Iraqi forces launched a Russian-designed SA-6 "Gainful" missile against two US F-16s patrolling the northern no-fly zone. Secretary Perry told reporters that Iraq's air defense crews were "playing some kind of game, and they will soon learn that we are not playing games." He said, "The responses that we will make will be disproportionate with the provocations that are made against us."

At press time, the US had dispatched eight 49th Fighter Wing F-117 Nighthawk stealth fighters from



US and coalition forces extended the northern edge of the no-fly zone over southern Iraq from 32° N to 33° N on September 4. The no-fly boundary over northern Iraq remains at 36° N. In the first Desert Strike attack, two USAF B-52 bombers from Barksdale AFB, La., fired Conventional Air-Launched Cruise Missiles, and two US Navy warships in the Persian Gulf launched Tomahawk cruise missiles into Iraq. In a second "mop-up" attack less than twenty-four hours later, Navy ships fired cruise missiles at four of the same targets. The idea was to eliminate doubts about their destruction raised by bomb-damage assessments.

Holloman AFB, N. M., to Kuwait and two B-52s from Andersen AFB, Guam, to the British Indian Ocean territory Diego Garcia, closer to the Persian Gulf region.

C-130 Crash Claims Nine

Eight USAF crew members and one Secret Service agent were killed when a USAF C-130 carrying Presidential support equipment and vehicles crashed August 17 near Jackson Hole, Wyo.

The aircraft, assigned to the 7th Wing, Dyess AFB, Tex., slammed into Wyoming's Sleeping Indian Mountain just minutes after takeoff. A USAF investigating team found the cargo airplane's two "black boxes," flight data recorder, and cockpit voice recorder on August 19. Pentagon officials said the boxes had been sent to Oklahoma City, Okla., for analysis.

Air Force members killed were

Capt. Kevin N. Earnest, aircraft commander, Kingsport, Tenn.; Capt. Kimberly Jo Wielhouwer, pilot, Andover, Kan.; 2d Lt. Benjamin T. Hall, navigator, Bayfield, Colo.; SSgt. Michael J. Smith, Jr., loadmaster, Tecumseh, Okla.; SrA. Rick L. Merritt, flight engineer, Lynch Station, Va.; SSgt. Michael R. York, loadmaster, Kennesaw, Ga.; SrA. Billy R. Ogston, crew chief, Boise City, Okla.; and Amn. Thomas A. Stevens, loadmaster, Florida.

USAF Survey Shows Positive Trends

Approximately thirty-six percent—189,900—of the active-duty and civilian force returned responses to the 1996 Air Force Personnel Survey. Officer and enlisted respondents apparently now have a more positive view of the assignment and evaluation systems than they did in 1995.

Concerns raised in the 1995 Quality of Life Survey [see *"The Quality of Military Life," December 1995, p. 30*] prompted USAF leaders to seek more specific information about both officer and enlisted perceptions of the military assignment and evaluation systems.

In 1995, the results were almost evenly divided between officers who disagreed (forty-one percent) and those who agreed (forty-four percent) that the assignment process was fair. This year, more officers (fifty-one percent) feel the "assignment system is as fair as it can be." However, although rated officers do have a more positive impression this year than last, they still were less positive than nonrated officers.

High among the reasons listed by those who rated the assignment system as unfair was the belief that "advertised jobs are already promised to someone," specifically through a "good-old-boy system."

Similarly, more enlisted members agreed that the assignment process is "as fair as it can be in allowing qualified persons to compete for advertised requirements while meeting mission needs." In 1995, forty percent agreed and thirty-eight percent disagreed, while this year fifty-six percent agreed and only twenty-seven percent disagreed.

Favorable perceptions of evaluation systems' fairness also rose. More than half (fifty-five percent) of officers reported their system to be "as fair as it can be," compared with forty-three percent in 1995. Only thirty-two percent of enlisted respondents in 1995 rated their evaluation system

as fair. This year, sixty-two percent of technical sergeants and below and fifty-four percent of master sergeants and above said the system was fair.

Personnel officials said next year's survey will focus on retirement, housing, and pay issues.

"Joint Vision 2010" Unveiled

Gen. Joseph W. Ralston, vice chairman of the Joint Chiefs of Staff, officially released the Pentagon's new warfighting strategy, "Joint Vision 2010," at a Pentagon press briefing July 17. General Ralston said the new strategy will be "the yardstick by which service programs will be measured."

Two years in the making, the new strategy offers four operational concepts for enabling US forces to dominate a future high-tech battlefield. [See *"Joint Vision," August 1996 "Editorial," p. 3.*]

The Joint Chiefs also planned to begin a series of war games to test the operational concepts and to release this year an expanded Joint Vision 2010. The expanded strategy would usher in a series of technology demonstrations, war games, exercises, and seminars to start in late 1998.

Review To Focus on More Cuts

House and Senate defense authorization conferees want the Pentagon to use its quadrennial review to consider the extent to which technologies that may be available within the next ten years will make additional force reductions possible.

The Fiscal 1997 conference report directed the Defense Department to assess the impact on force structure of emerging technologies, such as precision guided munitions, stealth, night vision, digitization, and communications. Then the Chairman of the Joint Chiefs of Staff and a National Defense Panel [see *"New Strategy Review on Tap," September 1996 "Aerospace World," p. 23*] each would submit assessments of the quadrennial review to the Defense Secretary. The NDP is expected to be operating by December 1, 1996.

The conference report calls for the Secretary of Defense to submit a comprehensive report to Congress by May 15, 1997.

How Much Brass Is Enough?

With the Marine Corps asking for twelve new general officer positions, Congress wants the Pentagon to review the whole shooting match—topside.

The conference report for the Fiscal 1997 defense authorization bill calls for Defense Secretary Perry to "conduct a comprehensive review" of the number of authorized reserve and active-duty general and flag officers. Congress also wants the General Accounting Office to take a look. The Pentagon's review results would be due six months after the defense bill becomes law.

At the same time, the conference report requires Secretary Perry to cut his Pentagon military and civilian staff by twenty-five percent over the next three years, using October 1, 1994, as a baseline. He is to reduce personnel by fifteen percent by October 1, 1997, and by another five percent each in 1998 and 1999.

Individual service staffs at the Pentagon may face additional reductions. Secretary Perry must "review the size, mission, organization, and functions of the military department headquarters staffs." The review must consider duplication between the Office of the Secretary of Defense and the military departments, as well as further consolidation between the civilian secretariats and service chiefs.

The review is due to Congress by March 1, 1997, and, specifically, "shall make every effort to provide for significant reductions in the overall number of military and civilian personnel assigned to or serving in the military department headquarters staffs."

ABL Closes In on Requirements

A high-energy laser, built by TRW, has met the performance requirements needed to build a megawatt-class laser for USAF's Airborne Laser (ABL) program, the Boeing, TRW, and Lockheed Martin ABL team announced August 19.

TRW said that its tests highlight the maturity of ABL technology and provide a solid technical basis for the Air Force to proceed with development of its revolutionary theater missile defense system. The ABL system would employ a chemical oxygen-iodine laser mounted on a 747 aircraft to shoot down theater ballistic missiles while they are still in their boost phase over their launch areas.

Although the program has not received widespread support within DoD or Congress, Air Force leaders have repeatedly stated their support and intent to fund the effort.

USAF expects to select either the Boeing-led team or one headed by Rockwell International next month to continue to the program-definition-and-risk-reduction phase, in which

the winning team will integrate the laser on a 747.

SMTS Deployment in Question

Congress expressed its dismay at the Pentagon's handling of the Space and Missile Tracking System (SMTS) program in the conference report for the Fiscal 1997 defense authorization bill.

The report stated that DoD's "on-again, off-again approach to competition is not acceptable." The SMTS is the portion of the Spacebased Infrared (SBIR) system featuring low-Earth orbit satellites.

The report authorized a total of \$427.4 million in Fiscal 1997 for the SBIR system but prohibited the Pentagon from spending more than \$100 million on the SBIR system Space Segment High until the Secretary of Defense certifies to Congress appropriate management responsibilities for the SMTS portion of the program.

The Fiscal 1996 defense authorization bill directed the Pentagon to deploy SMTS satellites beginning in Fiscal 2002. However, *Defense Week* reported that acquisition chief Paul G. Kaminski sent a letter to Congress July 24 stating that the accelerated program involved technical risk and a "significant chance for failure." He

said the SMTS flight demonstration system could not meet its planned Fiscal 1999 launch date, precluding early deployment in Fiscal 2002.

Lt. Gen. (Gen. selectee) Howell M. Estes III told Congress July 31 in his nomination testimony for the top US Space Command post that acceleration of the program was still under review. He said that for the system architecture to be implemented, the high component must be deployed before the low component to successfully make the transition from the Defense Support Program without operational degradation.

Changing Face of Assignments

A smaller personnel pool and the Internet are enabling the Air Force to make the assignment process more user friendly. The service is also creating a larger role for commanders in individual officer assignments.

A major change that started this summer affects follow-on assignments from remote tours. The Air Force now offers all enlisted members and company-grade officers the opportunity to request a base or area before they depart for a remote assignment. Prior to this change, the service's home basing policy allowed only some forty-four percent of en-

listed members to know where they would be assigned following a remote tour. There was no similar program for officers.

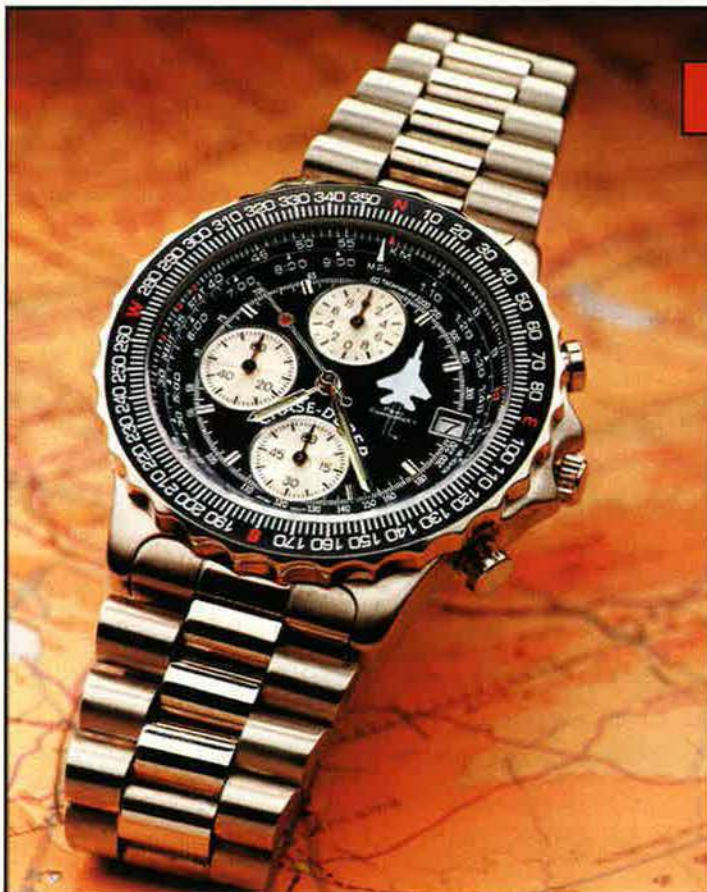
"There were simply too many people [for us] to do this in the past, but with a smaller force it's manageable now, so we'll do it," said Brig. Gen. Susan L. Pamerleau, Air Force Personnel Center commander. In the mid-1980s, about 35,000 members completed remote tours each year. Now, that number is approximately 11,000.

Personnel officials stated that they would also extend the new policy to field-grade officers "to the maximum extent possible."

Another change gives commanders "more voice and more choice" in officer assignments, according to General Pamerleau. Commanders can now send their comments on the best next job for an officer to AFPC assignment teams via the Internet.

Previously, the losing commander did not get involved until AFPC had already selected an officer for a particular position. The change allows commanders to enter the assignment process early and to update their comments before assignment selection.

Additionally, AFPC now provides gaining commanders an entire list of all qualified volunteers for a position,



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rather than just the names the center determined were the best match. Since May, commanders have also had access through their local personnel flight to data on each volunteer, such as duty history and professional military education—the same information AFPC assignment officers use to determine the best person for a job.

General Pamerleau thinks these small steps will have “a very positive effect on the Air Force.”

Volunteering Through the Web

AFPC increasingly is using the latest communications technology to help bring the assignment process directly to service members. It seems to be a smash hit.

From January to June this year, AFPC tallied some 4.2 million “hits” on its World Wide Web site. About seventy-five percent of those who check out the AFPC home page go to the assignment listings: <http://www.afpc.af.mil/asnment/htdocs/default.htm>, according to SSgt. John Hancock, one of the center’s home page managers.

Officers can volunteer for jobs—or withdraw volunteer statements—using the center’s Web site.

Since May, both officers and enlisted members have been able to ask AFPC to send them lists of job advertisements via e-mail. Individuals may subscribe to the center’s Assignments Mail Robot using either e-mail or the center’s Web page.

The robot’s chief architect, MSgt. Mike Benefiel, said that this new sys-

tem “makes things as simple as receiving a weekly magazine through the mail.”

He added that officers now can electronically update their e-mail addresses, phone numbers, and fax numbers to stay in touch with their assignment teams.

Personnel officials said that the option to volunteer electronically is not yet available to the much larger enlisted force. They can, however, access the Web page to check out positions by specialty.

Hall of Fame Inducts *Enola Gay* Pilot

The National Aviation Hall of Fame honored four aviation greats, including Brig. Gen. Paul W. Tibbets, Jr., USAF (Ret.), at its 1996 enshrinement ceremonies July 20 in Dayton, Ohio. Since its founding in 1962, the NAHF has inducted 155 aviation pioneers and heroes.

General Tibbets was the pilot of the *Enola Gay*, the B-29 that dropped the first atomic bomb on Hiroshima. The other three inductees were Harry B. Combs, Capt. David S. McCampbell, USN (Ret.), and Donald K. “Deke” Slayton.

Mr. Combs founded Combs Aircraft, was president of Gates Learjet, and wrote about the Wright brothers. Captain McCampbell, who died in June, was considered the Navy’s “Ace of Aces” and was a Congressional Medal of Honor recipient. Mr. Slayton was a combat pilot in World War II, a test pilot, and an astronaut.

The NAHF also broke ground July

19 for its permanent new home, expected to open in 1998. The 15,000-square-foot building, adjacent to and connected with the US Air Force Museum in Dayton, will house a display, research, and interactive-learning center. It will be free to the public.

Meal Surcharge Decreases

The surcharge for meals at base dining facilities dropped from 280 percent to twenty-five percent this month, in a move by DoD to simplify dining facility meal rates.

The change means that enlisted members who receive basic allowance for subsistence will pay the same price for meals whether they’re on temporary duty (TDY) or at their home base.

Per-diem rates will also change as a result of the reduction, depending on whether an individual on TDY eats at a government dining facility, a commercial restaurant, or a morale, welfare, and recreation facility, according to SMSgt. Mike DiVittorio, USAF’s chief of Travel and Contingency Policy.

DoD approved a change to the per-diem system in May that lets commanders and orders-approving officials choose one of three meal rates for persons on TDY. Sergeant DiVittorio said, “We want to make sure service members are properly reimbursed for meal costs.”

One rate is based on eating all meals at a government dining facility and will range from \$6.25 to \$7 per day under the new surcharge rate. A second per-diem rate will be paid for

Internet Addresses

Air Force Medical Support Agency <http://www.medic.brooks.af.mil:88/oldmaster.html>

Defense Department Health Affairs <http://www.ha.osd.mil/>

Department of Health and Human Services <http://www.os.dhhs.gov/>

GulfLINK (DoD site on Persian Gulf War Syndrome) <http://www.dtic.dla.mil/gulfink/>

Gulf War Veteran Resource Pages <http://www.gulfwar.org/>

Health Care Financing Administration <http://www.hcfa.gov/>

OCHAMPUS Tricare Support Office <http://www-sun.ochampus.mil/>

National Institutes of Health <http://www.nih.gov/>

US National Library of Medicine <http://www.nlm.nih.gov/>

Uniformed Services University of the Health Sciences <http://www.usuhs.mil/>

USAF Surgeon General (SG) <http://usafsg.brooks.af.mil/>

SG Medical Inquiries and Information <http://www.medic.brooks.af.mil:90/users/S/SGI/index.htm>

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locations where no meals can be eaten at a government facility and varies by location. The third rate, added this month, provides a proportional rate for areas where some meals can be eaten at a government facility and some cannot.

Quality Merges With Manpower

USAF leaders announced in August that the service would integrate manpower and quality offices at every level by the end of 1996. The new career field will be called manpower and quality management and will gain more than 240 additional personnel in Fiscal 1997.

The Air Force will also establish the Air Force Center for Quality and Management Innovation, a field operating agency (FOA), at Randolph AFB, Tex. The new center will report to the Air Force director of Programs and Evaluation at the Pentagon. According to a USAF release, it will integrate the functions of the Air Force Quality Institute, at Maxwell AFB, Ala., and Randolph's Air Force Management Engineering Agency.

USAF Chief of Staff Gen. Ronald R. Fogleman said the center would concentrate on "strategic planning, process improvement, applying modern business practices, and looking at opportunities to outsource and privatize more functions." He said that the new center would conduct a "complete scrub" of Air Force infrastructure and business practices. "Basically, they will focus on better defining the resource needs for tomorrow's Air Force."

At the major command level, integrated manpower and quality offices will fall under the Directorate of Plans and Programs. General Fogleman also stated that each major command would create its own FOA to parallel the efforts of the larger center.

The Air Force plans to merge manpower and quality functions at the wing and center level into new manpower and quality offices that would work directly for the wing or center commander.

Medics Deploy Computer Room

USAF medical personnel have taken prototype Mobile Computer Rooms that provide laboratory, pharmacy, radiology, inpatient administration, outpatient scheduling, and emergency triage capabilities to the field to support forward-deployed forces. Once fully operational, project officials say the nine-foot by twenty-foot facilities will save time and money for US medical personnel.

Two years' effort by the Medsite Mobility Team, headquartered at Brooks AFB, Tex., has produced four of the computer rooms, valued at \$300,000 each.

So far, USAF has taken the rooms to Operation Sea Signal at Guantanamo Bay, Cuba; Operation Joint Endeavor in both Tuzla, Bosnia-Herzegovina, and at Taszar AB, Hungary; and exercises at Ramstein AB and Grafenwöhr, Germany.

The rooms save time "particularly in retrieval of lab results," said Maj. Ray Bender, Medsite project officer. He said that before they took the room to Bosnia and Hungary, lab work had to be sent to Germany, then the results would eventually be sent back. "With the database on site, we cut the time and don't run the risk of losing the results."

Major Bender said the room is a "customer-friendly system." It normally takes four people to set up the room, but "once it's up and running, anyone can be trained on site to use the system." He added that the other services are considering possible use or adaptation by their medical communities.

It's Official: Aardvark

The last four USAF F-111Fs returned to their birthplace at Lockheed Martin Tactical Aircraft Systems, Fort Worth, Tex., July 27 for a retirement and naming ceremony. Long known as the "Aardvark," the F-111 now officially carries the name.

Throughout the F-111's thirty-year career, the aircraft did not have an official name, a singular occurrence, according to Air Force historians.

The F-111 was produced in seven variants, with first production delivery in October 1967 and the last in September 1976. The various versions saw action from the Vietnam War to the Persian Gulf War.

The aircraft also claimed several firsts. It was the first production aircraft with variable-sweep wings that could swing backward or forward to increase efficiency. It had the first terrain-following radar, allowing it to fly at night at high speeds and low altitudes. It also had the first crew escape module.

Ejection Seats for "Lightweights"

US women combat pilots and some male pilots may one day benefit from ejection-seat testing under way at Aeronautical Systems Center, Wright-Patterson AFB, Ohio, on a mannequin named "Lois," or Lightest Occupant in the Service.

Lois is the lightweight dummy used in ASC's Light Occupant Weight Ejection Seat Test program. Under LOWEST, which began in June 1995, engineers have pioneered the use of a specially modified, lightweight mannequin and a new, stand-alone electronic instrumentation system for ejection-seat sled testing.

The program collects data on ejection forces during an Advanced-Concept Escape System II ejection. ACES II, now used in most USAF combat aircraft, was designed in the early 1970s for the typical US male pilot weighing 140 to 211 pounds.

LOWEST Program Manager Andrew S. Kididis said the majority of DoD's female population and many foreign male aircrew members flying US-built aircraft with ACES II seats weigh less than 140 pounds. Air Force women currently in aircrew screening weigh as little as 103 pounds.

Program officials expect to complete their tests next month. The data will confirm if risk to the neck, chest, and lower back for lightweight occupants increases and will provide a basis to develop solutions, if necessary.

ASC engineers plan to provide the data to Armstrong Laboratory, Brooks AFB, Tex. Congress directed in Fiscal 1996 defense authorizations that Armstrong Lab test lightweight compatibility in Air Force and Navy ejection seats and report by March 1997.

News Notes

■ A U-2 spy aircraft crashed into the parking lot of the Oroville *Mercury-Register* in Oroville, Calif., August 7, killing the pilot and a woman who had just left the newspaper office. The pilot, Capt. Randy Roby, ejected just before the aircraft crashed but was found dead, still strapped in his ejection seat. Two other individuals in the area received minor injuries. Eyewitnesses said the U-2 was in flames before it crashed. The aircraft are based at Beale AFB, Calif., about twenty-five miles southeast of Oroville.

■ McDonnell Douglas reported that the C-17 passed the "three design lifetimes" test mark—90,000 hours of simulated flight in durability testing—on July 17. Initially, the Air Force contracted only for the equivalent of two lifetimes—60,000 hours—but once the aircraft reached that mark last July, USAF asked for extended testing. The 90,000 hours of testing represents more than 25,000 simulated flights and 36,000 landings.

COMBAT READY...

A Boeing 747-400F is armed with a precision-aimed high-powered laser. On defensive patrol, it is ready and waiting if an outlaw nation launches theater ballistic missiles at friendly forces.

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■ An empty fuel tank from an F-16 crashed through the roof of a home in San Antonio, Tex., August 15, and a full tank fell onto a road when a Kelly AFB, Tex., pilot had to jettison them before making an emergency landing at San Antonio IAP. No one was injured. USAF officials said the aircraft developed engine trouble just after takeoff from Kelly on a routine training flight.

■ An F-16 enforcing the no-fly zone in southern Iraq crashed thirteen miles northwest of Dhahran, Saudi Arabia,

August 4. The pilot bailed out and was not injured. USAF officials also said no injuries or property damage occurred on the ground.

■ On August 22, Mountain Home AFB received the first two of eight B-1B bombers to be permanently stationed at the Idaho base. The aircraft, formerly located at Ellsworth AFB, S. D., are assigned to the 34th Bomb Squadron. USAF plans to have all eight bombers in place by March 1997.

■ Whiteman AFB, Mo., received

its twelfth B-2 stealth bomber July 3, the fourth delivered in 1996. The base will receive nine more of the new bombers by early 1998. The Air Force also recently dedicated the tenth B-2 to the state of Alaska and plans to dedicate the eleventh to Oklahoma.

■ USAF inactivated 17th Air Force July 31 at Sembach Annex, Germany, leaving only two Europe-based numbered air forces, 16th and 3d. US Air Forces in Europe has dropped from 80,000 personnel in 1990 to fewer than 30,000 today.

■ Falcon AFB, Colo., now sports the US Naval Observatory's Alternate Master Clock. Moving the alternate clock from Richmond, Fla., places it in proximity to Falcon AFB's Global Positioning System operators. The alternate clock facility will be able to distribute Universal Time Coordinated, as kept to within a billionth of a second by the Master Clock in Washington, D. C., through GPS. It also has a telephone voice announcer at (719) 567-6742.

■ A small team of Wright Laboratory researchers from Wright-Patterson AFB, Ohio, flew into Hurricane Bertha aboard a 53d Weather Reconnaissance Squadron WC-130 out of Keesler AFB, Miss., to test their prototype GPS-based Dropsonde Atmospheric Profiling System. They confirmed that the system, which senses and relays wind speed, temperature, and humidity level in real time, could help predict hurricane paths. The team is part of the Improve Precision Airdrop Capability program set up to improve, by at least fifty percent, the accuracy of humanitarian relief and strategic and tactical airdrops.

■ The 42d Airborne Command and Control Squadron marked its third year in continuous support of flying operations over Bosnia July 17. The EC-130 unit, based at Davis-Monthan AFB, Ariz., is the longest-deployed USAF unit. Its aircrew members have flown more than 1,000 missions and 9,300 hours, while controlling more than 30,000 aircraft, plus additional sorties for air rescue operations. The unit credits its top-notch maintenance personnel for sustaining this one-of-a-kind squadron's high operations tempo.

■ The Texas Instruments, Navy, and USAF Joint Standoff Weapon team successfully executed the first USAF F-16 launch of the AGM-154 on July 17 at Eglin AFB, Fla. The baseline JSOW has already been integrated with the F/A-18, and plans call

Senior Staff Changes

RETIREMENTS: Gen. Joseph W. Ashy, L/G Charles E. Franklin, L/G Jay W. Kelley, B/G Thomas R. Mikolajcik, M/G Arnold R. Thomas, Jr.

PROMOTIONS: To be **Lieutenant General:** William P. Hallin, Normand G. Lezy, David J. McCloud, Joseph J. Redden.

To be **Major General:** Charles H. Perez, Gary A. Voellger.

To be **ANG Brigadier General:** Dwight M. Kealoha, Gerald W. Wright.

CHANGES: L/G George T. Babbitt, Jr., from DCS/Log., Hq. USAF, Washington, D. C., to Dir., DLA, Fort Belvoir, Va. . . . M/G Jeffrey R. Grime, from Dep. Cmdr., Canadian NORAD Region, NORAD, CFB North Bay, Ontario, Canada, to Cmdr., Cheyenne Mountain Ops. Ctr., NORAD/USSPACECOM, Cheyenne Mountain AS, Colo., replacing M/G Raymond P. Huot . . . M/G (L/G selectee) William P. Hallin, from Dep. Dir., Materiel Mgmt., DLA, Under Sec'y of Defense for Acquisition and Technology, Fort Belvoir, Va., to DCS/Log., Hq. USAF, Washington, D. C., replacing L/G George T. Babbitt, Jr. . . . M/G Hal M. Hornburg, from Dep. Cmdr., 16th AF, USAFE, and Dir., Combined Air Ops. Ctr., 5th ATAF, NATO, Vicenza, Italy, to Cmdr., Jt. Warfighting Ctr., J-7, Jt. Staff, Fort Monroe, Va., replacing M/G (L/G selectee) Joseph J. Redden.

M/G Raymond P. Huot, from Cmdr., Cheyenne Mountain Ops. Ctr., NORAD/USSPACECOM, Cheyenne Mountain AS, Colo., to Chief, Office of Defense Cooperation to Turkey, USEUCOM, Ankara, Turkey, replacing M/G John L. Welde . . . B/G Silas R. Johnson, Jr., from Cmdr., 552d ACW, ACC, Tinker AFB, Okla., to Dep. Dir., Ops., National Mil. Command Ctr., J-3, Jt. Staff, Washington, D. C., replacing B/G Tome H. Walters, Jr. . . . M/G (L/G selectee) Normand G. Lezy, from Dir., Leg. Liaison, OSAF, Washington, D. C., to Dep. Ass't Sec'y of Defense (Mil. Personnel Policy), Office of the Ass't Sec'y of Defense (Force Mgmt. Policy), Washington, D. C. . . . Col. (B/G selectee) Maurice L. McFann, Jr., from Dep. Dir., Ops., DCS/P&O, Hq. USAF, Washington, D. C., to Cmdr., E-3A Component Command, NATO Airborne Early Warning Force, NATO, Geilenkirchen, Germany, replacing B/G Robert T. Newell III.

M/G David W. McIlvoy, from Dir., Personnel Prgms., Education, and Training, DCS/Personnel, Hq. USAF, Washington, D. C., to Spec. Ass't to the C/S for Long-Range Plans, Hq. USAF, Washington, D. C., replacing M/G (L/G selectee) John A. Gordon . . .

B/G Robert T. Newell III, from Cmdr., E-3A Component Command, NATO Airborne Early Warning Force, NATO, Geilenkirchen, Germany, to Cmdr., 552d ACW, ACC, Tinker AFB, Okla., replacing B/G Silas R. Johnson, Jr. . . . M/G (L/G selectee) Joseph J. Redden, from Cmdr., Jt. Warfighting Ctr., J-7, Jt. Staff, Fort Monroe, Va., to Cmdr., AU, Hq. AETC, Maxwell AFB, Ala., replacing retiring Lt. Gen. Jay W. Kelley . . . Col. (B/G selectee) James N. Soligan, from Spec. Ass't to the Supreme Allied Commander Europe, SHAPE, NATO, Mons, Belgium, to Exec. Officer to the Supreme Allied Commander Europe, SHAPE, NATO, Mons, Belgium.

B/G Lansford E. Trapp, Jr., from Dep. Dir., Leg. Liaison, OSAF, Washington, D. C., to Dir., Leg. Liaison, OSAF, Washington, D. C., replacing M/G (L/G selectee) Normand G. Lezy . . . B/G Tome H. Walters, Jr., from Dep. Dir., Ops., National Mil. Command Ctr., J-3, Jt. Staff, Washington, D. C., to Mission Area Dir., Global Reach, Ass't Sec'y of the Air Force for Acquisition, Hq. USAF, Washington, D. C., replacing retired B/G James M. Richards III . . . M/G John L. Welde, from Chief, Office of Defense Cooperation to Turkey, USEUCOM, Ankara, Turkey, to Vice Cmdr., 9th AF, ACC, and Dep. Cmdr., USCENTCOM Air Forces, Shaw AFB, S. C., replacing retired M/G Arnold R. Thomas, Jr.

STEADY AIM...

A high-powered laser targets an outlaw nation's theater ballistic missile, destroying it from an airborne vantage point hundreds of miles from the launch site. The Airborne Laser's (ABL) surefire accuracy comes from optics and beam control technology delivered by Lockheed Martin.

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Air Force Association

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Aerospace World

for its use with the F-15E, B-52, B-1B, and the AV-8B, with initial operational capability in 1998.

- The Department of Defense created a World Wide Web site on August 1 for information on humanitarian demining. The site includes a mine database with photographs and physical characteristics of and specifications for more than 675 mines; explores current research-and-development solutions; provides information on mine effects and emergency medical treatment; and accepts feedback from users. The World Wide Web address is <http://www.demining.brtrc.com>.

- Rockwell delivered the first Pacer CRAG (Compass, Radar, and Global Positioning System) upgraded C/KC-135 aircraft to USAF July 19. The avionics upgrade program ultimately will produce 602 C/KC-135 aircraft and is designed to modernize the cockpits and reduce crew work load. The program uses off-the-shelf and nondevelopmental equipment and was one of the first contracts awarded under USAF's "Lightning Bolt" acquisition streamlining initiatives.

- During its annual Labor Day Parents' Weekend, the US Air Force Academy, Colo., marked the twentieth year that women have attended the military academy.

- Two AFROTC cadets—Roosevelt Loveless, Jr., of Tennessee State University, and Etienne Rosamont of Tuskegee University, Ala.—who completed the Air Force's first pilot training program at Delaware State University received cadet pilot wings August 15 from Lt. Gen. Lloyd W. Newton, USAF's assistant vice chief of staff. Both students hold grade-

point averages above 3.0 and maintained outstanding training records in the program, designed to encourage minorities who have been underrepresented in USAF aviation.

- The Air Force's last active-duty Medal of Honor recipient, Col. James P. Fleming, retired July 1 after thirty years of service. In 1968, as a first lieutenant, he flew his UH-1F helicopter to rescue a six-man Special Forces reconnaissance patrol in danger of being overrun by a large, heavily armed hostile force near Duc Co, South Vietnam. He descended twice, through a barrage of fire, and precariously balanced on a riverbank until all six men boarded the helicopter.

- The 48th Fighter Wing, RAF Lakenheath, UK, won the Columbia Trophy for being USAF's safest wing. The wing finished 1995, including actual combat operations over Bosnia during Operation Deliberate Force, without a single Class A mishap and only one Class B mishap, caused by a birdstrike.

Obituary

Sir Frank Whittle, inventor of the jet engine, died of lung cancer August 8 at age eighty-nine. The British engineer patented the concept for the turbojet engine in 1930 and successfully tested the first jet engine on April 12, 1937. However, the Germans followed with their own engine in September 1937 and became the first to fly a jet-engine aircraft in August 1939. The British government finally recognized the potential of the Whittle engine and put it into an aircraft, leading to development of the twin-engine Gloster Meteor. ■

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RAPID FIRE...

A high efficiency, high-powered laser, flying aboard a 747, defends friendly territory against outlaw nations' theater ballistic missiles, shooting them down in seconds. This revolutionary missile defense system is under development for the Air Force by Team ABL. Its fire power is a megawatt-class chemical laser developed by TRW.

TRW brings Team ABL members Boeing and Lockheed Martin nearly 25 years of research and operational experience with high energy lasers, including industry's first Chemical Oxygen Iodine Laser (COIL), the ABL baseline. TRW has proven the viability of the ABL concept by demonstrating the requisite scalable COIL power levels and world-record laser efficiencies. TRW's laser meets ABL's performance requirements and provides operational margin for weapon system flexibility.

TRW's fast firing laser will destroy ballistic missiles in the boost phase of flight. Armed with this proven power, Team ABL will deliver the Airborne Laser to the front line of America's theater missile defense.

Team ABL.
Ready. Aim. Fire.



By John A. Tirpak, Senior Editor

McDonnell Douglas's entry in the Joint Strike Fighter competition is this tailless JSF (right), reminiscent of the McDonnell/Northrop competitor in the Advanced Tactical Fighter contest. Boeing's candidate (below) is the only one of the three that doesn't require larger wings for naval operations.



Strike Fighter



The Air Force, the Navy, and the Marine Corps have all placed their bets on this aircraft.

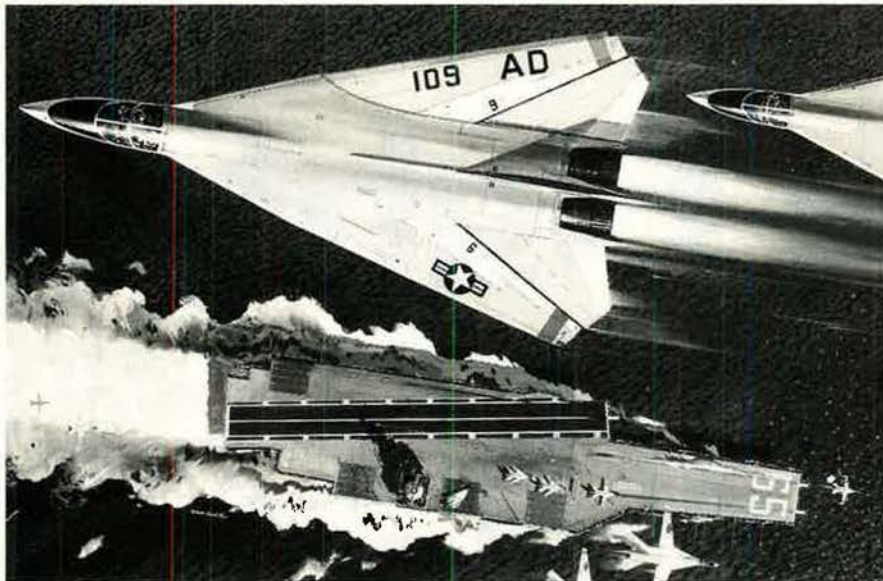
NEXT month, just after the Presidential election, the Pentagon will award two contracts for further development of the Joint Strike Fighter. This airplane isn't even fully designed yet but already is carrying a heavy payload. Resting on its small wings are the needs and expectations of three US services, one foreign navy, and numerous friendly air forces, not to mention the US aerospace industry.

The Joint Strike Fighter will have to be a remarkable airplane. If it works, the JSF will be the most cost-effective and versatile combat jet that the US has ever produced. It will become the centerpiece of the Air Force and naval aviation strike missions and a bridge to the aerospace technologies of the far future.

If it fails, it will become another corpse on the pile of false-start modernization projects of the past decade. Failure would also demand expensive work-arounds that would overwhelm the projected defense budgets of the future and starve industry of any all-new fighter work for decades.

"This is the kingpin program in the Department of Defense," re-

Lockheed Martin is offering this twin-tailed design. While this concept's lines strongly suggest its F-22 heritage, the two aircraft are decades apart in technology and would have few components in common.



The F-111B—the Navy version of the TFX—was a failure at carrier operations and highlighted the problems of building a common airplane that would serve USAF and the Navy. Streamlined acquisition may help the JSF succeed.

marked R. Noel Longuemare, principal deputy under secretary of defense for Acquisition and Technology. Speaking at a June conference in Washington, he added, “We are trying to solve all our financial problems with this one airplane.”

The JSF came about through a long chain of program mishaps, shifting strategies, and financial realities. In 1991, the A-12 program, which was to have replaced first the A-6E in the Navy and then the F-111 in the Air Force, was terminated as a result of schedule and cost overruns. Its successor was the A-X, then rearranged into the A/F-X because its mission had been too narrowly focused on deep attack. Meanwhile, the Air Force planned to replace its F-16 squadrons with an aircraft it called the Multirole Fighter.

From Three to One

Taking office in early 1993, the Clinton Administration concluded that future budgets could not sustain new aircraft development programs for both USAF and the Navy, and their projects were merged into the Joint Advanced Strike Technology (JAST) program. In 1995, a Defense Advanced Research Projects Agency effort to develop a prototype for an advanced short takeoff, vertical landing (ASTOVL) airplane for the Marine Corps was folded into the JAST effort.

JAST was initially chartered to catalog the aircraft technologies al-

ready available in the areas of stealth, propulsion, materials, manufacturing processes, and contracting methods and make them available for swift inclusion in upcoming aircraft projects. However, when deadlines loomed for getting something into the field to fill carrier decks and Air Force squadrons, JAST became an acquisition program dubbed the Joint Strike Fighter.

It would be a vast understatement to call the program “ambitious.” The JSF effort will attempt to produce a highly common family of aircraft that will replace, at a minimum, the

F-16 and A-10 in the Air Force, the A-6E in the Navy, the AV-8B Harrier and F/A-18C/D in the Marine Corps, and the Sea Harrier in Britain’s Royal Navy. It may also fill in behind the F-111, F-117, and F-15E.

Congress and key Pentagon leaders have not always been sure the JSF could work. “I was skeptical” that a one-airplane-fits-all project could actually be developed, said Lt. Gen. George K. Mueller, USAF’s top uniformed acquisition official and former director of JAST. “But the technology has really come a long way . . . and so has the acquisition environment. . . . When the contractors saw we were serious, they got serious,” he added.

Secretary Longuemare was another skeptic. “We’ve tried this before,” he said. “The TFX program (of the 1960s) attempted to build a universal airplane that did everybody’s job and wound up doing everybody’s job poorly.

“In the past,” he explained, “requirements were more like detailed design specs. . . . On TFX, we had such rigidity in our specifications that . . . the contractors . . . had very little opportunity” to innovate. “Manufacturing specifications were so stringent that they constrained efficiencies. . . . In effect, the government predetermined the cost of the equipment.”

The overspecification of TFX naturally led to “three similar designs, and then we decided to go with the



Boeing’s entry features an expandable inlet to gulp air for short takeoff and vertical landing operations. All JSF entries will be STOVL-capable, possibly paving the way toward smaller Navy carriers.

lowest bidder. So is it any wonder that program didn't succeed?" This time, instead of setting specifications that contractors had to meet, the JSF program has given contractors a set of performance and cost goals and left them free to innovate in manufacturing techniques, use of new technologies, testing, and materials.

"Expressing true warfighter needs in performance rather than as design specs . . . allows [contractors] the flexibility to actually pull this off," Mr. Longuemare asserted.

He added that the three JSF competitors—contractor teams led by Boeing, McDonnell Douglas, and Lockheed Martin—"have the flexibility to create designs that meet or exceed all the needs but do so at much, much less expense than in the past."

Gen. Joseph W. Ralston, vice chairman of the Joint Chiefs of Staff and chair of the Joint Requirements Oversight Council (JROC), also admitted to having had serious doubts about the feasibility of a JSF that would provide meaningful capability to the Navy, the Marines, and USAF. These doubts, he added, were "snapshots" of the travails the program went through while it was being adjusted to various and competing needs.

"I'm much more comfortable today than a year and a half ago" about the prospects for the JSF's success, General Ralston said.

Dropping an Engine

He observed that the services have come a long way in getting their acts together and harmonizing their requirements, which the JROC validated. As an example, he noted that, after long advocacy of a two-engine design, the Navy now finds a single-engine approach acceptable.

Cost has been the most compelling factor. Rear Adm. Craig E. Steidle, JSF program director, estimates that the cost of developing one-for-one replacements for the F-16, A-6E, and AV-8B, individually, would be \$33 billion. By contrast, he said, it will cost less than half that amount—\$16 billion—to develop a family of JSF aircraft to do the jobs of all those airplanes.

The services will realize substantial savings by using a single production line operating at a high output rate rather than several lines



The JSF program demands extensive testing to reduce risk. Here, Lockheed studies airflow under its design during a vertical landing. Few new technologies—and none that are unproven—will be incorporated into the JSF.

dribbling out an aircraft or two per month, noted Admiral Steidle. That, combined with savings in parts, avionics systems, engines, and labor, could bring the JSF in for thirty-five to fifty-five percent less than would be the case in separate, noncooperative efforts, he said.

That's just the up-front cost. Paul G. Kaminski, under secretary of defense for Acquisition and Technology, sees "bigger potential" for savings "downstream . . . in the life-cycle costs" of maintaining, operating, and upgrading a single type of aircraft.

"I've seen estimates from the program office as high as \$60 billion" in life-cycle cost savings for the JSF vs. separate efforts, he said. "It's a big benefit."

There will also be an engine competition, patterned after the highly successful "great engine war" between the Pratt & Whitney F100 and the General Electric F110 during the 1980s and early 1990s. Pratt's F119 engine, designed for the F-22, is the "baseline" powerplant for the JSF, but a competitor—likely to be GE's F120—will be brought into the program after engineering and manufacturing development starts in 2000.

Commonality is the key driver of the savings, but the JSF program has not given contractors a specific "metric" on how to achieve it. "There's commonality by weight, commonality by cost, . . . some parts are identical, some are 'cousins,' . . . and some are unique," Admiral Steidle

observed. The commonality goal is eighty percent, but it will be measured within cost proposals.

"We've asked them to go as hard as they can" toward commonality of components, displays, and even machines and tools, he continued.

More Than 2,000 Needed

The Air Force has the largest requirement for the JSF. The service said it needs 2,216 airplanes to replace F-16s bought in the 1980s and A-10s bought in the late 1970s and early 1980s. Both aircraft types will begin retiring in less than a decade. The F-16 turns in a fine performance, and the new JSF really doesn't need to outfly it in speed or maneuverability. However, the Air Force does want the JSF to be stealthier than the F-16.

Over the past twenty years, the Air Force consciously procured a mix of "high-end" (higher-cost) F-15s and "low-end" (lower-cost) F-16s. The practice has worked well—so well that USAF intends to continue the scheme, with new F-22 air-superiority fighters on the high end and the JSF as a low-end aircraft.

General Muellner said he "would not be surprised" to see USAF's tactical aviation assets evolve into a force composed entirely of F-22s and JSFs. But, he added, "It would be JSF in several variants, to do the mission of the F-117 and F-15E, . . . which will retire after 2010."

Lockheed has proposed to the Air Force that it procure variants of the



The Air Force JSF will carry two 1,000-pound bombs internally with more slung under the wings when stealth is not as important. The precision and power of future munitions make a smaller, yet more effective, weapon load possible.

F-22 to carry out missions of the F-15E and F-117 at some point. The Air Force has taken the proposals under advisement. Partly as a result of the proposals and partly at Congress's urging, the F-22's design was modified to accommodate two 1,000-pound Joint Direct Attack Munitions (JDAMs) in its weapons bay.

"The very first one off the assembly line will have the capability to do the strike mission," General Ralston noted.

However, said General Muellner, the Air Force's long-term acquisition plan does not include a follow-on to the F-117 or F-15E. If the JSF succeeds, it probably would be a cheaper solution to replacing the F-117 and the F-15E than the F-22 would be.

The Air Force's needs for JSF capabilities also will be influenced by other assets that either are available now or will be around 2010, General Muellner said. These include the Joint Air-to-Surface Standoff Missile, the JDAM guided bomb, the E-8 Joint Surveillance and Target Attack Radar System (Joint STARS), and the E-3 Airborne Warning and Control System (AWACS) surveillance platforms and such bombers as the B-2 and B-1B.

Under General Muellner's direction, JAST was to determine whether the United States even needed a new fighter if advanced standoff weapons and new bombers were available. The General reported that the

JSF indeed "earned its way into the battle plan, . . . and every capability in the plane itself earned its way on board."

For example, the Air Force believes that bombers in the inventory are sufficient in number "to handle the deep target set," General Muellner noted. The JSF will complement bombers with a "higher sortie and surge rate."

The Navy's requirement is for 300 highly survivable, "first day of the war" stealth aircraft, each with the ability to carry two 2,000-pound pre-

cision weapons internally over a range of more than 600 nautical miles.

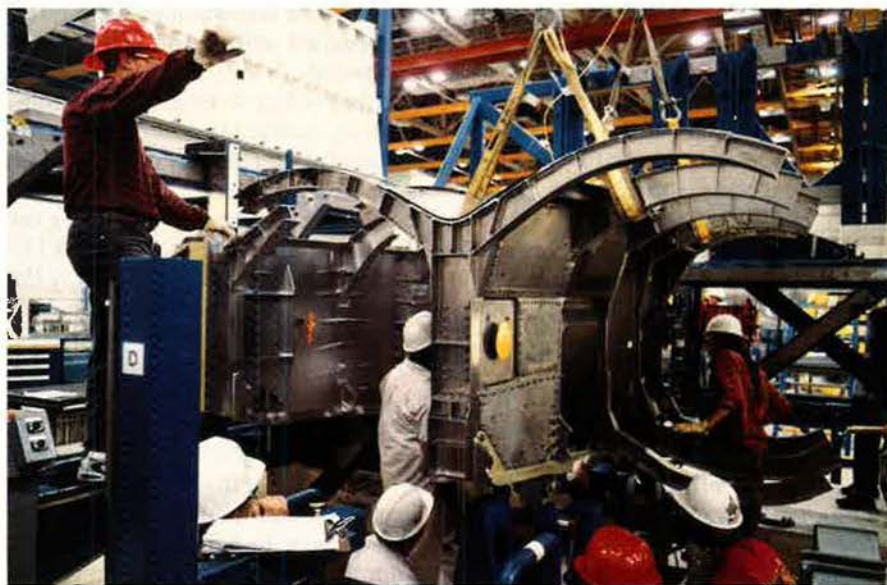
Getting Back in the Game

In the Navy view, this type of aircraft would get it back into the "deep attack" game, currently dominated by the Air Force and its long-range strike aircraft. It would restore to the carrier fleet the ability to penetrate enemy air defenses without elaborate help from standoff jammers and defense suppression aircraft, all of which take up precious aircraft space on a carrier deck that could otherwise be used for attack aircraft.

The Navy argues that one JSF-equipped squadron per carrier could effectively serve as "pathfinders" for its F/A-18 fighters, which will continue to provide the bulk of the Navy's air strike assets for the next three decades.

Once the Navy starts getting the bigger and more capable F/A-18E/F Super Hornet, it will begin making a transition to an air wing of thirty-six F/A-18C/D models and fourteen E/F versions. When the JSF starts entering the inventory, the C/Ds will be retired, and the standard mix on a carrier air wing will shift to thirty-six F/A-18E/Fs and fourteen JSFs.

The JSF will give the Navy its first limited capability in the field of stealth, now monopolized by the Air Force with its F-117s, B-2s, and the F-22. The JSF also will serve as a



The F-22 taking shape here is a testing ground for "lean manufacturing." Production efficiency will be critical if the services are to afford 3,000 JSFs. Rules of the competition insist on eighty percent commonality.

kind of technology pot from which the F/A-18E/F program can draw, said Rear Adm. Dennis V. McGinn, director of the Navy's Air Warfare Division.

"Because of the open systems architecture" on the Hornet, the Admiral said, "we anticipate the back-fit of technologies from the JSF onto the F/A-18E/F." The two programs, he asserted, will "feed each other" with innovations.

Earlier this year, the F/A-18E/F Super Hornet was the subject of a highly unfavorable report from the General Accounting Office. GAO's report claimed that the Super Hornet would yield only a "marginal" improvement over the C/D model in range and payload, and no improvement at all in agility, but at a high cost. GAO recommended a continued buy of the C/D until the JSF becomes available.

Secretary Kaminski disagreed with the GAO and claimed that improvements to the Super Hornet are not marginal but "significant."

"We are pretty much out of space for growth in the F/A-18C/D," he said, noting that, if the Pentagon defers modernizing naval aviation, F/A-18C/Ds with 1970s and 1980s technologies would be operating until 2010 or even later.

General Ralston noted that some critic in Congress or industry can always be expected to agitate for skipping a current program in order to wait for the next, but this strategy rarely proves wise. "It's always easy toglom onto a paper program to replace a real capability," he said. "The F/A-18E/F is here today, . . . and we ought to take advantage of it."

In addition to providing room for growth, said Secretary Kaminski, the F/A-18E/F provides a hedge against failure in the JSF.

"Having an F/A-18E/F in production as we ramp up the Joint Strike Fighter . . . gives us some options," he said. Specifically, he said, it gives the Pentagon the option to continue buying new aircraft even if the JSF program falters or fails.

The Terminator

Secretary Kaminski also noted that the Pentagon could terminate the F/A-18E/F program earlier than planned if the JSF proceeds on track and does well.



The Navy's F/A-18E/F effort gets badly needed aircraft on carrier decks now and is a hedge against potential problems with the JSF. The Super Hornet is neither stealthy nor cheap, however, and may be curtailed if the JSF proves a winner.

General Muellner said that the Navy is not planning to completely replace its fleet of F/A-18 fighters with JSFs. The combination of JSFs and other systems, such as the Tomahawk land-attack missiles, were figured against the Navy's need for an all-aspect stealth aircraft. The requirement for only 300 airplanes "takes into account the extensive legacy systems we will have," Admiral Steidle noted.

Measured in sheer numbers of aircraft, the Marine Corps requirement for the JSF is even bigger than the Navy's. USMC wants 646 new airplanes to replace its AV-8Bs and F/A-18s and is adamant about having a supersonic short takeoff and vertical landing (STOVL) jump-jet. Such an airplane would be able to operate close to the front lines for quick response to calls for close air support.

The Marine Corps is so determined to have such an airplane that it has bowed out of the Navy's F/A-18E/F program and will make do with what it has until the JSF arrives. It is literally holding itself hostage to the success of the new program.

When an infantryman calls for close air support, "you have to be right there," said Lt. Gen. Harold W. Blot, USMC deputy chief of staff for Aviation. "Despite best efforts" with typical fixed-wing aircraft, he added, the fastest response between a CAS request and bombs on target is twenty-seven

minutes. "That is completely unsatisfactory," he said.

In the Persian Gulf War, operating the AV-8B Harrier, the Marines "proved you could put a sophisticated airplane at the front" and still respond "within five minutes" to a call for CAS. The AV-8B "achieved a ninety percent availability rate . . . and didn't require in-flight refueling," General Blot said. Even so, the Marines want to move beyond the AV-8B and buy a more reliable, faster, and more sophisticated airplane, he said. "That's why we have to have the JSF."

In the Marine Corps version, additional ducting or an engine, or both, will be installed to provide STOVL capability. In the Air Force version, the ASTOVL equipment will be deleted and the space used for fuel.

The Marine Corps managed to get along without STOVL in the Vietnam War and well into the 1970s, and some members of Congress nearly succeeded in getting the STOVL JSF knocked out of the program this year, touting the move as a cost-saver.

Such a move would have a "significant" impact on the JSF program, warned Secretary Kaminski. He said that the Marines "perhaps" could get by with a conventional takeoff and landing aircraft, but "I don't today think that's the best solution." He noted that eliminating the ASTOVL variant would certainly force the Marines back into the F/A-18E/F



The Pentagon is gambling heavily on the JSF. If it is not a success—in price as well as performance—the cost of modernizing tacair will be prohibitive, and policymakers will have to rethink airpower strategies.

effort. It would also eliminate participation of the Royal Navy, whose “primary interest” is in the ASTOVL version. It plans to buy about sixty JSFs identical to the Marine Corps version for use aboard Britain’s ski-ramp carriers.

But Secretary Kaminski also said the JSF provides other options “not easily quantified.” He observed, for example, that “there may be some room for a STOVL variant in the Air Force or Navy inventory.”

“Going to shorter fields doesn’t hurt us for some of the Air Force operations in the world of the future, and this may also open up opportunities for alternatives to current carrier size,” he added.

The ASTOVL, he said, needs to be considered “more broadly than thinking about it as a Marine Corps issue.”

General Muellner concurred with Secretary Kaminski’s view and added that “technology has come along that has reduced the penalty” for carrying around ASTOVL-specific hardware.

The JSF was developed by “bringing together” the regional commanders in chief and active-duty operational pilots and unit commanders to define “what was really needed,” General Muellner said.

“These guys were in the habit of saying things like, ‘Well, I need 1,000 miles of range.’ In this program, when that occurred, we said, ‘Okay, but this is what it will cost

you’ ” in price, agility, or weapons load, he explained. “Most of the warfighters were surprised by what things they really didn’t care about” but that they had typically thrown into a requirements package as boilerplate cost, General Muellner noted.

Before any design work was done, the JAST program developed “a matrix of requirements” from each service, having to do with such factors as lethality, maneuverability, and sortie generation, Admiral Steidle said. When this matrix was presented to the JROC, “they agreed that these things were not as far apart as they seemed” and that a family of highly common aircraft could actually meet all needs.

The JSF office continues to run simulations and computer campaign analyses assigning the airplane various capabilities in various scenarios, according to Admiral Steidle.

“The Defense Planning Guidance, which tells us how to prioritize the defense budget, gives us these scenarios,” he explained. The guidance specified two major regional conflicts in general and such scenarios as northeast and southwest Asia in particular.

Such simulations have been run six times. During the most recent one, the contractors were allowed to run their specific concepts to determine the breakpoints in cost-effectiveness. Such analyses will be run throughout the JSF development

cycle. The design will be tweaked if more or less capability in a given area proves a big cost-saver or force enhancer.

Sorties and Targets

The JSF program measures the candidate designs by a sophisticated formula boiling down to “how many sorties does it take to hit the target . . . or better, how many targets can you hit with one sortie,” Admiral Steidle pointed out.

The JSF will definitely make substantial use of off-board sensors. By piping information into the cockpit from Joint STARS, AWACS, unmanned aerial vehicles, and satellites to gain greater situational awareness, the aircraft can be built with a much less expensive on-board sensor suite.

Systems that once required their own hardware can now be networked to save weight and cost. For example, the JSF’s electronically steered antenna can work on behalf of the radar, communications, and warning systems simultaneously.

The JSF will incorporate only those technologies that have been demonstrated as “low risk” by the time one contractor is picked to do final development and production. This “design freeze” will occur in 2000. The Pentagon hopes the approach will minimize the delays that typically afflict aircraft with unproven technologies.

The JSF office has given briefings in a dozen countries that would be candidates to participate in the development program or would simply like to buy the end product. Norway, Denmark, Belgium, and the Netherlands—the partner countries in the F-16 program—will have a requirement almost identical to that of the Air Force in the next decade or so as their F-16s reach the end of their useful service lives. Thousands of JSFs could be sold abroad, and the airplane would be America’s designated “export fighter.”

Admiral Steidle also said he is not concerned, at this stage, that the JSF will be virtually a winner-take-all program. Should Lockheed win, it would be the Air Force’s sole supplier of fighters; if McDonnell Douglas wins, it would be the Navy’s sole fighter source. Whoever wins, it will be the only US company making fighter airplanes after 2015. ■



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LOCKHEED MARTIN



A photograph of an F-15E fighter jet on a tarmac at sunset. The jet is silhouetted against a bright orange and yellow sky. The ground is cracked and textured. In the background, there are some buildings and structures. The overall mood is dramatic and atmospheric.

For four months, the 4417th Air Expeditionary Force (Provisional) made a home at a desert airfield outside of Doha, Qatar.

An F-15E from the 335th Fighter Squadron sits on the tarmac, behind a security ring of concertina wire.



Assignment Qatar

Photographs by Guy Aceto, Art Director



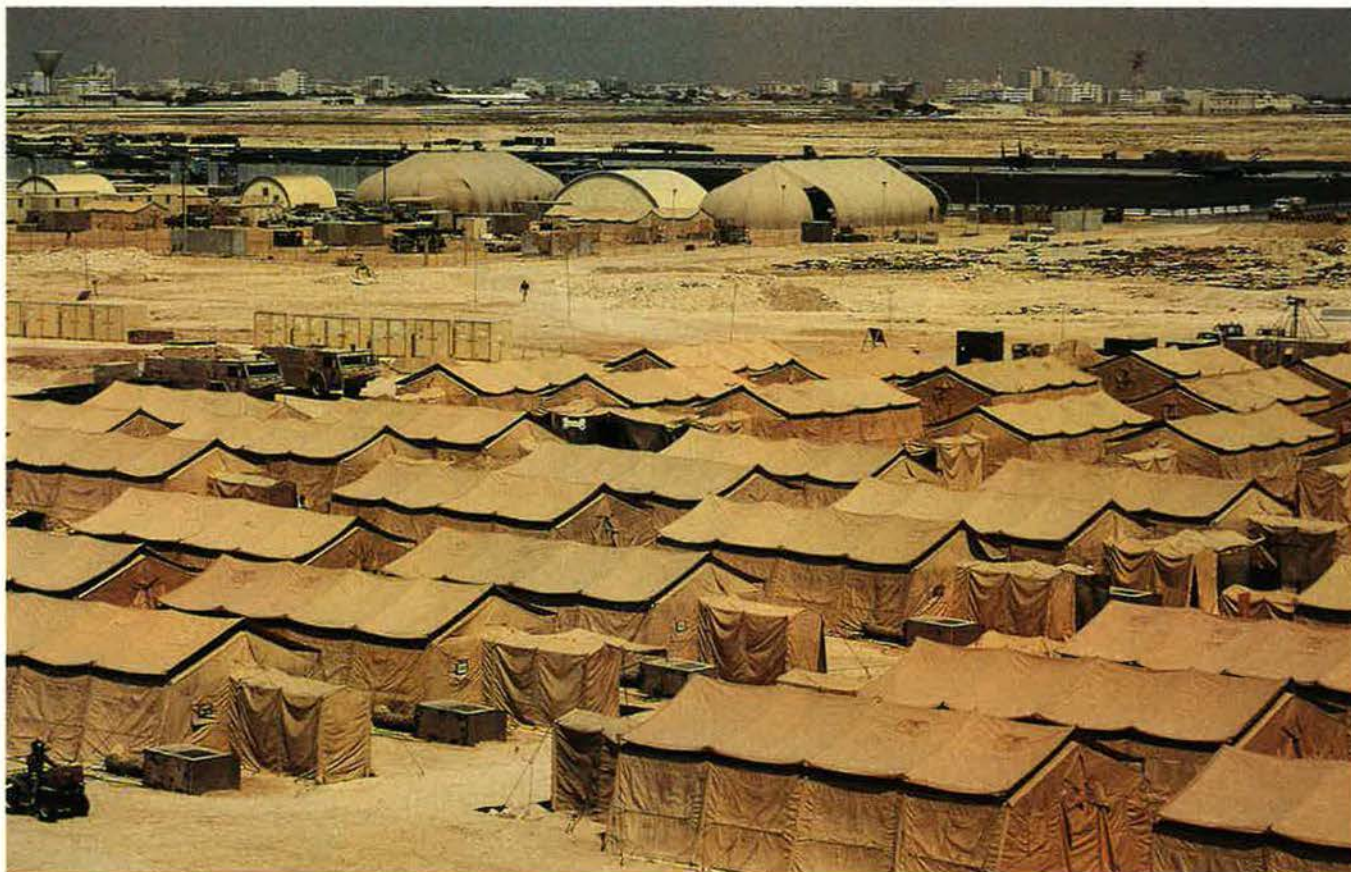
In June, elements of the 4th Fighter Wing, Seymour Johnson AFB, N. C.; 20th Fighter Wing, Shaw AFB, S. C.; 33d Fighter Wing, Eglin AFB, Fla.; and 319th Air Refueling Wing, Grand Forks AFB, N. D., gathered at an installation near Doha, Qatar, to form USAF's third air expeditionary force. AEF III—the 4417th Air Expeditionary Force (Provisional)—was a further refinement of a concept that first appeared in the fall of 1995: taking a composite group from Stateside bases and creating a lethal force on short notice. The idea originated in October 1994, when quickly deployed airpower, augmenting forces already in the area, caused Iraq to halt its buildup of troops on Kuwait's border.

For AEF III, the 4th FW served as the core, bringing twelve F-15Es from its 335th Fighter Squadron, as well as operational and logistics personnel. Three B-1Bs from the 7th Wing, Dyess AFB, Tex., and three B-52Hs from the 5th Bomb Wing, Minot AFB, N. D., and the 2d Bomb Wing, Barksdale AFB, La., were also ready to support the AEF from Stateside bases. Brig. Gen. Lance Smith, commander of the 4th FW and AEF III, said, "Our goal is, once we're notified, . . . to deploy and fly combat sorties within about forty-eight hours of initial notification." He also said that the fighter pilots flew fifteen hours nonstop from Shaw AFB and Seymour Johnson AFB to Qatar—with the F-15Es requiring eleven air refuelings and the F-16s needing fourteen to fifteen.



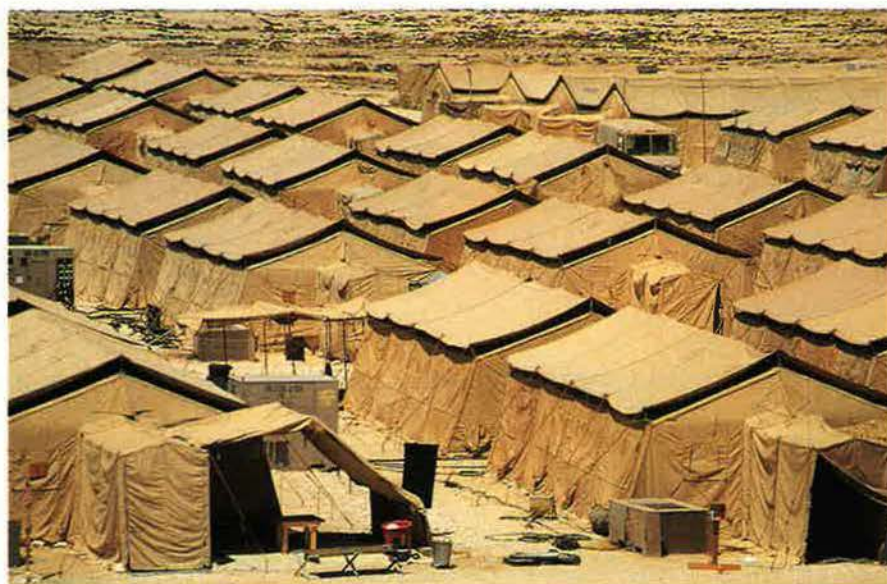
General Smith added that three AEF III F-16s were ready to fly Operation Southern Watch sorties—one of their tasks on this AEF—two hours and fifteen minutes after arriving in Qatar.

At left, an F-15C arrives back at base after a Southern Watch sortie. In addition to supporting the enforcement of the no-fly zone over southern Iraq, AEF III participated in Rugged Nautilus, a USAF-Navy exercise to test US Central Command's ability to gather and organize forces quickly in theater. As part of Rugged Nautilus, B-52s from the 2d BW flew more than 16,000 miles on a round-trip mission to a target range in Kuwait.



There was not much to start with. Above, the modern international airport of Qatar's capital city, Doha, lies in the distance. But the Camp Snoopy operations center— whose maintenance facilities are shown in the middle distance of the photo above, along with the tarmac where AEF III F-15Es are parked— needed to be supplemented to support the thirty-four aircraft and more than 1,000 people that made up the air expeditionary force. Improvements included a hot-pit refueling center on the flight line and additional maintenance space. Air Force civil engineers had been in and out of this region since 1991, but they still found some unexpected problems. Beneath a foot or so of desert sand lay solid coral that had to be drilled for every tent peg.

It's easy to see how the section of sand-colored tents (foreground above and at right) got the nickname "Dune." Along with tents for housing, special tents were set up for everything from movie and recreational facilities to the post office, finance center, and mess hall. The tents and many vehicles were prepositioned and will be put into storage for the next AEF.





News from home—and for the folks back home—is always welcome. Near the end of the mission in Qatar, news teams from Goldsboro, N. C., Columbia, S. C., and other home bases of the troops arrived to collect personal viewpoints for families in the States. The airmen enjoyed being interviewed by familiar faces—hometown television anchors and newspaper reporters. At left, television cameras run as a Security Policeman describes what life is like in Qatar.

F-16C crew chief A1C Robert Coursey, of Shaw's 78th Fighter Squadron, had been to the desert before and, like many of the AEF III crews, knew what to expect. Located on a peninsula on the Persian Gulf's western shore, Qatar can average daily temperatures of 115° F during the summer, with humidity at ninety-five percent. For Airman Coursey and other experienced maintenance crews, coping with intense heat and humidity was a minor adjustment as they went about their jobs of turning aircraft for their missions.



AEF III was assigned as a package for most of its time in Qatar. The Suppression of Enemy Air Defenses (SEAD) mission was a small but important part of this package, with F-16s from the 20th FW the key players. At left, three fully armed F-16s from the 78th FS await the next sortie. No training rounds here; all the weapons used by the AEF were live for these real-world missions. Future AEFs will be structured like this one, combining twelve F-15Cs for air superiority, twelve precision guided munition airplanes, six SEAD aircraft like these F-16Cs, and four tankers. For AEF III, KC-135Rs from the 319th ARW were kept extremely busy, supporting more than 800 sorties in Qatar.



The terrorist bombing of Khobar Towers in Saudi Arabia in June highlighted the need for increased security at Camp Snoopy and Dune. Extra Security Police were added, augmented by Qatari security. A series of stone berms was constructed to ring the area and enhance security. Above, what appear to be random piles of rubble are stone berms strategically placed to slow traffic on base.

Near the flight line, concrete barriers serve as protection from both outside threats and flight-line mishaps.

At right, A1C Rueben Aguirre, a Security Policeman from the 377th Security Police Squadron, Kirtland AFB, N. M., mans an M60 machine gun atop a Humvee near one of the smaller outposts on the edge of the camp. On the horizon are the hangars (far left) of Camp Snoopy and the tents of Dune. Security is tight enough so that only some of the local wildlife (below right) have free access to the base.





Keeping AEF III adequately supplied was a logistical challenge. At left, MSgt. Mark Freund, chief of supply, goes over the details with Maj. John Cooper (far left), head of logistics. Both from the 4th FW, they praised the other units who augmented them during AEF III. Each unit brought expertise in the systems they use and knowledge of what their aircraft needed to keep flying.

Part of that supply line is the "air bridge" created by the transports of Air Mobility Command. At right, a C-5B is loaded at Dover AFB, Del., for the lengthy haul "across the pond." Long hours put in by active-duty, Guard, and Reserve crews are vital to the success of AEF deployments.



General Smith noted that the operations tempo was seven days a week, with only two days off each month. But everyone needs a break, and services that some might take for granted at home become special events for the troops in Qatar. The recreation tent (left) is a popular place to spend spare time. Though security concerns after the Khobar Towers bombing curtailed most off-post activities, gracious Qatari hosts arranged for cultural events that allowed the American service members to taste traditional Arabic cooking and meet local people.



US airpower has been a regular presence in the region since the Persian Gulf War, but with AEF III, the pattern has been set for future deployments. A tailored force can arrive within hours, operate out of a familiar airfield, and be able to put iron on target.

Allied cooperation is vital in an AEF, and everyone has a chance to work with the Qatari military. "We are learning as much from them as they are learning from us," said General Smith. "There are exchanges at all levels, not just [at the] flying [level]. Our firemen are similar to their firemen. Our controllers are similar to theirs. Our maintenance folks have exchanges back and forth."

When these aircrews walk off the flight line at Doha for the last time, they will have gained more than improved facilities for the next deployment. General Smith noted that the American and Qatari troops who work together today will be tomorrow's military leaders and will have established a good relationship because of this AEF deployment. ■



These snapshots from the albums of Air Force Association members recall faces and places from the long conflict in Southeast Asia.

Vietnam War Scrapbook

Compiled by John T. Correll, Editor in Chief, and
Erica Milkovich, Administrative Assistant

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FOR SERVICE IN THE ARMED FORCES OF THE UNITED STATES

SERGEANT WILLIAM J. MCCORMICK UNITED STATES AIR FORCE 7 MARCH 1968 - 2 MARCH 1972

I extend to you my personal thanks and the sincere appreciation of a grateful nation for your contribution of honorable service to our country. You have helped maintain the security of the nation during a critical time in its history with a devotion to duty and a spirit of sacrifice in keeping with the proud tradition of the military service. I trust that in the coming years you will maintain an active interest in the Armed Forces and the purpose for which you served. My best wishes to you for happiness and success in the future.

Richard Nixon

COMMANDER IN CHIEF





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Photo by Paul Kennedy

U.S. AIR FORCE



Note: All AFA positions as of September 1, 1996.

In April 1968, after his 108th mission over North Vietnam, Col. Frederick C. Blesse (left) poses with back-seater Lt. Pete Gunn. "Boots" Blesse was a double jet ace in the Korean War; established a still-unbeaten record in winning the 1955 Gunsmoke, USAF's air-to-ground fighter gunnery meet; wrote a book, Check Six, and a tactics manual titled No Guts, No Glory; spent twenty-eight of his thirty years in the Air Force actively flying fighters; and retired as a major general. He lives in Melbourne, Fla.



Lt. Col. Doyle E. Larson, commander of the 6990th Security Squadron, is congratulated at Kadena AB, Okinawa, by Brig. Gen. Eugene Staltzer, commander of the 4157th Strategic Wing. The squadron, which Colonel Larson commanded from 1967 to 1970, had just completed its 1,000th "Combat Apple" mission in the RC-135 aircraft. Colonel Larson flew seventy-one combat missions in Southeast Asia. As this issue went to press, Major General Larson, USAF (Ret.), had been nominated to be National President of the Air Force Association for 1996-97.



Maj. Gene Smith, flying F-105s out of Takhli RTAB, Thailand, was on his thirty-third combat mission over North Vietnam in October 1967—his target that day was the Doumer Bridge—when he was shot down near Hanoi. He was a POW until March 1973. Lieutenant Colonel Smith, USAF (Ret.), has held numerous positions in the AFA volunteer structure. He served as National President from September 1994 to September 1996. In May, the AFA nominating committee recommended him as the Association's next Chairman of the Board.



This shot of MSgt. John E. Schmidt, Jr., and a Vietnamese family he knew was taken in Saigon in 1968. He was assigned at the time to the 1131st Special Activity Squadron. Chief Master Sergeant Schmidt, USAF (Ret.), is now president of AFA's Colonel H. M. "Bud" West Chapter in Tallahassee, Fla.



Passing through Don Muang RTAB in Bangkok, Thailand, in 1969, Lt. Michael R. Gallagher (left), then a C-130E pilot, encountered two friends from his pilot training days at Webb AFB, Tex. Lt. Andrew A. Tijernia (center) was flying C-130Bs and Lt. Philip L. French was a U-10 pilot. Michael Gallagher was still in service for the Persian Gulf War and retired in 1994 as a colonel. He lives in Sacramento, Calif.



A2C Ken Basque of the 531st Munitions Maintenance Squadron sits atop a 750-pound bomb during an afternoon break at Bien Hoa, South Vietnam, in 1966. The aircraft behind him is an F-100 Super Sabre. Ken Basque today lives in Rockford, Ill.



2d Lt. Bill McDonald, maintenance officer (right), and an NCO from the 308th Tactical Fighter Squadron at Tuy Hoa display freshly painted munitions and a greeting for North Vietnamese leader Ho Chi Minh in 1969. The messages were delivered by the squadron's F-100 aircraft. In 1972, Bill McDonald deployed with the 308th—by then equipped with F-4Es—from Homestead AFB, Fla., to Udorn RTAB, Thailand, for Operation Linebacker I over North Vietnam. Colonel McDonald, USAF (Ret.), lives in Fairbanks, Alaska, where he is vice president of AFA's Fairbanks Midnight Sun Chapter.



When this photo was taken in March 1966, TSgt. Thomas A. Pierce was NCO in charge of an Air Force combat news team at Da Nang AB, South Vietnam. Today, Senior Master Sergeant Pierce, USAF (Ret.), lives in Bellevue, Neb.

This photo of Capt. Bob Pardo (left) and Lt. Steve Wayne was taken at Ubon RTAB, Thailand, in February 1967. A month later, Captain Pardo made history by pushing another F-4, badly shot up in battle, out of North Vietnam. He did it by positioning his own F-4 so the windscreen pressed against the tailhook of the crippled aircraft. He did this in thirty-second increments until they crossed the North Vietnamese border. [See "Valor: Pardo's Push," p. 8.] Today, Lieutenant Colonel Pardo, USAF (Ret.), lives in Golden, Colo.



This photo of Capt. Richard Allen "Magellan" Strong in an O-1F aircraft was taken over the Ho Chi Minh Trail in Laos in 1966. He was assigned to the 23d Tactical Air Support Squadron at Nakhon Phanom RTAB, Thailand. The "Magellan" nickname came from a flight over a solid undercast in North Vietnam. He now lives in Huber Heights, Ohio.



Capt. Jim Simpson, O-1E forward air controller, sports the beret and patches of the ARVN Airborne Division in this photo taken in 1970 at Song Be West. Today, Lieutenant Colonel Simpson, USAF (Ret.), is director of AFA Volunteer and Regional Activities.

A2C Roy A. Boudreaux (left) and A1C William H. Pitsenbarger stand by an HH-43 Huskie helicopter at Bien Hoa, South Vietnam, in early 1966. Airman Pitsenbarger, a pararescueman, was killed in action a few months after this photo was taken. For conspicuous bravery until mortally wounded on a rescue mission, he was the first enlisted man awarded the Air Force Cross. Today, Chief Master Sergeant Boudreaux, USAF (Ret.), is president of AFA's Montgomery (Ala.) Chapter and a member of the Association's Finance Committee.



Col. William A. Lafferty, director of Plans and Programs for the Air Force Advisory Group in Saigon, 1970-71, talks with his counterpart, Col. Vu Thuong Van, director of Plans and Programs for the Vietnamese Air Force. Colonel Lafferty, USAF (Ret.), is National Vice President (Far West Region). He lives in Green Valley, Ariz.



Enjoying a SAC ADVON (Strategic Air Command Advanced Echelon) party at Tan Son Nhut AB, South Vietnam, in April 1971 are, left to right, Maj. Tommy Harrison, Don Rose, Wally Hamilton, and Jack Powell. Major Rose was in the intelligence shop, and the other three were in the tanker shop, scheduling tanker aircraft flying out of U Tapao RTAB, Thailand. Veterans of the era will recognize the uniforms as khaki shade 1505. Today, Colonel Harrison, USAF (Ret.), is an AFA national director and is AFA's Member of the Year for 1996. He lives in Apopka, Fla.



Col. William H. Roberts, chief of Maintenance for the 56th Special Operations Wing at Nakhon Phanom in 1971, catches a few moments in his trailer. Colonel Roberts, USAF (Ret.), is a Life Member of AFA. He now lives in Alexandria, Va. His daughter, Jancy Bell, is executive assistant to the AFA Executive Director.



A1C Sal O. Martinez, Jr., crew chief (far right), and his colleagues wet their whistles after a hard day's work, rearming, loading, and turning around A-1E Skyraiders for their next combat missions. This crew from the 34th Tactical Group at Bien Hoa was on detached duty at Qui Nhon AB, South Vietnam, in March and April 1965. Also shown are A1C Dan Roberts, A1C James Gouard, A2C J. Morales, SSgt. Francisco Vega, and A1C Jerry Helling. Master Sergeant Martinez, USAF (Ret.), a Life Member of AFA, now lives in Fresno, Calif.



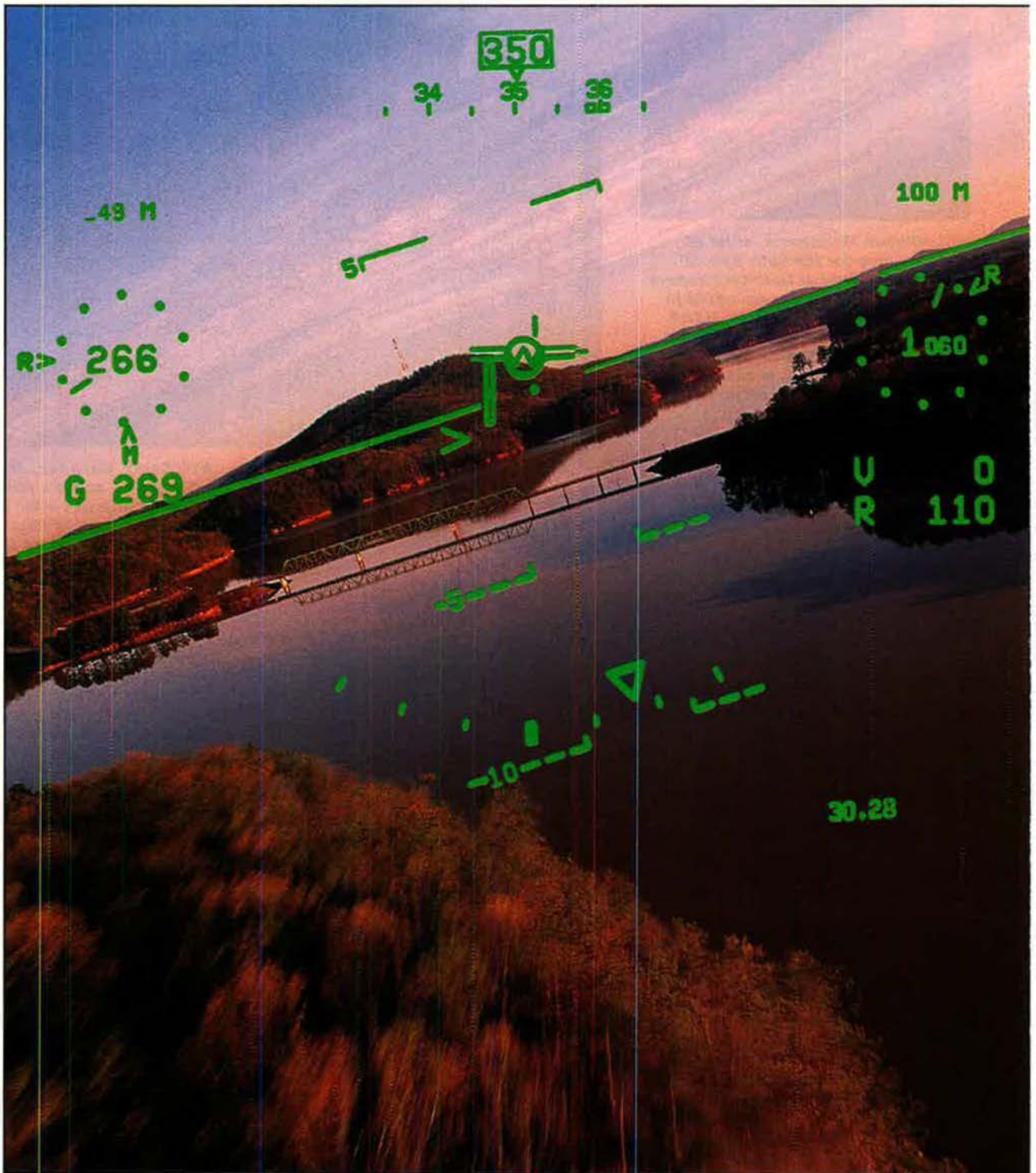
Behind SSgt. Miguel C. Lechuga, on temporary duty to Tan Son Nhut for evacuation operations prior to the fall of Saigon, are smoldering fires caused by a North Vietnamese rocket attack on the airfield April 27, 1975. Chief Master Sergeant Lechuga is still on active duty with the Air Force, serving as 52d Logistics Group chief enlisted manager at Spangdahlem AB, Germany. He is a Life Member of AFA.



TSgt. Gazzie L. Seckinger, NCO in charge of Operations for the 600th Photo Squadron at Tan Son Nhut in 1968-69, logs in combat documentation film footage and photos. He now lives in Twin City, Ga.



1st Lt. Dan Callahan III (right), navigator, stands with his aircraft commander, Lieutenant Colonel Crow, by their C-130E at Udorn RTAB, Thailand, in May 1971. They have just returned from flying a 7th Airborne Command and Control Squadron "Cricket" orbit mission over Laos. Dan Callahan is a former AFA national director and state president. He is still flying C-130s with the 118th Airlift Wing (ANG). He presently lives in Nashville, Tenn.



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Mission Success





Maj. Charles G. Durazo flew 180 combat missions as an RF-4C reconnaissance systems operator in 1970 and 1971. This photo was taken at Udorn RTAB, Thailand. Major Durazo had just completed preflight of the aircraft in preparation for a photoreconnaissance mission over North Vietnam. Colonel Durazo, USAF (Ret.), is presently an AFA national director and lives in McLean, Va.



The big smile from RF-4C pilot Maj. John Shaud (right) marks the completion of his tour in Southeast Asia. He and back-seater Maj. Vic Coopland have just been hosed down upon landing at Tan Son Nhut in January 1969. Major Shaud flew combat missions from both Phu Cat and Tan Son Nhut. Later on in his career, General Shaud was chief of staff of Supreme Headquarters Allied Powers Europe. He is presently Executive Director of the Air Force Association.



Capt. George R. Partridge, forward air controller, had just landed his O-1 Bird Dog on the 1st Infantry Division's laterite strip at Lai Khe when this photo was taken October 16, 1965. Immediately before, Captain Partridge had directed Vietnamese Air Force F-5s in an attack on Viet Cong bunkers and trenches. Today, Lieutenant Colonel Partridge, USAF (Ret.), lives in Prattville, Ala.



Capt. Vernon P. Wagner, an 8th Tactical Fighter Wing flight surgeon, returns from a mission with the 497th Tactical Fighter Squadron "Night Owls" at Ubon in February 1969. In 1970, he transferred to Nha Trang, where he logged 147 search-and-rescue/medevac sorties as senior medical officer of the 327th Combat Support Group. Dr. Wagner retired following two tours of duty in the Persian Gulf War and resides in Huntington Beach, Calif.



Maj. Bill Anderson prepares for an O-2 forward air control mission out of Chu Lai, South Vietnam, in 1968 in support of ground troops of the Americal Division in the northern I Corps area. Colonel Anderson, USAF (Ret.), presently lives in Abilene, Tex.



Capt. Robert A. Oliveri, EC-47 instructor navigator, stands in front of 362d Tactical Electronic Warfare Squadron headquarters at Pleiku AB, South Vietnam, after returning from a surveillance mission in June 1969. At the time this photo was taken, he had accumulated almost 1,000 hours of combat and combat-support flight time in less than a year. Today, Colonel Oliveri, USAF (Ret.), lives in Severna Park, Md.



1st Lt. Paul B. Gallant, Jr., is pictured in his OV-10A Bronco at Quang Tri Airfield, South Vietnam, after flying a forward air control mission near the DMZ on May 12, 1970. Lieutenant Colonel Gallant, USAF (Ret.), lives in Burke, Va.

Capt. Bill Croom poses with his F-100C training aircraft at Myrtle Beach AFB, S. C., on his way to Tuy Hoa AB, South Vietnam, and 218 combat missions in F-100D fighters. (He notes that he had 218 takeoffs but only 217 landings, having gotten one ride back in a rescue helicopter after he was shot down twelve miles north of Tuy Hoa in May 1970.) Lieutenant Colonel Croom, USAF (Ret.), is presently an AFA national director and chairman of the Long-Range Planning Committee. He lives in Colorado Springs, Colo.



1st Lt. Vic Seavers logged 100 missions over North Vietnam and twenty-five over South Vietnam and the Ho Chi Minh Trail, flying F-4s from Da Nang in 1966 and 1967. Today, Vic Seavers serves on the AFA Executive Committee and is National Vice President (North Central Region). Colonel Seavers, USAF (Ret.), lives in Apple Valley, Minn.



Capt. Steven G. Oxner stands by an F-4E at Korat RTAB, Thailand, in the spring of 1971. He flew 190 combat missions, mostly in Laos, while assigned to the 34th Tactical Fighter Squadron as a weapon system officer. Lieutenant Colonel Oxner, USAF (Ret.), lives in Huntington Beach, Calif.



In 1967, Capt. Michael J. Dugan was an A-1E pilot with the 1st Air Commando Squadron, flying out of Pleiku. He went on to become Air Force Chief of Staff. General Dugan, USAF (Ret.), is an AFA national director and a member of the Association's Executive Committee. He lives in Hastings-on-Hudson, N. Y.



A1C James B. Walker, Jr., F-105 jet engine mechanic with the 388th Tactical Fighter Wing, stands in front of his hootch at Korat in August 1967. He also served at Takhli and U Tapao. Master Sergeant Walker, USAF (Ret.), now lives in Dayton, Ohio.



This photo of Sgt. William J. McCormack of the 1982d Communications Squadron was taken at a softball game and unit outing at Ubon RTAB, Thailand, in May 1970. Today, William McCormack lives in Bowie, Md.



Capt. Delmar S. Hilliard, an A-1E flight commander with the 602d Fighter Squadron (Commando) based at Bien Hoa, was on detached duty with his flight at Qui Nhon when this photo was taken in March 1965. Major Hilliard, USAF (Ret.), lives in Corpus Christi, Tex.



MSgt. Walter E. Scott, chief STAN/EVAL loadmaster with the 315th Troop Carrier Group at Tan Son Nhut AB, South Vietnam, stands in front of a C-123B loaded with flares for a night combat-support mission in January 1964. He flew sixty-three combat support missions during his tour. Today, Chief Master Sergeant Scott, USAF (Ret.), is a permanent national director of AFA and Chairman of the Board of the Aerospace Education Foundation. He lives in Dixon, Calif.



This photo of Capt. Alfred A. Zealy (right) and a fellow navigator, Maj. Lambert L. Kroone, was taken at Da Nang in May 1965. They were awaiting the arrival of some VIPs from the United States, which accounts for the dress-up scarves. On a daily basis, they flew C-123 missions to deliver everything from flares to livestock. Today, Lieutenant Colonel Zealy, USAF (Ret.), lives in Brookfield, Wis.



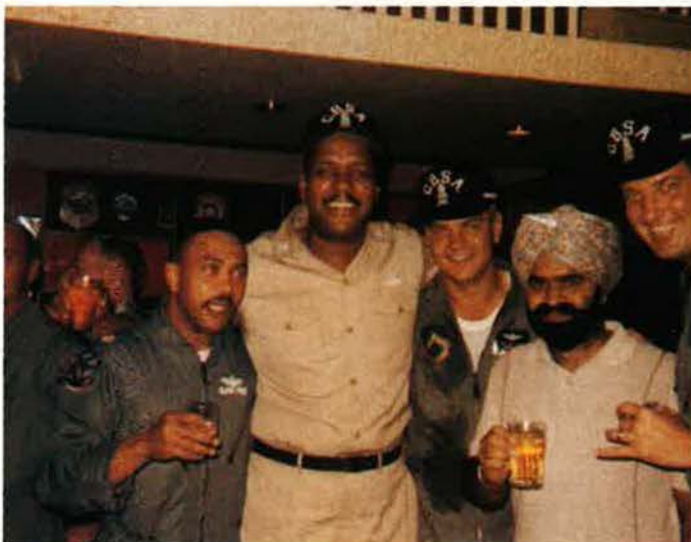
Col. Robin Olds (right), leader of the 8th Tactical Fighter Wing "Wolfpack," master of the "MiG Sweep" that downed seven North Vietnamese aircraft in a single day, and the only USAF ace with victories in World War II (thirteen) and in the Vietnam War (four), relaxes with his colleagues and a monkey at Ubon. Brigadier General Olds, USAF (Ret.), lives in Steamboat Springs, Colo.



Maj. Joe Ochota was assigned to the 309th Air Commando Squadron at Tan Son Nhut AB flying C-123 aircraft in 1966 and 1967. This photo was taken during the unloading of Huey helicopter parts at Qui Nhon in the spring of 1967. Lieutenant Colonel Ochota, USAF (Ret.), lives in Poulsbo, Wash.



CMSgt. Thomas B. Wilkes takes a ride in a samlor pedicab in Takhli in 1967. He was NCO in charge of Maintenance Control for the 355th Tactical Fighter Wing. Chief Wilkes, USAF (Ret.), now lives in Euless, Tex.



Pictured at a going-away party at the 8th Tactical Fighter Wing at Ubon in October 1967 are (foreground, left to right) Maj. Clark Price, Col. Daniel James, Jr., Maj. William L. Kirk, Ubon tailor Raja Wongsee, and Capt. Dee Simmonds. ("Chappie" James, who died in 1978, was the first African-American to reach four-star rank in the US armed forces.) Colonel Price, USAF (Ret.), lives in Arlington, Va. General Kirk, USAF (Ret.), is former commander in chief of US Air Forces in Europe. He lives in Niceville, Fla.



Popular casual wear at bases in Thailand included "party suits," custom-made by local tailors. Thus attired for a gathering at Ubon RTAB, Thailand, in 1968 are Marguerite Cummock (right), secretary to the base commander and the wing commander, and Maj. Shirley Fortner. Today, both Marge Cummock and her husband, Dave Cummock, are active in Florida AFA. They live in Daytona Beach.



In 1968, Capt. Philip W. Dreiling was "Barky 18," a forward air controller flying missions in an O-2 in the I Corps area around Quang Tri, near the North Vietnamese border. Major Dreiling, USAF (Ret.), lives in Simi Valley, Calif.



This Polaroid shot of Capt. Richard A. Slowik was taken by the intelligence shop at Binh Thuy AB, South Vietnam, in July 1968. Such photos were then kept on file as a means of visual identification for the rescue pilots if a pilot was shot down. The rescue crews compared the photos with the faces of the people they picked up and also had several questions that would elicit specific answers—which in Captain Slowik's case were "Lucky Strike" (his favorite cigarette) and "Rita" (his girlfriend). Today, Richard Slowik lives in Blytheville, Ark.



Lt. Col. George Chabbott (pointing) took over from Maj. Al Barbero (left) as exec of the 56th Special Operations Wing at Nakhon Phanom RTAB, Thailand, in 1970. Currently, Al Barbero is president of the Nation's Capital (D. C.) Chapter of AFA, and George Chabbott, former National Treasurer, is AFA National Vice President (Central East Region). Colonel Barbero, USAF (Ret.), lives in Vienna, Va., and Colonel Chabbott, USAF (Ret.), lives in Dover, Del.



On his first tour in Southeast Asia, Maj. Alan G. Nelson was a forward air controller with the 9th Army of the Republic of Vietnam (ARVN) Division, flying this Vietnamese Air Force O-1A. He and Sergeant Hieu, who maintained the aircraft, posed for this photo at Can Tho, South Vietnam, in July 1965. Later on, Alan Nelson flew 116 missions out of Korat RTAB, Thailand, in F-105s. Colonel Nelson, USAF (Ret.), lives in Saint Petersburg Beach, Fla.



In 1966, entertainer Martha Raye brought a USO show to Pleiku AB, South Vietnam, where she was welcomed by Capt. Murlin R. "Monte" Lower, officer in charge of the 315th Air Commando Group Transport Movement Control Center. Monte Lower now lives in Hopatcong, N. J.



Entertainer Bob Hope is welcomed to Nha Trang, South Vietnam, on Christmas Day 1964 by Col. Robert J. Jones, commander of the early US Air Force contingent there. As an additional duty, Colonel Jones flew C-123Bs to Special Forces camps for "drops and short stops." Today, Colonel Jones, USAF (Ret.), lives in Roseville, Calif.



Thousands of members know Rosemary Pacenta as AFA's director of Meetings and Conference Services. In 1972-73, however, she was a civilian employee with the 388th Tactical Fighter Wing at Korat. In this picture, she picks up absentee voting information for the 1972 elections back home.



Maj. John A. Morgan looks up Highway One, south of Nha Trang AB, during the Tet Offensive. He was assigned to the 35th Tactical Fighter Squadron at Phan Rang but in January 1968 was leading a supply convoy from Nha Trang to Phan Rang and An Phuoc. Colonel Morgan, USAF (Ret.), lives in Greenwood, S. C.



A2C Gail H. Meyer, who served in both Vietnam and Thailand, stands in front of a hootch at Cam Ranh Bay AB, Vietnam, in 1967. He then cross-trained, became a flight engineer on C-141s, and flew in and out of Southeast Asia until the end of the war. Senior Master Sergeant Meyer, USAF (Ret.), lives in Altus, Okla.



Maj. Monroe W. Hatch, Jr. (in white cap), sees how to rig a shelter from a parachute at Jungle Survival School at Clark AB, the Philippines, in 1969. From there, he went to Tan Son Nhut AB, South Vietnam, flying CT-39s as a 7th Air Force courier pilot. In time, he achieved four-star rank, served as USAF vice chief of staff, and was Executive Director of AFA from 1990 to 1995. Today, he is a member of the AFA Board of Directors and lives in Clifton, Va.



Capt. Dwight Moore, B-52D aircraft commander, checks his weapons load at U Tapao RTAB, Thailand, in 1972. He flew 216 missions in Southeast Asia and took part in both Operations Linebacker I and Linebacker II. Lieutenant Colonel Moore, USAF (Ret.), lives in Mascoutah, Ill.



Capt. William J. Pelham, an O-1 forward air controller, shaves at the Army of the Republic of Vietnam (ARVN) 1st Division outpost on Highway One, north of Hue in July 1965. At present, Colonel Pelham, USAF (Ret.), lives in Frisco, Colo.



Maj. Ned J. MacCarthy, assigned to an Air Force advisory team working with the Vietnamese Air Force depot at Bien Hoa, stands outside a hootch in 1971. Lieutenant Colonel MacCarthy, USAF (Ret.), now lives in Newark, Ohio.

During his first tour in Southeast Asia, Maj. William T. McAdoo of the 8th Tactical Fighter Wing "Wolfpack" at Ubon, celebrates his return from his 100th mission over North Vietnam—fifty-six of them into Route Pack Six around Hanoi and Haiphong—in October 1967. Today, Colonel McAdoo, USAF (Ret.), lives in Shalimar, Fla.



**THROUGH THESE DOORS PASS THE PROFESSIONAL
SAC'S FINEST COMBAT CREWS**



Prior to a B-52 mission over Southeast Asia in 1968, Maj. Edward Nystrom (right) and a colleague head for an aircrew briefing in the combat ops building at Andersen AFB, Guam. Today, Edward Nystrom lives in Spokane, Wash.



This photo of Lt. Col. Charles B. Jiggetts, newly promoted, was taken at Tan Son Nhut, South Vietnam, where he was a communications-electronics requirements officer at 7th Air Force headquarters, 1966-67. Note the barbed wire. Today, Brigadier General Jiggetts, USAF (Ret.), is treasurer of AFA's affiliate, the Aerospace Education Foundation. He lives in Clifton, Va.



1st Lt. Barbara Coffey, squadron section commander, and her colleagues in the 635th Supply Squadron stood for this photo at U Tapao in 1974. Lieutenant Colonel Coffey, USAF (Ret.), is now director of Protocol for the Air Force Association.



TSgt. Bobby L. Kapperman stands by the aircraft that took him to many of his assignments in 1966 and 1967 as a combat reporter/photographer assigned to Military Assistance Command, Vietnam (MACV). He had an earlier tour in Vietnam as chief clerk for a provisional squadron at Tan Son Nhut from 1962 to 1963. Senior Master Sergeant Kapperman, USAF (Ret.), is a former AFA chapter president. He currently lives in Evansville, Ind.

TSgt. Lewis H. Fountain (right) takes a martial arts lesson at a Korean dojang in Phu Cat in 1972. He was in and out of Vietnam frequently as a C-141 flight engineer between 1967 and 1971 and was subsequently stationed in-country at Phan Rang, Phu Cat, and Saigon. In his thirty-one-year flying career, he logged a record of more than 15,000 hours in C-141s and another 1,000 hours in C-47s and C-7s. Chief Master Sergeant Fountain, USAF (Ret.), lives in Maple Shade, N. J.





Among the first Air Force permanent-party airmen assigned to Vietnam were Capt. David M. Murane and his colleagues at the Air Support Operations Center at Pleiku in early 1962. Left to right in front of a Vietnamese Air Force AD-6 are Captain Murane, the close air support duty officer; Capt. Roy Hibbs, the intelligence officer; Lt. Col. Ray Lancaster, the commander; Capt. Dick Hall, the reconnaissance duty officer; and Capt. Bob Stubberfield, on temporary duty from Japan as reconnaissance liaison. Colonel Murane, USAF (Ret.), now lives in Alexandria, Va.



Maj. Thomas S. Swalm (right), leader of B Flight, 391st Tactical Fighter Squadron, and 1st Lt. Sven Edlund stand in front of an F-4 at Cam Ranh Bay AB, South Vietnam, in 1967. During his tour, Major Swalm flew 220 missions, 105 of them over North Vietnam. Today, Major General Swalm, USAF (Ret.), is a member of the Air Force Scientific Advisory Board. He lives in Melbourne, Fla.



1st Lt. Francis C. Gideon, Jr. (left), of the 615th Tactical Fighter Squadron, and his father, Lt. Gen. Francis C. Gideon—commander of 13th Air Force—check the triple ejector racks prior to their combat mission together from Phan Rang in an F-100 in February 1969. Today, Maj. Gen. Francis C. Gideon, Jr., is director of Operations for Hq. Air Force Materiel Command at Wright-Patterson AFB, Ohio.



In October 1968, Capt. Jim Callahan had just returned to Pope AFB, N. C., after a tour as a C-130 pilot at Cam Ranh Bay. With him in this photo are his two daughters, both now Life Members of AFA. Jodi (left), then six months old, is now an Air Force captain and an under-forty national director. Jamie (right), three years old in this photo, is a US Air Force Academy graduate and a former Air Force captain. Colonel Callahan, USAF (Ret.), is AFA National Vice President (Northeast Region) and serves on the Long-Range Planning Committee. He lives in East Amherst, N. Y. ■

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The European Allies want to play a larger role, but they won't be able to do it without US assistance.

Remaking NATO

By Stewart M. Powell

THE US military may be grappling for quite some time with the effects of a recent NATO decision that changes a fundamental rule about deployment of Alliance forces.

Under the new system, NATO will be permitted to provide hardware, manpower, and expertise to support non-NATO European coalitions engaged in small, noncombat operations ranging from peacekeeping to civilian evacuations and disaster relief on the fringes of the treaty area.

Leadership would fall to the Western European Union (WEU), a ten-member organization in which the US plays no role.

Some analysts say that this step marks a notable departure from the Alliance's forty-seven-year-old prohibition against using NATO's forces for non-NATO duties. They noted that it allows Europe to act somewhat independently of Washington, a factor especially important to France.

However, the practical effect may be to actually increase pressure on US forces. Experts say the change is certain to lead to greater demands for American capabilities, especially USAF's. They concede that Europe will be able to conduct little more than police missions without substantial American support.

"To the extent that we remain engaged on the periphery of Europe with our European allies—either

through NATO or through providing support for European operations—there will continue to be implications for those same [US] forces that are already heavily tasked," said a ranking US defense official.

He added, "It's something we will need to take into account when we make decisions about whether or not we're willing to task those forces even more heavily than they're already tasked."

The landmark decision was announced at the June meeting of Alliance foreign ministers in Berlin. Defense officials in NATO capitals and NATO staffers are working to create, by December, a system for supporting the WEU and participating in combined joint task forces (CJTFs) formed for missions not in conflict with Alliance or US security interests.

Identity Crisis

The newfound readiness of the NATO members to lend support to operations conducted by the oncemoribund WEU marks the latest effort by the Alliance to deal with low-intensity conflicts flaring on the fringe of Alliance territory and to develop what is referred to as a "European security and defense identity."

The US supports this effort. Said Army Lt. Col. Charles Barry, a senior military fellow at National Defense

University in Washington, D. C., "If you don't want to be the world's policeman, you've got to find other cops out there to help you out."

White House spokesman Mike McCurry, in a June 3 briefing, claimed the agreement "set forward procedures by which Europe can take greater responsibilities for its own security and defense, establishing a European security and defense identity within NATO—separable but not separate, as we like to say."

Robert E. Hunter, the US ambassador to NATO, asserted that Europe's effort should be considered "an insurance policy," to be available "just in case there were circumstances in which my country did not wish to participate in some necessary act of European security. I do not foresee that, but insurance policies . . . are sometimes useful to have."

One ranking Defense Department official, asked to project the kinds of operations that Europe may take on, responded, "We think it's likely that a European-led CJTF would only be formed to undertake missions that don't require a lot of firepower, a long-distance deployment, or an extended duration."

Ambassador Hunter put it this way, "What the WEU will do will be at the low end of the totem pole."

Even so, experts say that almost any European operation will require US support. Philip H. Gordon, senior research fellow at the International Institute for Strategic Studies in London, said Europe could probably handle very small-scale, local operations on its own. He added that, for anything more, "what the Europeans would need . . . are not NATO assets but American assets—long-range heavy transport aircraft, air refueling capabilities, and satellite intelligence systems."

Through NATO, the US could receive urgent requests for a variety of noncombat support activity. Parts of the nation's extensive intelligence-collection system could be used to gather strategic or tactical information required to plan, deploy, and protect a European contingency force.

Sophisticated spacebased communications systems are expected to be called on as well, much as they were used in Operation Provide Comfort to help coordinate humanitarian relief to Iraqi Kurds who had fled into

the mountains near the Turkish border following the Persian Gulf War.

"Heavily Dependent"

One senior Pentagon official said that "the absence of deployable long-range multiple-user systems" and a further "lack of interoperable systems" means that European task forces "will be heavily dependent on the United States and one or two other countries for strategic and operational communications and intelligence systems."

As the NATO task force in Bosnia-Herzegovina underscored, American forces will be expected to field an array of combat support units, such as military police and engineers, plus combat service support, such as logistics personnel, refueling, and water-purification capabilities. Transportation systems also will be in great demand.

USAF's fleet of sophisticated surveillance and battle-management aircraft, long-range reconnaissance aircraft, airlift aircraft, and supporting air refueling tankers also are certain to get many calls.

The Air Force will bear the brunt of providing US support. Its unique fleet of 358 long-range active-duty and Guard and Reserve airlifters—C-5s, C-141s, and C-17s—could be called into service early in a European operation, backed by KC-135 and KC-10 aerial tankers.

Officials warned that the Air Force can expect greater demands on the already overtaxed fleet of reconnaissance and battle-management aircraft and such command-and-control systems as the E-3 Airborne Warning and Control System, EC-130 Airborne Battlefield Command and Control Center, EC-130H "Compass Call," and RC-135 Rivet Joint aircraft. One-third of the 100 USAF aircraft flying direct support of NATO forces in Bosnia are battle-management, support, or search-and-rescue assets.

One Pentagon analyst noted that these systems "have been working at a pretty intense pace" because the US has most of the specialized capabilities, and "they are particularly useful for a lot of the security challenges that we've been responding to."

Defense Department officials explained that, once the President decides that the United States will

provide noncombat support to a European coalition, participating US forces would be drawn from active-duty units not only in Europe but possibly from the United States as well. With so much of combat support embedded in the reserves, they said, activation of some units would be assured.

"It's a political decision," said one DoD official. When the White House decides whether or not to participate in a mission, he said, "the need to activate reserves would be one of the factors that I'm sure would be considered."

US officials are quick to knock down assertions that Washington is losing control of its forces. They insist that US military personnel, equipment, and capabilities provided to a European operation would remain under tight US control. As the senior US defense official put it, "We're not going to just lend the car to someone and say, 'Do whatever you want with it and bring it back when you're through.'"

Direct Control Preserved

As evidence, Clinton Administration officials note provisions for the US-led North Atlantic Council (NAC) to retain direct control of NATO assets as well as continued oversight responsibility to make sure that they are "competently used, . . . protected, and preserved."

Moreover, Army Gen. George A. Joulwan, Supreme Allied Commander Europe, or his successor will retain command of US forces.

Defense Secretary William J. Perry said that the US chain of command will remain sacrosanct, no matter what revisions are made in NATO's military command structure to accommodate support for European operations. "There has to be a unified command, a single line of command," Mr. Perry told NATO defense ministers in June. "That is absolutely essential."

American officials are alert to the possibility, too, that a European coalition bolstered by noncombat NATO assets might bite off more than it can chew and ultimately draw in NATO combat power for protection. As Colonel Barry warned, "Any deployed CJTF—even if WEU-led—is vulnerable to attack, which then becomes an Article V [collective defense] situation."

The Pentagon expects to avoid such problems by negotiating strictly worded agreements with the WEU to delineate the scope of the tasks that the US would undertake.

"You always have this mission creep concern, whenever you get engaged in any low-intensity operation," remarked the Defense Department official. "But we would insist [that] that agreement would be kept—or at the very least insist that, before we deviate from it, there would be a new agreement reached."

He added that the White House would always have the final say on how US capabilities were being used, because of provisions allowing NATO members to withdraw forces at any time.

As NATO and the WEU prepare to work together, the United States is insisting that the partnership be driven by scenario-based planning rather than "theological debates" over the situations in which the United States might contribute to a European operation.

Pentagon officials are pressing European counterparts to lay out a "threat scenario against which they think they might be able to respond" and then work with NATO planners to meet that threat.

The approach requires the Europeans to "confront their own limitations, to identify their requirements, and to come to some sort of understanding about what their real capacity is rather than arguing about it from a theological standpoint," said one US official.

Pentagon planners are looking to past examples of US support operations as guides to future US contributions. US airlifters have flown French combat forces into trouble spots in Africa, for example. The United States provided highly valuable intelligence, logistics support, and weapon replacements to Britain during the 1982 Falkland Islands War.

The United States has also participated in a variety of near-combat task force operations with allies in recent years, including the enforcement of no-fly zones over Iraq and Bosnia. US naval forces have taken

part in multinational operations enforcing sanctions in the waters off the Balkans as well as Iraq.

The New Model

Administration officials and the Joint Chiefs of Staff also want to factor in a more recent model, NATO's US-dominated peace implementation force (IFOR) in Bosnia, to guide NATO support for European coalition operations. The US-commanded task force in Bosnia managed to enlist the support of all sixteen NATO nations and another sixteen non-NATO countries from Europe, North Africa, the Middle East, and Asia.

Satisfied with the command arrangements, President Clinton ordered 20,000 heavily armed ground troops into Bosnia as part of Task Force Eagle. The no-nonsense task force, part of a 60,000-strong multinational presence, moved into Bosnia last winter with more than 100 M1A1 Abrams tanks, dozens of Bradley Fighting Vehicles, and other heavy vehicles.

Secretary Perry observed that the Alliance already has a CJTF "in practice" in Bosnia, "so we don't have to spend too much time on the theology. All we have to do is generalize what is already a successful CJTF in operation."

Critics contend that, while the IFOR operation showed that NATO can indeed function well in a CJTF, the trick will be to have such forces prepared well, with clear lines of military and political control, and not thrown together in an *ad hoc* fashion.

Officials envision a variety of scenarios on the fringes of Europe where the new concept could come into play.

Paris, for example, might seek help through the WEU for an evacuation of French noncombatants in North Africa, where Islamic terrorists are threatening regimes in the former French colonies of Algeria, Tunisia, and Morocco. European allies might count on NATO logistics support to assist whatever force replaces the US-led contingent in the Balkans. If tensions between Greece and Tur-

key intensify, the WEU might attempt to interpose an all-European buffer force. Similar kinds of forces could be deployed in such strife-torn areas as Chechnya.

Because Europeans now can act independently of the United States, said Administration officials, European coalitions have gained the freedom to carry out politically sensitive missions on the doorstep of Russia or to enlist Russian support in European operations elsewhere. European forces can now take the lead "in appropriate circumstances," explained a senior defense official after the NATO foreign ministers met in June. "This gives Europe the opportunity to provide a collective defense in a way that hasn't been possible before."

NATO's decision to support European task forces also serves to bring France back into the military structure of the Western alliance after an absence of thirty years. French President Jacques Chirac sought a stronger European voice in the US-led Alliance in return for resumption of full French participation.

By NATO standards, the Alliance is moving quickly to lay the groundwork to support CJTF operations. Military leaders were preparing to advise the NAC at the meeting in December about what types of "separable but not separate capabilities, assets, and support assets" NATO ought to make available to WEU-led operations.

Military authorities were weighing "double-hatting appropriate personnel within the NATO command structure" in order to "permit the rapid constitution of a militarily coherent and effective operational force" within the Alliance that could "support, command, and conduct the WEU-led operations."

Despite its potential long-term impact on US forces, the makeover of NATO policy has attracted little public attention and debate. "It's not easy to get people's attention on something that's this arcane," conceded one DoD official. "NATO generally is not on most people's scopes."

That could change in a heartbeat if the President orders American forces to support a European-led contingency operation. One official said, "When you have to make a decision about a contribution of US troops, it pops up real quick." ■

Stewart M. Powell, White House correspondent for Hearst Newspapers, has covered national and international security affairs during a twenty-five-year career based in Washington and London. His most recent article for Air Force Magazine, "NATO's Eastern Question," appeared in the January 1996 issue.

The number of retirees is up, and their average age is down. Congress keeps finding ways to cut the costs (also known as benefits) of the program.

Revisions to Retirement

By Bruce D. Callander

IN 1992, Congress gave the services the power to retire members with as few as fifteen years of active duty. Through 1995, the Air Force used the authority to retire more than 2,500 officers and 11,500 enlisted troops before their normal exit points at twenty years and beyond. In previous force-cutting actions, USAF pushed out thousands under tightened up-or-out policies and special drawdown actions, such as Selective Early Retirement Boards (SERBs).

For years now, USAF has used retirement as a tool to shrink the force as well as to keep it young and vigorous. The full impact of shortening so many careers will not be felt for some years, but some of the effects already are apparent.

For one thing, the force cuts have added unprecedented numbers of retirees to the service retirement rolls. USAF has almost 600,000 former members on paid retirement, a total that almost matches the combined strength of active-duty and Guard and Reserve forces. The services now have more than 1.5 million retirees. Early force-outs also have brought the average age at retirement to a record low, meaning that retirees will draw their benefits longer.

However, Congress for years also has been cutting the cost of retiring an individual member. Because it "grandfathered" these changes, most of the savings will not take hold for a generation, but the results will be painful. Moreover, pay isn't the only facet of military retirement to undergo major change. Restrictions on employment and on veterans benefits also have emerged in recent years to complicate the lives of those who take off the uniform.

The Big Switch

The record of recent times stands in sharp contrast with the practices of an earlier era, when the lawmakers' goal was to make retirement more attractive so experienced members would stay for a full career in order to derive full benefits.

When the basic eligibility rules for today's system were laid down in the 1940s, annuities were based on a member's final pay, and retirement pay was recomputed with each increase in active-duty pay. "Recomp" was abolished in 1958 because Congress thought it too expensive. The approach thereafter was to adjust retirement pay according to increases in the Consumer Price Index (CPI). (This economy measure at the expense of retirees would eventually backfire on the economizers when inflation in the 1970s hit double-digit percentages and the CPI rose to heady altitudes.)

Later, the lawmakers added other improvements. A "look-back" formula protected members from losing money as a result of the timing of their retirements. A one percent "kicker" made up for lags in the adjustment formula. A 1971 law assured

members retiring after that year that they would not receive less than they would have by retiring earlier, when raises in active-duty pay had failed to keep pace with those in retired pay.

By 1976, however, Congress had decided that the system was over-compensating for cost-of-living increases. That year, it eliminated the one percent kicker and provided for cost-of-living adjustments every six months. In a later economy move, it substituted annual raises for the semi-annual COLAs.

The two most dramatic changes, however, came in the 1980s when the lawmakers twice revised the formula for computing the pay itself. In September 1980, they ordered that annuities for those joining after that date be based not on final pay but on the average for the member's highest-paid three years. In 1986, they combined this "high-three" formula with a plan called "Redux." Thereafter, the annuity would be based on 2.5 percent of the member's highest-paid three years multiplied by the years of service minus one percent for every year short of thirty. This reduced annuity would last until the member reached age sixty-two, then would be raised to the full 2.5 percent per year served.

(In 1995, Congress sought to impose a "High One" plan on members who joined prior to September 8, 1980, basing their retired pay computation on an average of their last year's pay rather than using the final month as a basis. This led to protests that the change was being assessed retroactively to service performed during the past fifteen years. Congress eventually backed away from the proposal.)

The effect of the changes was twofold. First, it reduced the rate of basic pay on which the annuity was based. And second, it cut the multiplier used to figure it. A member leaving at twenty years, for example, would receive forty percent of his or her high-average pay rather than half his final pay.

Congress also changed the formula for later pay raises. COLAs for those under final-pay and high-three plans still were expected to give full protection against inflation. However, members who retired under the Redux plan would receive COLAs for the CPI minus one percent. Re-

tirees in this last group would have their pay adjusted to full COLAs at age sixty-two but then go back to the partial COLA formula.

Those were the only major changes in the formula itself. However, Congress in subsequent years several times delayed or limited COLA in-

Overall, the changes have reduced the value of military retirement by one-fourth, hurting its effectiveness as a recruiting tool.

creases. Further, it repealed the one-year, look-back provision, required that retirement and survivor payments be rounded down to the nearest dollar, and adopted provisions to count months of creditable service as one-twelfth of a year, rather than counting anything over six months as a full year.

High Three and Redux

High-three averaging affects only those members who entered service between September 8, 1980, and July 31, 1986. The Redux applies only to those who came in after August 1, 1986. Members in service before September 8, 1980, retired under earlier rules.

For future retirees, however, these "reforms" will have considerable impact. Sixty percent of the members now on active duty will find that their retired pay is based on the

high-three formula, and those with ten years of service or less will face the added limitations of the Redux formula.

Overall, officials estimate, the changes have reduced the value of military retirement by about one-fourth. They worry that this will reduce the system's value as a retention incentive and leave the Air Force with an experience gap that will take years to close and could affect readiness in the meantime.

Indeed, attitude surveys conducted by the Air Force have already begun to reflect growing displeasure with the retirement system. In USAF's 1990 poll, officers rated retirement as the fourth highest item on a list of career "satisfiers." In 1994, it had slipped to sixteenth place. Over the same period, retirement benefits dropped from tenth to sixteenth place as a satisfier for enlisted members.

Much of the dissatisfaction stems from the reduction of benefits now available for younger troops. Some of it also may be traced to the fact that service members in general no longer can count on staying in the military as long as they had hoped to. Traditional up-or-out policies combined with lower tenure points, SERBs, and fifteen-year retirement have made early retirements more the rule than the exception in recent years.

Adjustment in military retired pay isn't the only change buffeting service retirees these days. Once, many retired service members found second careers as federal civilian employees or as workers in the defense industry. In recent years, however, Congress has placed new restrictions on both types of work, some of them designed to save the government money and others to prevent conflicts of interest.

For example, many service members are barred from taking jobs with the federal government until 180 days after retirement. Some who do qualify for employment must give up a portion of their retired pay in return. The reduction applies to all retired regular officers and to other members retired after January 11, 1979, if their combined retired and civilian pay exceeds the base rate for level five executive employees.

Most retirees receive credit for their military service toward civil

service retirement, but, again, there is a penalty. Because military and civilian wages come under the Social Security program, many must take a reduction in retired pay when their old-age benefits kick in. In 1982, Congress granted some relief from this limitation, but many retirees still see a loss of benefits.

Post-Service Penalties

There are no pay penalties for retirees working for private employers, but there are some barriers to taking jobs with firms that do business with the government.

Most of these conflict-of-interest rules were designed to prevent high-ranking military retirees from showing up in their former offices as vendors for private companies. Under the Ethics in Government Act of the late 1970s, general officers with fewer than two years in retirement could not represent firms dealing with the government in areas where they had had responsibilities in their last year of service. A 1987 law extended the restriction to all those who retired as majors or above.

After the two years have passed, these restrictions ease, but field-grade officers who work for prime contractors still must file reports with their former services if they make more than a given amount of money in a given year.

At times, the rules make fine distinctions between what is and what isn't a conflict of interest. A retiree can take a job promoting products that are sold in exchanges, for example, but may not sell them to exchanges. He also can conduct career seminars with military members present but can't use the occasion to push his firm's insurance program.

Retirees may work abroad for private companies subject to similar restrictions. If they want to work for foreign governments, however, they must have Congress's permission, even if the job involves only an indirect connection, such as teaching in a government-funded school. The rule is based on the Constitutional provision that forbids persons holding positions of trust with the US from accepting compensation from foreign states.

Until the 1980s, it took a private bill or a Presidential order to overcome this limitation. That year, however, Congress eased the restriction,

allowing such employment with the joint approval of a service secretary and the Secretary of State. Retirees who go to work for a foreign government before getting the approval, however, will have their retired pay cut by the amount they earn abroad.

All retirees with at least fifteen

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but not more than nineteen years of service must register for public or community-service jobs. The Departments of Defense and Labor will help them find jobs in law enforcement, education, public health, social services, and other designated fields. Those registered are not required to take such jobs, but if they do, they can receive added retired pay credits when they reach age sixty-two. A member who leaves after fifteen years and works another five years in public service, for example, eventually could have his or her retired pay adjusted to the rate for a full twenty years of service.

So far, though, the program has not attracted Air Force retirees in large numbers. At last count, only about 400 of the almost 14,000 members who took early retirement were working in such jobs—thirty-one percent as teachers and twenty-four percent in law enforcement.

Disabled Veterans

Many of the limitations placed on other retirees do not apply to those retired for disability, but even their status has changed in recent years. While disability retirees were exempted from some COLA cuts and the 1986 Redux changes, for example, those who entered service after September 1, 1980, are subject to the same high-three averaging rules as nondisabled retirees.

Nor is disability retirement as generous as it once was. Having dual status, retirees who are also disabled veterans can ask for VA disability compensation, but those who receive it must give up an equal amount of military disability retired pay. For members who entered service after September 24, 1975, it may be a good trade. Their VA benefits are not taxable while their service disability retirement pay is taxable, unless it is for a combat-related injury.

The last Congress considered the addition of a provision to the Appropriations Act to allow 100 percent-disabled retirees to receive both service retired pay and VA disability, but it was dropped from the final measure. The Defense Department opposed the concurrent payments because of the added cost.

As the drawdown ends, longer careers once again may become the norm. The fifteen-year authority is due to end in Fiscal 1999, and officials say there is no plan to make it permanent. There is no immediate plan to return to earlier high-year-of-tenure levels, but the officials say that possibility will be reviewed when the force stabilizes. When and if more-normal conditions do return, some troops eligible for full careers may not want to stay. ■

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The Chairman's View

"I don't think that Saddam Hussein is any better off than he was when he started [attacking the Kurds in northern Iraq]. I submit to you, Saddam Hussein is worse off today than when he started all of this."

Army Gen. John M. Shalikashvili, Chairman of the Joint Chiefs of Staff, in a September 8, 1996, appearance on NBC's "Meet the Press."

For Fifty B-2s

"I absolutely believe the minimum number of B-2s we should have is fifty. We need to make a commitment and let industry know our intentions."

Rep. Newt Gingrich (R-Ga.), Speaker of the House, in an August 23, 1996, statement to B-2 workers at Northrop Grumman's stealth bomber facility in Palmdale, Calif.

Facts of Life

"We have never, from the beginning, sought their permission for establishing the no-fly zone. . . . This is not an issue in which they have a vote."

Defense Secretary William J. Perry, in a September 3, 1996, response to Iraq's complaints about US imposition of an enlarged no-fly zone following Iraqi attacks on Kurds in northern Iraq.

Facts of Life (Cont.)

"We have separately warned Iran not to meddle [in the battle in Kurdistan]."

Secretary Perry, same statement.

"Intelligence Failures"

"Intelligence failures left military personnel in Khobar Towers, as well as the 4404th [Composite] Wing's leaders, largely unaware of the magnitude of the threat they faced. Intelligence support fell short in at least three ways. First, available intelligence was virtually devoid of specific knowledge of terrorist and cis-sident activity inside Saudi Arabia. . . . Second, there were failures of analysis. . . . Finally, and perhaps most significantly, these intelligence assessments did not acknowledge

their own limitations. They did not communicate a level of uncertainty that should have been appropriate, considering the lack of specific knowledge available and the difficulty of understanding the complex currents of Saudi society. Based on such intelligence assessments, commanders in the theater likely had a false sense of confidence [about] the level of threat they faced and the requisite level of security required to protect US forces."

Rep. Floyd D. Spence (R-S.C.), chairman of the House National Security Committee, in an August 14, 1996, statement accompanying an HNSC report on the June 25 bombing of Khobar Towers in Saudi Arabia.

Dole and Defense

"If I make a mistake on defense spending, I'm going to err on the side of spending a little too much [rather] than a little too little."

Presidential candidate and former Sen. Robert Dole (R-Kan.), in an August 14, 1996, speech at the Vietnam Veterans Memorial in San Diego, Calif.

Historically Novel

"The Air Force changed the course of history . . . last September [1995], when we led a precise, vigorous air campaign that finally altered the series of events in Bosnia[-Hercegovina]. Besides breaking the cycle of violence that had fed that [country's] three-year war, Operation Deliberate Force also gave us a hint of what combat will look like in the twenty-first century. For instance, while only nine percent of all munitions used in [Operation] Desert Storm were precision guided, in Bosnia, ninety-eight percent of munitions dropped by US forces were precision guided. . . . The photos from Bosnia typically show one crater where the target used to be, with virtually no collateral damage."

Sheila E. Widnall, Secretary of the Air Force, in a June 14, 1996, speech to the National Press Club, Washington, D.C.

Harassment Declining

"Sexual harassment is declining in the active military. . . . In 1988, sixty-four percent of female respondents reported experiencing one or another form of gender-related [misbehavior]. In 1995, fifty-five percent of female respondents reported such experiences. . . . That decline is pretty consistent across the services. . . . People know the rules, they understand how to report these unwanted incidents, and most aren't reluctant to report. There's confidence that their leaders will deal with it. But—and this is a message that leaders throughout the chain of command will be especially attentive to—sexual harassment is occurring. It may be occurring in your organization, on your watch, and some believe that it isn't being taken seriously enough."

Edwin Dorn, under secretary of defense for Personnel and Readiness, in a July 2, 1996, Pentagon statement on the release of a massive new DoD study of sexual harassment.

The Big Three Targets

"Let me tell you the kinds of targets that are threatened by information warfare: first, the domestic infrastructure, both the government sector and the private sector—for example, air traffic control, powerplants, and banks. The second category of targets threatened by information warfare involves international commerce—international funds transfer, international transportation, and, of course, international communications. Finally, information warfare threatens our military forces, whether they're deployed in peacetime or . . . wartime. In some sense, the electron is the ultimate precision guided weapon. . . . It can be directed directly to the command and brain structure of our military systems and our military forces. The electron, in my judgment, is the ultimate precision guided munition."

John M. Deutch, director of Central Intelligence, in June 25, 1996, testimony to the Senate Governmental Affairs Committee.

Gallery of Middle East Airpower

By John W. R. Taylor and Kenneth Munson

Bombers

Tu-22KD ("Blinder")

There are persistent reports of Iran's eagerness to acquire Tupolev Tu-22M-3 ("Backfire-C") bombers, but the only genuine bombers operational in the Middle East/North Africa region appear to be about five Tu-22KDs ("Blinders") deployed by Libya primarily for maritime surveillance over the Mediterranean. Seventeen were delivered originally, from 1974.

Contractor: Tupolev OKB, Russia.

Power Plant: two Dobrynin RD-7M-2 turbojets in pods above rear fuselage, on each side of tailfin; each 36,375 lb thrust with afterburning. Provision for four JATO rockets.

Dimensions: span 77 ft 7 in, length 140 ft 3 in, height 33 ft 3½ in.

Weight: gross 187,390–207,230 lb.

Performance: max speed at 40,000 ft Mach 1.52, ceiling, supersonic 43,635 ft, T-O run 7,385 ft, landing run 5,415–7,120 ft, combat radius 807–1,365 miles.

Accommodation: crew of three, in tandem, on ejection seats.

Armament: one 23-mm NR-23 gun in radar-directed tail mounting; conventional bombs in weapons bay (typically 24 FAB-500 or one FAB-9000). Max weapon load 26,455 lb.



A-4N Skyhawk (Ahit), Israel Air Force (Denis Hughes)



Alpha Jets, Egyptian Air Force

Fighters and Attack Aircraft

A-4 Skyhawk

Following reequipment of Israel's last active squadrons of Skyhawks with F-16s, only 90 veteran A-4Hs and Ns remain, in storage, for use by part-time personnel of Reserve Squadrons 102, 137, 141, 145, and 202 in times of emergency.

Characterized by its saddleback hump (for avionics and extra fuel), the **A-4H** also introduced a zero/zero ejection seat, underwing spoilers to reduce landing run, and nosewheel steering, to which the **A-4N** added a tail braking parachute and square-tipped vertical fin. Since their original delivery, virtually all Israeli Skyhawks have been life-extended, rewired, and upgraded by Israel Aircraft Industries. Improvements have included 30-mm (replacing 20-mm) guns, an extra underwing stores pylon on each side (making six), lengthened nose and jetpipe, a chaff/flare dispenser just ahead of the brake-chute fairing, and an Elta WDNS (Weapon Delivery and Navigation System) that includes provision for launching Gabriel ASMs. Israeli name for the A-4 is **Ahit** ("vulture"). (Data for original A-4N.)

Contractor: Douglas Aircraft Company, USA.

Power Plant: one Pratt & Whitney J52-P-408A turbojet; 11,200 lb thrust.

Dimensions: span 27 ft 6 in, length 40 ft 3¾ in, height 15 ft 0 in.

Weights: empty 10,465 lb, gross 24,500 lb.

Performance: max speed at S/L 670 mph clean, 646 mph with 4,000-lb weapons load, ceiling approx 40,000 ft, T-O run 2,730 ft, combat radius (hi-lo-hi) with 4,000-lb weapon load 340 miles.

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

Armament: one 20-mm Mk 12 gun (30-mm DEFA in Israeli refit) in each wingroot; one centerline and four underwing stations (six in Israeli refit) for AAMs, ASMs, bombs, rockets, or gun pods; max (five-station) external load 9,195 lb.

Alpha Jet

Most Alpha Jets operated by the Arab Republic of Egypt Air Force, the major Middle East customer, were

license-assembled in that country by AOI (Arab Organization for Industrialization). Twenty-nine of the initial advanced training version, designated **MS1**, are flown by the Air Force Academy at Bilbeis AB. Fifteen **MS2** Alpha Jets, optimized for light attack, equip a specialized counterinsurgency unit. They have a SAGEM Uliss 81 inertial nav/attack system, Thomson-CSF HUD and nose-mounted laser rangefinder, and a Thomson-TRT radio altimeter, all managed by a Dassault Electronique digital data bus, enabling them to designate targets automatically, fire guns or rockets in a dive, release retarded bombs in level flight, and toss-release free-fall bombs automatically.

Morocco's 20 Alpha Jet Hs are employed on advanced training at Meknès-Mézergues AB. The six operated by the Qatar Emiri Air Force since 1980 equip No. 11 (close support) Squadron at Doha International Airport.

Contractors: Dassault Aviation, France, and Dornier GmbH, Germany.

Power Plant: two SNECMA/Turbomeca Larzac 04-C6 turbofans; each 2,976 lb thrust.

Dimensions: span 29 ft 10¾ in, length 43 ft 5 in, height 13 ft 9 in.

Weights: empty 7,749 lb, gross 17,637 lb.

Performance: max speed (clean) at 32,800 ft Mach 0.85, at S/L 621 mph, ceiling 48,000 ft, T-O run 1,215 ft, landing run 1,640 ft, close support combat radius (hi-lo-hi) 363 miles on internal fuel, 668 miles with two 119-gallon drop tanks.

Accommodation: crew of two, in tandem, on zero/zero ejection seats.

Armament: hardpoint under fuselage and two under each wing for 5,510 lb of stores, including centerline 27-mm or 30-mm gun pack; four free-fall, retarded, or cluster bombs; gun or rocket pods; and two 82- or 119-gallon drop tanks.

CM 170 Magister

Designed for advanced (including weapons) train-

ing, the Magister is also eminently suitable for light ground-attack duties. Algeria operates 18 in two counterinsurgency squadrons, and the Royal Moroccan Air Force uses its remaining 20 as counterinsurgency trainers. Israel is seeking a replacement for its 40 remaining license-built Magister trainers, known locally as **Tzukits** ("merlin"); the Lebanese Air Force still has three Magisters.

Contractor: Aerospatiale (originally Fouga), France.

Power Plant: two Turbomeca Marboré IIA turbojets; each 880 lb thrust.

Dimensions: span over tip tanks 39 ft 10 in, length 33 ft 9½ in, height 9 ft 2¼ in.

Weights: empty 4,268 lb, gross 6,978 lb.

Performance: max speed at 30,000 ft 443 mph, ceiling 30,000 ft, T-O run 1,800 ft, range 576 miles.

Accommodation: crew of two, in tandem.

Armament: provision for two nose-mounted 7.62-mm machine guns, plus hardpoint under each wing for two 110-lb bombs, four 55-lb rockets, or a Nord SS.11 wire-guided missile.

F-4 Phantom II

Iran received 32 **F-4Ds** and 177 **F-4Es** between September 1968 and August 1979. Originally they equipped more than a dozen squadrons, but, because of spares embargoes and attrition, estimates of those still operable vary from 40 to as few as 20. Egypt received the first of 35 early model former USAF **F-4Es** in 1979 and still has two squadrons (Nos. 76 and 88) at Cairo West, but they are reported to be in poor condition.

Known to Israeli pilots as the **Kurnass** ("sledgehammer"), the **F-4E** has been a mainstay of that country's air force since the first of an eventual 200-plus were delivered between September 1969 and late 1976. They have suffered considerable attrition since then, but about 95 remain in service with two squadrons at Tel Nov (Nos. 119 and 201) and two reserve squadrons (Nos. 107 and 142) at Hatzarim. About 50 of those in service were redelivered from 1989 after upgrading to **Phantom 2000** standard with an Elbit mission computer, Kaiser-licensed wide-angle HUD, dual MIL-1553B data buses, multifunction electronic displays in both cockpits, HOTAS (hands on throttle and stick), and improved ECM and self-protection systems. Airframe changes include reinforced skins and fuel cells in the fuselage and wings, new one-piece canopy, all-new electrical wiring and hydraulic lines, improved crew comfort, and strakes added to the engine air intake trunks to enhance maneuverability and stability. Israel has recently offered an unspecified number of its older **F-4s** for sale. (Data for **F-4E**.)

Contractor: McDonnell Aircraft Company, USA.

Power Plant: two General Electric J79-GE-17A turbojets; each 17,900 lb thrust with afterburning.
Dimensions: span 38 ft 7 1/2 in, length 63 ft 0 in, height 16 ft 5 1/2 in.

Weights: empty 31,853 lb, gross 41,487–61,795 lb.
Performance: max speed at height above Mach 2, ceiling 54,400 ft, T-O run 3,180–4,390 ft, landing run 3,040–3,780 ft, combat radius 494–786 miles.

Accommodation: crew of two, on tandem ejection seats.
Armament: one M61A1 20-mm multibarrel gun under nose; four semisubmerged underbelly mounts and four underwing pylons for AAMs, ASMs, laser-guided or cluster bombs, rocket packs, gun pods, or ECM pods, totaling about 16,000 lb. Weapons adapted to Israeli F-4s include AGM-45 Shrike and AGM-78 Standard ARMs, AGM-65 Maverick and AGM-142 Popeye ASMs, Luz TV-guided ASMs, and Gabriel antiship missiles. Although assigned almost exclusively to ground attack, provision is retained for Shafir, Python, Sidewinder, or Sparrow AAMs for self-defense.

F-5E/F Tiger II

Around 200 of America's cost-effective F-5 International Fighter Aircraft, developed for export to friendly nations, remain in service with seven air forces in the Middle East/North Africa region. Numbers mean little. Nearly half of the total equip Nos. 3, 10, 15, and 17 Squadrons of the Royal Saudi Air Force. These are by far the best equipped. All RSAF single-seat F-5Es and two-seat combat-capable F-5Fs have INS, ECM pods, and radar warning receivers (RWRs). The F-5Es have an in-flight refueling probe for use with the Royal Saudi Air Force's KC-130 tankers and are able to carry Maverick ASMs for ground-attack and antiship missions, as well as antiradiation AGM-45 Shrikes, laser-guided bombs, Rockeye cluster bombs, and wingtip-mounted AIM-9P Sidewinder and Magic AAMs.

By comparison, Iran's estimated 45 F-5Es and Fs are survivors of years of war and sanctions. Serviceability should be better than that of its other aircraft, as F-5s were designed for easy maintenance. They entered service well equipped with Litton INS and a weapons computer and have been able to arm with Chinese PL-7 close-range AAMs; but little else is known.

Bahrain's few F-5E/Fs are likely to be replaced by more F-16s, as are those of No. 9 Squadron, Royal Jordanian Air Force, which may be the only fully active unit of four original F-5 squadrons. Yemen's total of, perhaps, 13 Es and early two-seat F-5Bs are being kept airworthy by spares from the US now that relations have improved. Tunisia's 13 F-5s and Morocco's two squadrons at Meknes-Mézergues, which include ex-USAF "aggressors," have sufficient life left in them for both nations to consider an upgrade with Italian FIAR Grifo F/X Plus radar. (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 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 at 13,350-lb combat weight Mach 1.64, ceiling 51,800 ft, T-O run 2,000–5,700 ft, landing run with brake-chute 2,500 ft, 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 (one in F-5F); AIM-9 Sidewinder AAM or equivalent at each wingtip; one underfuselage and four underwing stations for up to 7,000 lb of bombs (incl one 2,000-lb), cluster bombs, rocket launchers, napalm tanks, or auxiliary fuel tanks; provision for AGM-65 Maverick ASMs or laser-guided bombs.

F-6

Egypt has progressively reduced its fleet of F-6 Chinese versions of the Russian MiG-19 ("Farmer") fighter-bomber, replacing them with F-16s. Its Air Force began receiving 40 Shenyang-built F-6s in 1979, prior to the assembly of others at the Helwan factory, near Cairo. Around 40 are thought to remain in service, plus a few FT-6 tandem two-seat trainers. The current status of 16 F-6s once operational in Iran is unknown. (Data for F-6 day fighter.)

Contractor: Shenyang Aircraft Corporation, People's Republic of China.
Power Plant: two Shenyang/Chengdu WP6 turbojets; each 7,165 lb thrust with afterburning.
Dimensions: span 30 ft 2 1/4 in, length incl probe 48 ft 10 1/2 in, height 12 ft 8 1/4 in.

Weights: empty 12,700 lb, gross 19,764–22,045 lb.
Performance: max speed at 36,000 ft Mach 1.45, at S/L Mach 1.09, ceiling 58,725 ft, T-O run 2,200–2,953 ft, landing run 1,970–2,920 ft, range 1,366 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 fuel 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-14A Tomcat

Recent flybys over Tehran by the Islamic Republic of Iran Air Force have included 23 of the 79 F-14A Tomcats delivered before the overthrow of the Shah. Contrary to press reports, the fighters' AWG-9 radar and Phoenix missiles were fully operational during the Iran-Iraq war of 1980–88, when they provided air cover for the Iranian Army, and for merchant shipping in the Persian Gulf.

Contractor: Grumman Aircraft Systems Division, USA.
Power Plant: two Pratt & Whitney TF30-P-412A turbofans; each 20,900 lb thrust with afterburning.

Dimensions: span 64 ft 1 1/2 in (min 20° sweep), 38 ft 2 1/2 in (max 68° sweep), length 62 ft 8 in, height 16 ft 0 in.

Weights: empty 40,104 lb, gross 58,715–74,349 lb.

Performance: max speed at high altitude Mach 2.34, at low altitude Mach 1.2, ceiling above 50,000 ft, T-O run 1,400 ft, landing run 2,900 ft, max range with external fuel 2,000 miles.

Accommodation: crew of two, in tandem, on zero/zero ejection seats.

Armament: one 20-mm M61A1 gun in port side of forward fuselage; four AIM-7 Sparrow or AIM-54 Phoenix AAMs semirecessed under fuselage; pylon under each inboard (fixed) wing pylon for additional Phoenix/Sparrows, and/or Sidewinder AAMs, or various missile/bomb combinations.

F-15 Eagle

The Royal Saudi Air Force has four squadrons (Nos. 5, 6, 13, and 42) of F-15Cs and Ds. Initial deliveries of 46 Cs and 16 Ds were augmented during the 1990–91 Persian Gulf campaign by a further 20 Cs and four Ds; nine more Cs and three Ds were delivered from August 1991 as attrition replacements. About 92 remain in service. In Operation Desert Storm, two of the 38 Iraqi aircraft to fall to F-15s in air combat were claimed by an RSAF pilot; they have since taken part with other coalition forces in Operation Southern Watch patrols over southern Iraq.

Beginning in November 1995, the RSAF is receiving a further 72 Eagles at approximately one per month; 24 of these are optimized for air superiority and 48 for air-to-air and ground attack. Designated F-15S, they are generally similar to USAF's dual-role F-15E, but their AN/APG-70 radars are "detuned" to the performance level of the APG-63, some of the F-15E's ECM capabilities are omitted, and in 48 of them a Lockheed Martin Sharpshooter system replaces the AN/AAQ-14 LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) targeting pod. Like other Saudi Eagles, the F-15Ss do not have stores-carrying CFTs (conformal fuel tanks), but the contract includes 900 AGM-65D/G Maverick ASMs, 600 AIM-9M/S Sidewinders, plus 1,300 CBU-87 bomblet dispensers and GBU-10/12 Paveway laser-guided bombs. The F-15S is powered by two 29,100 lb thrust F100-PW-229 afterburning turbofans.

Two Israeli Air Force air defense squadrons still have an estimated 38 F-15As and six Bs (local name Baz; "falcon") of those delivered from 1976, plus 16 F-15Cs and 12 Ds (Akef; "buzzard") delivered a decade later. These later Eagles equip No. 106 Squadron; all three squadrons are based at Tel Nov. From next year, Israeli attack squadrons will begin to receive the F-15I, a dual-role version similar to the RSAF's F-15S. These will be known by the local name Ra'am ("thunder"); 25 are currently on order. Powered by F100 engines, they will have fully capable APG-70 radar, an Israeli EW system, and LANTIRN pods. (Data for F-15C.)

Contractor: McDonnell Aircraft Company, USA.
Power Plant: two Pratt & Whitney F100-PW-100 or F100-PW-220 turbofans; each approx 23,450 lb thrust with afterburning.
Dimensions: span 42 ft 9 3/4 in, length 63 ft 9 in, height 18 ft 5 1/2 in.

Weights: empty 28,600 lb, gross 44,630–68,000 lb.
Performance: max speed Mach 2.5, ceiling 60,000 ft, T-O run (interceptor) 900 ft, landing run without brake-chute 3,500 ft, ferry range with external tanks more than 2,878 miles, with CFTs 3,570 miles.

Accommodation: pilot only, on zero/zero ejection seat.
Armament: one M61A1 20-mm multibarrel gun in starboard wingroot; four AIM-7 Sparrow and four AIM-9 Sidewinder AAMs (Rafael Shafir and/or Python 3 on Israeli F-15s); provision for up to 23,600 lb of bombs, rockets, or additional ECM.

F-16 Fighting Falcon

More than 450 F-16s have been delivered to or ordered by four Middle East air forces, with Israel (260) and Egypt (182) the major customers. Starting in March 1982, Egypt received 34 F-16As and eight F-16Bs, with Pratt & Whitney F100-PW-200 engines and AIM-9L Sidewinders, as MiG-21MF replacements. Then, from August 1986, came 34 F-16Cs and six F-16Ds, with

F100-PW-220 engines, followed in 1991–94 by 35 Cs and 12 Ds with F110-GE-100 engines. Sparrow AAMs and Egyptian IFF introduced on this batch were also retrofitted to early models, and Mavericks became available for air-to-ground missions. The next 46 F-16C/Ds (34 + 12), delivered from spring 1994, are from license production by TAI of Turkey. Latest order, placed this year, is for 21 more F-16Cs for 1999–2000 delivery.

Eight of the 67 F-16As and eight Bs with F100-PW-200 engines supplied to Israel from January 1980 became the first F-16s (Israeli name **Netz**; "hawk") used in combat when they destroyed Iraq's Osirak nuclear reactor June 7, 1981. In 1982, they shot down 44 Syrian MiG-21s and MiG-23s over the Bekaa Valley in Lebanon. In late 1986, they were followed by the first of 51 F-16Cs (**Barak**; "lightning") and 24 Ds (**Brakeet**; "thunderbolt"), with F110-GE-100 engines. Some of these Ds have deep spines housing equipment for "Wild Weasel" defense-suppression roles, including Elisra SPS 3000 self-protection ECM; locally modified F110-GE-100A engines give much increased thrust at low level. A further engine change, to F110-GE-200s, was made in the 30 F-16Cs and 30 Ds delivered from July 1991, which also have Elta ECM instead of the usual Loral Rapport. In August 1994, Israel began receiving 48 surplus USAF F-16A/Bs (36+12). Eleven IDF/AF squadrons (six with A/Bs, five with C/Ds) fly the F-16. Recent use includes Operation Grapes of Wrath attacks on Hezbollah targets in southern Lebanon.

No. 1 Squadron of the Bahrain Amiri Air Force at Shaikh Isa AB began equipping with eight F-16Cs and four F-16Ds in March 1990. These have F110-GE-100 engines, Sparrows, Sidewinders, Mavericks, Mk 20 Rockeyes, GBU-10/12s, ALQ-131 ECM and laser designator pods, and ALE-40 chaff/flare dispensers. Next year, Jordan will receive former USAF F-16As (12) and Bs (four), incorporating a "Falcon Up" upgrade, as a first step in replacing its elderly F-5s and Mirage F1s; up to 60 more are said to be required. (Data for F-16C with F110-GE-100 engine.)

Contractor: General Dynamics Corporation (now Lockheed Martin Tactical Aircraft Systems), USA.

Power Plant: one General Electric F110-GE-100 turbofan; 28,984 lb thrust with afterburning.

Dimensions: span over missiles 32 ft 9 3/4 in, length 49 ft 4 in, height 16 ft 8 1/2 in.

Weights: empty 19,020 lb, gross 27,185–42,300 lb.

Performance: max speed at height above Mach 2, ceiling above 50,000 ft, typical T-O and landing distance 2,500 ft, typical combat radius 392–852 miles.

Accommodation: pilot only, on zero/zero ejection seat.
Armament: one M61A1 20-mm multibarrel gun in port wing/body fairing; up to 12,000 lb of stores on wingtip AAM mounts, centerline hardpoint, and six underwing pylons. Standard armament of Israeli F-16s includes Sidewinder, Sparrow, and Python 3 AAMs, Maverick ASMs, GBU-10/12 laser-guided bombs, and Rockeye cluster bombs. LANTIRN pods are being made available for the latest aircraft, and Rafael Litening IR targeting pods are being evaluated.

F/A-18C/D Hornet

In September 1988, Kuwait ordered 32 single-seat F/A-18Cs and eight two-seat F/A-18D combat-capable trainers, in a multimillion-dollar package that also included AGM-65G Maverick, AGM-84 Harpoon, AIM-7F Sparrow, and AIM-9L Sidewinder missiles. They were the first to be powered by the Dash 402 version of the F404 engine, which produces some 1,600 lb more thrust than the original Dash 400. The first three two-seaters were accepted by No. 25 Squadron of the Kuwait Air Force in January 1992, and the final delivery was made in August 1993. No. 25 Squadron is allocated to ground-attack duties; the second squadron, No. 9, fulfills an air-defense role. Both are located at the now-reopened Ahmed al Jaber AB. (Data for F/A-18C.)

Contractor: McDonnell Aircraft Company, USA.
Power Plant: two General Electric F404-GE-402 turbofans; each approx 17,600 lb thrust with afterburning.
Dimensions: span 37 ft 6 in, length 56 ft 0 in, height 15 ft 3 1/2 in.

Weights: empty 23,832 lb, gross 36,710 lb (fighter), 56,000 lb (attack).

Performance: (F404-GE-402 engines): max speed at high altitude above Mach 1.8, ceiling approx 50,000 ft, T-O run less than 1,400 ft, typical combat radius (interdiction) 340 miles.

Accommodation: pilot only, on zero/zero ejection seat.
Armament: one 20-mm six-barrel M61A1 gun in nose; nine external stations (wingtips, four underwing, two nacelle, and one centerline). Weapons can include AIM-9 Sidewinder AAMs at wingtips; Sidewinders, AIM-7 Sparrows, AIM-120 AMRAAMs, AGM-84 Harpoons, or AGM-65 Mavericks underwing; Sparrows or sensor pods (nacelles). Centerline and inboard underwing stations suitable for drop fuel tanks.

Hawk

Britain's BAe Hawk has long since outgrown its original design role as an advanced trainer for the Royal Air

Force, maturing into an increasingly aggressive dual-role trainer/ground-attack aircraft (50/60/100 series) and single-seat multirole combat aircraft (200 series). More than 120 have been sold to Middle East countries. In the now-unified UAE Air Force, Dubai contributes seven Mk 61s (5,700 lb thrust Adour 861 turbofan) to No. 3 Shaheen ("warrior") Squadron at Mindhat. Abu Dhabi's 15 similar Mk 63s, now upgraded to Mk 63A with an Adour 871 and new "combat wing" with four stores pylons and wingtip AAMs, have more recently been joined by four further-modified Mk 63Cs, all serving at the Air Academy in Al Ain-Sharjah. The UAEAF also has 18 Mk 102s, with Adour 871, combat wing, MIL-1553B data bus, HOTAS controls, HUD, dual color multipurpose CRTs, radar warning receiver, and provision for an ECM pod, plus laser ranging and FLIR in an extended nose.

Five or six of the Kuwait Air Force's 12 Mk 64s (No. 12 Squadron) remained airworthy after escaping to Bahrain during the August 1990 Iraqi invasion. Four others were returned by Iraq after the war but in very poor condition. The Royal Saudi Air Force bought 30 Hawk Mk 65s for its own Nos. 11, 21, and 37 Squadrons at Riyadh and Dhahran for light attack missions, and under its Al Yamamah II program it is expected to purchase a further 60 Hawks, of which 20 Mk 105s are already on order. Most of the rest will be single-seat Mk 205s, with Westinghouse APG-66H multimode radar. No. 6 Squadron of the Royal Air Force of Oman is another operator of these latest versions, deliveries of four Mk 103s and 12 Mk 203s to its base at Thumrait having started in December 1993 and December 1994, respectively. The two-seaters have a radar warning receiver and wingtip AIM-9 Sidewinders; the single-seaters have a fixed in-flight refueling probe and 6,614-lb weapons load. (Data for 100 series.)

Contractor: British Aerospace Defence Ltd., UK.
Power Plant: one Rolls-Royce Turbomeca Adour 871 turbofan; 5,845 lb thrust.

Dimensions: span 29 ft 9 1/2 in, length 40 ft 9 1/4 in, height 13 ft 0 3/4 in.

Weights: empty 9,700 lb, gross 20,061 lb.
Performance: never-exceed speed at height Mach 1.2, max speed at S/L 622 mph, ceiling 44,500 ft, T-O run 2,100 ft, landing run 1,980 ft, combat radius 620-900 miles.

Accommodation: basically, crew of two in tandem, on zero/zero ejection seats. Pilot only in combat role.

Armament: one 30-mm Aden Mk 4 gun pack on centerline; four underwing pylons for packs of 18 x 68-mm or 12 x 81-mm rockets, bombs up to 1,000 lb, cluster bombs, Maverick ASMs, or Sidewinder/Magic AAMs. Optional AAM on each wingtip. Max stores load 6,614 lb.

Jaguar International

Nineteen of the 24 (20 single-seat and four two-seat) Jaguar International attack aircraft bought by Oman in the late 1970s continue to equip Nos. 8 and 20 Squadrons, based at Al Masirah. Upgraded at the end of the 1980s with a Ferranti FIN 1064 INS, they are employed for both ground attack and air defense, carrying a pair of underwing AIM-9P Sidewinder AAMs. (Data for single-seater.)

Contractor: SEPECAT, a Franco-British company.
Power Plant: two Rolls-Royce Turbomeca Adour Mk 811 turbofans; each 8,400 lb thrust with afterburning (8,040 lb Mk 804s in first 12 Omani aircraft).

Dimensions: span 28 ft 6 in, length 55 ft 2 1/2 in, height 16 ft 0 1/2 in.

Weights: empty 15,432 lb, gross 24,149-34,612 lb.
Performance: max speed at 36,000 ft Mach 1.6, at S/L Mach 1.1, ceiling approx 50,000 ft, T-O run with typical tactical load 4,100 ft, landing run without brake-chute 2,200 ft, typical hi-lo-hi combat radius 530 miles on internal fuel, 875 miles with auxiliary fuel.

Accommodation: pilot only, on zero/zero ejection seat.
Armament: two ventral internal 30-mm Aden guns (one in trainer); one centerline and four underwing stations for mixed loads including free-fall, retarded, cluster, or laser-guided bombs, or air-to-surface rockets; provision for one wing-mounted AIM-9 Sidewinder, Matra Magic, or similar AAM each side. Max external stores load 10,500 lb.

Kfir

Major design changes in this Israeli development of the Mirage 5 included replacement of the original Atar 9C turbojet by the larger US J79 in a shorter and latter rear fuselage, a large dorsal air scoop for afterburner cooling, strengthened landing gear, and a lengthened nose. Major version was the C2, with fixed canards, small nose strakes, and dogtooth wing leading-edges for improved performance. IAI produced 185 C2s (including combat-capable TC2 tandem-seat trainers with longer noses), later upgrading many to C7/TC7 standard with more advanced avionics, notably HOTAS controls, an improved weapon delivery and navigation system, two additional external weapon stations, and a "combat plus" engine power reserve giving an extra 890 lb of optional afterburner thrust.

The C7 Kfir ("lion cub") still equips one front-line IDF/AF squadron (No. 144 at Hatzor), and there are two C2 and two C7 squadrons in the reserve, although Israel has recently declared an unspecified number of these aircraft available for sale. Among options for potential export customers is a C10 version, incorporating in-flight refueling and the radar and other avionics of the abandoned Lavi multirole fighter. (Data for Kfir C7.)

Contractor: Israel Aircraft Industries Ltd, Israel.
Power Plant: one General Electric J79-J1E (Israeli modified J79-GE-17) turbojet; 17,860 lb thrust with afterburning (18,750 lb with "combat plus" reserve).

Dimensions: span 26 ft 11 1/2 in, length 51 ft 4 1/4 in, height 14 ft 11 1/4 in.

Weights: empty 16,060 lb, gross 22,961-36,376 lb.
Performance: max speed (clean) at 36,000 ft more than Mach 2.3, at S/L Mach 1.13, ceiling 58,000 ft, T-O run 4,750 ft, landing run 4,200 ft, combat radius 482 miles (high-altitude interception), 737 miles (hi-lo-hi ground attack).

Accommodation: pilot only, on zero/zero ejection seat.
Armament: one 30-mm DEFA 552 gun in lower lip of each air intake duct; five underfuselage and four underwing stations for weapons, ECM or other sensor pods, or drop tanks, to max weight of 13,415 lb. Python 3, Shafir 2, or Sidewinder AAM on each outer wing station as interceptor; bombs (standard, smart, cluster, or other), Shrike or Maverick ASMs, napalm tanks, or rocket launchers for ground attack.

L-39/L-59 Albatros

Aero had built more than 2,800 of these advanced jet trainer/light attack aircraft by the beginning of this year, including 2,094 trainer-only L-39Cs for the former USSR, Iraq (81), Libya (181), and Syria (55) all had the L-39Z0 version, which has four (instead of two) underwing stores pylons and a reinforced airframe. Syria's fleet remains at nearly full strength, but that of Iraq may now be as few as 20 through attrition in its long war with Iran, and their airworthiness is uncertain. Libya, too, has lost more than a few in border conflicts with neighboring Chad, and in 1990 it donated 10 of its L-39s to Egypt, but about 150 probably remain. Secondhand purchases have increased Egypt's total to about 48. Syria (44) and Algeria (now down to about 10 from its original 32) are the regional operators of the specialized ground-attack/reconnaissance L-39ZA, with an underfuselage gun in addition to the four underwing weapon stations.



F-15C Eagle, Royal Saudi Air Force (Paul Jackson)



Hawk Mk 61, United Arab Emirates Air Force/Dubai (Robbie Shaw)



Jaguar International, Royal Air Force of Oman (P. R. Foster)

The L-59 is an improved Albatros, first flown (as the L-39MS) on September 30, 1986. It has a more powerful turbofan, strengthened airframe, and upgraded Western avionics that include head-up/head-down displays, IFF, and a radar altimeter. The Egyptian Air Force received 48 L-59Es in 1993-94; Tunisia acquired 12 L-59Ts in 1995-96. (Data for L-59E.)

Contractor: Aero Vodochody, Czech Republic.
Power Plant: one PS/ZMK DV-2 turbofan; 4,850 lb thrust.

Dimensions: span over tip tanks 31 ft 3 1/2 in, length 40 ft 0 1/4 in, height 15 ft 7 3/4 in.

Weights: empty 8,885 lb, gross 12,257-15,432 lb.
Performance (clean): max speed at 16,400 ft 544 mph, ceiling 38,475 ft, T-O run 2,100 ft, landing run 2,365 ft, range with reserves 752 miles.

Accommodation: crew of two, on tandem zero/zero ejection seats, but normally flown solo in attack role.

Armament: underfuselage pod for 23-mm twin-barrel GSh-23 gun, with up to 150 rds; four underwing stations for up to 3,307 lb of external stores, including bombs of up to 1,102 lb, UB-16-57M rocket pods (16 x 57-mm), infrared AAMs (outer stations only), daytime reconnaissance pod (port inner only), or drop fuel tanks (inboard stations only).

MiG-21 ("Fishbed")/F-7

Nearly 700 MiG-21s, including Chinese-built F-7s, continue to be flown by seven air forces in the Middle East and North Africa. Three fighter regiments of the Egyptian Air Force operate about 110 Soviet-built MiG-21s (mostly MiG-21PF, PFM, and MF), and a fourth flies up to 60 Chinese F-7Bs. Most of the latter have been updated with a GEC-Marconi HUD, air data computer, RWR, ECM jamming, and Sidewinder or Magic AAMs. Training is performed on about 15 two-seat MiG-21UMs or USS. Syria, the other major operator in the region, has some 10 squadrons equipped with about 225 MiG-21s, including PFs, MFs, and late-model MiG-21bis, plus about 15 two-seat MiG-21U or UM trainers.

The survivors of some 70 prewar Iraqi Air Force MiG-21s and 80-90 F-7Bs are likely to have extended service lives. Iran received 18 of Chengdu's much-refined F-7M Airguard, with a GEC-Marconi HUDWAC (head-up display and weapon-aiming computer), new ranging radar, IFF, more secure radio communications, air data computer, two additional underwing pylons, provision for PL-7 infrared AAMs, birdstrike-resistant windshield, strengthened landing gear, zero-height/81-mph ejection seat, and 13,448 lb thrust WP7B (BM) turbojet. Those remaining are now flown by the Revolutionary Guard.

Libya has around 42 MiG-21bis and eight MiG-21UB trainers operational, while Algeria's strength is about 75 MiG-21MF/21bis and some 15 combat trainer MiG-21UM/US. In Yemen, before the north and south fought a civil war, the theoretically united air force had about 40 MiG-21MFs and 30 MiG-21bis, which were supplemented by 16 more acquired by the south during the fighting. Several were lost, and the number still extant and serviceable is unknown. (Data for MiG-21MF.)

Contractor: Mikoyan OKB, Russia.
Power Plant: one Soyuz/Gavrilov R-13-300 turbojet; 14,550 lb thrust with afterburning.

Dimensions: span 23 ft 5 3/4 in, length 51 ft 8 1/2 in, height 14 ft 9 in.

Weight: gross 18,078-20,725 lb.
Performance: max speed at height Mach 2.1, ceiling 50,000 ft, T-O run 2,625 ft, landing run 1,805 ft, combat radius (internal fuel and four underwing 550-lb bombs) 230 miles, range with three drop tanks 1,118 miles.

Accommodation: pilot only, on zero/zero ejection seat.
Armament: one GSh-23L twin-barrel 20-mm gun, with 200 rds, under fuselage; four underwing hardpoints for K-13 ("Atoll"), Matra Magic, or AIM-9 Sidewinder AAMs, pods of 24 x 57-mm rockets, four 240-mm rockets, or bombs of up to 1,100 lb.

MiG-23 ("Flogger")

About 400 MiG-23 variable-geometry combat aircraft, in six basic forms, are deployed by five air forces in the Middle East/North Africa region. The MiG-23MS interceptor ("Flogger-E") is single-seat, with a 22,045 lb thrust Tumansky R-27F2M-300 afterburning turbojet, Sapfir-21 ("Jay Bird") radar with an 18-mile search range and 12-mile tracking range, and armament of R-3S ("Atoll") or R-60 ("Aphid") AAMs and a 23-mm GSh-23 gun. The lighter-weight MiG-23ML ("Flogger-G"), identified by a smaller dorsal fin, has a 28,660 lb thrust R-35-300 afterburning turbojet, no rear fuselage fuel tank, Sapfir-23ML ("High Lark 2") radar with search range of 43 miles and tracking range of 34 miles, undernose pod for TP-23M IRST, and basic armament of R-23R/T ("Apex") and R-60T AAMs.

The single-seat light attack MiG-23BM and BN ("Flogger-F") differ from the interceptors in having the front fuselage tapered in side elevation to house a nav/attack system (slaved to a computer in the BM), a 25,350 lb thrust Soyuz/Khachaturov R-29B-300 after-

burning turbojet, armored cockpit sides, low-pressure tires, explosion-resistant fuel tanks, active and passive ECM, and six pylons under the wings and fuselage for R-3S or R-13M AAMs, Kh-23 ("Kerry") or Kh-29 ("Kedge") ASMs, up to 6,600 lb of bombs, or napalm. The MiG-23BK ("Flogger-H") has equipment changes, including RWR fairings on the bottom of the fuselage.

Libya has an estimated 75 MiG-23MS interceptors, 35 MiG-23BN light attack aircraft, and 15 MiG-23UB tandem two-seat trainers. Syrian Arab Air Force squadrons have up to 80 MiG-23MS and ML interceptors, 60 MiG-23BNs, and a few trainers. The 20 MiG-23MSs and 70 BKs (some with in-flight refueling capability) equipping the Iraqi Air Force before Operation Desert Storm made little use of available weapons, including French Magic AAMs and Russian Kh-29 ASMs guided by French Atlas laser-designation pods, and lost about one-third of them in various ways, such as flight to Iran. Other operators are the Algerian Air Force, with about 70 MiG-23MS/BMs, and the Republic of Yemen Air Force, with 20 MiG-23MLs. (Data for MiG-23ML.)

Contractor: Mikoyan OKB, Russia.
Power Plant: one Soyuz/Khachaturov R-35-300 turbojet; 28,660 lb thrust with afterburning.

Dimensions: span 45 ft 10 in (18° 40' min sweep), 25 ft 6 1/4 in (74° 40' max sweep), length incl probe 54 ft 10 in, height 15 ft 9 3/4 in.

Weights: empty 22,485 lb, gross 32,405–39,250 lb.
Performance: max speed at height Mach 2.35, at S/L Mach 1.1, ceiling 60,700 ft, T-O run 1,640 ft, landing run 2,460 ft, combat radius 435–715 miles.

Accommodation: pilot only, on zero-height/80–775 mph ejection seat.

Armament: one 23-mm GSh-23L twin-barrel gun in belly pack; two pylons under fuselage, one under each engine duct and two under fixed wing panels for R-23R/T ("Apex") or R-60T ("Aphid") AAMs. For other roles, packs of 20 x 80-mm or 32 x 57-mm rockets, bombs, container weapons, 23-mm gun pods, or 240-mm S-24 rockets.

MiG-25 ("Foxbat")

Although superseded by MiG-31s in Russian service, there is no faster fighter than the Mach 2.83 MiG-25P/DP single-seat interceptors still equipping four air forces in North Africa and the Middle East. The original MiG-25P ("Foxbat-A") has Smertch-A ("Fox Fire") radar, with a search range of 62 miles and tracking range of 31 miles; its 22,500 lb thrust R-15B-300 afterburning turbojets have a service life of only 150 hours. The MiG-25PD ("Foxbat-E"), built in 1978–82, switched to updated (24,700 lb thrust) R-15BD-300 engines with a 1,000-hour life, anIRST, and Sapfir-25 radar providing lookdown-shutdown capability comparable with early MiG-23 interceptors.

Algeria is reported to have 30 MiG-25 interceptors based with its MiG-25Rs in two squadrons at Bou Sfer. There are about 12 survivors of the Persian Gulf War in Iraq, 40 in Libya, and 30 in Syria. Most are likely to be MiG-25PDs. (Data for MiG-25P.)

Contractor: Mikoyan OKB, Russia.
Power Plant: two Soyuz/Tumansky R-15B-300 turbojets, each 22,500 lb thrust with afterburning.

Dimensions: span 45 ft 11 3/4 in, length 78 ft 1 1/4 in, height 20 ft 0 1/4 in.

Weight: gross 76,985–80,950 lb.
Performance: max speed at height Mach 2.83, ceiling 67,900 ft, T-O run 4,100 ft, landing run with brake-chute 2,625 ft, range 776 miles supersonic, 1,075 miles subsonic.

Accommodation: pilot only, on zero-height/80–775 mph ejection seat.

Armament: four underwing pylons for R-40R/T ("Acrid"), R-23 ("Apex"), R-60T ("Aphid"), or R-73A ("Archer") AAMs; no gun.

MiG-29 ("Fulcrum")

Even in its "Fulcrum-A" form, serving with Middle East air forces, the MiG-29 is acknowledged to be one of the most agile and effective fighters of the 1990s. Its integrated weapon system includes an N019 Sapfir-29 coherent pulse-Doppler lookdown-shutdown radar ("Slot Back") with a search range of 62 miles and tracking range of 43 miles, collimated with a laser rangefinder, and anIRST sensor. It operates in conjunction with the pilot's helmet-mounted target designator for off-axis aiming of AAMs. Other features include "fences" forward of the dorsal tailfins that house flare dispensers, and grilles inside the engine air ducts that close to prevent foreign object ingestion during takeoff and landing.

The Syrian Arab Air Force, with 42 MiG-29s and six MiG-29UB two-seat combat trainers, has the largest fleet in the region. Iran has about 35, for which it has developed an in-flight refueling system. Yemen has only a few. Those in Iraq that survived Desert Storm are reportedly being dismantled as a result of spares and servicing problems.

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

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

Weights: empty 24,030 lb, gross 33,600–40,785 lb.
Performance: max speed at height Mach 2.3, at S/L Mach 1.225, ceiling 55,775 ft, T-O run 820 ft, landing run with brake-chute 1,970 ft, range 932–1,305 miles.
Accommodation: pilot only, on zero/zero ejection seat.
Armament: one 30-mm GSh-301 gun in port wingroot extension; six underwing pylons for R-27R1 ("Alamo-A"), R-60T or R-60MK ("Aphid"), or R-73A/E ("Archer") AAMs. Able to carry bombs, submunitions dispensers, napalm tanks, and 80-mm, 130-mm, and 240-mm rockets in attack role. Max weapon load 6,615 lb.

Mirage F1

The main single-seat variants of the Mirage F1 are the F1-C all-weather, all-altitude interceptor with capability for VFR ground attack, and the F1-E multirole fighter/ground-attack/reconnaissance version; tandem-seat, combat-capable trainer equivalents are the F1-B and F1-D, respectively. Most export Mirage F1s, except those of Iraq, have one or another version of the French Cyrano fire-control radar. Jordan has one squadron (No. 25) of 16 F1-CJs and one (No. 1) of 17 EJs, plus a pair of BJ trainers, all based at Azraq. The large Iraqi fleet of 110 F1-EQs and 18 BQ trainers, equipped with Thomson-CSF Agave fire-control radar and Exocet ASMs, suffered heavy losses during the Persian Gulf War. It now totals only about 35–40, possibly including three captured Kuwaiti CKs and five BKs. Iraq is reported to have adapted the Kh-29 "Kedge" ASM for carriage by its remaining F1s.

In North Africa, Libya still has about 14 early F1-AD interceptors (with Aida radar), 12 ED multiroles, and a half-dozen BD trainers; Morocco has about 15 F1-CHs (down from an original 30 because of frequent clashes with Polisario guerrillas) and 14 (from 20) F1-EHs, plus a pair of F1-Bs. They are being refurbished by Dassault; some have chaff/flare dispensers. (Data for F1-C.)

Contractor: Dassault Aviation, France.
Power Plant: one SNECMA Atar 9K50 turbojet; 15,873 lb thrust with afterburning.

Dimensions: span 27 ft 6 3/4 in, length 49 ft 11 1/4 in, height 14 ft 9 in.

Weights: empty 16,314 lb, gross 24,030–35,715 lb.
Performance: max speed at high altitude Mach 2.2, at low altitude Mach 1.2, ceiling 65,600 ft, T-O run 1,970 ft, landing run 2,200 ft, combat radius 265–435 miles.

Accommodation: pilot only, on ejection seat.
Armament: two ventral internal 30-mm DEFA guns; one centerline, four underwing, and two wingtip stations for typical practical max load of 8,818 lb, including Matra Super 530 AAMs, single Armat ARM or Exocet antiship missile, ASMs, conventional or anti-runway bombs, rocket launchers, Atlas laser designator pod with laser-guided bombs or AS.30L missiles, alternative sensor pods, drop fuel tanks, and (at wingtips) Magic or Sidewinder AAMs.

Mirage III and 5

Lebanon is the only Middle East holder of the Mirage III (10 IIIEI), but these have been grounded for some years and are reportedly to be resold after refurbishment by Dassault, with Pakistan a possible customer.



MiG-21PFM, Egyptian Air Force
(Denis Hughes)



Mirage F1-EJ, Royal Jordanian Air Force (P. R. Foster)

Three air forces in the region have the Mirage 5 clear-weather, low-level, ground-attack derivative, which has a slimmer nose, accommodating a range-only radar and some avionics; a bay behind the cockpit accommodates an additional fuel tank that increases internal capacity by 15 percent. Initial Middle Eastern orders for the single-seat 5A, plus batches of two-seat 5D trainers, were placed by Libya (53 + 15) and Abu Dhabi (12 + 3). Both later ordered the 5E strike version (Libya 32, Abu Dhabi 14), as did Egypt (51, plus six trainers, with funding assistance from Saudi Arabia). Egypt's final 16 were upgraded 5SDE2s with the same inertial nav/attack system and laser rangefinder as those in its MS2 Alpha Jets; its earlier Mirage 5s have also undergone a midlife update program. Approximate numbers now in service are: Egypt 52 single-seat and five two-seat, equipping three fighter regiments; Libya 44 + 6; and Abu Dhabi 23 + 3 with one squadron of the United Arab Emirates Air Force at Al Dhafra AB. All three nations also operate small numbers of the Mirage 5R photoreconnaissance version (which see). (Data for 5A.)

Contractor: Avions Marcel Dassault-Breguet Aviation, France.
Power Plant: one SNECMA Atar 9C turbojet; 13,668 lb thrust with afterburning.

Dimensions: span 27 ft 0 in, length 51 ft 0 1/2 in, height 13 ft 11 1/2 in.

Weights: empty 15,763 lb, gross 21,825–30,203 lb.
Performance: max speed at 40,000 ft Mach 2.1, at S/L Mach 1.13, ceiling 55,775 ft, T-O run 2,625 ft clean, 6,000 ft at max gross weight, landing run 2,295 ft clean, combat radius with 2,000-lb weapon load 404 miles lo-lo-lo, 808 miles hi-lo-hi.

Accommodation: pilot only, on ejection seat.
Armament: one 30-mm DEFA 552A gun in lower lip of each air intake duct; one or three underfuselage and four underwing stations, with multiple launchers, for more than 8,818 lb of stores, including single or cluster bombs, rocket pods, ASMs, two self-defense AAMs, or two drop tanks.

Mirage 2000

The single-seat multirole Mirage 2000E is the basic fighter version of this delta-wing aircraft currently operational with Middle East air forces. Egypt has 15 single-seat 2000EMs and three two-seat 2000BMs serving with an interceptor squadron at Berigat AB. Abu Dhabi's 21 single-seat 2000EADs, six tandem-seat 2000EDAD operational trainers, and eight 2000RAD reconnaissance aircraft were delivered to Nos. 1 and 2 Shaheen ("warrior") Squadrons, now at Al Dhafra, between November 1989 and November 1990. The 2000RADs are equipped as standard with a COR 2 multicamera pod but can be fitted instead with a Raphaël side-looking airborne radar (SLAR) pod or a Harold long-range oblique photographic pod. The EADs carry a GEC-Marconi Hakim 2,450-lb standoff ground-attack weapon and are fitted with French Spirale chaff/flare dispensers and RDM radar; 18 of them each have an Italian Elettronica ELT/158 RWR and ELT/558 jamming equipment.

Deliveries will begin in 1997 of nine single-seat 5EDAs and three tandem-seat 5DDAs to Qatar. They will have an upgraded Thomson-CSF RPY radar, improved weapons capability, and the option of a 22,046 lb thrust M53-P20 engine. (Data for 2000C; 2000E generally similar.)

Contractor: Dassault Aviation, France.
Power Plant: one SNECMA M53-P2 turbofan; 21,385 lb thrust with afterburning.

Dimensions: span 29 ft 11 1/2 in, length 47 ft 1 1/4 in, height 17 ft 0 3/4 in.

Weights: empty 16,534 lb, gross 23,940–37,480 lb.
Performance: max speed at high altitude Mach 2.2, at low altitude Mach 1.2, ceiling 54,000 ft, range with four 550-lb bombs 920 miles.

Accommodation: pilot only, on zero/zero ejection seat.
Armament: two 30-mm DEFA 554 guns, each with 125 rds. Five underfuselage and four underwing stations for up to 13,890 lb of external stores, which can include Matra Super 530D, Magic, or Magic 2 AAMs; free-fall, retarded, cluster, antirunway, or laser-guided bombs; 68-mm or 100-mm rocket launchers; Armat ARM or Exocet antiship missile(s); a centerline 30-mm twin-gun pod; or other weapons specified by customers.

Strikemaster

The 12 Strikemaster Mk 82/82As serving with No. 1 Squadron of the Royal Air Force of Oman, at Al Masirah, are used mainly for training but retain their attack potential for counterinsurgency missions.

Contractor: British Aircraft Corporation, UK.
Power Plant: one Rolls-Royce Bristol Viper Mk 535 turbojet; 3,410 lb thrust.

Dimensions: span over tip tanks 36 ft 10 in, length 33 ft 8 1/2 in, height 10 ft 11 1/2 in.

Weights: empty 6,195 lb, gross 9,303–11,500 lb.
Performance: max speed at 18,000 ft 481 mph, ceil-

ing 40,000 ft, T-O to 50 ft 3,500 ft, landing from 50 ft 2,400 ft, combat radius lo-lo-lo with 3,000-lb weapons load 145 miles, hi-lo-hi with 1,000-lb load 575 miles.

Accommodation: crew of two, side by side on zero-height/104 mph ejection seats (pilot only in ground-attack role).

Armament: one 7.62-mm FN Herstal machine gun in lower lip of each air intake duct; two weapon stations under each wing for maximum 3,000 lb (single-seat) of bombs, rocket pods, napalm tanks, or 7.62-mm or 20-mm gun pods.

Su-7/20/22 ("Fitter")

The only remaining operator of vintage fixed-wing Su-7BMK ("Fitter-A") single-seat attack aircraft in this region is the Algerian Air Force, which has two squadrons alongside 40 far more effective Su-20 ("Fitter-C") variable-geometry derivatives, with 24,800 lb thrust Saturn/Lyulka AL-21F-3 afterburning turbojets.

Four Middle East air forces fly the later Su-22M-3 ("Fitter-J"), with internal Doppler nav radar, a laser rangefinder in the intake centerbody, and a more powerful Tumansky engine. Libya has about 75, Syria 35 (possibly with some Su-20s), and Yemen up to 40. Iran still has 40 former Iraqi Su-22s that sought sanctuary there during Desert Storm. (Data for Su-22M-3.)

Contractor: Sukhoi OKB, Russia.

Power Plant: one Tumansky R-29BS-300 turbojet; 25,350 lb thrust with afterburning.

Dimensions: span 44 ft 10 $\frac{1}{2}$ in (30° min sweep), 32 ft 10 $\frac{1}{4}$ in (63° max sweep), length 62 ft 5 in, height 16 ft 0 $\frac{1}{2}$ in.

Weight: gross 36,155–42,990 lb.

Performance: max speed at height Mach 1.74, at S/L Mach 1.1, ceiling 46,585 ft, T-O run 2,955 ft, landing run 3,120 ft, range 870 miles at low altitude, 1,430 miles at high altitude.

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 8,820 lb of bombs, rocket packs, SPPU-22 twin-barrel 23-mm gun pods, R-3 ("Atoll") AAMs, and Kh-23 ("Kerry") or Kh-25ML ("Karen") ASMs.

Su-24MK ("Fencer")

Algeria is confirmed as the fourth operator of this variable-geometry "battlefield bomber" in the Middle East/North Africa region, with 10 Su-24MKs ("Fencers") based at Reggane. At least 16 of 36 similar aircraft now in Iranian markings were seen recently at Shiraz. The total force consists of 24 Su-24MKs delivered originally to Iraq, flown to intended sanctuary in Iran during Operation Desert Storm in 1991 and there retained as an unintended contribution to reparations for the Iran-Iraq war of 1980–88. Twelve more, ordered directly by Iran, each have 54 chaff/flares in wing fence dispensers, in addition to the usual 24 on the sides of the rear fuselage. Fifteen are estimated to serve with the Libyan Air Force and 20 with the Syrian Air Force.

Su-24MKs are supersonic at both high and low level. Standard equipment includes two superimposed radar scanners in the nose, for nav/attack and automatic terrain following/ranging to airborne targets, a TV weapon guidance system and laser ranger/designator, active and passive ECM, and missile warning receivers. An in-flight refueling probe and buddy refueling capability are optional.

Contractor: Sukhoi OKB, Russia.

Power Plant: two Saturn/Lyulka AL-21F-3A turbojets; each 24,690 lb thrust with afterburning.

Dimensions: span 57 ft 10 $\frac{1}{2}$ in (16° min sweep), 34 ft 0 in (69° max sweep), length 80 ft 8 $\frac{1}{4}$ in, height 20 ft 3 $\frac{3}{4}$ in.

Weights: empty 49,163 lb, gross 79,300–87,235 lb.

Performance: max speed at height Mach 1.35, at S/L Mach 1.08, ceiling 57,400 ft, T-O run 4,265 ft, landing run 3,120 ft, combat radius 200–650 miles.

Accommodation: pilot and weapon systems officer side by side, on zero/zero ejection seats.

Armament: one GSh-6-23M six-barrel 23-mm Gatling-type gun on starboard side of belly; no internal weapon bay; nine pylons under fuselage, wingroot gloves, and outer wings (pivoting) for 17,857 lb of weapons, including up to four TV- or laser-guided bombs, conventional bombs (typically 38 x 220-lb FAB-100), 57-mm to 330-mm rockets, 23-mm gun pods, and such missiles as Kh-23 ("Kerry"), Kh-25ML ("Karen"), Kh-58 ("Kilter"), Kh-25MP ("Kegler"), Kh-59 ("Kingbolt"), Kh-29 ("Kedge"), and Kh-31 ("Krypton"). Two R-60 ("Aphid") AAMs can be carried for self-defense.

Su-25 ("Frogfoot")

The only potentially airworthy Su-25s in the region are thought to be seven former Iraqi aircraft impounded in Iran after Desert Storm. Details of the Su-25 can be found in the "Gallery of Russian Aerospace Weapons" in the March 1996 issue of *Air Force Magazine*.



Tornado IDS, Royal Saudi Air Force (Chris Pocock)



Bell AH-1F HueyCobra (Tsefa), Israel Air Force (Denis Hughes)

Tornado

The initial Royal Saudi Air Force order for 48 Tornado IDS (interdictor/strike) aircraft was part of the Al Yamamah I agreement signed with the UK in 1985. About 42 serve with Nos. 7 and 66 Squadrons, at Dhahran, and work has begun on another 48 ordered in June 1993 under the follow-up Al Yamamah II, for delivery from this year. Equipment includes a Texas Instruments multimode terrain-following and ground-mapping radar, digital INS, electronic HUD, laser rangefinder and marked target seeker, IFF, RWR, and active ECM. Six aircraft of the original batch, some with each Saudi squadron, are configured for reconnaissance, and 14 have dual controls.

Under Al Yamamah I, the RSAF also ordered 24 Tornado ADV (air defense variant) interceptors, which currently equip No. 29 Squadron also at Dhahran. Generally similar to the IDS, the ADV has a slightly longer fuselage to house Foxhunter pulse-Doppler radar and to allow four Sky Flash AAMs to be carried in tandem underbelly pairs, supplementing a single 27-mm gun. The lengthening reduced drag, especially at supersonic speed, and provided a 10 percent increase in internal fuel capacity. The ADV's RB199 Mk 104 engines are each rated at 16,520 lb thrust. (Data for Tornado IDS.)

Contractor: Panavia Aircraft GmbH, a UK-German-Italian consortium.

Power Plant: two Turbo-Union RB199 Mk 103 turbofans; each 16,075 lb thrust with afterburning.

Dimensions: span 45 ft 7 $\frac{1}{2}$ in (25° min sweep), 28 ft 2 $\frac{1}{2}$ in (67° max sweep), length 54 ft 10 $\frac{1}{4}$ in, height 19 ft 6 $\frac{1}{4}$ in.

Weights: empty 31,065 lb, gross 45,000–61,620 lb.

Performance: max speed at height Mach 2.2, max speed with external stores Mach 0.92, balanced runway length 2,950 ft, combat radius 863 miles.

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

Armament: two 27-mm IWKA-Mausers in fuselage, each with 180 rds; seven hardpoints under fuselage and wings for 19,840 lb of external stores, including AIM-9L Sidewinder AAMs; ALARM and Sea Eagle ASMs; JP 233 cluster bombs; napalm; "smart," retarded, and conventional bombs up to 1,000 lb; rockets; incendiary and flare bombs.

Helicopters

AH-1 HueyCobra

The 202 Bell AH-1J International gunship helicopters (1,673 shp Pratt & Whitney Canada T400-WV-402 Turbo Twin Pac) delivered to Iran from late 1971 were generally similar to the US Marine Corps AH-1J SeaCobra, with some features of Bell's YAH-63 KingCobra, an improved gun turret, and in most cases ability to carry TOW antitank missiles. Perhaps 80–100 remain, but many were lost in the long war with Iraq, and estimates of those still serviceable (and with enough TOWs to equip them) suggest that perhaps no more

than a dozen are still fully combat-capable. Iran is thought to have regrouped its Army Cobras, Chinooks, and Bell 214 Isfahans into a new airmobile force in the early 1990s, under the operational control of the Revolutionary Guard.

The 24 single-engine Cobras of Jordan's No. 10 and No. 12 Squadrons form the fighter helicopter wing of the Royal Jordanian Air Force. Like the 39 that equip No. 160 and No. 161 Squadrons in Israel, they are similar to the US Army's AH-1F fully upgraded TOW version, with an IR jammer, hot metal and plume IR suppressor, RWR, low-air-speed sensor probe, 20-mm three-barrel gun in an electrically powered undernose turret, automatic compensation for off-axis firing, laser rangefinder and tracker, HUD, Doppler, and IFF transponder. Israeli HueyCobras, known locally as *Tsefa* ("viper"), have a US-funded Rafael night targeting system and are to be retrofitted in-country with GE T700 engines for commonality with the service's AH-64s and UH-60s. They have figured frequently in attacks on Hezbollah guerrilla forces in southern Lebanon. By the end of this year, Israel should have received 14 AH-1Es from US Army surplus to replace its single squadron of MD 500 Defenders. Fourteen other ex-US Army AH-1Es, purchased by Bahrain in 1994, equip one combat helicopter squadron at Shaikh Isa AB. (Data for AH-1F.)

Contractor: Bell Helicopter Textron, USA.

Power Plant: one AlliedSignal T53-L703 turboshaft; 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: one 20-mm three-barrel M197 gun, with 750 rds, in GE turret; outer of two weapon pylons under each stub-wing can carry four TOW ASMs; inner pylon can carry a pack of 7–19 x 2.75-in rockets.

AH-64A Apache

Exports of this formidable attack helicopter began in January 1990 with a joint offer to Israel and Egypt, Israel placing an order for 18 (since increased to 42) two months later. The first two were delivered that September, and all are now in service with the IDF/AF's Nos. 113, 127, and 190 Squadrons. Only the first 18 are new-build, the remainder being from surplus US Army stocks. The Israeli name for the AH-64A is *Petan* ("cobra").

The next Middle East orders to be received came from the Royal Saudi Land Forces (in April 1991, for 12) and Abu Dhabi (in December 1991, for 20). Deliveries of these began in April and October 1993, respectively. Abu Dhabi was to receive a further 10 Apaches in 1996; Saudi Arabia may order up to 48 more. Egypt received the first of an initial 24 Apaches in February 1994; these are to be joined next year by a further 12. **Contractor:** McDonnell Douglas Helicopter Systems, USA.

Power Plant: two General Electric T700-GE-701C turbo-shafts; each 1,890 shp.

Dimensions: rotor diameter 48 ft 0 in, fuselage length, tail rotor turning 51 ft 0 in, height 15 ft 3 $\frac{1}{2}$ in.

Weights: empty 11,387 lb, gross 14,445–22,283 lb.

Performance: max speed at S/L 182 mph, ceiling 21,000 ft, max range (internal fuel, including reserves) 253 miles, typical mission endurance (no reserves) 2 hr 40 min.

Accommodation: crew of two, in tandem (copilot/gunner in front seat).

Armament: turreted 30-mm M230 Chain Gun, with up to 1,200 rds, under front fuselage; four underwing stations, each for four AGM-114 Hellfire antitank missiles or 2.75-in FFAR rockets in seven-rd M200 or 19-rd M260 launchers.

AS 332 Super Puma/AS 532 Cougar

The AS 332 Super Puma (military designation AS 532 Cougar) differs from its predecessor, the Puma (which see), in having a new power plant, uprated transmission, and airframe changes to improve crew survivability, payload, performance, and ease of maintenance. Suffixes C and L signify short (*court*) and long fuselage, for 21 or 25 passengers/troops, respectively. Military subvariants are dubbed AS 532SC and AS 532UC/UL, the SC being a naval version for anti-submarine, antiship missile defense, and search-and-rescue missions. It has a folding tail rotor pylon, deck landing assist device, and mountings for Exocet missiles. Operators of the AS 532SC include Kuwait's No. 62 Squadron (three), the UAE Air Force (two), and the air element of the Royal Saudi Navy (six).

Standard transport versions of the Super Puma equip the Royal Jordanian Air Force (No. 7 Squadron, 10 AS 532UCs); the Royal Flight of the Royal Air Force of Oman (two AS 332Cs, two 332Ls, and one 332L1); the Royal Saudi Navy (six 532UCs); and the UAE Air Force (seven 532ULs). Those of Jordan and Oman include some configured as VIP transports. (Data for AS 532SC.)



Agusta-Bell 412, United Arab Emirates Air Force/Dubai (Paul Jackson)

Contractor: Eurocopter SA, a Franco-German company.
Power Plant: two Turbomeca Makila 1A1 turboshafts; each 1,877 shp.
Dimensions: rotor diameter 51 ft 2½ in, fuselage length 50 ft 11½ in, height 16 ft 1¾ in.
Weights: empty 9,920 lb, gross with internal load 19,841 lb, with slung load 20,615 lb.
Performance: cruising speed at S/L 149 mph, ceiling 13,450 ft, range 540 miles.
Accommodation: crew of two or three; optionally, 21 passengers, or six litters and 11 seated persons, or freight.
Armament: options include two Exocet missiles or two lightweight torpedoes.

AS 350/355 Ecureuil

Three Middle East countries operate France's attractive little Ecureuil ("squirrel") helicopter. The Tunisian Air Force has six AS 350Bs, which form a part of its No. 32 Squadron in company with older Alouette IIs and IIIs. A more recent customer for the single-engine 350B is Algeria, which began to receive the first of nine in 1994. The third operator is Djibouti, which since the early 1980s has had a pair of AS 355F Ecureuil 2s, powered by two 425 shp Allison 250-C20F turboshaft engines. (Data for AS 350B2.)

Contractor: Eurocopter SA, a Franco-German company.
Power Plant: one Turbomeca Arriel 1D1 turboshaft; 732 shp.
Dimensions: rotor diameter 35 ft 0¾ in, fuselage length 35 ft 10½ in, height 10 ft 3½ in.
Weights: empty 2,542 lb, gross 4,960 lb.
Performance: max cruising speed at S/L 153 mph, ceiling 15,750 ft, hovering ceiling OGE 8,350 ft, max range (no reserves) 414 miles.
Accommodation: six persons, including pilot(s).
Armament: none in AS 350; AS 355 has provision for single 20-mm gun, 7.62-mm twin-gun pods, TOW antitank missiles, or launchers for twelve 68-mm or seven 2.75-in rockets.

AS 365 Dauphin/AS 565 Panther

Middle East customers for Eurocopter's twin-engined Dauphin/Panther family are the air forces of Israel, Saudi Arabia, and the United Arab Emirates. The major operator is Saudi Arabia, whose armed forces have 29. Six are AS 365N2 Dauphins used as medevac helicopters by the Royal Saudi Land Forces, with outward-opening (instead of sliding) rear cabin doors permitting side-loading of up to four casualty litters, accompanied by medical attendants. Four of the Royal Saudi Navy's 23 are AS 565SC Panthers, equipped for search and rescue; the rest are frigate-based AS 565SA Panthers, equipped with search radar and AS.15TT missiles for the antiship missile defense role. The UAE Navy ordered seven AS.15TT-armed AS 565SA Panthers in 1995 but has yet to receive them. The Dubai element of the UAEAF has a single AS 365N1 used as a VIP transport. Israel's No. 193 Squadron acquired two basically similar ex-US Coast Guard HH-65As (AS 366G, Hebrew name *Dolpheen*) in 1985, which serve on Saar-class fast attack boats in a search-and-rescue role. An undisclosed number of AS 565SAs (reportedly 20) were ordered in 1994 and 1995; named *Atalef* ("bat"), these will have a Telephonics search radar and FLIR, Litton INS/GPS navigation system, and Israeli (Elbit) communications and self-defense equipment. (Data for AS 565SA.)

Contractor: Eurocopter SA, a Franco-German company.
Power Plant: two Turbomeca Arriel 1M1 turboshafts; each 749 shp.
Dimensions: rotor diameter 39 ft 2 in, fuselage length 39 ft 8¾ in, height 13 ft 0¾ in.
Weights: empty 4,987 lb, gross 9,370 lb.



S-70A-1 Desert Hawk, Royal Saudi Land Forces

Performance: max cruising speed at S/L 170 mph, hovering ceiling IGE 8,530 ft, combat radius 155-173 miles, max range 543 miles.
Accommodation: crew of two, plus systems operators.
Armament: four Aerospatiale AS.15TT radar-guided antiship missiles or (in ASW role) two homing torpedoes, mounted on cabin sides.

Bell 205 and UH-1 Iroquois

Despite its age, this workhorse helicopter continues to give useful service with the air arms of several Middle Eastern and North African countries: Iran (Army 20, Navy five), Jordan (10), Morocco (Air Force 27), Oman (Air Force 18), Saudi Arabia (Air Force eight), and Tunisia (Air Force 17). Most of these are Agusta-built 205/205A-1s, although ex-US UH-1Hs account for the Jordanians and two of the Tunisians. Additional UH-1Hs, refurbished and upgraded by UNC, have recently been supplied to Jordan (18 for No. 8 Squadron, reportedly for "special forces" operations) and Lebanon (16). Most other Bells, however, are used for a broad range of utility and general transport duties. (Data for Agusta-Bell 205.)

Contractors: Bell Helicopter Textron, USA; Agusta SpA, Italy.
Power Plant: one AlliedSignal T53-L-13B turboshaft; 1,400 shp.
Dimensions: rotor diameter 48 ft 0 in, fuselage length 41 ft 10¼ in, height 14 ft 5½ in.
Weights: empty 4,800 lb, gross 9,500 lb.
Performance: max speed at S/L 138 mph, max cruising speed 127 mph, ceiling 15,000 ft, max range 360 miles.
Accommodation: one pilot; up to 14 troops, six litters plus one medical attendant, or 3,880 lb of cargo.
Armament: normally none.

Bell 212 and 412

By changing to a twin-turbine PT6T-6 power plant, the Bell 212 was able to offer an increased payload of 4,000 lb internally or 4,500 lb externally and enhanced reliability, especially in hot and high environments, compared with the 205/UH-1 series. Current operators are Dubai (one), Iran (Air Force six, Army 30, Navy six ASW), Israel (35 *Anafa*: "heron"), Lebanon (seven), Libya (two), Morocco (five), Oman (two), Saudi Arabia (25), and Yemen (five, plus one VIP). Israel's aircraft came from US production, but most other 212s in the Middle East/North Africa region came from Bell's Italian licensee, Agusta, which also developed its own antisubmarine version, the AB 212 ASW. The Agusta ASW version is equipped with Tacan, ECM, and a Bendix AN/AQS-13 sonar; for antiship missions, the sonar can be replaced by a GEC-Marconi Seaspray search radar. Dubai also has nine Agusta-Bell 412s, with four-blade (instead of two-blade) main rotor and

increased performance; Bahrain has three. (Data for Agusta-Bell 212 ASW.)

Contractor: Agusta SpA, Italy.
Power Plant: one Pratt & Whitney Canada PT6T-6 Turbo Twin Pac turboshaft; 1,875 shp.
Dimensions: rotor diameter 48 ft 0 in, fuselage length 42 ft 4¾ in, height 14 ft 10¼ in.
Weights: empty 5,621 lb, gross 10,692 lb.
Performance: max speed at S/L 122 mph, max cruising speed 115 mph, ceiling 13,000 ft, search range with 10 percent fuel reserves 382 miles, max range with auxiliary fuel and 15 percent reserves 414 miles.
Accommodation: flight crew of one or two; one or two ASW/ASV systems operators, or seven/eight passengers, or four litters plus medical attendant.
Armament: two Motofides 244 AS or Mk 44/46 homing torpedoes, or depth charges, for ASW; two Marte Mk 2, Sea Skua, or similar antiship missiles for ASV operations.

Bell 214

The Bell 214 is a derivative of the Bell 205/UH-1 with increased power and payload. Iran ordered 287 Model 214As (Iranian name *Isfahan*), all of which were delivered in 1975. Further orders followed, for six more 214As and 39 of an SAR version designated 214C. Bell built a basically commercial version of the 214A as the 214B BigLifter and continued with the stretched 214ST SuperTransport, which has two 1,625 shp General Electric CT7-2A turboshafts and an 8-ft-longer fuselage, seating up to 18 passengers.

More than 200 of these various utility helicopters still operate in the Middle East, most of them with Iranian Islamic Army Aviation, plus 20 214A/Cs with the Air Force. Iraq is believed to retain about half of an original 45 214STs, although their serviceability is unknown. Dubai and Oman each have five 214Bs. (Data for Bell 214A.)

Contractor: Bell Helicopter Textron, USA.
Power Plant: one AlliedSignal LTC4B-8D turboshaft; 2,930 shp.
Dimensions: rotor diameter 52 ft 0 in, fuselage length 49 ft 3½ in, height 15 ft 0 in.
Weights: empty 7,460 lb, gross 11,480 lb.
Performance: max cruising speed at S/L 161 mph, ceiling 20,000 ft, max range 215 miles.
Accommodation: crew of two; up to 14 passengers or equivalent cargo.
Armament: none.

Bell 406 CS Combat Scout and OH-58D

The *Combat Scout* was intended as a simplified scout/attack export version of the US Army's OH-58D Kiowa Warrior. The Royal Saudi Land Forces received 15 in 1990, with folding rotor blades and stabilizer, "squatting" skids, a roof-mounted Saab-Emerson HeliTOW sight, and a SFENA hybrid cockpit combining conventional instruments with electronic displays for TOW missile and communications control. Only five were configured to carry TOW.

Israel received the first four of an unspecified number of OH-58Ds in the same year, fitted with TV cameras, IR thermal imagers, and laser rangefinder/designators. Little has been heard about them since then. (Data for *Combat Scout*.)

Contractor: Bell Helicopter Textron, USA.
Power Plant: one Allison 250-C30U turboshaft; 650 shp.
Dimensions: rotor diameter 35 ft 0 in, fuselage length 34 ft 4¾ in, height 12 ft 10½ in.
Weights: empty 2,271 lb, gross 5,000 lb.
Performance: max speed at 4,000 ft 144 mph, max cruising speed 138 mph, range with max fuel 251 miles.
Accommodation: crew of two, side by side.
Armament (RSLF version): cabin-side outriggers optional for four TOW 2 antitank missiles, 0.30- and 0.50-in machine gun pods, and 2.75-in FFAR rocket pods.

BO 105 and BK 117

Major Middle Eastern operator of the twin-turboshaft BO 105 is Iraq, with up to 30 estimated still in service following losses in the Persian Gulf War. The first 10, of a much larger total ordered as HOT antitank missile carriers, were delivered from Germany in 1979. The next 10 were embargoed by the then Federal Republic but were allowed to go to Iraq, via Geneva, "after conversion for medevac duty." At least 40 more followed, many from production in Spain by CASA, and many were seen missile-armed during Desert Storm. Iraq also has about 15 Eurocopter/Kawasaki BK 117s, of a similar configuration but with more powerful turbines and improved performance, in use for communications and liaison duties.

Other Gulf States to operate these helicopters are Bahrain and the United Arab Emirates. The Bahrain Air Force has two BO 105Cs, which are used for paramilitary public security duties, while the Bahrain Navy has two examples of the slightly stretched BO 105CBS in a

search-and-rescue role. In the UAE Air Force, the Abu Dhabi element employs four CBSs as general utility helicopters; all or most of Dubai's seven CBSs are used by the Police Air Wing, and Sharjah's Amiri Air Wing is believed to have a pair of BK 117s. (Data for basic BO 105CB.)

Contractors: initially MBB, Germany; now Eurocopter SA, a Franco-German company.

Power Plant: two Allison 250-C20B turboshafts; each 420 shp.

Dimensions: rotor diameter 32 ft 3½ in, fuselage length 28 ft 1 in, height 9 ft 11 in.

Weights: empty 2,815 lb, gross 5,511 lb.

Performance: max cruising speed at S/L 149 mph, ceiling 10,000 ft, range 345-634 miles.

Accommodation: pilot and four other persons (five in CBS); rear clamshell doors for loading two stretchers or freight.

Armament (optional): HOT or TOW antitank missiles and associated sighting system.

CH-47C Chinook

In its standard transport role, this widely used heavy-lift helicopter carries a substantial load of troops, casualty litters, or internal or slung cargo. The cabin is loaded via a rear ramp/door. Typical loads include a complete artillery section, with personnel and ammunition. Optional equipment can include RWR, missile approach warning equipment, IR jammers, chaff/flare dispensers, and INS with GPS. Those serving with air and land forces in the Middle East and North Africa were almost all license-manufactured by Meridionali of Italy, an Agusta subsidiary. The Egyptian Air Force has 15, Iran about 40 (Army 30, Air Force 10), Libya about 14 (Air Force four, Army 10), and the Royal Air Force of Morocco nine.

Contractor: Elicotteri Meridionali SpA, Italy.

Power Plant: two AlliedSignal T55-L-11A turboshafts; each 3,750 shp.

Dimensions: rotor diameter (each) 60 ft 0 in, fuselage length 51 ft 0 in, height 18 ft 7¼ in.

Weights: empty 21,464 lb, gross 33,000-46,000 lb.

Performance: max speed at S/L 189 mph, average cruising speed 131-160 mph, ceiling 15,000 ft, mission radius with 11,650-lb internal payload 115 miles, with 21,700-lb slung payload 23 miles.

Accommodation: crew of two or three; up to 44 troops, or 24 litter patients and two medical attendants, vehicles, or freight.

Armament: provision for one machine gun in forward hatchway.

CH/RH-53 Sea Stallion

Israel originally had some 35 of these large heavy-lift helicopters, including 33 CH-53D-standard S-65C-3s; the MATA Helicopters plant of Israel Aircraft Industries has recently upgraded 30 of them. They equip Nos. 114 and 118 Squadrons of the Israel Defense Force/Air Force. Named Yas'ur ("albatross") 2000, their airframe life is now extended beyond 2000, including armored cockpits, crashworthy seats, external sponson fuel tanks, an in-flight refueling probe, rescue hoist, and an Elbit-led avionics suite that includes a mission computer, two multifunction displays, a moving map display, Elisra ECM, and new autopilot. The first flight of a Yas'ur 2000 took place on June 4, 1992; redeliveries began in February 1993. These aircraft were supplemented by 10 earlier-vintage CH-53As, with lower-rated T64 turboshafts and reduced performance and payload, from US Marine Corps surplus.

One or two of the six RH-53D mine-sweeping helicopters delivered to the Iranian Navy during the reign of the Shah are believed to be still serviceable; that service may also have an ex-US Navy HH-53H. (Data for CH-53D.)

Contractor: Sikorsky Aircraft, USA.

Power Plant: two General Electric T64-GE-413 turboshafts; each 3,925 shp.

Dimensions: rotor diameter 72 ft 3 in, fuselage length 67 ft 2 in, height 24 ft 11 in.

Weights: empty 23,485 lb, gross 42,000 lb.

Performance: max speed at S/L 196 mph, max cruising speed 173 mph, ceiling 21,000 ft, max range at 173 mph, with reserves, 257 miles.

Accommodation: flight crew of three; up to 55 troops, 24 litters plus four medical personnel, or equivalent cargo.

Armament: none in CH-53D; RH-53D, provision for two 0.50-in machine guns to detonate surfaced mines.

McDonnell Douglas 500MD Defender

No. 5 Squadron of the Royal Jordanian Air Force at King Hussein Air College, Mafrqa, has seven unarmed 500MDs for training, and Iraq received about 30 in the mid-1980s, which it uses for scout missions; a few are used by the Israel Defense Force/Air Force in a liaison capacity, and a couple form part of the public security flying wing of the Bahrain Amiri Air Force. The only combat-equipped Defenders in the Middle East are Israel's antitank 500MD/TOWs, known in-country as the Lahatoot ("acrobat"). About two dozen remain of

the 30 delivered from mid-1979, serving with No. 162 Squadron and the Flying Training School. They carry a stabilized telescopic sight in a prominent turret on the port side of the nose. Fifteen Israeli Defenders were put up for sale earlier this year in anticipation of their replacement by additional AH-1 HueyCobras. (Data for 500MD/TOW.)

Contractor: McDonnell Douglas Helicopter Systems, USA.

Power Plant: one Allison 250-C20B turboshaft; 375 shp.

Dimensions: rotor diameter 26 ft 4 in, fuselage length 25 ft 0 in, height 8 ft 10¾ in.

Weights: empty 1,976 lb, gross 3,000 lb.

Performance: max speed at S/L 150 mph, max cruising speed at 5,000 ft 132 mph, ceiling 13,800 ft, range with standard fuel 242 miles at S/L, 266 miles at 5,000 ft.

Accommodation: crew of two, side by side.

Armament: four Hughes TOW antitank missiles, in twin pod at each end of tubular beam through cabin.

Mi-6 ("Hook")

The world's largest helicopter by far when it first flew, in June 1957, the Mi-6 has been widely used but little publicized. More than 860 were built, of which a handful still fly on transport duties with air forces in the Middle East/North Africa region. Algeria is reported to have two and Syria 10. About 10 of the 15 that Iraq received to support construction and operation of its missile and radar sites may still be airworthy.

Contractor: Mil OKB, Russia.

Power Plant: two Aviadvigatel/Soloviev D-25V turboshafts; each 5,425 shp.

Dimensions: rotor diameter 114 ft 10 in, fuselage length 108 ft 10½ in, height 32 ft 4 in.

Weights: empty 60,055 lb, gross 84,657-93,700 lb.

Performance: max speed 186 mph, max cruising speed 155 mph, ceiling 14,750 ft, range with 17,637-lb payload 385 miles, with 9,920-lb payload and external tanks 621 miles, ferry range 900 miles.

Accommodation: crew of five (two pilots, navigator, flight engineer, and radio operator); 70 combat-equipped troops, or 41 litter patients and two medical attendants; rear ramps; 1,765-lb-capacity winch and pulley block system for handling max internal freight payload of 26,450 lb; sling for max external freight load of 17,637 lb (normally with stub-wings removed).

Armament: provision for 12.7-mm machine gun in nose.

Mi-8/17 ("Hip")

Mi-8s and uprated Mi-17 series helicopters serve in standard military armed transport form with the air forces of Algeria (59), Egypt (40), Iraq (possibly 70 following Desert Storm), Libya (seven), Syria (100), and Yemen (50). These totals include Mi-8s ("Hip-C" and "E"), Mi-17s ("Hip-H"), and Mi-8s built or uprated to Mi-17 standard as Mi-8MT/MTVs, with 1,923 shp TV3-117MT engines in shorter nacelles and with the tail rotor transferred to the port side. Basic military tasks are assault, troop transport, and general duties, with a sliding, jettisonable passenger door at the front of the cabin on the port side, clamshell rear freight-loading doors, hook-on ramps for vehicle entry, cargo tie-downs in the floor, a 330-lb-capacity winch and pulley block system for cargo handling, and 6,614-lb-capacity cargo sling. All versions can be used for casualty evacuation. Ten of the Syrian aircraft are Mi-8SMVs ("Hip-J"), equipped for ECM, with small equipment boxes on each side of the cabin, and Mi-8BPPA ("Hip-K") active communications jammers, with a large antenna array on each side. (Data for standard Mi-8.)

Contractor: 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 2 in.

Weights: empty 16,007 lb, gross 24,470-26,455 lb.

Performance: max speed at 3,280 ft 161 mph, max cruising speed 140 mph, ceiling 14,765 ft, range with 24 troops 264 miles, cargo version 286-596 miles.

Accommodation: crew of two or three; 24 combat-equipped troops on tip-up seats along cabin side walls; 8,820 lb of freight internally, 6,614 lb externally; or up to 12 litter patients and medical attendant.

Armament: provision for 12.7-mm machine gun in nose; twin rack each side for total of four 16-rd packs of 57-mm rockets or other stores ("Hip-C" standard), or triple stores rack each side for six 32-rd rocket packs, and four 9M17P Falanga M ("Swatter") antitank missiles on rails above packs ("Hip-E" standard).

Mi-14PL ("Haze")

This shore-based amphibious helicopter is basically an Mi-17 with a boat-type planing bottom for operation on water, a sponson on each side carrying an inflatable flotation bag, a small float under the tail, and fully retractable wheel landing gear. Libya and Syria each

have 12 of the Mi-14PL ("Haze-A") ASW version, with a large undernose radome, retractable sonar, sonobuoys and signal flares, a towed MAD bird stowed against the rear of the fuselage, and a life raft. An autopilot/ autohover system and autocontrol system are standard. The Libyan and Syrian Mi-14s are under Navy direction for coastal surveillance.

Contractor: Mil OKB, Russia.

Power Plant: two Klimov TV3-117MT turboshafts; each 1,923 shp.

Dimensions: rotor diameter 69 ft 10¼ in, fuselage length 60 ft 3½ in, height 22 ft 9 in.

Weights: empty 25,900 lb, gross 30,865 lb.

Performance: max speed 143 mph, normal cruising speed 127 mph, ceiling 11,500 ft, range with max fuel 705 miles.

Accommodation: crew of four.

Armament: torpedoes, bombs, depth charges, and other stores in weapons bay in bottom of hull.

Mi-24/25/35 ("Hind")

Most Mi-24 helicopter gunships in the Middle East and North Africa are of the basic Mi-24D ("Hind-D") version, but Iraq and Libya are known to have some Mi-24Vs ("Hind-E"). These carry up to eight radio-guided, tube-launched 9M114 ("Spiral") antitank missiles in place of the less effective 9M17P ("Swatters") on the Mi-24D. The Mi-24V also has a HUD instead of the D's reflector sight and can carry R-60 ("Aphid") AAMs for self-defense. Both models have a heavily armored airframe containing a cabin for eight troops or four litters in an assault transport role; an undernose missile guidance pod (port) and electro-optical sight (starboard); and pilot's Doppler-fed mechanical map display, IFF, RWR, IR jammer, and chaff/flare dispensers. Engine exhaust IR suppression mixer boxes are optional.

Iraqi Mi-24s took little part in Desert Storm, and 20 are estimated to remain available. Algeria is believed to have 24, Libya 21, Syria 36, and Yemen 15. (Data for Mi-24D.)

Contractor: Mil OKB, Russia.

Power Plant: two Klimov TV3-117MT turboshafts; each 1,923 shp.

Dimensions: rotor diameter 56 ft 9¼ in, fuselage length excl gun 57 ft 5¼ in, height 21 ft 4 in.

Weights: empty 18,520 lb, gross 24,250 lb.

Performance: max speed 192 mph, max cruising speed 183 mph, ceiling 14,750 ft, combat radius with max military load 99 miles, with four external fuel tanks 179 miles.

Accommodation: crew of two in tandem; flight mechanic, and provisions for eight troops or four litters in main cabin.

Armament: one YakB-12.7 four-barrel 12.7-mm machine gun in nose turret, slaved to electro-optical sight; four underwing hardpoints for 32-rd UB-32 packs of 57-mm rockets, 20-rd B-8V-20 packs of 80-mm rockets, UPK-23-250 twin-barrel 23-mm gun pods, GUV pods each containing one four-barrel 12.7-mm gun and two four-barrel 7.62-mm guns or a 30-mm grenade launcher, 3,300 lb of conventional bombs or mine dispensers. Provisions for firing AKMS guns from cabin windows.

S-70/UH-60 Black Hawk

The S-70A basic export version of Sikorsky's infantry squad transport and general-purpose helicopter is essentially similar to the US Army's UH-60A and are sent supplied to several Middle East customers.

The Royal Saudi Land Forces Army Aviation Command is the region's largest operator. In early 1990, it took delivery of 12 S-70A-1s in Desert Hawk configuration (15 troop seats, Jaguar 5 frequency-hopping radio, special rotor blade erosion protection, and provision for an external hoist, searchlights, and internal auxiliary fuel tanks). A thirteenth S-70A-1, with a VIP interior, was added in December 1990, followed a year later by the first of eight medevac S-70A-1Ls (signifying use of the uprated UH-60L engine), each with fittings for six litters, air-conditioning, an IR-filtered searchlight, rescue hoist, and improved avionics. The Royal Jordanian Air Force acquired three S-70A-11s in 1986-87 (one since reported lost) and also has two UH-60As; two S-70A-21s, outfitted as VIP transports, were acquired by the Egyptian Air Force in 1990; Morocco's one S-70A-25 and one A-26 serve with the Royal Gendarmier Air Squadron.

In 1994, Israel began to replace its aging Bell 212s with 10 ex-US Army UH-60As, to which it has given the name Yanshuf ("owl"). These equip No. 124 Squadron. Bahrain has a single UH-60A in use as a VIP transport. Kuwait has requested to buy 16 UH-60Ls, plus Hellfire antitank missiles, Hydra rockets, and night vision equipment, but this order still awaits US government approval. (Data for current production standard UH-60L.)

Contractor: Sikorsky Aircraft, USA.

Power Plant: two General Electric T700-GE-701C turboshafts; each 1,800 shp (1,723 shp T700-GE-701A optional for export).

Dimensions: rotor diameter 53 ft 8 in, fuselage length 50 ft 0 $\frac{1}{2}$ in, height 16 ft 10 in.
Weights: empty 11,500 lb, gross 17,000–23,500 lb.
Performance: max cruising speed 173 mph, ceiling 19,000 ft, range with internal fuel 363 miles, with four external tanks 1,380 miles.

Accommodation: crew of three; 11–14 troops, or up to six litters and one to three attendants, or cargo, in cabin. VIP configurations for seven to 12 persons. Up to 8,000-lb load on external cargo sling.

Armament: provision for external stores support system on which can be suspended more than 10,000 lb of fuel tanks and weapons, including 16 Hellfire laser-guided antiarmor or other missiles, gun pods, mine dispensers, rockets, or ECM pods. Two pintle mounts in cabin for a 0.50-in or 7.62-mm machine gun.

SA 321 Super Frelon

The maritime versions of this three-engine, heavy-duty helicopter have a boat hull and a stabilizing float on each side at the rear of the fuselage. IFF and dipping sonar are standard in versions used for ASW missions. Five of Iraq's SA 321GVs, bought in the 1970s, appear still to be serviceable, each equipped with ORB-31D radar in a large nose radome and armed with two Exocet antiship missiles. No more than four of Libya's original total of 14 SA 321Ms, acquired for SAR and logistical support, and maritime SA 321GMs with ORB-32WAS search radar are likely to be operational. (Data for SA 321G.)

Contractor: Aerospatiale, France.
Power Plant: three Turbomeca Turmo IIIIC6 turboshafts; each 1,550 shp.

Dimensions: rotor diameter 62 ft 0 in, fuselage length 65 ft 10 $\frac{1}{2}$ in, height 21 ft 10 $\frac{1}{2}$ in.

Weights: empty 15,130 lb, gross 28,660 lb.
Performance: cruising speed 155 mph, ceiling 10,325 ft, range 509–633 miles.

Accommodation: crew of five, including equipment operators; provision for 27 passengers.
Armament: two Exocet ASMs or four homing torpedoes carried on sides of hull.

SA 330 Puma

First flown in 1965, the Puma was originally developed under Anglo-French collaboration for the British and French armed forces. Initial military export versions were the SA 330C and H, with 1,400 shp Turmo IVB engines; Middle East customers included Abu Dhabi, Iraq, Kuwait, and Morocco, all of whom received this version during the 1970s. Approximate strengths are eight, 10, nine, and 30, respectively. More powerful engines characterized the SA 330L, of which Lebanon has been an operator since 1980; the nine that survive are being refurbished by Eurocopter. Since French Puma production ended, manufacture has continued in Romania as the IAR-330L, and 10 secondhand IAR-330Ls were acquired by Dubai in 1993. (Data for SA 330L.)

Contractor: Aerospatiale, France, and (IAR-330L) IAR, Romania.

Power Plant: two Turbomeca Turmo IVC turboshafts; each 1,494 shp.

Dimensions: rotor diameter 49 ft 5 $\frac{1}{2}$ in, fuselage length 46 ft 1 $\frac{1}{2}$ in, height 14 ft 10 $\frac{1}{2}$ in.

Weights: empty 7,970 lb, gross 16,315 lb.
Performance: max cruising speed 160 mph, ceiling 15,750 ft, max range 341 miles.

Accommodation: crew of one or two; up to 16 troops, six litters and seven seated patients, or equivalent cargo. Max external sling load 7,055 lb.

Armament: options include two 23-mm gun pods, up to four AAMs or antitank missiles, or four rocket pods, on fuselage-side pylons; 12.7-mm pintle-mounted machine gun can be mounted in each cabin doorway.

SA 342 Gazelle

Eight of the 11 countries in this region that bought military Gazelles of various models continue to fly them. Egypt imported 60 SA 342Ls (the predominant version) and assembled another 30 locally; nine continue to serve with its Navy as antiship helicopters and about 65 of the others as an Air Force antiarmor element. Syria is thought to have around 50 SA 342Ls, Libya 35, Morocco 20, Kuwait 15, Lebanon three, Qatar 12, and Abu Dhabi 11. The majority of these, as in Egypt, are equipped for antitank, antiship, or counterinsurgency duties. Iraq has about 20 SA 342Ks (generally similar except for 870 shp Astazou XIVH engines), and five of this model serve with the Royal Moroccan Gendarmerie. Qatar also has two civil SA 341Gs for communications duties. (Data for SA 342L.)

Contractors: Aerospatiale, France, and Westland Helicopters, UK.

Power Plant: one Turbomeca Astazou XIVH turboshaft; 858 shp.

Dimensions: rotor diameter 34 ft 5 $\frac{1}{2}$ in, fuselage length 31 ft 3 $\frac{1}{4}$ in, height 10 ft 5 $\frac{1}{2}$ in.

Weights: empty 2,202 lb, gross 4,410 lb.
Performance: max cruising speed at S/L 161 mph, ceiling 13,450 ft, range with standard fuel 440 miles.

Accommodation: crew of one or two; up to three other persons.

Armament: outriggers on fuselage sides for variety of weapons, which can include up to six HOT wire-guided antitank missiles, two launchers for 68-mm or 2.75-in rockets, two 7.62-mm machine guns, or a single 20-mm gun.

Sea King, Commando, and AS-61

All S-61/SH-3 helicopters operated by Middle Eastern nations were supplied by Sikorsky's European licensees. Westland of the UK delivered 34 to Egypt and 12 to Qatar. Five of the original six ASW/ASV Sea King Mk 47s continue to equip the Egyptian Navy. The Egyptian Air Force has five landbased Commando Mk 1s, minimally modified from the Sea King airframe, 17 tactical transport Mk 2s, two VIP transport Mk 2Bs, and four electronic warfare Commando Mk 2Es, with Elettronica ECM and ESM. Qatar's Commandos consist of three Mk 2A transports, one VIP Mk 2C, and eight Exocet-equipped antiship Mk 3s; the transports serve with No. 9 (Multirole) Squadron and the Mk 3s with No. 8 (ASV) Squadron.

Still-active helicopters delivered by Agusta of Italy include two VIP AS-61As and 10 antisubmarine ASH-3Ds in Iran, three utility AS-61Ts in Iraq, and a single VIP AS-61A in Libya. (Data for Commando Mk 2.)

Contractor: Westland Helicopters, UK.

Power Plant: two Rolls-Royce Gnome H.1400-1 turbo-shafts; each 1,660 shp.

Dimensions: rotor diameter 62 ft 0 in, fuselage length 55 ft 10 in, height 16 ft 10 in.

Weights: empty 12,390 lb, gross 21,500 lb.
Performance: max speed at S/L 140 mph, cruising speed at S/L 126 mph, hovering ceiling 1GE 6,500 ft, range 246 miles with max payload and fuel reserves, 920 miles with max fuel.

Accommodation: crew of two; up to 28 troops (21 in Mk 1).

Armament: provision for guns, missiles, rocket pods, bombs, torpedoes, depth charges, or other weapons, according to mission requirements.

SH-2G Seasprite

This twin-turbine antisubmarine helicopter has filled the US Navy's LAMPS I (Light Airborne Multipurpose System) requirement since late 1971, notwithstanding the introduction of the more sophisticated LAMPS III Sikorsky SH-60. New-build production of the SH-2G ended in early 1993, and conversion of earlier SH-2Fs to the same standard ended more than a year later. Seasprites received a special upgrade for service in the Persian Gulf from 1987, which may have helped persuade the Egyptian Navy to place a contract in February 1995 for 10 SH-2Gs. These, too, are re-manufactured from ex-USN F models, with new T700 engines offering more than 20 percent better fuel consumption. Other improvements include Bendix AQ5-18A dipping sonar, LN-66HP surveillance radar, self-protection systems, and cockpit/avionics upgrades. Deliveries will be made in 1997–98. Egypt has been negotiating to buy a second batch of 10.

Contractor: Kaman Aerospace Corporation, USA.

Power Plant: two General Electric T700-GE-401 turboshafts; each 1,723 shp.

Dimensions: rotor diameter 44 ft 0 in, fuselage length 40 ft 6 in (38 ft 4 in with nose and blades folded), height 15 ft 2 in.

Weights: empty 9,200 lb, gross 13,500 lb.
Performance: max speed at S/L 159 mph, normal cruising speed 138 mph, ceiling 23,900 ft, max range with two external fuel tanks 500 miles.

Accommodation: crew of three; one passenger with LAMPS equipment installed, or four passengers or two litters with sonobuoy launcher removed.

Armament: one or two Mk 46 or Mk 50 torpedoes and eight smoke markers; provision for 7.62-mm gun in each cabin doorway.

Reconnaissance and Special-Mission Aircraft

Beechcraft 1900C-1 and Super King Air

Orders for the Beechcraft 1900C-1, better known as a civil commuter, cargo, or executive aircraft, included a 1985 contract for six for the Egyptian Air Force: four for electronic surveillance and two for maritime patrol. This model has a "wet" wing offering much better payload/range performance than the original Model 1900. Four were delivered in 1988 and two the follow-

ing year. Equipment in the elint aircraft has not been revealed but may be similar to that in the US Army's RC-12 Guardrail Common Sensor aircraft. A fifth and sixth EW aircraft delivered to Egypt in September 1992 were described as having all main cabin windows deleted, an underfuselage radome forward of the wing, and more antennas above and below wings and fuselage than the previous elint quartet. Two of these antennas were of the "hockey stick" shape associated with Guardrail equipment.

The maritime pair are each equipped with weather radar, Daimo Victor S-3075 ESM, and a long ventral pod containing a Motorola SLAMMR (side-looking airborne modular multimission radar). The cargo door of the standard 1900C-1 and about half of the main cabin windows are deleted; ESM equipment is thought to include a tailcone-mounted radar warning receiver. Maritime and EEZ patrol is also the function of two Super King Air 200Ts operated by the Algerian Air Force since the early 1980s. (Data for 1900C-1.)

Contractor: Raytheon Aircraft Company, USA.

Power Plant: two Pratt & Whitney Aircraft of Canada PT6A-65B turboprops; each 1,100 shp.

Dimensions: span 54 ft 5 $\frac{1}{2}$ in, length 57 ft 10 in, height 14 ft 5 $\frac{1}{2}$ in.

Weights: empty approx 9,850 lb, gross 16,600 lb.
Performance: max cruising speed at 8,000–16,000 ft 307 mph, ceiling more than 25,000 ft, T-O run 2,200 ft, landing run 1,530 ft, range 1,806 miles.

Accommodation: crew of one or two; mission systems operators according to role.

Armament: none known.

Boeing 707-320

The Bedek Aviation Division of Israel Aircraft Industries has made a speciality of converting large transport aircraft for alternative roles, for the country's air force and for export. The Israel Air Force inventory includes at least 12 707s (including six tankers, which see). Two are airborne early warning aircraft, which have the Hebrew name Tavas ("peacock"). Based with them at Lod are two EC-707 elint conversions (Hasida: "stork") and two sigint RC-707s (Barboor: "swan"), operated by No. 134 Squadron. (See *Transports and Tankers section for data.*)

E-2C Hawkeye

Unlike those of the US Navy, the Hawkeye AEW aircraft acquired by foreign customers all operate from land bases. Four Group 0 E-2Cs, delivered in 1977–78, equip Israel's No. 192 Squadron at Hatzarim. They are known locally by the Hebrew name Daya ("kite"). Egypt received five Group 0s from 1987, and a sixth, to upgrade Group II standard, was delivered in 1993. These form the AEW squadron of No. 222 Fighter Regiment and are based at Cairo West.

The Martin Marietta (now Lockheed Martin) AN/APS-125 radars of all except the last Egyptian E-2C are less advanced than the APS-145 fitted to Group II US Navy Hawkeyes. The AN/APS-145 has greater resistance to jamming, better overland detection, and can detect and classify approaching aircraft more than 345 miles away, track more than 2,000 targets simultaneously and automatically, and control more than 40 intercepts.

Loral's TRAC-A (Total Radiation Aperture Control) radar and IFF antennas are mounted in a 24-ft-diameter disc above the center-fuselage, rotating at five to six rpm; vertical tail surfaces are made of glassfiber to avoid compromising the radar. An ATDS (airborne tactical data system) compartment in the center-fuselage receives and displays incoming intelligence to the combat information center officer, air control officer, and radar operator. Other Group II improvements include JTIDS tactical software, upgraded engines, and provision for GPS navigation. (Data for US Navy Group II E-2C.)

Contractor: Northrop Grumman Corporation, USA.

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

Dimensions: span 80 ft 7 in, length 57 ft 9 in, height 18 ft 4 in.

Weights: empty 40,484 lb, gross 54,426 lb.
Performance: max speed 389 mph, cruising speed for max range 299 mph, ceiling 37,000 ft, min T-O run 1,850 ft, min landing run 1,440 ft, on-station endurance 200 miles from base 4 hr 24 min, max endurance 6 hr 15 min.

Accommodation: flight crew of two; three mission personnel.

Armament: none.

E-3A Sentry

Five standard Boeing E-3A AWACS aircraft, delivered from 1986, are operated by No. 18 Squadron of the Royal Saudi Air Force from Riyadh Military City Airport. Carrying one or more relief crews, and refueled in flight by KE-3A tankers, each E-3A can stay aloft for an average mission time of 16–18 hours, with two or more orbiting aircraft providing a constant radar picture of the region from the Red Sea to the Arabian Sea. Up to 600 low-flying aircraft can be tracked by its

Westinghouse AN/APY-2 radar, the 24-ft antenna for which is housed in a 30-ft-diameter dorsal rotodome rotating at 6 rpm when in active use.

Contractor: Boeing Aerospace Company, USA.

Power Plant: four CFM International CFM56-2A-2 turbofans; each 24,000 lb thrust.

Dimensions: span 145 ft 9 in, length 152 ft 11 in, height 41 ft 9 in.

Weights: empty (estimated) 160,000 lb, gross 335,000 lb.

Performance: max speed at 40,000 ft 530 mph, ceiling approx 40,000 ft, T-O run approx 5,200 ft, landing run approx 2,500 ft, on-station endurance 1,000 miles from base 6 hr, max endurance (unrefueled) 11 hr.

Accommodation: flight crew of four; up to 13 specialist AWACS personnel.

Armament: none.

MiG-21R ("Fishbed-H")

The Egyptian Air Force has a reconnaissance regiment of 20 MiG-21Rs, each fitted with a locally produced underfuselage pack of three cameras. (Data generally as MiG-21MF.)

MiG-25R ("Foxbat")

Reconnaissance MiG-25Rs are deployed side by side with fighter versions by the air forces of Algeria (three), Libya (five), and Syria (eight). All are believed to be of the original RB series ("Foxbat-B"), with a nose-mounted pack of cameras and elint sensors. They have no guns but can make precision automatic attacks with bombs in all weather, day and night, at supersonic speed, and from heights above 65,000 ft, against targets with known geographic coordinates. Equipment includes INS, updated by Doppler. Range at subsonic speed can be extended to nearly 1,500 miles by attaching a 1,400-gallon conformal underbelly fuel tank. Supersonic cruising speed is Mach 2.35.

Contractor: Mikoyan OKB, Russia.

Power Plant: two Soyuz/Tumansky R-15B2-300 turbojets, each 24,675 lb thrust with afterburning.

Dimensions: span 44 ft 0¼ in, length 70 ft 8½ in, height 21 ft 4 in.

Weight: gross 81,570-90,830 lb.

Performance: max speed at height Mach 2.83, at S/L Mach 0.98, ceiling 68,900 ft, range at supersonic speed on internal fuel 1,015 miles, subsonic with underbelly tank 1,490 miles.

Accommodation: pilot only, on zero-height/80-775 mph ejection seat.

Armament: provision for six 1,100-lb bombs on two underfuselage and four underwing pylons.

Mirage 5R

Compared with the basic Mirage 5 fighter/ground-attack aircraft, the tactical reconnaissance 5R is identified by a different nose profile, adapted to accept a pallet housing three oblique and two vertical Omera 31 film cameras for all-altitude day and night missions. It is operated by the air forces of the United Arab Emirates (three), Egypt (six), and Libya (eight). (Data generally as for Mirage 5A.)

RC-12D/K and R/EU-21A/D

The RC-12D and RC-12K are sigint/elint aircraft using the Beechcraft Super King Air 200 airframe. Similar to the Guardrail RC-12s operated by the US Army for battlefield intelligence-gathering, they are characterized by many large dipole antennas sprouting above and below the airframe. Five RC-12Ds and two RC-12Ks, known locally as *Kookiya* ("cuckoo"), were supplied to the Israel Defense Force's No. 191 Squadron under FMS. The squadron also has two RU-21As and four other Super King Air 200s (*Tsofit*: "thrush") for similar duties. Four ex-US Army EU-21As (converted U-21As) and EU-21Ds (ex-U-21Ds), combining the unpressurized fuselage of the Beech Queen Air 65-80 with the wings of the King Air 90, serve with No. 128 Squadron; local name is *Sh'hafit* ("ibis"). (Data for RC-12D.)

Contractor: Raytheon Aircraft Company, USA.

Power Plant: two Pratt & Whitney Canada PT6A-41 turboprops; each 850 shp.

Dimensions: span over wingtip pods 57 ft 10 in, length 43 ft 10 in, height 15 ft 5 in.

Weights: empty 8,143 lb, gross 14,200 lb.

Performance: max speed at 14,000 ft 299 mph, ceiling 31,000 ft, T-O run approx 1,850 ft, landing run approx 1,750 ft, range approx 1,750 miles.

Accommodation: flight crew of two; up to eight other personnel.

Armament: none.

RF-4 Phantom II

Israel's air force has 10 RF-4E reconnaissance Phantoms (known by the name *Oref*: "raven"), equipped with Israeli-manufactured reconnaissance and avionics equipment, and self-defense AAMs. Three of its F-4E fighters were sent to the US in 1975-76 for conversion to F-4E(S) ("special") standard. This involved deleting the AN/APQ-120 radar and fitting a huge General

Dynamics HIAC-1 high-altitude, high-resolution camera, a normal vertical KS-87 camera, and data link and other equipment into a new 70-cu-ft nose, which increased the Phantom's length by 12 in. Two are thought still to be operational, offering a reconnaissance capability as good as that of any comparable system in the world. Six standard RF-4Es remain serviceable in Iran with oblique/panoramic cameras and SLAR/IR sensors in the modified nose. (RF-4E data similar to those for F-4E, except as follows.)

Weights: empty 31,110 lb, gross 52,835 lb.

Performance: max speed at 40,000 ft Mach 2.25, at S/L Mach 1.2, ceiling 62,250 ft, ferry range 2,170 miles.

Armament: normally none, but Israeli aircraft carry Python, Shafrir, or Sidewinder self-defense AAMs.

RF-5E TigerEye

Side-by-side with its F-5 fighters, No. 17 Squadron of the Royal Saudi Air Force, at Tabuk, has 10 RF-5E reconnaissance aircraft. Capable of round-the-clock operation, the single-seat TigerEye differs from the F-5E in having a longer nose of modified shape. A KS-87D oblique camera is standard and can be combined with one of three interchangeable nose pallets: one with a single LOROP (long-range oblique photography)



SH-2G Seasprite, ordered for Egyptian Navy



Boeing 707-320 (Rem), Israel Air Force (Robbie Shaw)

camera, another with one medium- and one low-altitude pan camera, and a third that adds a Texas Instruments RS-700 infrared linescan to the two pan cameras. The Royal Moroccan Air Force has two early model RF-5As. (RF-5E data generally as for F-5E, except as follows.)

Dimensions: length 48 ft 0¼ in.

Performance: combat radius with three drop tanks and two AIM-9 Sidewinder AAMs 403 miles (lo-lo-lo), 610 miles (hi-lo-hi).

Transports and Tankers

An-24/26 ("Coke/Curl")

Between 1960 and 1979, about 1,200 An-24 ("Coke") twin-turboprop transports were built, the final versions with 2,515 ehp Al-24A engines, an optional Type RU-19-300 auxiliary turbojet in the rear of the starboard nacelle, and a payload of up to 50 passengers or 10,168 lb of freight. To improve the freighter configuration, Oleg Antonov designed a unique rear-loading ramp that forms the underside of the fuselage when retracted but can slide forward under the rear of the cabin for direct loading onto the floor of the hold, or when cargo is to be air-dropped. He then swept up the rear fuselage for much-enhanced access, to create the An-26 ("Curl"). With uprated turboprops, it offered increased performance and payload. Approximately

1,410 were built in 1968-85, and derivatives are still in production in China.

Algeria and Iraq each have about six An-26s; the Libyan Arab Republic Air Force has eight; Syria's single An-24 and five An-26s operate in civil markings but are available to the military. The Republic of Yemen Air Force has a total of 13 An-24s and An-26s. Iran will receive 14 Xian Y7 Chinese-built An-26 look-alikes over the next decade, but it is not known whether they will bear military or civil markings. (Data for An-26.)

Contractor: Antonov OKB, Ukraine.

Power Plant: two ZMKB Progress AI-24VT turboprops; each 2,780 ehp. One 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 9½ in, length 78 ft 1 in, height 28 ft 1½ in.

Weights: empty 32,518 lb, gross 52,911 lb.

Performance: cruising speed at 19,685 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. Electrically powered mobile hoist, capacity 4,409 lb, and conveyor. Provision for carrying 40 paratroops or 24 litters. Improved An-26B version has roll-gangs and mechanical handling system, enabling two men to load or unload three 8-ft-long standard freight pallets in 30 min.

Armament: provision for bomb rack on fuselage below each wingroot trailing-edge.

Boeing 707

Transport and/or tanker versions of this veteran airliner serve with a half-dozen air forces in the region. The fleets of Iran (14) and Israel (14) include four (Iran) and six (Israel) 707-320s converted to flight refueling tankers; eight tankers, illogically designated KE-3A, are based with the E-3As of No. 18 Squadron of the Royal Saudi Air Force at Riyadh. These can transfer up to 123,190 lb of fuel to fighters or other aircraft 1,150 miles from their base. The Royal Moroccan Air Force has a short-fuselage 707-138 tanker, converted in-country by AMIN (Aéro Maroc Industrie). Israeli conversions, undertaken by IAI's Bedek Aviation Division, have the local name *Saknayee* ("pelican"). Other 707s serve as personnel or VIP transports with Egypt (one 707-320), Iran (10 707-320s), Israel (two 707-320s, known as *Rem*: "unicorn"), Libya (one 707-320), Morocco (one 707-138), and Saudi Arabia (one 707-138 and two 707-320s). (Data for basic 707-320, except where indicated.)

Contractor: Boeing Commercial Airplanes, USA.

Power Plant: four Pratt & Whitney JT3D-7 turbofans; each 19,000 lb thrust.

Dimensions: span 145 ft 9 in, length 152 ft 11 in, height 42 ft 5 in.

Weights (IAI tanker/transport): empty 145,000 lb, gross 335,000 lb.

Performance: max cruising speed at 25,000 ft 605 mph, ceiling 39,000 ft, T-O to 35 ft 10,020 ft, landing run 2,575 ft, range with 88,000 lb payload 3,625 miles, with max fuel 5,755 miles.

Accommodation: flight crew of three; standard airliner seats up to 219 passengers; elint/tanker variants carry appropriate mission personnel; VIP transports individually customized.

Armament: none.

Boeing 747

Pre-revolution Iran was an early customer in the 1970s for six ex-airline 747-100s, three of which were converted as flight refueling tankers. The tankers are believed to remain in service, along with about four of a batch of 747-200F freighters ordered later. Two civil-registered short-fuselage 747SPs form part of the Royal Flight in Oman. The other Middle East operator is Saudi Arabia, whose Royal Flight includes two 747SPs and a more recently acquired 747-300. These are operated on its behalf by the commercial airline Saudia. (Data for 747-200F.)

Contractor: Boeing Commercial Airplanes, USA.

Power Plant: four Pratt & Whitney JT9D-7R4G2 turbofans initially; each 54,750 lb thrust. Later options include General Electric CF6-50E2 (52,500 lb thrust) and CF6-80C2 (56,700 lb) or Rolls-Royce RB211-524D4 (53,110 lb) turbofans.

Dimensions: span 195 ft 8 in, length 231 ft 10 in (747SP, 184 ft 9 in), height 63 ft 5 in.

Weights: empty 342,700-349,300 lb, gross 785,000-833,000 lb.

Performance (at 785,000 lb T-O weight, JT9D engines): max speed at 30,000 ft 600 mph, ceiling 45,000 ft, T-O to 35 ft 10,350 ft, landing from 50 ft 6,900 ft, range 3,570-8,020 miles.

Accommodation: crew of three; up to 254,640 lb of cargo. **Armament:** none.

C-130 Hercules

More than 20 veteran C-130Es still serve with the air forces of Iran, Israel, and Saudi Arabia, and even five C-130Bs with Tunisia; but most Hercules transports in the Middle East are recent-production C-130Hs or L-100s. Standard-length C-130Hs are operated by Abu Dhabi (six), Algeria (10), Egypt (19), Iran (about 10), Israel (10), Jordan (four), Libya (seven), Morocco (13), Oman (three), Saudi Arabia (22), Tunisia (two), and Yemen (two). VIP transport versions serve with Egypt and Saudi Arabia; Israel has two KC-130H hose/reel tankers, Morocco (two), and Kuwait Arabia (eight); Egypt has two (unofficially "EC-130H") converted for electronic warfare/elint duties, Israel two for ECM duties, and Morocco two "RC-130H" border surveillance Hercules with a SLAR (side-looking airborne radar) in the starboard mainwheel fairing.

Stretched Hercules are operated by Algeria (seven C-130H-30s), Dubai (one H-30, one L-100-30), Egypt (three H-30s), Kuwait (three L-100-30s), and Saudi Arabia (eight L-100-30s). Three of Saudi Arabia's C-130Hs and one L-100-30 are outfitted as AEHs (airborne emergency hospitals). Israel calls its C/KC-130s by the name Karnaf ("rhinoceros") and its EC-130 Aya ("condor"). (Data for current basic C-130H.)

Contractor: Lockheed Martin Corporation, USA.
Power Plant: four Allison T56-A-15 turboprops; each 4,508 ehp.

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: (at 155,000 lb gross weight): max cruising speed at 20,000 ft 362 mph, ceiling 26,500 ft, T-O run 4,000 ft, landing run 1,700 ft, range with 40,000-lb payload 2,238 miles.

Accommodation: flight crew of four, plus optional loadmaster/jumpmaster; up to 64 paratroops, 92 troops, or 74 litters plus two medical attendants standard (92/128/97/4 in H-30), or up to 42,673 lb of light armored vehicles/artillery, supply pallets, or other cargo.

Armament: none.

CN-235M

The Royal Saudi Air Force received two CN-235Ms configured as VIP transports in February 1987, followed two months later by two standard general-purpose transports. Assigned to No. 1 Squadron at Riyadh, these early aircraft are Series 10s with 1,700 shp CT7-7A turboprops; later production aircraft, with Dash 9C engines, are designated Series 100 and 200. Morocco's seven Spanish-built Series 100s, including one to VIP standard, were delivered from September 1990 and are stationed at Kenitra AB; the seven for Abu Dhabi, delivered from August 1993, were produced in Indonesia by IPTN and serve with the transport squadron of the UAE Air Force. Two other civil-registered CN-235 Ms are operated from Muscat by the Police Air Wing of Oman. (Data for Series 100.)

Contractor: Aircraft Technology Industries (Airtech), a Spanish-Indonesian company.

Power Plant: two General Electric CT7-9C turboprops; each 1,750 shp (1,870 shp with automatic power reserve).

Dimensions: span 84 ft 8 in, length 70 ft 2½ in, height 26 ft 10 in.

Weights: empty 19,400 lb, gross 36,376 lb.

Performance: max cruising speed at 15,000 ft 286 mph, ceiling 26,600 ft, T-O to 50 ft 4,235 ft, landing run with propeller reversal 1,306 ft, range with 13,227-lb max payload 932 miles, with 7,826-lb payload 2,704 miles.

Accommodation: flight crew of two; up to 46 paratroops, 48 troops, 24 litters and four medical personnel, or equivalent cargo, plus jumpmaster/loadmaster when appropriate.

Armament: provision for six underwing stations for up to 7,716 lb of ASMs, bombs, or other weapons or stores.

F27 Friendship/Troopship

The number of military F27s in Iran appears to have stabilized at a total of 10 Mk 400Ms and Mk 600s in the Air Force and two of each version in the Navy. Both the Mk 400 and Mk 600 have a large cargo door, but the latter lacks the reinforced and watertight cabin floor of the dedicated military version. The Mk 600 has airline-type seating for 44 passengers, whereas the Mk 400M has folding sidewall canvas seats. Both can be operated in all-cargo or combi forms.

The Republic of Yemen Air Force is reported to have two F27s. Those once operated by the Algerian Air Force were transferred to the civil register, but one Mk 400M and one Mk 600 appear to be available for military operation when required. (Data for Mk 400M.)

Contractor: Royal Netherlands Aircraft Factories NV Fokker, the Netherlands.

Power Plant: two Rolls-Royce Dart Mk 532-7R turboprops; each 2,140 ehp.

Dimensions: span 95 ft 2 in, length 77 ft 3½ in, height 27 ft 11 in.

Weights: empty 25,696 lb, gross 45,000 lb.



L-100-30 Hercules, Kuwait Air Force
(Robbie Shaw)



CN-235M Series 100, Royal Moroccan Air Force
(Robbie Shaw)

Performance: normal cruising speed at 20,000 ft 298 mph, ceiling 30,000 ft, T-O run 3,200 ft, landing run 2,000 ft, range (all-cargo) with standard fuel 1,375 miles, with max fuel 2,727 miles.

Accommodation: crew of two or three; 13,283 lb of freight, up to 46 troops, or 24 litter patients and nine attendants or sitting casualties.

Armament: none.

G222T

Libya's decision to purchase Italian-built G222s was frustrated initially by a US embargo on the aircraft's standard General Electric T64 turboprops and US avionics, but 20 of a revised version, designated G222T, with Rolls-Royce Tyne turboprops and UK/French equipment, were delivered from 1981. These are likely to be in poor condition following a mid-1980s Italian embargo on spares, and Libya was not permitted to take up its option on further G222Ts, only 16 of which remain. The single standard G222 supplied to Dubai is no longer in service.

Contractor: Aeritalia SpA (now Alenia), Italy.

Power Plant: two Rolls-Royce Tyne RTy.20 Mk 801 turboprops; each 4,860 shp.

Dimensions: span 94 ft 2 in, length 74 ft 5½ in, height 32 ft 1¾ in.

Weights: empty 39,685 lb, gross 63,935 lb.

Performance: long-range cruising speed at 30,000 ft 345 mph, T-O run 2,130 ft, landing run 1,240 ft, range with max payload 1,174 miles, with max fuel (ferry) 3,166 miles.

Accommodation: crew of three; 53 troops on folding and stowable seats; 42 paratroops; 36 litters, two seated casualties, and four attendants; or 19,840 lb of freight, vehicles, and guns.

Armament: none.

IAI Arava

At Ben-Gurion International Airport, No. 126 Squadron of the Israel Air Force uses a handful of standard IAI 201s, as both light transports and for operational conversion of pilots assigned to transport units. It also has up to eight IAI 202 elint conversions, which have flown in at least two configurations. One of these has blade antennas located on the wings, tailbooms, flight deck roof, and elsewhere. Another, equipped with an Elta EL/L-8310 elint system, features a canister-shaped antenna stowed against the lower fuselage on the port side, just aft of the propeller plane; in operation this is lowered to an under-fuselage location, enabling it to scan through a full 360°. (Data for IAI 201.)

Contractor: Israel Aircraft Industries Ltd, Israel.

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, range with max payload 174 miles, with max fuel 656 miles.

Accommodation: flight crew of one or two; 16 paratroops plus two dispatchers, 24 troops, 12 litters plus two medical personnel, small wheeled vehicles (loaded via rear fuselage swing-tail), or equivalent cargo.

Armament: (optional): 0.50-in Browning machine gun pack and/or six-rd 82-mm rocket pod on each side of fuselage.

Il-76 ("Candid") and Adnan 1

Few of the Il-76s exported to the Middle East/North Africa region are allocated to only military or commercial use. Many spend time in the insignia of national airlines that make aircraft and crews available to the military when needed. As a result, Il-76Ms, with a rear gun turret but no weapons installed, arrive at civil airports on commercial business, while turretless Il-76Ts haul military cargoes. Typically, Jamahiriya Libyan Arab Airlines has a mix of 21 Il-76Ts and Ms; Syrianair has two of each version. Before Desert Storm, Iraqi Airways operated a large fleet of Il-76Ts and Ms, mainly for military duties, of which many were destroyed; 13 were flown to sanctuary in Iran and impounded. These included one of the AEW&C conversions that had been produced in Iraq under the name Adnan 1; another was put out of commission during an attack on Al Taqaddum Airfield. With a dorsal rotodome, Adnan 1 closely resembles the Russian A-50 AEW&C derivative of the Il-76 but can be identified by two large strakes under the rear fuselage. A further Il-76 operator in this region is the Algerian Air Force, which has four standard transports. (Data for Il-76M.)

Contractor: Ilyushin OKB, Russia.

Power Plant: four Aviadvigatel D-30KP turbofans; each 26,455 lb thrust.

Dimensions: span 165 ft 8 in, length 152 ft 10¼ in, height 48 ft 5 in.

Weight: gross 374,785 lb.

Performance: cruising speed at 29,500–39,350 ft 466–497 mph, ceiling 50,850 ft, T-O run 2,790 ft, landing run 1,475 ft, nominal range with max payload 3,100 miles, max range 4,163 miles.

Accommodation: crew of seven, incl two freight handlers; 88,185 lb of freight, or 140 troops, or 125 paratroops.

Armament: two 23-mm twin-barrel GSh-23L guns in tail turret.

L-410

Designed originally as a general-purpose light transport for the short-haul routes of the former Soviet airline Aeroflot, the L-410 flew for the first time in April 1969. More than 1,100 have since been built, the initial version (146 produced) being succeeded in 1980 by the improved L-410UVP (512 built) and since 1985 by the further upgraded L-410UVP-E with four extra passenger seats, permanent wingtip fuel tanks, and five-blade propellers. Libya received at least 18 UVPs, of which about 14 remain. Three UVP-Es were delivered to Tunisia in 1994, forming the utility element of No. 21 Squadron at Bizerte. (Data for L-410UVP-E.)

Contractor: Let Kunovice, Czech Republic.

Power Plant: Two Walter M 601E turboprops; each 750 shp.

Dimensions: span over tip tanks 65 ft 6½ in, length 47 ft 3¾ in, height 19 ft 1½ in.

Weights: empty 8,730 lb, gross 14,550 lb.

Performance: max cruising speed at 13,780 ft 236 mph, ceiling 21,200 ft, T-O run 1,495 ft, landing run 1,060 ft, range 416 miles with max payload, 818 miles with max fuel.

Accommodation: crew of one or two; up to 19 passengers, 18 paratroops and a dispatcher, six litters plus five seated patients and a medical attendant, or 3,560 lb of cargo.

Armament: none.

Skyvan 3M

Photographs taken at Sana'a Airport in Yemen revealed that two Skyvan 3Ms delivered to that country in the mid-1970s appear to be still available to the Air Force. The 6 ft 4 in square cabin cross section, rear loading, and low floor of the little Skyvan enable it to handle a surprising variety of awkward shaped loads or cabin installations. The Royal Air Force of Oman has eight standard 3M transports in its No. 2 Squadron at Muscat-Seeb. The Dubai Transport Squadron of the UAE Air Force has a single Skyvan 3M, plus a Shorts 330 UTT, similar in configuration but larger, with room for 33 troops, or 30 paratroops and jumpmaster, or 15 litters and four seated personnel in an ambulance role. Both were acquired from the Sharjah Amiri Guard Air Wing in 1995. (Data for Skyvan 3M.)

Contractor: Short Brothers plc, UK.

Power Plant: two AlliedSignal TPE331-2-201A turboprops; each 715 shp.

Dimensions: span 64 ft 11 in, length 41 ft 4 in, height 15 ft 1 in.

Weights: empty 7,400 lb, gross 13,700–14,500 lb.

Performance: (at 13,700 lb gross weight): max cruising speed at 10,000 ft 202 mph, ceiling 22,000 ft, T-O run 780 ft, landing run 695 ft, range with 5,000-lb payload 240 miles, with max fuel 670 miles.

Accommodation: flight crew of one or two; 16 paratroops plus dispatcher, 22 troops, 12 litters plus two medical personnel, or 5,200 lb of cargo.

Armament: none.

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Variations in the airfoil trace the history of flight.

By Walter J. Boyne



Wings

WINGS have always captured human imagination. The mythology of flight is found in every culture. Despite this fascination, it was not until the nineteenth century that scientists began to use precise mathematics to compute the optimum size and shape of wings for a flying machine.

Orville and Wilbur Wright did it best with their 1903 Flyer, forcing competitors to try wings of all shapes, styles, and dimensions to avoid infringing on their patents. Some went to multiple wings—triplanes, quadraplanes, and more. Others altered the shape of wings to sweptback, tandem, joined, and cruciform.

Most of the results were too inefficient to fly; some were capable of generating just enough lift to stagger through the air if coupled with a sufficiently powerful engine, and a very few were both stable and efficient.

Some concepts were diametrically opposed—very low aspect ratio (the ratio of span to chord) vs. high aspect ratio, or a pure wing form vs. a lifting body—yet success was sometimes found at either end of the spectrum.

From the 1920s through the 1940s, advances in aeronautical engineering resulted in much stronger, more complex wings using now familiar high-lift devices and modern airfoils. Nonetheless, variations in span, incidence, and geometry persisted. For some, the ultimate goal became the elimination of all surfaces except

the wing, or the elimination of all or part of the wing.

Aerodynamic Magic

Since the late 1940s, aerodynamic progress has accelerated at an ever greater rate, so much so that modern engineering methods and materials have combined with new requirements to create totally new wing configurations. Now, elaborate high-lift devices are tucked into wing leading and trailing edges to deploy during the approach to landing, with the slats and flaps folding out like handkerchiefs from a magician's sleeve.

Some by-products have become perhaps too sophisticated. Where the thick wing of a Douglas C-47 "Gooney Bird" would let you plow through cold, wet clouds forever, shaking off the ice buildup with pneumatic boots, some modern airfoils—as on the Aerospatiale/Alenia ATR-42—have become so efficient that even a small buildup of ice becomes a deadly hazard.

On the other hand, the increased sophistication has occasionally permitted a return to some of the ideas put forward by earlier inventors but not realized at the time for technical, mechanical, or even political, reasons. Thus, the unsuccessful tandem wing design of Samuel Pierpont Langley was reprised through the years, first by the French Albessard "Tri-avion" and Arsenal-Delanne 10 fighter, and most recently by Burt Rutan with his Advanced Technology Tactical Transport.

At least since the Greeks crafted the myth of Icarus (depicted here in an eighteenth century woodcut), man has dreamt of taking wing. That dream was realized in 1903 by the Wright brothers and is carried on today in the B-2, the most successful flying-wing design ever.





In a similar way, the greatest comeback has been that of the flying wing, well expressed by the Wrights in their 1901 glider and found now on the flight line at Whiteman AFB, Mo., in the superlative form of the Northrop Grumman B-2 bomber.

The Wrights went on to attach elevators and rudders but maintained their strongly braced biplane wings. This combination of wings was a masterpiece of design, with a balance of span, chord, and gap that was imitated by myriad other designers. Coupled with their insight into the need for three-axis control, the Wrights set the pattern for most other inventors of the time, few of whom were deterred by the brothers' patents.

Some, such as Glenn H. Curtiss, used a similar biplane layout, employing ailerons in an attempt to circumvent the patents. Other inventors depended on their intuition, their aesthetic sense, or their fascination with complex mechanical solutions to approach flight in a way they hoped differed from the Wrights' method.

Wilbur Wright's triumphant exhibition at Le Mans, France, in 1908 opened the floodgates of European imagination and turned loose an outpouring of innovative designs. Although most of these were failures, many of them forecast future trends.

The low aspect ratio found in the Lockheed Martin F-117 Nighthawk stealth fighter or the older Convair F-102 Delta Dagger and F-106 Delta Dart interceptors was anticipated by many aircraft, beginning with

trolled flights around its home field at Cicero, Ill.

Flying Flapjacks

In later years, there were dozens of attempts to obtain the high lift believed to be inherent in low-aspect-ratio aircraft. Some of the most successful of these were designed by Charles H. Zimmerman, who enhanced the low-aspect-ratio concept by directing the airflow from very large propellers over the entire wing surface in the 1942 Vought V-173 "Flying Pancake."

The V-173 was flown successfully by Boone T. Guyton, Charles A. Lindbergh, and Najeeb E. Halaby, among others, and was developed into the wicked-looking Vought XF5U-1, a



Photo courtesy Art Schoeni

Aircraft designers sometimes use the same approach to solve different problems. The Vought V-173 "Flying Pancake" (above) owes its low-aspect-ratio design to a quest for reduced drag, while Lockheed Martin's F-117 (top) takes a similar shape in order to reduce radar signature.

the Flick-Reinig "Apteroid" of 1911, whose biplane wings ran fore and aft along the fuselage rather than perpendicular to it, as if it had been packaged for shipment by railcar.

Many low-aspect-ratio airplanes followed, including the McConnick Romme "umbrella plane" of 1912. Designed by the young Chance Vought, it had a circular wing absolutely devoid of camber and in appearance was no more than a set of loosely connected awnings. When a rip-roaring fifty-horsepower Gnome-Rhône rotary engine was installed, however, the "doughnut," as it was called, not only managed to get airborne but made con-

ventional circular-planform Navy fighter. The XF5U-1, too radical and made obsolete by the jet engine, was dismantled before its first flight.

Low-aspect-ratio wings found their ultimate expression in the delta-wing designs that flowed from the genius of Dr. Alexander M. Lippisch, whose first delta-wing aircraft flew in 1931. He followed with a series of innovative designs, most notably the world's first delta-wing, rocket-powered fighter—the Messerschmitt Me-163 Komet. After World War II, the delta-wing layout served many aircraft well, including the beautiful Convair B-58 Hustler, the first su-

personic bomber. Foreign manufacturers who adopted the delta configuration include Dassault, Avro, Fairey, Saab, Tupelov, and the MiG Design Bureau.

Success was easier at the other end of the aspect-ratio spectrum. High-aspect-ratio wings were undeniably efficient and were widely used by sailplanes. The French manufacturer Hurel-Dubois carried the idea a step further with its extremely high-aspect-ratio, strut-braced-wing aircraft of the late 1940s. The idea lapsed for years, only to be revived by the successful Short Brothers transports, such as USAF's C-23 Sherpa.

By the 1930s, while most of the world's aeronautical engineers struggled toward a common denominator of the cantilever low-wing all-metal aircraft, some designers persisted in pressing for unorthodox solutions to specific problems.

The concept of variable-span wings was tried in the 1931 monoplane designed in France by Mikhail Makhonine, a Russian engineer. The handsome aircraft featured extensible outer wing panels that could vary the wingspan from forty-three feet to sixty-nine feet and the wing area from 226 to 335 square feet. The greater wingspan allowed for takeoff with greater loads. At altitude, the wings retracted for more speed.

Other inventors sought safety with their unorthodox designs. In 1931, Al-

bert A. Merrill designed a stall-proof biplane. That same year, George W. Cornelius created his first variable-angle-of-incidence aircraft and followed it a few years later with his "Mallard," which had both variable incidence and forward-swept wings. The practical success of variable incidence came in 1955 with the debut of the Vought (later LTV) F8U Crusader, whose object was not avoiding a stall but getting off a carrier deck.

The Germans led the way in variable-geometry wings with the Messerschmitt P-1101 jet prototype. It never flew but was to have had

ground-adjustable wing sweep for comparative flight tests. Bell adapted the design in 1951 with the X-5, whose wings could be swept from 20° to 60°, making it the first high-performance aircraft to fly with a variable-geometry wing.

Grumman experimented with variable-geometry wings in its unsuccessful XF10F-1 Jaguar of 1952. The principle of the swing wing served its successor, the F-14 Tomcat, well, as it did a number of US and foreign aircraft, including the US F-111 and B-1, the Soviet MiG-23 and Su-24, and the European consortium Panavia's Tornado.

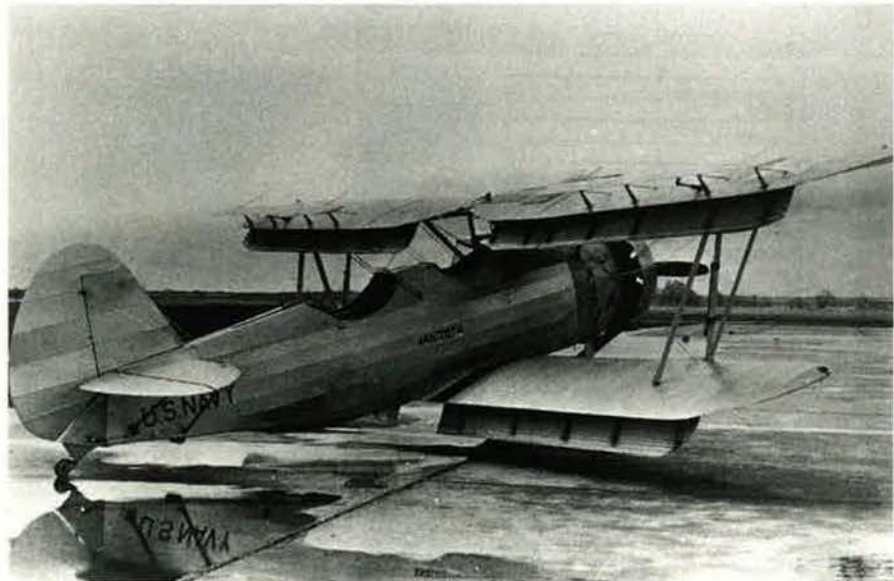


Photo courtesy Warren Bodie



Ever since the Wrights discovered wing-warping, designers have manipulated the size and shape of wings for better performance, from the Berliner-Joyce XO-J1 with its "zap flaps" (top) to the Boeing-NASA-USAF F-111 with mission adaptive wing (above).

Accidental Benefit

Fixed wing sweep had been built into dozens of aircraft since the earliest days of flight, often as a solution to center-of-gravity problems. Sweep designed to raise the limiting Mach number had been a subject of study since the early 1930s but appeared quite by accident on an early operational jet fighter, the Messerschmitt Me-262, first flown July 18, 1942. The Me-262 had been originally designed as a straight-wing aircraft, but the need to compensate for engine growth and changes in the center of gravity caused the designer to sweep the wings, with the accidental aerodynamic benefit of increasing the aircraft's critical Mach number.

Forward-swept wings appeared as early as 1906 on Alberto Santos-Dumont's *Number 14 bis*, which

made the first official powered aircraft flight in Europe. Later, Cornelius designed a series of aircraft with forward-swept wings, one of them a glider/tanker.

The first jet aircraft to fly with forward-swept wings was the 1944 prototype of the six-engine Junkers Ju-287 bomber. Forward-swept wings were deemed to have the advantage of increasing the limiting Mach number, while transferring adverse characteristics of swept wings from the low- to the high-speed regime, where they were easier to handle.

The first successful commercial application came with the postwar

Several combatant nations created tailless prototypes during World War II, when the goal was not inherent stability but greater speed via elimination of slipstream drag, improved visibility, and concentration of firepower in a central nacelle. First to score was Italy's handsome Ambrosini S.S.4 interceptor of 1941, which was fast and flew well but was abandoned after a crash due to engine failure.

Black Bullets

In 1943, Curtiss flew the first of three XP-55 Ascenders. The XP-55 had appalling stall characteristics and

only modest performance. The Ascenders were stellar aircraft, however, compared to another 1943 tailless entry, the all-magnesium Northrop XP-56 Black Bullet. Two XP-56s were built, and one managed to crash while taxiing.

A desperate Japan threw a hat into the ring in 1945, producing the Kyushu J7WI Shinden ("Magnificent Lightning"). Similar in design to the Ambrosini—pusher engine, swept-back wings, and canard surfaces—the Shinden was ordered into mass production before testing was begun. Initial flight tests in 1945 were successful, but the war was over before the second prototype flew, and production ended.

The only tailless aircraft to see production and enter combat was the previously noted Messerschmitt Me-163 rocket-powered fighter, an example of which exceeded 623 mph in 1941. Delightful to fly—when it did not explode—the Me-163 had deficiencies in duration and armament, making it ineffective as a warplane.

The shining goal of a pure flying wing entranced designers from Hugo Junkers and the Horten brothers to Anthony Stadlman and John K. Northrop. There was always something intrinsically appealing about the pure flying wing, whose sleek lines and low drag were complemented by a large payload capacity.



Hansa executive jet (from the same design team that produced the Ju-287), while the most prominent modern use has been in the very advanced Grumman X-29.

The pure flying wing, unencumbered by any vertical surfaces, was the goal of many designers, but others sought to simply rid their designs of the weight and drag penalties of a rear fuselage and tail surfaces. The very first of these was attributed to a Wright test pilot, Eugène Lefebvre—the first pilot of a powered aircraft to be killed in an aircraft accident, on September 7, 1909.

The design concept went through a long series of permutations by a wide range of manufacturers, including Blériot, Granville Brothers, Westland Aircraft Works, and Focke-Wulf, but achieved its greatest success in the variations of Burt Rutan's sleek composite Long-EZ design.



George Cornelius's 1930s-vintage "Mallard" (above) combined forward-swept wings with variable incidence. Grumman's highly successful X-29 technology demonstrator (top) had forward-swept wings whose trailing edges changed shape continuously to match flight conditions.

Photo courtesy author's collection

The first pure flying-wing fighter (and incidentally, if not accidentally, the first fighter with stealth characteristics) was the Horten Ho IX V3, which would have been produced as the Gotha Go 229. A twin jet made primarily of molded wood (to help elude radar), its performance and handling were exceptionally good, but like so many German wonder weapons, it came too late in the war.

It fell to Northrop to create a line of pure flying wings, culminating in the XB-35 and XB-49 bombers that seemed to hold so much promise in the mid-1940s. During the war, four one-third-scale models had been flown successfully, and the prototype XB-35 took to the air on June



Photos courtesy author's collection



Blowing engine air over the wings to increase lift has been attempted several times over the years in such aircraft as the Custer Channel Wing (top) and the Boeing YC-14 (above), whose competitor, McDonnell Douglas's YC-15, is an ancestor of USAF's C-17 Globemaster III.

25, 1946. As many as 200 B-35s were on order at one time, but changing requirements and a lack of stability during the bomb run brought about cancellations and controversy.

The YB-49 was an even cleaner aircraft. Basically a YB-35 converted with eight Allison J35 turbojets buried in the wing, its performance led to an order, later canceled, for thirty

RB-49s. All of the large Northrop wings were broken up, but two of the scale models remain, one at the Smithsonian's National Air and Space Museum in Washington, D. C., and one flying example at the Planes of Fame Museum in Chino, Calif.

The concept of a blown wing was first enunciated by Willard R. Custer with his Channel Wing design. A

competition of medium-size jet transports resulted in the Boeing YC-14 and McDonnell Douglas YC-15. Experience with the latter led directly to today's McDonnell Douglas C-17 Globemaster III airlifter, the newest workhorse of Air Mobility Command.

An even more esoteric type is the mission-adaptive wing, as tested on the General Dynamics F-111 by a joint Boeing, NASA, and USAF team. (C-5 Galaxys and C-141 Starlifters have routinely flown with their wings "mission adapted" to their weight by judicious use of lift devices.) In "New World Vistas, Air and Space Power for the 21st Century," the Air Force Scientific Advisory Board's forecast of new technologies, the concept of adaptive mechanisms is carried forward beyond changes in camber and active aerodynamic control to monitoring the "health" of the aircraft by sensing and compensating for battle damage.

Interestingly, New World Vistas' bold leap into the future is accompanied by predicted returns to the past. For example, the report suggests that future long-range lifters might have strut-braced, very-high-aspect-ratio wings, like those made by Hurel-Dubois. It forcecasts blended-wing-and-body transports, similar in concept to those put forward by Vincent Burnelli years ago. And finally, the report says that long-range bombers of the future could have center nacelles and forward-swept wings, just as George Cornelius suggested in the 1930s. ■

Walter J. Boyne, former director of the National Air and Space Museum in Washington, D. C., is a retired Air Force colonel and author. He has written more than 400 articles about aviation topics and several books, the most recent of which was Silver Wings. His most recent article for Air Force Magazine, "The Spirit of Billy Mitchell," appeared in the June 1996 issue.

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Teamwork helped the 32d Squadron capture its first Outstanding Squadron Trophy.

The Roadrunners Run Away With It

By James A. McDonnell, Jr.

IN 1996, the US Air Force Academy's 32d Cadet Squadron—"the Roadrunners"—carried off AFA's Outstanding Squadron Trophy, the first time this group has been so honored.

The key to their victory in this thirty-seventh annual competition was perhaps best summed up by Fall Squadron Cadet Commander Bryan W. Gregory. He told the 500 guests at the annual black-tie salute dinner in May that the evening was "an affirmation of a belief I've held since the beginning of the year. I was confident that [the 32d] would accomplish incredible things this year. . . . Our success basically boils down to one simple fact: We saw the challenge, and we took it."

The dinner, sponsored in cooperation with AFA's Colorado Springs/Lance Sijan Chapter, recognizes one of the Academy's forty squadrons as the best, based on military, athletic, and academic achievements.

In the military arena, the Roadrunners as a group won several competitions. Individually, a number of its members are in the Academy Honor Guard, which took first place in a national meet. Others were chosen for wing and group staff positions, indicative of superior military talent.

In sports, the Academy won the national cross-country championships this year, and several Roadrunners contributed major victories. Additionally, the squadron members in all classes were tough competitors in the intramural programs.

In academics, the 32d was high overall throughout the year, and at the end, four of its members ranked number one in the Academy in their respective majors.

Underlying all of this activity, pointed out Academy Superintendent



USAF photo by Stan Hampton

AFA's Colorado Springs/Lance Sijan Chapter helped sponsor the annual Outstanding Squadron Dinner, at which members of the US Air Force Academy's 32d Cadet Squadron received the Outstanding Squadron Trophy.

Lt. Gen. Paul E. Stein, was teamwork. In his remarks, he stressed that while the 32d possessed a number of outstanding individual performers, teamwork pulled the diverse accomplishments into a squadron effort that captured the trophy.

Lt. Col. Michelle D. Johnson, commander of the 9th Air Refueling Squadron, Travis AFB, Calif., was this year's "returning cadet." A member of the second group of females to enter the Academy and a cadet in the 1978 Outstanding Squadron—the 18th—she was twice academic all-American in basketball and holds the all-time USAFA scoring record.

She was the first female cadet wing commander and graduated as top cadet in both military performance and operations research. A Rhodes scholar, C-141 pilot, and Academy faculty member, she served as USAF aide to President Bush and President Clinton.

She told the cadets how the Academy experience had helped her be-

come not only a better officer but a better citizen, and she stressed that the enlisted force is a highly trained and highly motivated group that gets the job done if properly led.

Leadership, she said, is where the lessons of the Academy and of being the Outstanding Squadron would pay off. "Service above self," she said, "putting the interests of your unit and your people before your own interests every day, is the key to building a winning team and a rewarding career." She found "a lot of truth in the old saying, 'Lead, follow, or get out of the way.' By earning the designation as Outstanding Squadron, you've proven you know the difference."

Cadet Gregory charged the 32d's underclassmen to remember "the importance of [using] everyone's natural strengths . . . and the need to be leaders, not just be called leaders. I think if you keep these in mind, there's no reason why you can't be back here one year from now." ■

AFA/AEF National Report

By Frances McKenney, Assistant Managing Editor

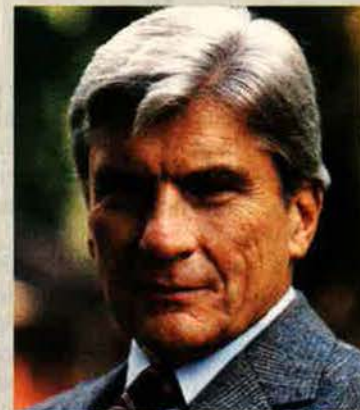
AFA Helps Teach the Teachers

Florida AFA chapters have worked with area schools on so many fronts—from ROTC to “Visions of Exploration” programs—that an Aerospace Education Seminar for teachers seemed like a natural step. But they added a spin to it: The one-day teachers’ workshop, sponsored with Embry-Riddle Aeronautical University of Daytona Beach, Fla., was held during the Florida State Convention in July. Combining the events gave conventioners, as well as teachers, a chance to learn about educational resources and approaches to aerospace education.

Patricia Fleener-Ryan, director and coordinator of the FAA/Embry-Riddle Teacher Resource Center, opened the workshop with a display of materials available at her facility. She also involved the teachers in demonstrations of teaching strategies and collaborative learning activities that can introduce students to various career fields, increase math and science knowledge, and sharpen communication skills and teamwork.

Aerospace Education Foundation Managing Director Phillip E. Lacombe described AEF’s grants and programs, and a grant recipient, Steven A. Bachmeyer of South Dade Senior High School, Homestead, Fla., told the teachers how his class had used an AEF grant to build a launchpad for its space shuttle replica. **General James R. McCarthy (Fla.) Chapter** President David R. Cummock, who first suggested combining the workshop and convention, informed the teachers about a program on aviation role models. Two Embry-Riddle students, Matthew Smoko and Timothy D. Wenger, did a presentation on a “Young Eagles” program that introduces youngsters to aviation, including ground-school training and an orientation flight.

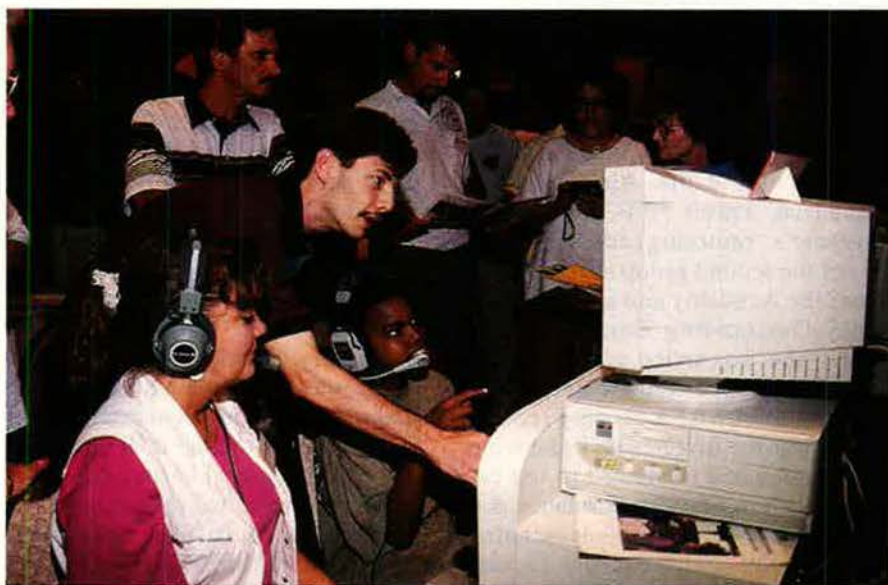
Sixty kindergarten through twelfth grade teachers received in-service, professional development credit for attending this seminar, and the **Central Florida Chapter** reimbursed them for half their enrollment fee.



“As second-ranking Republican on the Senate Armed Services Committee, I applaud the informative and thought-provoking journalism of Air Force Magazine. This fine publication continues to be a valuable resource for those concerned with our nation’s military and national security.”

—Sen. John W. Warner

Photo by Susan Kennedy



Florida AFA brought new technology and information on available resources to an Aerospace Education Seminar for teachers, included in the Florida State Convention in July. Above, a computer-assisted aviation career exploration lab served as a demonstration of a teaching activity.

The convention was dedicated to the nineteen airmen killed in the June 25 terrorist bombing at Khobar Towers, Saudi Arabia. As part of the dedication, Florida Governor Lawton Chiles proclaimed July 27, 1996, Airman Remembrance Day. Col. Gary R. Dylewski, 33d Fighter Wing commander at Eglin AFB, and Lt. Col. Donald R. Jozayt, 71st Rescue Squadron commander at Patrick AFB, received AFA Special Citations in recognition of the sacrifices of the units’ members and their families.

AEF’s Hollywood Connection

AEF is promoting an effort by Skymaster Ventures, Inc., of Studio City, Calif., to produce a Saturday morning cartoon show called “Defender Squadron.” The animated series will feature a former Air Force officer acting as mentor for a group of teenagers who battle evil extraterrestrial forces.

Created by Skymaster President Geoffrey B. Holland, the cartoon will

promote citizenship, courage, and integrity. He hopes to sell the series, now in development, to a television network and have it on the air by early 1997.

Mr. Holland envisions having a portion of the revenue from this cartoon fund a nonprofit educational foundation that will arrange for military pilots and other aviators to become mentors for children in their local schools. AEF will also use materials produced by this foundation to enhance existing AEF and AFA school-based programs.

In the Keystone State

In a talk to the Pennsylvania State Convention in July, Col. William G. Stratemeier, Jr., ANG, gave an eyewitness account of the midair explosion of TWA Flight 800, the 747 that exploded shortly after takeoff from John F. Kennedy IAP, N. Y., on July 17. Vice commander of the 106th Rescue Wing and New York State President, Colonel Stratemeier was piloting a C-130 training flight over Long Island when he and his crew spotted two huge fireballs in the sky, fourteen miles away.

Colonel Stratemeier assumed on-scene command of the initial search-and-rescue effort until the Coast Guard arrived, and his plane continued to help at the crash site until 3:30 a.m., lighting the area with flares.

The convention featured Brig. Gen. (Maj. Gen. selectee) William B. Lynch, deputy adjutant general for air and commander of the Pennsylvania Air National Guard, as keynote speaker for the awards luncheon. He spoke about the changing roles of the Guard and Reserve.

State President Raymond Hamman, who received the Pennsylvania Man of the Year award, reported that the **Lt. Col. B. D. "Buzz" Wagner Chapter** was named Chapter of the Year at the convention. Maj. Seamus P. McCaffery, AFRES, from the 913th Airlift Wing, Willow Grove ARS, Pa., received the Distinguished Pennsylvanian award. It recognizes his civilian role as a judge, holding court in a police station as late as 3:00 a.m. to give an immediate hearing to those arrested for disorderly conduct.



In a meeting on Capitol Hill with freshman Rep. George Nethercutt (R-Wash.) (top photo, center), National President Gene Smith and National Secretary Mary Anne Thompson discussed the outlook for the defense budget in next year's 105th Congress. Representative Nethercutt's district includes Fairchild AFB. The AFA leaders also discussed with Rep. Walter Jones, Jr. (R-N. C.), the need for comprehensive quality-of-life benefits for military members. His district contains Seymour Johnson AFB, where a high operations tempo and TDY rate highlight the importance of quality-of-life issues.

Carrying the Torch

Dressed in official commemorative T-shirts, shorts, and socks, **Carl Vinson Memorial (Ga.) Chapter** members Dr. Dan Callahan and Brig. Gen. Robert L. Scott, Jr., USAF (Ret.), ran the Olympic flame through Warner Robins, Ga., just a few days before the centennial Olympics opened in Atlanta in July. They were among the 10,000 "community heroes"—and two of only five people chosen from their town—who carried the torch for parts of its 15,000-mile journey from Los Angeles, Calif., to Atlanta.

A family doctor who served in World War II and as a volunteer physician in Vietnam, Dr. Callahan is a former National Vice President (Southeast Region), former Georgia state president, and now is state vice president for Government Relations. He took the torch a half-kilometer down a main artery in Warner Robins, toward early morning ceremonies at City Hall.

General Scott scored thirteen aerial victories in World War II and is author of *God Is My Copilot*. On his leg of the Olympic flame's journey, he ran the three-pound torch toward Robins AFB.

William N. Webb, 1927–1996



William N. Webb, AFA's Member of the Year in 1995 and an eight-term National Treasurer, died August 9 after a lengthy illness. He was sixty-eight years old.

A native of western Oklahoma, Mr. Webb completed primary and secondary school at Burns Flat, Okla., then attended Southwestern State Teachers College in Weatherford, Okla.

In 1950, he moved to Midwest City, Okla., and began his career at what was then called the Oklahoma City Air Materiel Command (now Oklahoma City Air Logistics Center), Tinker AFB, Okla. He started as a warehouseman at Tinker and retired from there in 1981 as chief of the Management Organization for Distribution, a position that gave him responsibility for accounting, manpower, funding, data systems, and engineering. He also served as an advisor on AFA matters to the ALC commander.

On hearing of Mr. Webb's passing, National President Gene Smith said in a letter to the Association's Board of Directors, "Bill's contributions to AFA and its Aerospace Education Foundation were many, and his dedication and service to his country, the US Air Force, and to AFA were exceptional."

Mr. Webb joined AFA in 1960 and was a member of the Central Oklahoma (Gerrity) Chapter. He was National Vice President (Southwest Region) and chairman of the Building Acquisitions Committee and the National Finance Committee. He served on the Finance

Committee for sixteen years and was a member of the Executive Committee and the Oklahoma AFA Executive Committee. He was also an AEF trustee.

When he nominated Mr. Webb as Member of the Year in 1995, AFA and AEF Executive Director Emeritus John O. Gray noted that Mr. Webb had completed the Association's second-longest stint as National Treasurer. Mr. Gray also wrote that he had had "the opportunity of observing firsthand [Mr. Webb's] management expertise and his complete dedication to the fiscal welfare and stability of AFA."

In addition to being named Member of the Year, Mr. Webb received AFA's Special Award, two Exceptional Service Awards, and the first Storz Award for membership recruiting.

He is survived by his wife, Ina Lee Webb, of Midwest City, Okla., two sons, Dwain and Lynn, two grandchildren, and two great-grandchildren.

The VIP Treatment

Michigan AFA members wrapped up their August convention as VIPs at a huge biennial airshow at Selfridge ANGB, Mich.

The conventioners held a Friday evening reception, a business meeting the next morning, and after lunch

boarded military buses for a ride to Selfridge. This arrangement let them bypass traffic created by 760,000 visitors to the three-day airshow. Once on the base, the convention-goers went to a reserved area on the flightline, where the **Mount Clemens Chapter** served as their host.

The airshow featured sixty aircraft from all services, including a C-17 from Charleston AFB, S. C., and Yankee Air Force warbirds. It concluded with a show by the Navy's Blue Angels.

According to public affairs officer Alice Errington, the number of aircraft on display and the number of visitors made this Selfridge's biggest airshow.



It was six a.m., but crowds were lining the streets when Carl Vinson Memorial (Ga.) Chapter member Dr. Dan Callahan (left) ran with the Olympic torch in Warner Robins, Ga., a week before the centennial Olympics opened in Atlanta. An official escort, Lt. Col. Marv Champion, USAF (Ret.), accompanied him.

From an AFA Booth

Fourteen years ago, Joseph "Ray" Lesniok, Jr., attended the annual Lakefront Airport airshow in Cleveland, Ohio, on the shores of Lake Erie. He had no ties to the Air Force but had an interest in aviation and national defense issues. So when he got near the **Cleveland Chapter's** modest booth at the airshow, it was easy to recruit him.

Mr. Lesniok joined as a patron, served on several committees, and was reclassified by AFA's Executive Committee to regular member status so he could eventually hold chapter office. The Cleveland Chapter, meanwhile, had its high and low points and about two years ago was ready to disband. Mr. Lesniok credits the late James W. Taddeo with trying to rejuvenate it. Mr. Lesniok built on Mr. Taddeo's initiative, stabilizing the group and maintaining membership. In June, he also secured the first AEF

Educator Grant given in Ohio. It went to Brad Henninger of North High School, in East Lake, Ohio.

At the Ohio State Convention that month, Mr. Lesniok, a lighting technician for General Electric, was recognized for these efforts: He was named Ohio AFA Man of the Year. He said his achievement was a matter of "just taking that manual and going by the book."

The convention was hosted this year by the 910th Airlift Wing (AFRES) at Youngstown-Warren Regional Airport ARS. Rep. James A. Traficant, Jr. (D-Ohio), whose district includes the base, was the luncheon speaker. Maj. Gen. Donald M. Jenkins, AFRES (Ret.), a mobilization assistant to the Secretary of the Air Force in 1984, spoke at the dinner banquet.

Garden State Gatherings

Lt. Gen. Edwin E. Tenoso, commander of 21st Air Force, Air Mobility Command, McGuire AFB, N. J., spoke at the New Jersey State Convention in May. State President Martin T. Capriglione said the General told the audience that although USAF today is smaller, it is a better equipped, more sophisticated, highly trained force.

Another special guest at the convention was Michael Warner, New



Texas State President Thomas Kemp, keynote speaker Brig. Gen. Susan Pamerleau, and National Director William McBride (l-r) congratulated San Antonio businessman Josef Seiterle (holding plaque), who received the Benjamin Foulois Award at the Texas State Convention in June.

Jersey's deputy commissioner of Veterans Affairs, who represented Governor Christine Todd Whitman. He read a proclamation from the governor, congratulating USAF and AFA on their fiftieth anniversaries.

Earlier in the Garden State, the **Sal Capriglione Chapter** hosted an annual awards dinner and dance, at which New Jersey Teacher of the Year Susan L. Roche was honored. The most unusual attraction during the cocktail

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hour was a falcon—a US Air Force Academy mascot, brought to the banquet by Academy cadet Steve D'Amico. Among the 250 guests at the event were Pennsylvania State President Raymond Hamman, Robert Bender, and Eugene B. Goldenberg, all of the **Metro Philadelphia Chapter**, and National Vice President (Northeast Region) James E. Callahan.

Alexander E. Harris (1914–1996)

Permanent National Director (emeritus) Alexander E. Harris died in August in Little Rock, Ark. He was eighty-one. A native of Little Rock, he graduated from the University of Arkansas and served in the Army and Air Force for more than thirty years.

Mr. Harris retired as a USAF lieutenant colonel in 1966 and became a property management executive.

A charter member and Life Member of AFA, he served as chapter president of the David D. Terry, Jr. (Ark.), Chapter, Arkansas State President, and National Vice President (South Central Region). He also served on the Organizational Advisory Committee and received two AFA Medals of Merit. He is survived by his wife, Fletcher Harris, of Little Rock, and two sons, Alexander and James. ■

Unit Reunions

3d Air Transport Squadron/Military Airlift Squadron. April 22–26, 1997, at the Treasure Island at the Mirage in Las Vegas, Nev., in conjunction with USAF's fiftieth-anniversary celebration. **Contact:** Frank I. Elam, 31 Rebellion Rd., Charleston, SC 29407-7457. Phone: (803) 763-6836.

4th Fighter-Interceptor Squadron (Misawa, Japan). April 18–20, 1997, in San Antonio, Tex. **Contact:** Bob Haley, 4404 Weeks Park Lane, Wichita Falls, TX 76308. Phone: (817) 696-5979. Fax: (817) 696-5890.

Classes 42-D through 44-K (pilots and instructors), Bonham Aviation Primary School, Jones Field, Tex. October 11–12, 1996, at the Tanglewood Resort in Pottsboro, Tex. **Contact:** Dale R. Daniel, 153 Eunice, El Dorado, KS 67042. Phone: (316) 321-1866.

Pilot Class 43-D "Delta Eagles." April 22–26, 1997, in Las Vegas, Nev., in conjunction with USAF's fiftieth-anniversary celebration. **Contact:** Donald A. Conner, 368 Prestwick Cir., Palm Beach Gardens, FL 33418. Phone/Fax: (561) 622-6852.

66th Fighter-Interceptor Squadron, Elmendorf AFB, Alaska. March 10–14, 1997, at Harrah's Casino Hotel in Laughlin, Nev. **Contact:** Ralph L. Parke, 43-420 Chapelton Dr., Bermuda Dunes, CA 92201. Phone: (619) 345-1419.

392d Bomb Group, 2d Air Division, 8th Air Force, including ground crew and support groups. February 23–24, 1997, in Orlando, Fla. **Contact:** Teddy Egan, 2619 Lafayette Ave., Winter Park, FL 32789-1372. Phone: (407) 644-5439.

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.

464th Bomb Group, including the 776th, 777th, 778th, and 779th Squadrons. October 9–13, 1996, at the Hilton Oceanfront Resort in Daytona Beach, Fla. **Contact:** George Stockinger, 24355 Peninsular Dr., Daytona Beach, FL 32118. Phone: (904) 252-8283.

1938th Airways and Air Communications System, Ramey AFB, Puerto Rico. March 2–8, 1997, in Aguadilla, Puerto Rico. **Contact:** Kenneth I. Coombs, P. O. Box 422, East Wakefield, NH 03830-0422. Phone: (603) 522-8365. ■

Bulletin Board

Seeking photos of, anecdotes about, and memorabilia related to the Boeing **E-3 Airborne Warning and Control System** airplane. Also seeking contact with **E-3B Sentry** personnel. **Contact:** James E. Riley III, 914 164th St. S. E., Box 351, Mill Creek, WA 98012.

If you need information on an individual, unit, or aircraft, or if you want to collect, donate, or trade USAF-related items, write to "Bulletin Board," Air Force Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Letters should be brief and type-written; we reserve the right to condense them as necessary. We cannot acknowledge receipt of letters. Unsigned letters, items or services for sale or otherwise intended to bring in money, and photographs will not be used or returned.—THE EDITORS

Seeking contact with former members of the **18th Reconnaissance Squadron** (later the 408th Bomb Squadron, 22d Bomb Group), Mitchel Field, N. Y., and/or Langley Field, Va. **Contact:** Jack Hirschbein, 7658 Fairfax Dr., Building I, Tamarac, FL 33321.

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Pieces of History

Photography by Paul Kennedy

Stripes and Wings



In June 1912, America's first enlisted pilot, Cpl. Vernon Burge, got his wings. Thirty years later, 3,000 US enlisted men had earned their wings and a unique place in aviation history. The services needed these pilots, and from 1926 to 1932, the National Defense Act actually required that twenty percent of tactical squadron pilots

be enlisted aviators. But the military was reluctant to give enlisted flyers the kinds of duties handled by commissioned pilots. The sergeant pilots served in such roles as test pilot, courier, flight instructor, or mechanic. The program ended in 1942, and USAF's last sergeant pilot, MSgt. George Holmes, retired in 1957.

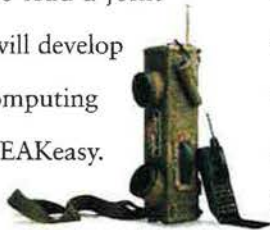
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