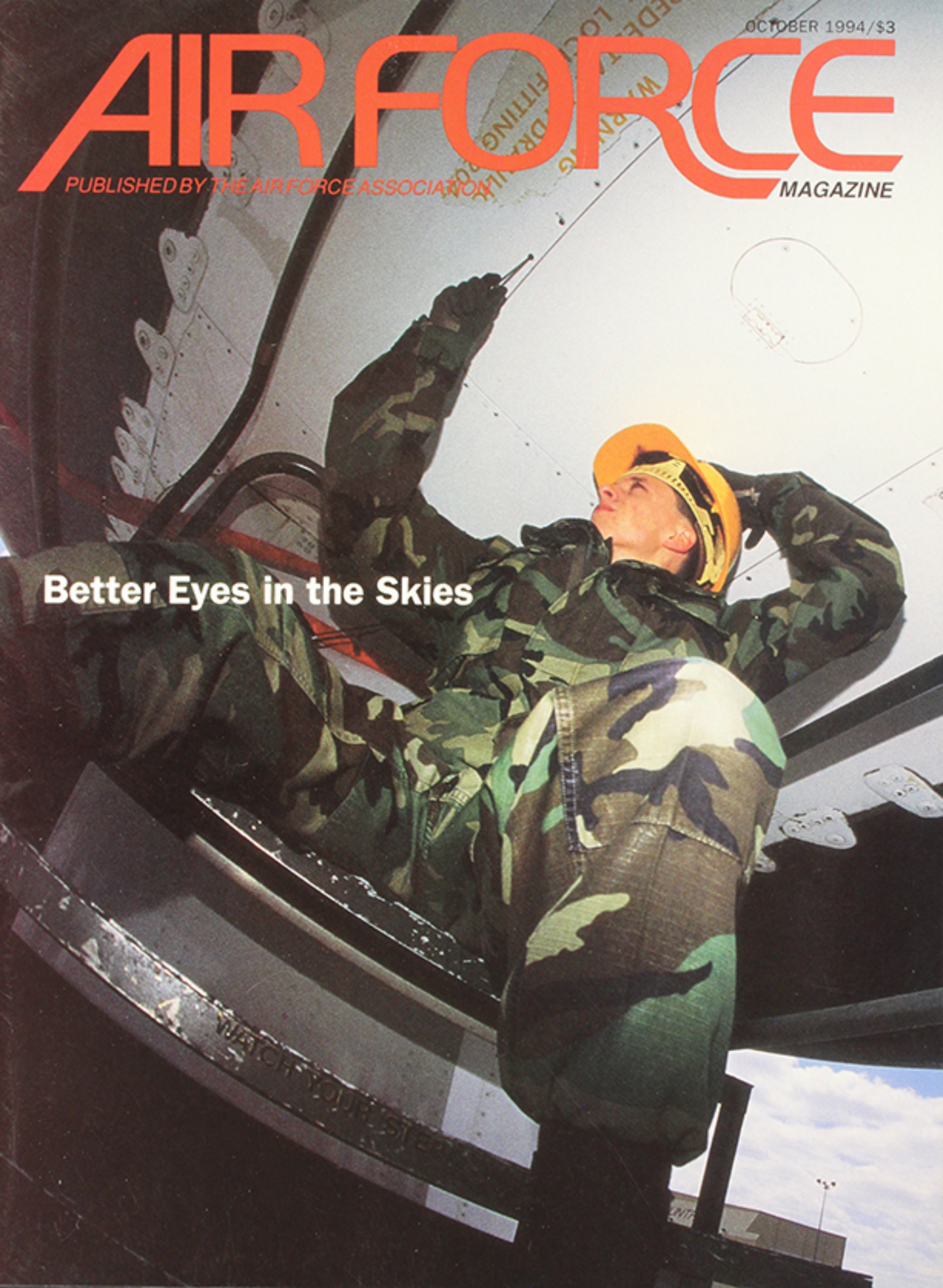


OCTOBER 1994/\$3

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE



Better Eyes in the Skies

NO STRINGS ATTACHED.



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AIR FORCE

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MAGAZINE

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By John T. Correll, Editor in Chief

The Cannibal Dynamic

ONE newspaper report called it "the cannibal dynamic." When an organization gets desperate enough, it is apt to turn on the neighbors for nourishment. It appears that some senior people in the US Army have recently become that desperate. They need money, and they are ready to take a bite out of the Air Force to get it.

Leading the charge is Maj. Gen. Jay Montgomery Garner, a longtime artillery officer and assistant deputy chief of staff for Operations and Plans (Force Development). In a memo to the Joint Staff on August 5, he launched an attack on the Air Force's top aircraft development program, declaring that "the Army does not understand the need for the F-22 fighter." He said that US air superiority is already better than it needs to be in order to handle a "greatly reduced air-to-air threat" and that the fighter budget should be "recapitalized." The Army, it is presumed, would gain sustenance from such a recapitalizing.

General Garner has also carried his crusade to the public. What is most remarkable about this is that Army leaders have said nothing to contradict him. Their silence is interpreted as a sign of approval. Finally, pressed hard by AIR FORCE Magazine on August 25, an Army spokesman said grudgingly—and not altogether convincingly—that General Garner had been "speaking personally."

As expounded to a symposium in Huntsville, Ala., General Garner's views were tantamount to pounding a stake through the heart of jointness. "Armies are the foundation of nearly all national military forces," he said. "Air forces and navies are 'add ons.' . . . Success or failure of the land battle typically equates to national success or failure." He conceded that "airpower contributes at the margins," but in his book, it's long-range Army fire that counts. An Army heavy division "has the daily firepower potential of over 8,000 F-16 sorties."

Stealth technology, "while impressive, is unnecessary," he said. The

stealthy F-22 fighter, therefore, is "the wrong aircraft for the land support function." Although airpower may conduct "limited strategic attacks to degrade the enemy's ability and will to fight" outside the area of the land battle, such operations "may or may not actually be of value to the joint force."

Is the Army not embarrassed by this contrived proposal to kill the F-22 for a share of the proceeds?



Do professional soldiers really believe this stuff? Does General Garner believe it himself? His vision of the Army dominating modern warfare, lightly assisted by other services, is inaccurate, contrived, and—we should think—somewhat embarrassing to the Army. In case General Garner doesn't recall the Persian Gulf War, may we remind him that deep-striking airpower destroyed Iraq's command and control system by dawn the first day, then closed down Iraq's supply routes, kept the world's sixth-largest air force out of action for the duration of the war, destroyed a high percentage of the enemy's armor, and induced mass desertions? That was contributing at the margin?

As General Garner must surely be aware, current US strategy hangs

on the capability of airpower to deploy to a distant battlefield, halt an invasion in progress, and hold the line until other forces can arrive. Troops of the combined arms force will look to airpower for many things, the first of which is to keep hostile airplanes off their backs. No American soldier has been killed by enemy air attack since April 1953. That is not a coincidence, and it is a record worth preserving.

US air superiority today *is* the best in the world. The F-22, however, is not for today. The first squadron won't be operational for another ten years—by which time the F-15 Eagle will have been in service for twenty-five years. The F-15 may rule the skies for a while yet, but if we intend to hold air superiority in the twenty-first century, we had better get on with fielding a new fighter.

On August 18, Deputy Secretary of Defense John M. Deutch announced a general shakedown of weapon programs, including the F-22, in search of funds to meet a budget crisis. Dr. Deutch made no pretense about his motives. He did not disparage the F-22 or any of the other programs that will now come under the gun. His difficulty is purely that the defense budget won't cover the defense program. He is trying to squeeze some relief out of the modernization accounts. Under the circumstances, the wild attack on the F-22 could be more damaging than would otherwise be the case.

Even so, and the weakness of General Garner's arguments aside, this budget attack across service lines is a poor tactic. The basic problem is not unfair allocation of resources. The relative service shares of the defense budget have not changed that much. The problem is that the budget is too small. The services will not solve that by turning on each other in a feeding frenzy. Furthermore, if General Garner practices cannibalism long enough, he may discover that what goes around, comes around. One day you're picking the menu. The next day you're in the pot. ■



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Letters

A Lengthy Twilight

"Twilight of the Missileers" [August 1994, p. 22] said some important things about the quality and professionalism of our ICBM crews. Unfortunately, the title sent the wrong message. Those crews are hardly on the verge of being out of a job.

Yes, the US has downsized its strategic forces, even more than it has downsized the rest of the armed forces. But the ICBM force remains a highly important and unique asset as part of our continuing strategic triad.

For the record, only Minuteman IIs were taken off alert in September 1991, not all ICBMs as the article suggested. Our Minuteman III and Peacekeeper ICBM force is still on strategic alert. The highly professional crews provide a significant ready-response capability that remains an essential part of our deterrent posture.

The Cold War is over, but thousands of nuclear missiles remain that could be targeted against the US. This is very much an uncertain world, with several nations aspiring to develop nuclear capabilities. If this is a "twilight of the missileers," I expect it to be a mighty long twilight. We will need these skilled people for years to come. They're a national treasure. Don't count them out.

Adm. H. G. Chiles, Jr., USN
Commander in Chief, US
Strategic Command
Offutt AFB, Neb.

There is much to reflect upon as the "coldest of the cold warriors" continue to draw down to a virtual shadow of our former strength. "Twilight of the Missileers" paid excellent tribute to the dedication and professionalism of more than thirty years of service. While the missileers got no fanfare or parade, they have the quiet pride of a mission accomplished and bid a sad farewell to the "pocket rocket" as the missileer and missile operations badges are retired in favor of the space operations badge ["Space and Missile Badges," August 1994, p. 57].

To some, it must seem appropriate

that these symbols of a mission too ghastly to contemplate should quietly slip away. To others, they will always represent the lasting contribution to peace made by the men and women who wore them.

1st Lt. Peter J. Flores,
USAF
Whiteman AFB, Mo.

I read "Twilight of the Missileers" with many different emotions. I felt great pride in our role in maintaining peace in the world during many turbulent periods in those thirty-plus years. The article brought back memories of what a thrill it was that morning in February 1962 at Sheppard AFB, Tex., to watch John Glenn rocket into orbit on an Atlas missile—the missile I was being trained to maintain. I spent close to twenty-three years in Air Force blue and twenty of those in the ICBM business, from turning wrenches to managing all the various challenges of ICBM maintenance.

We were a small, dedicated, and elite force that labored under some of the most adverse working conditions one could imagine (short of actual war, of course). Yet we were able to consistently maintain the highest alert rates of any weapon system in the military arsenal. Few people in the Air Force knew what we did or what obstacles we had to overcome to accomplish our mission. We were never able to see the fruits of our labors on a daily basis.

When aircraft maintainers fixed their aircraft, they could see it fly and

know they had accomplished their mission. Our satisfaction had to come when a light turned from red to green or a fault discrepancy indication disappeared from a computer-generated readout in a capsule thirty miles away. This is where faith played a huge role—the faith that if you do your job correctly every time, your system will be functional and ready to respond faster, farther, and with more punch than any weapon system in the history of warfare. . . .

We were missileers. We never received the accolades of fighter or bomber wings. The public could see them fly and, during Vietnam, could see them fight. We were silent sentinels, ready to respond in the blink of an eye. Although it would be nice to have someone tell us what a great job we did helping protect the free world from aggression, we realize that few people are aware of the part we played. We will have to be satisfied with our faith—only this time that faith tells us that what we did was definitely needed and, most of all, what we did was successful. . . .

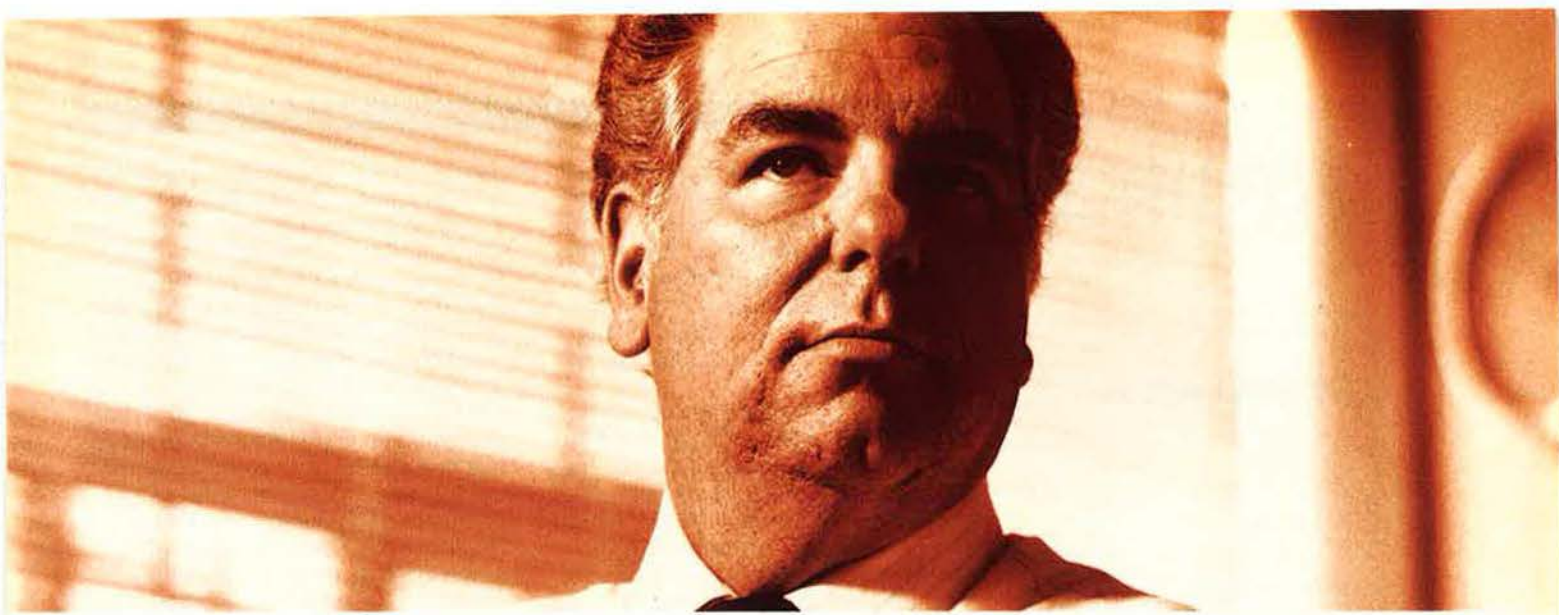
Although I no longer wear the "pocket rocket," earning the right to wear it is one of my most prized accomplishments. . . . I would not trade one minute of my time as a missileer for anything. I salute all of those who served in that special way, and I urge all who served to join the newly formed Association of Air Force Missileers. This is one way to keep our exploits from being forgotten.

CMSgt. Stan Bielecki,
USAF (Ret.)
Clinton, Tenn.

Thank you very much for "Twilight of the Missileers." As a former Titan II deputy and Minuteman III commander and staff officer, I have always considered missiles a forgotten career field, with much guts but little glory, and your article shed some much needed light down the hole. . . .

The world has changed much since I began pulling alert in the summer of 1984, but we must not forget that it is still a dangerous place. America's missileers still have a vital role to

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



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

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

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



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Letters

play. My watch on alert concluded in early 1990, after 378 alerts in two weapon systems, but I cheer on those who have followed me into a very vital and honorable profession. Three cheers for the missile force!

Mark W. Clark
Louisville, Ky.

I enjoyed "Twilight of the Missileers" because I have been to all the Minuteman sites during my time as chief of education at SAC. After I got out of the Army Air Forces in 1946, I joined the civil service. After many assignments in Japan and at 15th Air Force, I transferred to SAC. It was in 1962 that SAC Commander in Chief Gen. Thomas S. Power directed us to develop a master's degree program for all the Minuteman bases. We adopted the name "Minuteman Education Program" (MMEP). By the time I retired in 1977, more than 4,000 officers had earned master's degrees.

I realize that you concentrated on tactical aspects, but I believe MMEP was the carrot that attracted capable and motivated officers into the ICBM force. We contracted with the local universities and set up the unique program. Since a five-day program cannot fit into a seven-day schedule, the universities had to teach on Saturdays and Sundays. It was a radical adjustment for the professors and the universities.

I firmly believe that MMEP was an integral part of the missile program, creating a corps of officers who were great not only for the Air Force but for the entire country.

Paul E. Huff
Kaneohe, Hawaii

Indispensable Space Systems

The "Space Almanac" in the August 1994 issue [p. 44] is an excellent nontechnical summary of military space activity, one even a fighter pilot can understand. All kidding aside, the Almanac focuses primarily on the launch and satellite aspects of military space systems instead of the entire system.

Space systems have three basic components. The first is the launch base—*i.e.*, the booster operations and range support that provide access to the high ground of space. The second is the satellite component—the hardware actually in space collecting and passing data and information. Last, and by no means least, are the ground-based components of the space systems.

These components provide the functions succinctly listed in the Al-

manac under "Space Support of Military Functions" [p. 50]. The Air Force operates and maintains the Space Surveillance Network (73d Space Group), the Air Force Satellite Control Network (50th Space Wing), and the Ballistic Missile Warning Systems (21st Space Wing). These networks and systems provide the tracking and control, payload operation, and data dissemination required to make space systems useful. For example, GPS is useful only when the user can receive precise position and timing information. A space system without some sort of ground component is about as useful as an F-15 without any guns or missiles.

Space systems are indispensable for modern warfare because they allow us to control information. All current military functions in space are related to the collection and transmission of data or information. Space systems give us an unprecedented capability to dissipate the fog of war, enabling the warfighter to see the battlefield clearly. Please continue your fine reporting of military space activities.

Capt. Tom Doyne,
USAF
Patrick AFB, Fla.

A Recipe for Disaster

I hate to be the bearer of bad news, but "The New Way of Logistics in Europe" [August 1994, p. 60] is a recipe for disastrous defeat. This new two-level maintenance concept makes Federal Express and UPS vital components in keeping our jets flying. They are an obviously weak link in the chain. If an opponent blows up the few aircraft hubs of the civilian carrier, its operations will stop dead. Our fighters will be left broken on the airfield, and we will be vulnerable. An opponent need not even be so dramatic; just have a sniper kill a few dozen Federal Express and UPS drivers, and you will create a labor strike over working conditions. The result will be the same: In a short time, all our aircraft will be grounded by broken avionics.

I'm all for reducing the federal deficit, but to reduce the force by eliminating intermediate-level avionics is to cut bone and muscle, not fat. Stop it while you still can.

Mike Miller
Las Vegas, Nev.

The Wrights and Revisionism

My absolute and unlimited admiration for AIR FORCE Magazine doesn't stop me from writing to tell you I am steamed about the historically revi-

sionist article about the Wrights [*The Wrights and Their Rivals*, August 1994, p. 68]. We are on overload when it comes to revisionist history at the Smithsonian, the National Archives, and on college campuses. We don't need to provide a platform for these types in our own magazine.

Doesn't anyone read a manuscript like this and say, "Wait a minute. We weren't in the war until three years after the French and British. So how could we jump in the war and be ready with an airplane from day zero? How about all the Liberty engines used in British aircraft that were designed and built in the US? Didn't we contribute to the British effort? How come the Wrights weren't standing in the way then?"

The author shoots darts at the Wrights because they were good businessmen who were contending with double-dealing mendicants like a bicycle racer and a museum secretary. All of them were conniving to negate the patents, and all the Wrights did was stand by their patents and the law.

Why didn't the crooks whom Mr. Callander seems to champion simply get a license from Orville and Wilbur Wright and get in gear? Because they instead tried to dance around the patents. Mr. Callander implies that the Wrights held up the advancement of aviation in the US. Yeah, sure. Look at Boeing and Douglas and McDonnell and Lockheed and North American and a few others.

You can have your revisionists. I'll take honest businessmen like the Wrights. There are too many of the former and too few of the latter.

William A. Rooney
Wilmette, Ill.

US Aircraft in the Great War

Mr. Callander's articles are always very good and certainly enrich the fabric of Air Force history. "The Wrights and Their Rivals" is also excellent—with one exception. The caption to the photograph on p. 72 says, "The 11th Day Bombardment Squadron was the only US unit to reach France with American-built aircraft—de Havilland DH-4s—during World War I." This is incorrect.

The 1st Day Bombardment Group, in 1921 redesignated the 2d Group (Bombardment), had four squadrons: the 96th, equipped with French Breguet 14 aircraft, and the 11th, 20th, and 166th Squadrons, equipped with DH-4 (Liberty Plane) bombing aircraft. Please note the emphasis on bombing aircraft. There were other DH-4s in France, but they were in observation configuration.

On September 14, 1918, three squadrons—the 11th, 20th, and 96th—took off on their first combined bombing mission against Conflans in German-held French territory. The 166th Squadron, with DH-4s, came on line on September 21, 1918. The last mission flown by the 1st Day Bombardment Group was on November 5, 1918, against the town of Mouzan.

Col. Rudolph C. Koller, Jr.,
USAF (Ret.)
Walnut Creek, Calif.

Blight in August

In the interest of historical accuracy, I must point out the following errors in the August 1994 issue.

On p. 21 of "Aerospace World," the designation "AT-6" went out with the Army Air Corps. Long before the Korean War, the "Texan" had been redesignated T-6. The "Mosquito" version flown in the Korean War was designated LT-6.

Contrary to what you stated in "Flashback" [p. 67], there was nothing "improvised" about the landing of the Grumman SA-16A Albatross shown at rest on snow. It is a triphibian version with a hinge-and-shock-mounted ski built into the fuselage just forward of the "step" in the hull, compressed in this photo and, therefore, invisible. The giveaway is the tiny skis mounted on the leading edge of the wing floats. (Directional stability during water operations in this version left something to be desired.)

Although it was great to see Maj. Hunter Hackney and George Finck and their resupplying of Duc Lap written up in "Valor" [*The 'Stadium' at Duc Lap*, p. 73], I noticed that the proofreader's bane of the Vietnam War had struck again. After the mission, Major Hackney and his crew returned to Ban Me Thuot, not "Ban Me Thout."

Col. Robert J. Powers,
USAF (Ret.)
Shreveport, La.

Obtaining an FAA License

The recent publicity regarding Federal Aviation Administration Airframe and Powerplant (A&P) certification of USAF military personnel has led to some misconceptions about how easy it is to obtain an A&P license [*USAF Mechanics May Get FAA Licenses*, August 1994 "Aerospace World," p. 17].

The USAF-FAA agreement was an important and noteworthy first step among USAF, Community College of the Air Force (CCAF), and FAA officials who worked hard to recognize our existing aircraft maintenance

training for A&P certification. However, USAF aircraft maintenance personnel must realize (and many don't) that obtaining an A&P license is still not easy.

Advanced placement for A&P accreditation can vary among maintenance Air Force Specialty Codes and normally requires a strong commitment on the individual's part to work toward certification. This commitment can take up to two years under FAA Part 147 guidelines.

The Air Force Logistics Management Agency, in conjunction with CCAF, is studying how best to close the training gaps and reduce costs associated with obtaining A&P licenses for Air Force personnel. More work can be done to facilitate military access to A&P certification, strengthening the career-specific skills and education of USAF maintainers.

Capt. Edward R. Kramer,
USAF
Gunter Annex, Ala.

Remember the Liberty

Army MSgt. Gary Gordon and SFC Randal Shughart were both awarded the Medal of Honor (posthumously) by President Clinton in May 1994 [*Valor at Mogadishu*, July 1994 "Aerospace World," p. 15]. But were their medals the "first to be awarded for heroism in an action since the Vietnam War"?

Did not the skipper of USS *Liberty*, Cmdr. William L. McGonagle, receive the Medal of Honor (for actions taken during an assault on the ship) from Secretary of the Navy Paul Ignatius on June 11, 1968?

MSgt. Thomas W. Young, Sr.,
USAF (Ret.)
Denison, Tex.

■ While Commander McGonagle did receive the Medal of Honor for heroism on the *Liberty*, Medals of Honor were earned in Vietnam for actions as late as 1972.—THE EDITORS

The Will to Bomb

The ongoing debate over bombers misses the target [*The Bomber Debate Continues*, August 1994 "Capitol Hill," p. 9]. In planning the forces required to fight two wars (one of conventional "deterrence"), the Defense Department is really continuing the same old "what if" scenarios of the Cold War.

It would be far more practical to examine not what we "need" but what we will use. The Persian Gulf War was the first time since the Vietnam War that large bombers had been used in combat. For various reasons, bombers are usually deemed

unsuitable for the task at hand. The 1986 Eldorado Canyon raid on Libya—a strategic bomber mission if there ever was one—saw F-111s covering thousands of miles and pushing crews to their limits because those aircraft had precision munitions. Only now do we consider updating big bombers with precision munitions capability—and only to validate their existence.

So why buy or maintain an expensive weapon system if the will to use it is nonexistent? Furthermore, if the only time we will use a strategic bomber is when we have absolute command of the skies (as in Iraq), then why spend money to upgrade bombers or build new ones?

We are no longer in the Cold War deterrence mode. A single aircraft carrier off the coast can provide all the deterrence you could ask for. If we can't or won't use B-1s and B-52s on the tough targets, then let's retire them gracefully.

James L. Edmiston
Mesa, Ariz.

The MC-130H's Virtues

In reference to the letter from Gerald P. J. DeMocko in the August 1994 issue [*"May Issue Miscues," p. 5*], it is unfortunate that such a widely respected individual found it necessary to make an inaccurate series of statements about the MC-130H.

Jerry DeMocko was one of the finest MC-130E navigators in the Air Force. I flew with him and can attest to his skill and in-depth knowledge of the MC-130E. He is now an extremely valuable employee of Lockheed Air Services, the prime contractor for the MC-130E. He has no practical experience or firsthand knowledge of the MC-130H. It is reasonable to suspect that his views might be prejudiced.

The MC-130E and MC-130H are both exceptionally well suited to the long-range infiltration role. Both have remarkable strengths, and both have weaknesses that their crews must learn to overcome. Neither aircraft suffers any deficiency in navigation accuracy, and both are equipped with GPS. After 1,600 MC-130E and more than 2,000 MC-130H hours, I believe both are outstanding aircraft. Flown by the finest crews in the world, they are capable of the most demanding missions.

We have tried very hard to foster a sense of community, including healthy competition, among all Combat Talon units. Success in this endeavor has been based on mutual respect of professionals. Perhaps this effort should

also be undertaken by our contractors.

Maj. David G. White,
USAF
Niceville, Fla.

Prejean Responds

I wrote to *AIR FORCE Magazine* about the January 1994 "Pieces of History," which, I felt, misrepresented the place of flight scarves in the modern Air Force [*"Whose Heritage?" June 1994 "Letters," p. 8*]. I had hoped to spark a discussion about that issue. Instead, two writers [*"Scarves and Standards," August 1994 "Letters," p. 7*] chose to ignore my point, and—without having met me—attack my professionalism, service, and patriotism, along with that of my entire command.

To Lt. Col. Stephen C. German: While this is not the first time in my life that I have been called "narrow-minded" and "arrogant," it is the first time that someone has done so while completely missing my point. I did not—and would never—advocate non-compliance with military standards of appearance. If you read that into my letter, your imagination and emotion have overtaken your reading comprehension.

My letter discussed the heritage of flight scarves and challenged the assertion that they are part of every aviator's heritage. They are not part of the heritage of strategic airlift, and they have not been for the past several decades. Periodically, senior leaders with little or no experience in airlift have advocated, or directed, the mandatory wearing of distinctive flight scarves. The last time this happened, in the early 1980s, our leadership eventually listened to the crew members of their command, and the scarves went away. This time I am not so sure.

Your comment about plastic spoons and hats flapping in flightsuit pockets are part of an old, discredited Air Force. You have never met me, but you seem to feel comfortable mashing me—and all my colleagues—into some stereotypical lump of unprofessionalism.

Colonel, look at the calendar. It is 1994. While you were not paying attention, the world has changed around you. The Russians are now our training partners. We have new missions and new roles. Joint operations have replaced petty parochialism. We can no longer serve our nation if we have no respect for our colleagues. Your sneering, uninformed, and inaccurate attack on me and my command is not worthy of your present grade. . . .

To Lt. Col. William J. McCormick: At first reading, your letter hit closer to home, as you seem to speak from the experience of those who flew in "my father's war." You and your colleagues, whether in bomber formations over the Third Reich, flying airlift over the Hump in the CBI theater, or running bomber escort across the Pacific, paid a steep price for the freedom that we enjoy, and I salute your service.

It occurred to me, however, that no amount of service on your part gives you the privilege of trashing my professionalism and patriotism. . . . Your ill-informed assertions about my service cannot go unchallenged.

Your point about B-17 crews wearing scarves for warmth is simply not relevant to the issue at hand. The modern flight scarf is a "street decoration" only. Like pitot covers and gear pins, modern scarves must be "removed before flight." . . . There is no connection between the protective clothing worn by prior generations and the decorative uniform item that we discuss today.

My goal is not now—not ever—to insult the service of others or to make light of their traditions. The point of my original letter was merely to challenge an idea. Those who disagreed apparently chose personal attack over discussion of opinions. . . .

It would probably help both officers if they reread the last two sentences of my original letter: "I wish long life to every aviator's tradition. Just don't make yours mine." That's the point.

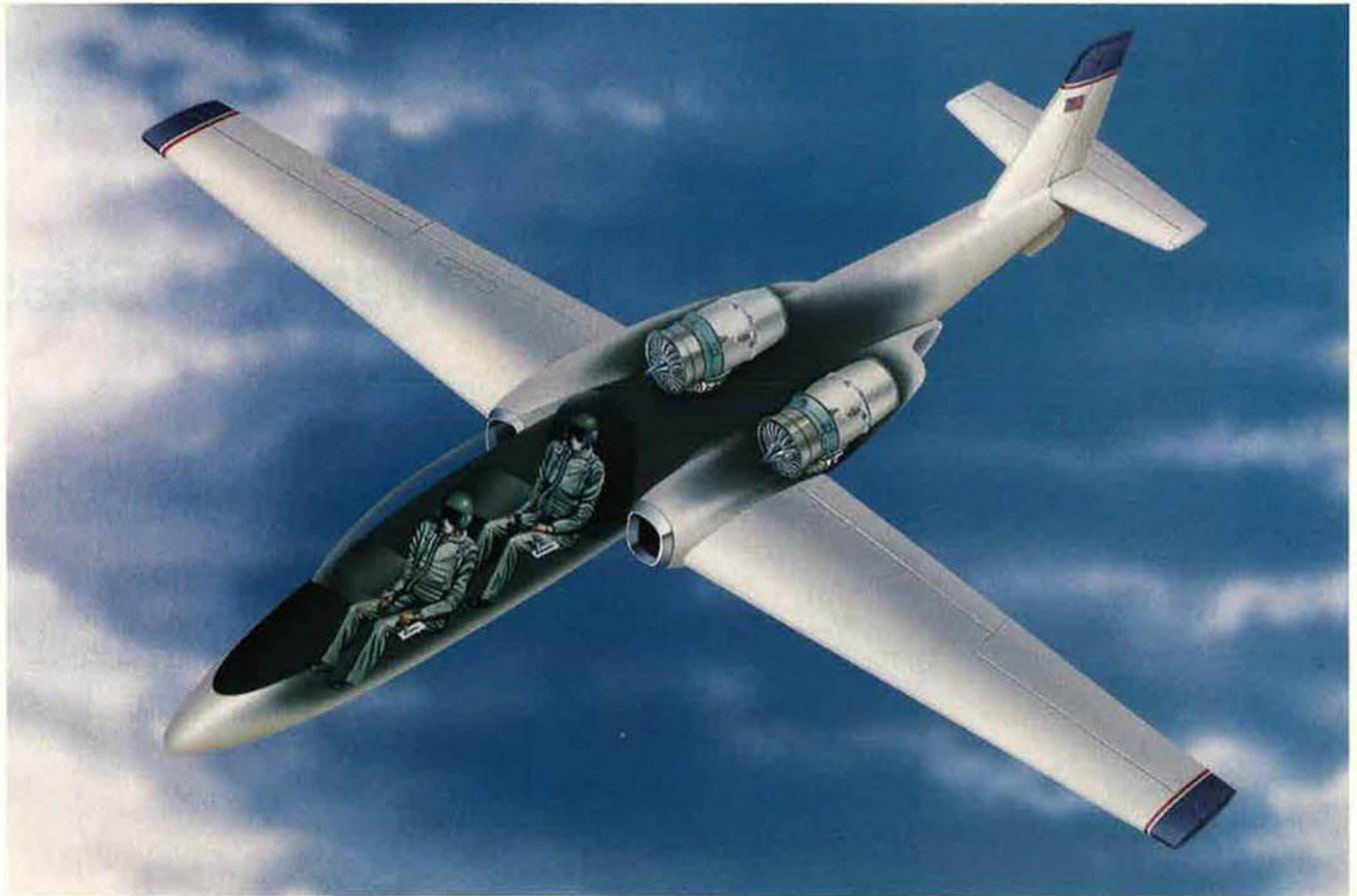
Lt. Col. Sidney J. Prejean,
USAF
Moorestown, N. J.

Proud To Be in AFA

How do you manage, month after month, to publish such a superb magazine? To a very old US Air Force retiree, it is like a breath of fresh air. I learn so much, I am kept current, and I not only find out about the most recent developments in aircraft but also am kept informed of what is on the drawing board both here and abroad. On top of that, every once in a while, I can read of the carryings-on of my old buddies, most of whom are now either four-star generals or retired.

I want to thank you and compliment you on such a fine job. It truly makes me pleased to be a member of the AFA.

Col. Charles Stearns,
USAF (Ret.)
Santa Barbara, Calif.

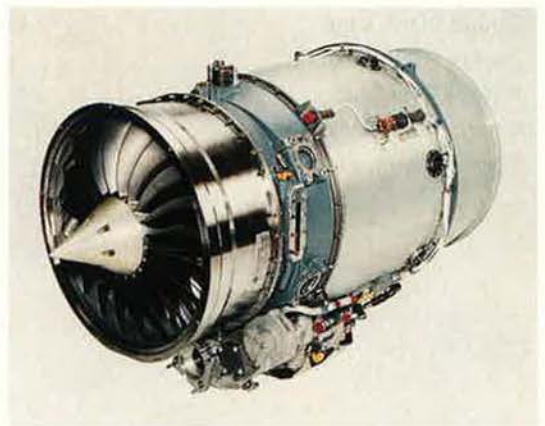


Twin-Engine Reliability for JPATS

The Williams F129 turboprop makes feasible the only twin-engine JPATS entry.

Cessna's highly successful modern technology CitationJet business aircraft was made feasible because Cessna turned to Williams for the FJ44 turboprop. Cessna is now demonstrating the remarkable JPATS CitationJet derivative, using the military version of the same engine, the F129.

- The only other turboprop engines that are certificated for JPATS use older technology and are too large, too heavy, and have too high a fuel rate for a small twin-engine trainer.
- The Swedish Air Force has already ordered 240 militarized FJ44s to re-engine their current fleet of jet trainers. Pilot training throughout the world is demanding the low fuel and maintenance cost of a modern small turboprop.
- The low noise level of the FJ44 is welcomed by CitationJet owners and was an important factor in the Swedish Air Force decision. The quiet Williams engines permit operations from Swedish airports that now ban trainer flights.
- Ensuring decades of reliable operation, the Williams F129 is a derated version of the FJ44 turboprop business aircraft engine. Like the Cessna JPATS and Cessna CitationJet business aircraft, the F129 and FJ44 fulfill the military/civil "dual use" advantage.



Williams International

The Chart Page

By Tamar A. Mehuron, Associate Editor

Cleaning Up DoE's Nuclear Weapons Sites

For nearly fifty years, the primary mission of the Department of Energy and its predecessors was to develop, produce, and test nuclear weapons. The end of the Cold War signaled a sharp drop in DoE's nuclear weapons activities. Now the department faces the challenges of environmental cleanup.

Appropriations by Facility, 1990–95
(Millions of current dollars)

	1990	1991	1992	1993	1994	1995 Request
Hanford, Wash.	\$ 441.3	\$ 828.6	\$ 1,060.4	\$ 1,481.4	\$ 1,490.0	\$ 1,591.6
Savannah River, S. C.	471.1	644.6	550.5	779.0	757.4	743.6
Oak Ridge, Tenn.	282.7	353.3	448.6	553.1	652.7	648.3
Rocky Flats, Colo.	139.7	173.0	181.8	291.2	477.2	639.7
Idaho National Engineering Lab	185.6	323.2	248.4	372.9	408.7	392.4
Fernald, Ohio	84.4	263.6	214.3	293.9	304.4	294.2
Waste Isolation Pilot Plant, N. M.	104.6	164.0	141.0	150.7	185.3	184.6
Los Alamos National Lab, N. M.	47.9	82.1	120.5	172.9	185.1	180.0
Lawrence Livermore National Lab, Calif.	33.8	52.7	77.8	107.6	89.5	80.2
Sandia National Lab, N. M.	16.3	37.7	58.5	73.7	73.0	51.9
Mound Plant, Ohio	19.1	30.7	42.2	44.5	47.4	45.0
Pantex Plant, Tex.	5.4	19.7	26.2	41.0	35.7	45.6
Nevada Test Site	13.0	n/a	13.7	20.7	18.0	23.1
Kansas City Plant, Mo.	12.0	17.4	27.5	16.9	14.1	13.2
Pinellas Plant, Fla.	3.0	4.7	4.6	9.2	11.1	9.0

As this table shows, cleanup costs continue to rise. In addition to these fifteen major sites, DoE is responsible for cleaning up thousands more sites once used in the weapons program, including sites used to process uranium.

Source: Congressional Budget Office, "Cleaning Up the Department of Energy's Nuclear Weapons Complex." Washington, D. C.: May 1994.

By Brian Green, Congressional Editor

Highlights of the 1995 Defense Bill

All major USAF programs have been funded, but some have been slowed.

THE HOUSE and Senate finally came to terms on the Fiscal 1995 defense authorization, agreeing to a plan that increased the funding for force readiness, provided a pay raise exceeding that requested by the Pentagon, and raised the possibility of new B-2 bomber production.

Congressional negotiators August 12 agreed to a final bill containing \$263.8 billion in budget authority—exactly what President Clinton had sought. High points included the following.

Personnel

Pay raise. Though the Pentagon sought a 1.6 percent raise for the troops, the new bill hiked pay by 2.6 percent. This marked the second year in a row that Congress approved a package more generous than that wanted by the Administration.

End strengths. Force levels continued to decline. The House-Senate conference report specified an active-duty Air Force end strength of 401,000, down 25,000 from Fiscal 1994's end strength. Air National Guard end strength was set at 115,600 (down 2,000), and the Air Force Reserve was authorized 78,800 (down 2,800).

Defense-wide, the active-duty level fell by 85,000 to 1.53 million. Reserves declined by 46,000 to 989,000.

Call-up authority. House-Senate negotiators agreed to modify the President's authority to mobilize members of the Guard and Reserve by extending the initial call-up period from ninety to 270 days. The compromise scaled back earlier proposals to give the Pentagon limited call-up authority for periods of up to a year.

COLA equity. Congress resolved an inequity in retirement benefits. Legislation passed in 1993 delayed payment of military retiree cost-of-living adjustments from 1995 through 1998 until October, while civilian federal retirees had to wait only until April. The

authorization bill moved the 1995 military retiree COLA to April also, realigning it with civilian adjustments.

Medical care. The bill contained measures to improve medical care for active-duty troops, veterans, and military families. These include a plan to develop dental benefits for military families overseas, an outreach program for victims of the Operation Desert Storm mystery illness and research funds to determine its cause, and a limited pharmacy benefit for Medicare-eligible retirees who lost access to a military pharmacy because of a base closure.

Readiness

Funding. The conferees increased key readiness accounts in response to concerns that the services could be facing serious readiness problems in the near future. Depot maintenance, real property maintenance, family housing, and recruiting all were given substantial boosts.

Depots. The bill generally supported the current split of depot work: sixty percent of the work load to military depots and forty percent to industry. It required continuation of competition among depots and between depots and the private sector. These measures put Congress in conflict with DoD leaders, who told the services to stop such competition.

Major Weapon Programs

B-2 production base. The Senate proposed spending \$150 million to preserve those parts of the B-2 bomber industrial base that would shut down as bomber production ended. House conferees opposed the measure. The final compromise allowed Secretary of Defense William J. Perry to spend up to \$25 million on early studies of a "new-generation, conventional-conflict-oriented, lower-cost bomber." He also could allocate up to \$100 million to preserve "core capabilities that would require extended periods of time or substantial cost to regenerate and that are in imminent danger of being lost."

Bomber force structure. The conferees provided money to fly an

additional twenty-four B-52 bombers, raising the inventory of flying bombers to 131 for Fiscal 1995. The bomber inventory was frozen at current levels—ninety-five B-1Bs and ninety-four B-52s, to preserve USAF bomber force options.

Bomber upgrades. The bill funded upgrades to the B-1 and B-52 force and provided \$95 million to speed delivery of precision guided munitions. The Triservice Standoff Attack Missile received \$305 million of \$606 million requested but no procurement funding. The House sought to terminate the program, but the conferees demurred.

Fighters. The bill authorized \$2.5 billion requested for the F-22, USAF's next-generation air-superiority fighter, and directed the Navy, Air Force, and Secretary of Defense to pursue a Navy derivative jointly. The Joint Advanced Strike Technology program was funded at \$230 million. It was merged with another program exploring advanced short takeoff, vertical landing aircraft technology.

C-17 transport. The request for six C-17s was approved, but funding was cut from \$2.9 billion requested to \$2.6 billion for procurement and R&D. Negotiators approved the financial agreement between McDonnell Douglas and DoD to settle outstanding C-17 contract claims.

Space systems. Congress fully funded the Milstar military communications satellite program. The Senate wanted to give Navy officials control, citing a perceived lack of USAF support, but program management was kept in the Air Force. The conferees added \$20 million to speed the next generation of Milstar.

The bill authorized funds to accelerate the Alert, Locate, and Report Missiles early warning satellite. Delivery would advance by two years, to 2002.

Reconnaissance. Congress authorized \$100 million to reactivate three USAF SR-71s to provide wide-area reconnaissance and intelligence support. The SR-71 was retired in 1990, and the Air Force believes that reactivation is impractical. ■

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Aerospace World

By Frank Oliveri, Associate Editor

B-52s In World-Circling Mission

Two B-52 aircrews from Barksdale AFB, La., completed the first around-the-world flight coupled with bombing mission. The crews, which performed the feat in August, flew their bombers for forty-seven hours.

The bomber crews dropped 27,000 pounds of bombs on target in the Kuwaiti desert within three seconds of the planned release time. It took seventeen hours to reach the target area.

The mission, which was three months in planning, went off without serious problems. After releasing bombs, the two aircraft began the return flight, but a tropical storm in the Philippines forced the aircraft to reroute. The crews adjusted their flight plans and made their fourth aerial refueling on time. After the fifth and final aerial refueling, over Montana, the aircraft completed the mission on schedule.

Brig. Gen. George P. Cole, Jr., airborne commander on the flight and 2d Bomb Wing commander, received the traditional hosing down after his final flight. He retired in September.

Mission Director Maj. Scott Thumser said the flights illustrated "the ability of the B-52 to fly any type [of] mission in any kind of weather with devastating effect."

A flight surgeon was sent on one aircraft to monitor sleeping patterns and food intake of crew members. The data will be analyzed by aerospace technicians at Brooks AFB, Tex., who want to determine the best ways to prepare crews for future missions of more than twenty hours.

General Fogleman Named to Top Post

Gen. Ronald R. Fogleman, commander of USAF's Air Mobility Command and commander in chief of the joint US Transportation Command, was tapped to become the next Air Force Chief of Staff, the service's highest uniformed position.

The plan, announced August 26 by the White House, was for General Fogleman to succeed Gen. Merrill A. McPeak in late October, following completion of General Fogleman's



One of two Barksdale AFB, La., B-52s completes a forty-seven-hour, first-ever transglobal flight with bombing mission. The flights underscored the mettle of the B-52 under extreme conditions, said Brig. Gen. George "Peyt" Cole, Jr., airborne commander on the flight and the 2d Bomb Wing's commander.

confirmation hearings before the Senate Armed Services Committee. General McPeak's four-year appointment as Chief of Staff ends in late October.

Confirmation of General Fogleman would make him the first Air Force Chief of Staff educated at the Air Force Academy. He is a fighter pilot who served during the Vietnam War, with the Air Staff in Washington, and as commander of 7th Air Force at Osan AB, South Korea. In recent years, General Fogleman has been instrumental in various relief and resupply missions, including those in Bosnia, Somalia, and Rwanda.

Merger Creates New Defense Behemoth

Lockheed Corp. and Martin Marietta Corp., two giants of the defense business, agreed to join forces and become *the* giant. It was the latest and largest of a wave of mergers sweeping the defense industry.

Lockheed, of Calabasas, Calif., and Martin Marietta, of Bethesda, Md., announced August 30 that they intended to combine their facilities,

personnel, and expertise, creating a single megacorporation. The new entity, to be called Lockheed Martin Corp. and headquartered in Bethesda, would begin operations with \$23 billion in sales, 170,000 employees, and product lines that range from advanced fighter aircraft to computers, from satellites to environment remediation equipment and space-launch vehicles.

Lockheed Martin would instantly become the largest defense company in the world.

Daniel M. Tellep, Lockheed's chairman and chief executive officer, called the move "a merger of equals." He said it would provide great economies for ongoing defense production ventures and would position the company well to survive in the harsh economic climate spurred by the drawdown of world defense forces and budgets.

DoD Opens More Jobs to Women

The Pentagon has opened an additional 80,000 active-duty military positions to women, effective Octo-



In July, Secretary of the Air Force Sheila E. Widnall toured the 90th Missile Wing's ICBM complex at F. E. Warren AFB, Wyo., spoke at a quarterly awards luncheon, and served as grand marshal for the opening parade of the ninety-eighth Cheyenne Frontier Days rodeo (above).

strength and that using such factors would reduce the C-17's advantage over the C-5. However, AMC said its assessment reflects the same minimum load classification number (LCN) for both aircraft. LCN is a number from one to 120 representing the runway's strength. The higher the number, the stronger the strip.

AMC said, "Using an LCN of twenty, there are 4,005 airfields suitable for C-17 wartime operations, compared to only 2,237 airfields that are C-5-capable."

GAO also said that the C-5 Galaxy's wartime runway width requirement is ninety feet. In wartime, the C-17 can land on paved airfields 3,000 feet long and ninety feet wide. Using those criteria, the C-17 could land at 2,404 airfields. Using similar criteria, said GAO, the C-5 could land at 2,153 airfields 5,000 feet by ninety feet.

AMC responded that ninety feet was the "absolute" minimum width requirement for the C-5 and would be

ber 1. Women in the armed services now have access to ninety-two percent of the military career fields, more than eighty percent of the total jobs, and ninety-nine percent of all Air Force jobs.

Defense Secretary William J. Perry announced the new policy in July.

US, UK Sign Agreement

The US and UK in August signed a memorandum of understanding calling for cooperative work on the Common Affordable Lightweight Fighter program.

In the US, the CALF program is a joint effort between the Advanced Research Projects Agency and the armed services. It will demonstrate new technologies for a modular aircraft design for a fighter variant with short takeoff and vertical landing (STOVL) capability for use by Navy and Marine forces. Another variant is to have conventional takeoff and landing capability for Air Force use. The program is commonly known as ASTOVL (advanced STOVL).

Program officials hope to develop a candidate to replace the AV-8B, F/A-18, and F-16 fighters in the US and the FRS. Mk. 2 Sea Harrier in service with the Royal Navy in the UK.

The MOU covers Phase II of the CALF program and will provide technology demonstrations of critical high-risk design concepts.

AMC Refutes GAO on C-17

Air Mobility Command, defending



Lockheed photo by John Rossino

On call for peacekeeping and humanitarian missions as well as strategic military airlift, C-5s are inspected by Secretary of Defense William Perry and AMC Commander Gen. Ronald Fogleman at Air Mobility Rodeo '94 at McChord AFB, Wash.

the C-17 transport, charged that a critical General Accounting Office report got its facts snarled.

GAO took issue in July with Air Force claims regarding the C-17's access to many of the world's austere fields—one of the plane's big selling points. The report stated that USAF failed to consider runway strength when it found the C-17 could land on 9,900 short airfields, compared to 3,500 for the C-5 transport.

AMC agreed that the 9,900 airfields were not assessed for runway

used only in dire emergencies. "While the C-17 can operate routinely from runways ninety feet wide," said AMC, "a C-5 has never landed on a ninety-foot runway."

It added that the C-17, under its own power, can complete a 180° turn on a ninety-foot-wide runway, while the C-5 requires approximately 150 feet to complete the same turn. Since the C-5 cannot back up as the C-17 can, any width less than 150 feet requires a towing vehicle to assist the C-5, delaying offloading and possibly

delaying other aircraft waiting to use the runway.

Peacekeeper Stages Salvaged

An Air Force LGM-118A Peacekeeper ICBM was hit by gunfire from an unknown source as it was being shipped from F. E. Warren AFB, Wyo., to Vandenberg AFB, Calif., the Air Force said in August.

USAF reported that the damage made it impossible to bring two stages of the missile back to flightworthy status.

The service plans to salvage the first two stages of the \$50 million missile. They will be used in the so-called "aging and surveillance" program in which missiles are monitored for deterioration over time.

The four-stage ICBM was being transported in unmarked railcars in June. The damage was discovered three days after the train trip, when the missile underwent routine examination. The Air Force said that several railcars, including two carrying Peacekeeper stages, were damaged. The incident is under investigation.

Approximately 110 Peacekeepers have been delivered to the Air Force, but the service deployed only fifty. F. E. Warren has the fifty missiles on its premises.

NATO Aircraft Destroy Serb Target

NATO aircraft, including four US A-10 attack aircraft, were launched in August against Bosnian Serb units near Sarajevo, Bosnia-Herzegovina, after the Serb forces broke into a weapon collection point to remove some of their heavy weapon systems, according to the Pentagon.

Because of bad weather, only two A-10s were able to spot and identify a target. The two aircraft found and destroyed a 76-mm antitank gun with their 30-mm Gatling guns.

Bosnian Serb forces had removed one T-55 tank, two armored personnel carriers, and a self-propelled gun from a weapon collection point. After the A-10 attack, the Bosnian Serb Army notified the UN commander that it was returning the weapons. The NATO attack was then called off.

In addition to the A-10s, NATO launched four Dutch F-16s, four French Mirage F1s, and four British Jaguars. There was one report of ground fire against the aircraft but no reports of damage or injuries.

The 1940s-vintage antitank weapon was destroyed about nine miles south of Sarajevo. It was not one of the stolen weapons, but it was targeted because foul weather prevented pilots from locating the stolen systems.

McPeak on Roles and Missions

Air Force Chief of Staff Gen. Merrill A. McPeak said recently that US armed forces can benefit from the work of the independent Commission on Roles and Missions of the Armed Forces.

Addressing the Oregon Air Force Association in July, General McPeak said that it must be determined how much independence the nation can afford for each service. The commission, mandated by Congress and chaired by former Defense Department official John White, is expected to file its report to the Defense Secretary and Congress next summer.

Pope AFB, N. C., in March blamed human error for the collision of an F-16 and a C-130. The Air Force made investigation results public in June.

In their assessment, investigators identified three main causes: Approach controllers at the Fayetteville, N. C., Regional Airport did not follow proper procedures; base air traffic controllers lacked training; and the F-16 pilot did not see the C-130.

The Air Force decertified one of the five military air traffic controllers involved in the accident and reassigned him to another career field. The Air Force is retraining the other control-



The President signs the General Aviation Revitalization Act, a statute that prohibits product liability suits against general aviation manufacturers for cases involving aircraft more than eighteen years old. The law does not bar injured persons from suing owners, operators, or repair facilities.

General McPeak said it is important to find the right mix of forces to have an affordable combat capability. He added that improving the economy is the top security challenge facing the nation because military power springs from national wealth and productive strength.

The Air Force Chief of Staff said battles in air and space and deep in hostile territory should be fought by an air component commander, although a ground commander has an intense interest in those areas. This view, he said, should be the starting point for determining the overlap and redundancy in US forces.

Human Error Blamed for Tragic Collision

The official investigation into an accident that killed twenty-three Army paratroopers and injured 100 more at

lers and will reassign them to other air traffic control jobs. The F-16 pilot also received additional training.

Air Combat Command headquarters responded to the accident by ordering a command-wide review of training for aircraft approaches and maneuvers and mixed-aircraft traffic procedures. ACC also ordered all controllers to be requalified whenever a wing changes to or adds to its inventory a different type of aircraft.

The seeds of the Pope crash were planted when Fayetteville controllers cleared the F-16 for a straight-in simulated flameout approach—meaning the pilot shuts down engines and glides to a landing, then powers up and takes off again.

Under FAA guidelines, the Fayetteville tower directs military air traffic until the aircraft enters base jurisdiction. The civilian controllers were

Museum Promises to Change *Enola Gay* Exhibition

WASHINGTON, D. C., September 6—Hammered by public opinion, Congress, and the news media, the National Air and Space Museum has promised major revisions to its plan for exhibiting the *Enola Gay*, the B-29 that dropped the first atomic bomb.

That was a major reversal of the position the museum had taken at midsummer, when the curators declared the script for the exhibition final except for "minor wording changes." In late June, however, *AIR FORCE Magazine* circulated a detailed analysis of the "final" script, finding it to be biased and emotionally charged, using the *Enola Gay* as a prop in a political program about the atomic bomb. (An expanded version of that analysis appeared as "The Last Act" at Air and Space" in the September 1994 issue.)

In early August, dozens of congressmen called on the museum to change its course. Rep. Peter Blute (R-Mass.), speaking for a bipartisan group of twenty-four congressmen, condemned the proposed exhibit as "anti-American" and "biased." Separately, Rep. Tom Lewis (R-Fla.) said on behalf of himself and five other congressmen that the museum's "job is to tell history, not rewrite it." Most of the congressional criticism and much of the coverage by the national news media that followed was based on *AIR FORCE Magazine* reports.

At a meeting with service historians and others on August 16, Dr. Martin Harwit, the museum's director, overruled his curators' call that the plan was final and promised that major revisions would be made. The new script, he said, would affirm emphatically that the United States employed the atomic bomb in 1945 to shorten the war and save lives. (This point had been disputed previously by Dr. Harwit's curators.) On August 29, the museum published a press release announcing the addition of a 4,000-square-foot section called "The War in the Pacific: An American Perspective" to the exhibition.

The revised exhibit, supposedly, will incorporate changes that Dr. Harwit directed months ago but which were largely ignored by his curators. Over a weekend last April, Dr. Harwit rechecked the museum's plan and concluded that "we do have a lack of balance" and that "much of the criticism that has been levied against us is understandable." In his public statements over the next several months, Dr. Harwit defended the exhibit as balanced and assailed the critics—especially *AIR FORCE Magazine*—who said otherwise. In late August, Dr. Harwit experienced another weekend discovery when he examined the latest plan in detail. He said he was "taken aback at how little had been done to correct the imbalances." He noted "some word changes here and there" but concluded that most of the alleged revisions "had fallen through the cracks."

Finally, on September 1, museum officials began circulating review copies of a revised exhibit script. Dr. Harwit's office mistakenly told *AIR FORCE Magazine* that morning that the new script was not ready. Well into the following week, the museum deliberately delayed providing a copy of the script to *AIR FORCE Magazine*. (The Office of Air Force History, which had also criticized the museum's plans, was likewise excluded from the first distribution.)

—John T. Correll

supposed to contact the Pope controllers about the simulated maneuver but failed to do so.

Concurrently, two airborne C-130 aircraft entered the base traffic pattern. The F-16 pilot notified Pope controllers about his practice landing maneuver. Four of the five controllers on duty were unfamiliar with the maneuver, the Air Force said. Therefore they were unaware of the F-16's exact position.

One controller—a trainee—ordered one of the two C-130s to maintain its position and then informed the F-16 of that position. The trainee attempted to redirect the other C-130 out of the traffic pattern but used the wrong call sign. As a result, the C-130 went into its final approach turn.

Recognizing the danger, the trainee again attempted to call off the second C-130 but again used the wrong call sign. The supervisor on duty coun-

termanded the trainee's instructions and cleared the second C-130 for landing. He then informed the F-16 pilot that the C-130 was coming in for a landing. It was the first time the F-16 pilot heard of the second C-130.

The C-130 was beneath the fighter, and the fighter pilot could not see it. The supervisor cleared the F-16 also, thinking it was coming in directly for a landing and would touch down and clear the runway before the C-130 landed. With the F-16 above the C-130 and both aircraft trying to land at the same time and place, the F-16 could not avoid colliding with the C-130. When the planes collided, the F-16 crew ejected, but the crewless fighter careened along the ramp, hitting a C-141 parked there, and then rolled into a staging area where paratroopers were preparing to board for a jump. The C-130 pilot was able to regain control and land safely.

A large fireball engulfed the paratroopers. The C-141 also was consumed in the fire.

ARPA to Modernize Combat Care

The Advanced Research Projects Agency (ARPA) is funding a research program to develop technologies for the modernization of combat casualty care in a war theater, said Dr. Donald P. Jenkins, ARPA's deputy director for Defense Health-Care Technologies (Defense Sciences Office), in testimony before the House Armed Services Committee's Research and Technology Subcommittee in August.

Dr. Jenkins said ARPA is developing telemedicine technologies—state-of-the-art diagnostic and interventional devices that promise to decrease fatalities.

"Telemedicine refers to the remote delivery of enhanced medical care through communications networks, whether it be in the battlefield or in remote geographic areas of our country," he said. "It encompasses different medical specialties, including radiology (teleradiology), surgery (telesurgery), etc., and enables teleconsultation (two-way video, simultaneous voice communication, and data transfer)."

In June 1993, the first telemedicine field training exercise occurred at Fort Gordon, Ga., where the efficacy of telemedicine in the remote battlefield was clearly demonstrated, Dr. Jenkins said.

ARPA is developing a personal status monitor to be fitted on each soldier in a combat zone. The device will enable a commander to know where each combatant is located—particu-



Northrop Grumman Corp. may develop an Affordable Lightweight Fighter (artist's rendering above) that would surpass existing models in range, payload, and survivability. The company is studying the viability of this fighter under an agreement with the Advanced Research Projects Agency.

larly important if the soldier becomes a casualty. The commander will be able to monitor vital signs and transmit those data to medical personnel. En-route triage within a geographic area will be possible.

ARPA is also developing capabilities for imaging parts of the body and for analyzing blood chemistry on the battlefield. Portable digital conventional X-ray devices will allow up-front identification of serious muscu-

loskeletal, neurovascular, and organ system injuries.

USAF Takes MRI to Chernobyl

Amid reports of a growing cancer rate in Chernobyl, the Ukrainian city near a 1986 nuclear reactor disaster, an Air Mobility Command C-5 aircraft airlifted a magnetic resonance imaging system there.

The MRI is considered ideal for detecting small tumors in young radiation victims since it avoids the need for X rays and other techniques of conventional nuclear medicine.

Studies by the World Health Organization and by regional health ministries show a sharp increase in infant mortality, thyroid cancer, and other illnesses among children who live in or near Chernobyl.

Members of the 436th Aerial Port Squadron at Dover AFB, Del., carefully moved the 68,500-pound, \$1.1 million system into a C-5 Galaxy from Travis AFB, Calif., for shipment to the Ukraine.

Memorial Dedicated to B-52 Crews

The commander of Air Combat Command dedicated a memorial at Langley AFB, Va., in July to B-52

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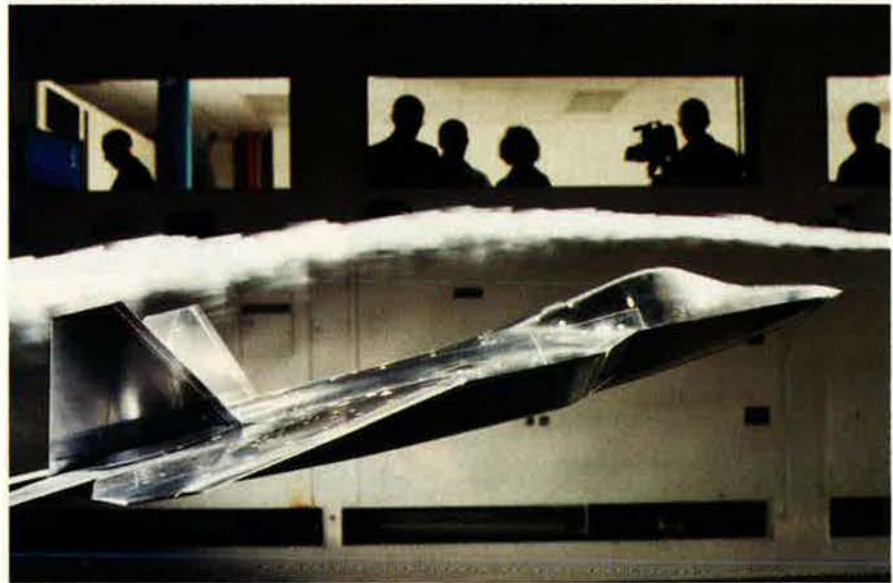


3/94

crews lost through the years in combat operations. The display includes a B-52 in an amphitheater-style setting, four plaques listing the names of B-52 crew members who never returned from combat operations, and a plaque outlining the history of the aircraft.

"ACC bombers serve as the backbone of our global power projection capabilities," said Gen. John Michael Loh, ACC's commander. "Their long range frees us from dependence on bases overseas. They stand ready to fly from their home bases to anywhere in the world on short notice to protect and defend America's interests with either conventional or nuclear means. Today, it is our bombers that give our nation superpower status."

General Loh said that the B-52 is merely a tool wielded by well-trained crews. Dedication plaques bear the names of seventy-eight crew mem-



Aerodynamic performance of a fully instrumented model of the Lockheed-Boeing F-22 is tested in a wind tunnel. Lockheed Aeronautical Systems has completed some 15,300 of a planned 17,000 test hours for the refined F-22 configuration.



Lockheed assembly mechanic Larry Rutledge works on the first leading-edge wing flap completed for the FS-X aircraft program. Lockheed is producing sixteen of these flaps for Mitsubishi Heavy Industries of Japan.

bers who died in combat or who are still missing in action.

C-5 Aids Rwandan Refugees

A C-5 airlifter in July carried a portable water supply unit capable of pumping 1.7 million gallons of water a day to cholera-plagued Rwandan refugees in Goma, Zaire.

The aircraft belongs to the 60th Airlift Wing at Travis AFB, Calif., and was flown by an Air Force Reserve crew from the 349th Airlift Wing (Associate), also from Travis. It made

the trip nonstop with three aerial refuelings.

AMC made several other humanitarian airlift missions into the region in July, delivering food, medical supplies, water, and water purification systems.

F-16s Employ HARMs

Block 50D F-16 fighters successfully launched twelve radar-blasting AGM-88 High-Speed Antiradiation Missiles in a recent air-to-ground weapon system evaluation program con-

ducted at the Air Force's Utah Test and Training Range in August.

The aircraft were equipped with Texas Instruments HARM Targeting System pods that enable the Block 50D version to launch the missiles autonomously in the range-known mode.

The F-16s launched their missiles from an operational base against simulated threat radar and missile sites. The Air Force is considering the F-16 as a potential platform for the future Suppression of Enemy Air Defenses mission.

In July, the Advanced Fighter Technology Integration/F-16 aircraft fired a live AGM-88 HARM at a radar site emitting a simulated threat signal in the Talon Sword Bravo demonstration conducted at China Lake Naval Warfare Center, Calif. Off-board sensor data were received and correlated by a support aircraft to allow the AFTI/F-16 to cue its weapons against the target emitter.

The aircrew correlated target data transmitted to a US Navy EA-6B aircraft via satellite to identify and locate an appropriate threat emitter for HARM employment. The data were sent through an improved data modem to the AFTI/F-16. The aircraft used the data to program the missile for a range-known, non-line-of-sight shot.

Latest Officer Release

In July, the Air Force ended the voluntary officer early release program for Fiscal 1994 and set criteria



Maj. Jim Smithers is the first B-2 instructor pilot to graduate from Whiteman AFB, Mo. He arrived there as a qualified B-2 pilot, having completed B-2 training at Edwards AFB, Calif. "I'm simply in awe of that plane," said Major Smithers, who looks forward to inspiring the same feeling in the future B-2 pilots he will train at Whiteman.

for the 1995 program, officials announced.

This program differs from the Voluntary Separation Incentive, Special Separation Benefit, and early retirement programs now under way. The program allows officers relief from active-duty service commitments to leave the Air Force early. All applicants are reviewed, and final decisions are based on the needs of the Air Force. The program was closed down in the summer because USAF met its force-reduction goals for 1994 before the end of the fiscal year (September 30).

Officers eligible for the 1995 program must be at or below the grade of lieutenant colonel. Colonels and colonel selectees will continue to be managed on a case-by-case basis.

Pilots, navigators, weapon controllers, and health professionals are excluded from the program.

Pentagon Studies Spouse Abuse

The majority of spouse-abuse cases reported in the Defense Department system are of moderate severity, claims a new Pentagon study.

The study found that because most abuse cases come to the attention of the military before the violence be-



The artist, Attila Hejja, best known for his dramatic aviation art for NASA, the United States Air Force and International Air Forces, has re-created the Nagasaki mission with meticulous attention to detail. His works have been recognized both nationally and internationally including the prestigious 1985 Hamilton King Award for illustration. His works are also exhibited in the Air Force Art Program at the Pentagon.

Exclusive 50th Anniversary Limited Edition Commemorative Print

War's End is the only authorized limited edition lithograph commissioned and signed by the Nagasaki Mission Commander and B-29 Bock's Car Pilot General Charles "Chuck" Sweeney.

This mission was plagued by a series of problems that began just before takeoff and continued until Sweeney's emergency landing 12 hours later in Okinawa. Yet Sweeney and his crew completed the mission which saved millions of American and Japanese lives by hastening the surrender of Japan. War's End is a tribute to the courage of ordinary men who carried out an extraordinary mission.

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Complete with certification of authenticity on the General's Personal 2 star stationery, this 20 1/2" x 38" signed and numbered work of art commemorates the brave men who flew this mission to end World War II.

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Rockwell Defense Electronics employee Julie Wood inspects precision light-weight GPS receivers to be shipped to the Department of Defense. DoD may purchase some 94,000 of the standard handheld/vehicular units by 1998. They are manufactured at Rockwell's Collins Avionics & Communications Division in Iowa.

comes severe, the ability to prevent further abuse and chances for rehabilitating the abuser are significantly higher than in the general population.

Edwin Dorn, under secretary of defense for Personnel Policy, said, "We feel this finding indicates that the military's effort to intervene early

in the cycle of violence is successful."

The study found that most spouses who report abuse want their abusers to seek professional help. Those who do not report the battery, according to the study, keep silent because they fear the military will punish the active-duty offender too severely.

As a result of the study, the Pentagon will expand its treatment options and improve service to victims. Prevention programs will be broadened. The Pentagon also plans to review organizational or regulatory issues that might be discouraging spouses from reporting abuse and seeking help.

Hero Dog Put to Rest

At Sembach AB, Germany, military working dog Carlo, considered by many to be a Persian Gulf War hero, was put to sleep in July after being diagnosed with bone cancer, the Air Force said.

Carlo, a ten-year-old Belgian Malinois, detected 167 caches of explosives, ranging from booby traps to unexploded ordnance, during a three-month deployment to Saudi Arabia at the start of the Gulf War. The dog's handler was TSgt. Chris Batta.

The team increased safety in areas occupied by US forces in Kuwait and at the American Embassy there.

Sergeant Batta was awarded the Bronze Star for his work in Kuwait. "Carlo worked harder than I did," he said.

Lockheed Wins F-16 Award

In August, Lockheed was awarded the first production-contract incentive in the history of the F-16 program, the firm said. The Air Force awarded Lockheed \$2.98 million for demonstrating continuous improvement in production of the fighter.

The company's performance was evaluated in four categories: production operations, program management, systems engineering, and proposal quality and timeliness.

Lockheed cited the benefits of improved factory efficiency recently when it presented an unsolicited proposal to the Air Force for future F-16 procurement at a fixed price of \$20 million per aircraft. Lockheed said it would commit to that price for the Block 50/52 F-16s to be delivered from 1999 through 2002 because of the company's success with process and efficiency improvements.

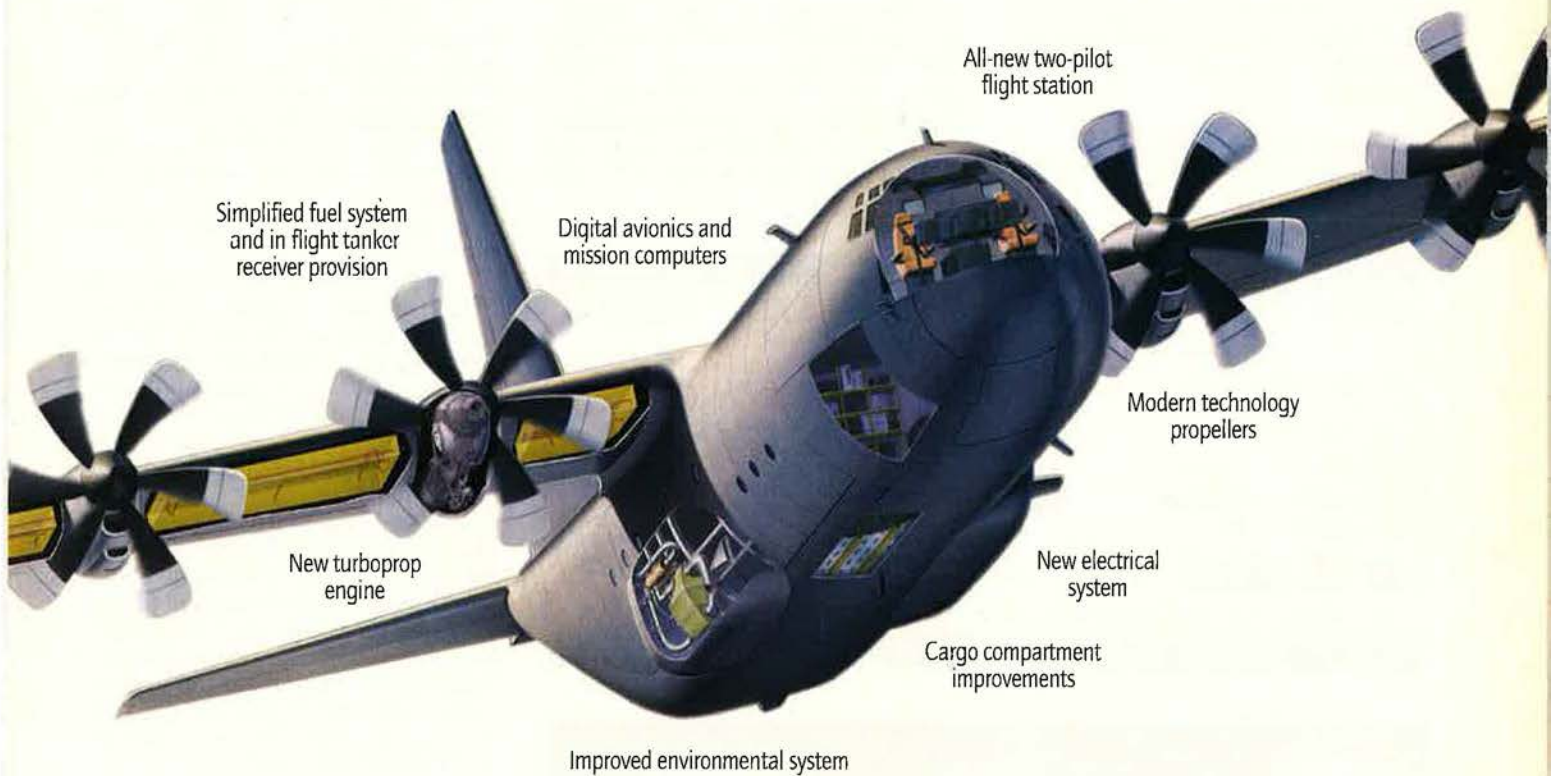
USAF Helps Flood Victims

Air Force personnel from Moody and Robins AFBs, Ga., volunteered to help flood victims in Georgia in July, after Tropical Storm Alberto moved inland.

Approximately 125 personnel from Robins participated in off-base relief work in Macon, Ga., including the delivery of cots, radios, water trailers, and sandbags.

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The new J model of the C-130 Hercules airlifter.

It looks just like a C-130. Until you open it up.

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New engines and all-composite six-bladed propellers markedly improve the J model's takeoff distance, climb rate, cruise altitude and range. A modernized flight station features electronic displays, controls and on-board mission computers. These cutting edge technologies also lead to significant cost savings. Reductions in the J model's aircrew and maintenance personnel requirements contribute to its 35% annual savings in operating and support costs.

Air mobility must be as good as its name. Only rapid-reaction airlifters like the new C-130J can deliver the force needed to ward off aggression and save lives.

Lockheed leads.

 **Lockheed**

Moody AFB personnel helped people in Bainbridge, Ga., and in Albany, Ga., where the rising Flint River drove 30,000 from their homes. Volunteers from Moody bagged sand and loaded and unloaded supplies delivered by helicopter to emergency locations.

The \$800 Million Stockpile

A gigantic stockpile of materiel left

behind from the war with Iraq fills an area in the Saudi desert four times the size of Washington, D. C. It is the job of the 4401st Asset Reconstitution Squadron to collect, inventory, and put the \$800 million worth of war-worn items back into usable shape. Unit personnel with backgrounds in civil engineering, parachute fabrication, aircraft maintenance, and sheet metal work, among others, will main-

tain and reconstitute tents, shelters, bombs, and vehicles.

F-15Es Depart Gulf Region

F-15Es from the 336th Fighter Squadron, Seymour Johnson AFB, N. C., departed from bases in the Persian Gulf region in July, marking the first time since the onset of Operation Desert Shield in August 1990 that F-15Es were not operating in the region.

F-16Cs from Moody AFB took over the F-15E mission.

"This will be the first time since the F-15E arrived at Seymour Johnson that the wing will be reconstituted," said Brig. Gen. Jeffrey Grime, 4404th Composite Wing (Provisional) commander and commander of the 4th Wing at Seymour Johnson. "Everyone in the 336th FS should be genuinely proud."

The Air Force looks forward to getting the aircraft back to the US, where they can be given a thorough cleaning. During its time in the Gulf region, the squadron flew nearly 8,000 sorties and 20,000 hours. Many pilots at Seymour Johnson have put in three tours in the region, with some getting in as many as five. The squadron will pull another tour next year.

Guard and Reserve Battle Fires

Air Force Reserve and Air National Guard C-130 aircraft battled wildfires in California and Arizona, flying more than 215 fire-fighting sorties in July.

More than thirty Reservists and three C-130s from the 302d Airlift Wing, Peterson AFB, Colo., were among the first deployed to southern California and Arizona in late June to help fight the blazes.

C-130 aircrews from the 731st Airlift Squadron and maintenance personnel from the 302d Maintenance Squadron joined ANG units from the 146th Airlift Wing, Channel Islands ANGB, Calif., 145th Airlift Group, Charlotte, N. C., and 153d Airlift Group, Cheyenne, Wyo., to fly twenty-eight sorties over three days to disperse more than 100,000 gallons of fire retardant over numerous sites. When fires in California were stabilized, the group was deployed to Arizona to fight fires there.

While the aircraft battled the fires, ground crews battled 137° tarmac heat as they serviced the C-130s.

Last F-106 Regenerated

The final F-106 taken from desert storage at Davis-Monthan AFB, Ariz., was delivered in July by the Aero-

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space Maintenance and Regeneration Center.

The Air Force withdrew 182 of the F-106s over nine years for use as full-scale aerial targets by Air Combat Command units at Tyndall AFB, Fla., and Holloman AFB, N. M. The regeneration center has been delivering four aircraft per month for the past three years.

The last F-106 had been used by NASA for testing and then stored. It was returned to service in 1992 and brought back to be regenerated, tested, and flown as a QF-106 drone.

News Notes

■ The Full Type Certification of the Northrop Grumman/Agusta S.211A trainer was obtained from the Italian Civil Airworthiness Authority in July. The S.211A will be entered in the Joint Primary Aircraft Training System (JPATS) competition. Contract award is expected in February 1995.

■ In July, the National Aerospace Plane (NASP) Joint Program Office at Wright-Patterson AFB, Ohio, began focusing its efforts in a new direction, closing the NASP program and making the transition to the Hypersonic System Technology Program. The new program will be funded by the Air Force and NASA. Over the next few years, they will concentrate on demonstrating the feasibility of hypersonic propulsion.

■ A single-stage-to-orbit Sergeant rocket successfully carried out the first suborbital launch in a two-part mission series for the Ballistic Missile Defense Organization in July. The rocket was launched at NASA's Wallops Flight Facility, Va., said the rocket's builder, Orbital Sciences Corp. The second launch was completed in mid-August. The initial launch included two ballistic missile targets, which allowed BMDO's Miniature Sensor Technology Integration 2 satellite to demonstrate its ability to detect, acquire, and track the solid rocket motor and downlink tracking data to ground telemetry stations. The program will also demonstrate various ground tracking capabilities and communication interfaces.

■ Military space-available travelers may sign up for travel by faxing their travel requests to the locations from which they plan to depart, the Air Force said in July. The fax should be sent on the effective date of leave, as its data header will be the basis for the date and time of sign-up.

■ Dr. Richard R. Weiss, chief scientist and lab director of the Phillips Laboratory Propulsion Directorate at Edwards AFB, Calif., won the Wyld Propulsion Award at the American

Institute of Aeronautics and Astronautics' International Propulsion Conference in late June. The award was based on Dr. Weiss's work in the field since 1958.

■ Northrop Grumman Corp. said in July that it had signed a memorandum of understanding with the Carlyle Group, LP, whereby Northrop Grumman would acquire Carlyle's fifty-one percent interest in Vought Aircraft Co., for \$130 million in cash. Northrop Grumman currently owns the balance of the outstanding common shares in Vought. Vought has no debt and about \$90 million in cash beyond its current needs. It is involved in the C-17 and B-2 programs and the Pampa 2000, which is competing for the JPATS contract.

■ In July, the Air Force presented its 1993 Small Business Special Achievement Award to the Lockheed/Boeing/Pratt & Whitney F-22 team and the F-22 System Program Office. The award honors the F-22 program as "the best of the best" in supporting the small- and minority-business goals of the Air Force.

■ Naval Air Systems Command received the Presidential Award for Quality, the nation's highest honor for quality in the federal government, DoD said in July. NAVAIR, with 47,000 employees, eighteen major sites across the country, and an \$11.5 billion Fiscal 1994 budget, provides aircraft and weapon systems to the Navy.

■ A. L. Ueltschi, president and chief executive officer of FlightSafety Inter-

national, was selected as the 1994 recipient of the Wright Brothers Memorial Trophy in August, the National Aeronautic Association said. The award promotes the advancement of worldwide aviation safety through sophisticated training methods and use of aviation to deliver state-of-the-art health care to people otherwise deprived of high-quality medical care.

■ Deputy Secretary of Defense John M. Deutch said there are four critical elements in DoD's role in the restructuring of the defense industry: Allowing restructuring costs only when DoD is satisfied that it will save money; encouraging restructuring and cost savings by the companies that supply it; refusing to pay acquisition costs; and ensuring that current policies are standard and consistent. Mr. Deutch testified in July before the House Armed Services Subcommittee on Oversight and Investigations.

Purchases

The Air Force awarded Martin Marietta Corp. a \$16.9 million face-value increase to a fixed-price incentive firm contract for Phase II of the Titan IV Launch Restoration Plan. Expected completion: September 1995.

The Air Force awarded General Electric Co. a \$176.3 million face-value increase to a fixed-price contract for forty-five F110-GE-129 engines for use on F-16 aircraft and forty engine monitoring system computers. Expected completion: July 1995. ■

Senior Staff Changes

RETIREMENTS: B/G Bruce J. Bohn; M/G Robert A. Bueche, Jr.; M/G Marvin S. Ervin; B/G Milton L. Haines; B/G Raymond A. Shulstad.

PROMOTION: To be Lieutenant General: Edwin E. Tenoso.

CHANGES: M/G Phillip E. Bracher, from Dir., Command, Control, Sys., and Log. (J4-J6), Hq. USSPACECOM; Dir., Command Control Sys. NORAD, and Dir., Communications-Computer Sys., AFSPC, Peterson AFB, Colo., to Dir., Plans, Policy, and Resources, DCS/Command, Control, Communications, and Computers, Hq. USAF, Washington, D. C., replacing B/G Buford R. Witt . . . B/G Kenneth W. Hess, from Cmdr., 47th FTW, AETC, Laughlin AFB, Tex., to Cmdr., 374th AW, PACAF, Yokota AB, Japan, replacing B/G Michael J. McCarthy . . . B/G James A. Jaeger, from Cmdr., AFTAC, Patrick AFB, Fla., to Ass't Dep. Dir., Ops., NSA, Fort Meade, Md., replacing B/G Billy J. Bingham . . . B/G Michael J. McCarthy, from Cmdr., 374th AW, PACAF, Yokota AB, Japan, to Dir., Ops., DCS/P&O, Hq. USAF, Washington, D. C., replacing M/G (L/G selectee) Edwin E. Tenoso . . . M/G (L/G selectee) Edwin E. Tenoso, from Dir., Ops., DCS/P&O, Hq. USAF, Washington, D. C., to Vice Cmdr., Hq. AMC, Scott AFB, Ill., replacing retired L/G John E. Jackson, Jr.

SENIOR EXECUTIVE SERVICE (SES) RETIREMENT: Roy C. Gay.

SES CHANGES: Roger M. Blanchard, to Dir., Civilian Personnel, Policy & Plans, DCS/Personnel, Hq. USAF, Washington, D. C., replacing John R. Graham . . . John R. Graham, to Chief, Hq. AFCPMC, Randolph AFB, Tex., replacing retired Roy C. Gay. ■

The sun never sets on AWACS operations, and everybody wants a piece of Joint STARS. Both of these airborne radar programs are in the midst of improvement.

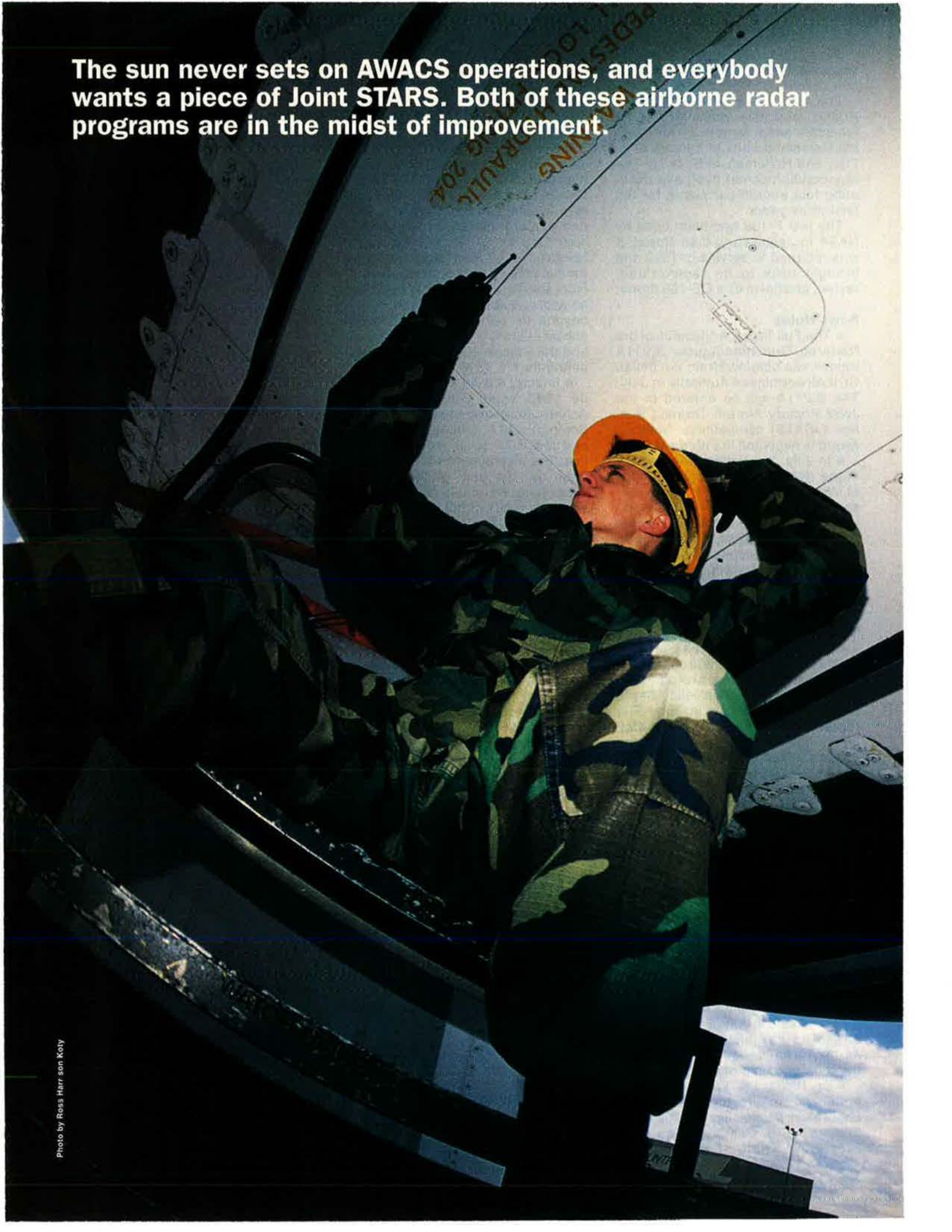
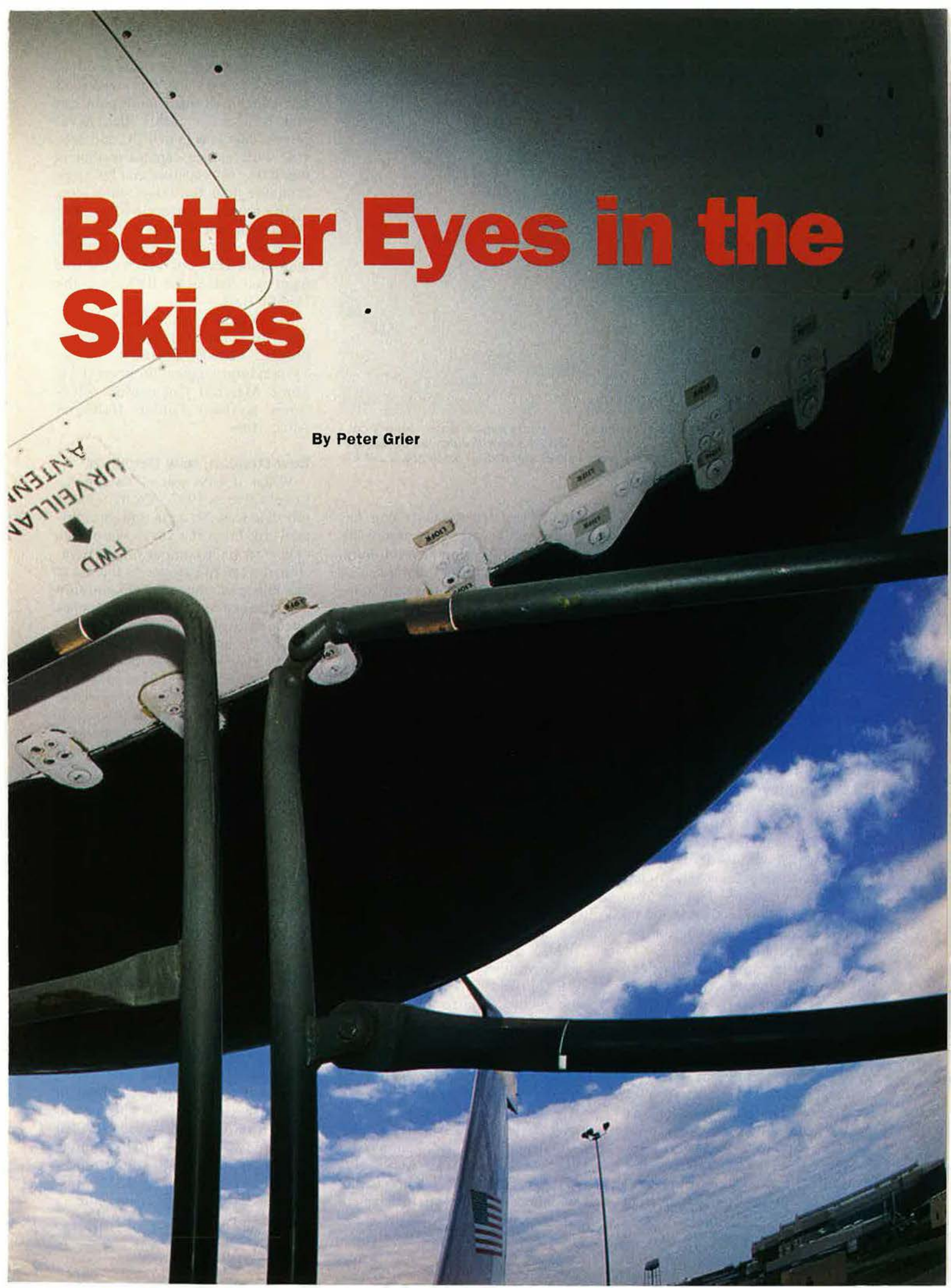


Photo by Ross Harrison Koty

Better Eyes in the Skies

By Peter Grier

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Under the dome, A1C Harry Paules (above and previous pages) goes to work on one of the 552d Air Control Wing's E-3s. The AWACS aircraft, a proven performer in great demand around the world, has been in the operational force since 1977.

GIVEN the range of standoff weapons and the chaos of regional conflicts, a clear picture of the battlefield is more important to United States armed forces today than ever before. If you spot your adversary first, you can strike first—and in modern combat, the first strike is often a knockout blow. The rout of the Iraqis in the 1991 Persian Gulf War plainly shows what happens when one side has clear vision and the other side is blind.

For US military forces, this vision depends on two of the most solid programs in the Air Force: the E-3 Airborne Warning and Control System (AWACS) and the E-8 Joint Surveillance and Target Attack Radar System (Joint STARS). One is a veteran and the other a newcomer, but both enjoy strong support from users, Air Force owners, and national officials across the Washington political spectrum.

The familiar, mushroom-topped E-3 AWACS aircraft is in the middle of a major radar and sensor system upgrade. When this work is finished, near the end of the decade, AWACS will possess a vastly improved ability to discern friendly aircraft from foes and be able to locate and track air targets many times smaller than those it can see today.

For its part, Joint STARS is nearing the beginning of full-rate production. The success of two Joint STARS prototypes in tracking Iraqi

ground forces in the Gulf War has given program officials a popularity problem other systems might envy, as parts of the military clamor to be added to the official mission statement of the aircraft.

"An awful lot of people are representing JSTARS as a cornerstone of some future architecture," such as theater missile defense plans, says Thomas J. Robillard, Joint STARS director of Programs.

These radar eyes of the US armed forces are prominent symbols as well as sought-after force multipliers for a shrinking military. For one thing, they represent the cutting edge of technology—airborne warning that no one in the world can match. Allies who want such capability must come to the US. The combined NATO military command, Britain, France, and Saudi Arabia all purchased their own models of the E-3 AWACS and put them in service. Last November, Japan signed contracts for two E-767 AWACS, a new version whose platform is based on the new Boeing 767 airframe instead of the out-of-production 707. South Korea and Italy have reportedly made inquiries about buying upgraded AWACS types.

The far-seeing E-3, in particular, is also a symbol of American commitment and the basis for something that could be called "AWACS diplomacy." In years past, US presidents dispatched battleships to the corners

of the world to demonstrate resolve; today, likely as not, they will send AWACS. Program officials point out that E-3s move faster than naval forces, cost less to deploy, and provide a defensive capability that is much less provocative and far more effective than the sixteen-inch guns of the bygone battleship fleet. The thirty-four operational E-3s in the Air Force inventory are constantly in motion. They operate everywhere from east Asia to the Balkans to the Middle East.

"The sun never sets on AWACS," says Maj. Dave Huss, production program manager for the E-3 Radar System Improvement Program at Air Force Materiel Command's Electronic Systems Center, Hanscom AFB, Mass.

New Mission, New Demands

When it first joined the operational force in 1977, AWACS had a job that was strategic and straightforward: Track the Soviet warplanes expected to accompany any invasion of western Europe. As the world has changed, the AWACS mission has changed as well. It now focuses on the tactical, rather than the strategic, and is used for everything from no-fly-zone enforcement to antidrug patrols. Once, it planned to spot huge Tu-95 "Bear" bombers or massive Soviet fighter-bomber raids; now it looks for small Cessnas or the lone intruding combat aircraft. This shift has made great demands on AWACS aircraft.

Current upgrades are intended to solve this problem and keep AWACS productive well into the next century. The Radar Sensitivity Improvement Program (RSIP), for example, is intended to greatly increase the sensitivity of the aircraft's Westinghouse APY-1 and APY-2 radar. After acquiring RSIP kits, E-3s operating in their pulse-Doppler radar mode will be able to spot targets having only one-tenth of the minimum radar return needed to show up on today's system, according to Raymond A. Hoag, MITRE Corp.'s AWACS chief systems engineer.

This sensitivity improvement in the radar will enable E-3 aircraft to see not only tiny Cessnas but also cruise missiles and perhaps air platforms that use stealthy low-radar-visibility technologies. RSIP's initial operational capability date is

set for February 1999. The NATO nations have contributed thirty-five percent of program costs and expect to obtain kits for all eighteen Alliance-owned AWACS aircraft, which are based in Geilenkirchen, Germany, and bear Luxembourg's markings.

The major Block 30/35 AWACS upgrade will add sensors to existing E-3 models and improve the plane's data communications system. The centerpiece of this effort is a set of oval pods attached to the side of the E-3's forward fuselage, giving the aircraft another distinctive mark to go with its trademark rotating, mushroom-shaped radar dome.

Inside the pods will be passive detection systems grouped under the name electronic support measures (ESM). This has been one of the most highly classified developments



AWACS missions are labor-intensive. In addition to the flight crew, up to eighteen mission specialists man the aircraft. Pods have been added to supplement the trademark rotating dome to help locate stealthy platforms.

Photos by Ross Harrison Koly



The limited computer power of outdated mainframes and nonstandard keyboards have made it difficult for AWACS aircrews to take advantage of recent computer advances. Upgrades are on the way.

in the AWACS program over the past decade.

The passive ESM will give AWACS a detection tool to complement the active, beaming radar. It will enable the aircraft to sense the electronic impulses emitted by other aircraft, a capability that presumably would help locate stealthy air platforms that might be able to evade or give the slip to radar. "It's a fuzzbuster for AWACS," says Mr. Hoag.

This capability could be especially helpful for identifying friend from

foe, as it enables operators to distinguish between the distinctive emissions of different types of aircraft. Perhaps a Block 30/35 AWACS could have helped avoid the catastrophic "friendly fire" destruction of two US Army UH-60 Black Hawk helicopters over northern Iraq, in which an AWACS operator inexplicably failed to warn two F-15s that two US helicopters were in the fighters' area [see September 1994 "Aerospace World," p. 21].

Other AWACS work at ESC in-

volves replacing outdated equipment, such as reel-to-reel tape computer drives and nonstandard keyboards whose keys are harder to push than those of old manual typewriters. (When AWACS was originally laid out, engineers thought that the officers and technicians who would man the plane probably would not know how to touch type, so the keyboard was designed for hunt-and-peck typists. In the computer age, nearly everybody types; AWACS operations consoles now will get standard electronic keyboards.)

Architectural Constraints

As engineers outfit AWACS for the next century, they face a crucial limitation. It is not the old Boeing 707 airframe; that will be up to the task until at least 2025 or so. The problem is the aircraft's outdated computer architecture. Given the age of the old centralized mainframe computer that AWACS now carries, little more can be done to upgrade the plane's detection skills. With today's radar and sensor upgrades, "this is the last time we can add complexity to the system," says Steve Carlon, AWACS director of Engineering.

AWACS has added new sensors or gone through extensive upgrades every two or three years since it was first fielded. The displays that operators stare at for long hours have thus become more complex, but the lack of computer power blocks major



Both the E-3 (left) and the E-8 Joint STARS are based on the Boeing 707 airframe, which is no longer in production. Some E-3 customers have moved to the Boeing 767 as a platform. E-8 procurement officials are scouring the world for used 707s capable of the Joint STARS mission.

improvements in this man-machine interface.

At a Hanscom computer lab, MITRE technicians are working with the Air Force on such commonsense display improvements as making a target's entire track the color of its assigned identity (red for hostile, yellow for unknown, green for friendly). New data-fusion algorithms could enable tracks to follow a target's maneuvers more accurately.

AWACS officials hope that somehow they can crack open the old closed-architecture mainframe and add more computer power and flexibility, which would make it far easier to carry out changes in the display interface. One idea is for new computers simply to be wired into the old ones, acting as a sort of electronic supercharger. "Maybe we could do it with a socket on the side of our current computers," says Jim Linder, MITRE's chief engineer for AWACS Development.

For all its problems, officials caution, AWACS is hardly a system whose usefulness is coming to an end. AWACS can be continually upgraded, they say, eventually with a new computer architecture, newer

sensors, and even a new airframe. When the 707s wear out, say Air Force officials, AWACS electronics can simply be unplugged and moved to a 767 or other new plane. "The mission plan does show a new platform at about 2025," Mr. Linder points out.

From Soviets to Scuds

Air Force officials say that Joint STARS will do for the ground battle what AWACS does for the air battle. However, in contrast to the venerable AWACS, Joint STARS is just a green recruit.

The official initial operational capability date for Joint STARS is not until 1997—even though two prototype E-8As served with distinction in the Kuwaiti theater of operations during the Persian Gulf War. The Air Force sent this special sensor to the Gulf at the request of Gen. H. Norman Schwarzkopf, commander in chief of US Central Command. Every night throughout the conflict, one of USAF's two developmental E-8As flew a ten- to twelve-hour orbit. Its systems beamed back real-time data on a wide range of military activity.

The Air Force's tactical fighter units grew increasingly eager to acquire Joint STARS target information, and the leaders of CENTCOM came to view the F-15E fighter, with its deep-strike, nighttime capability, as an especially effective stablemate of the E-8A.

Planners originally envisioned that this airborne, ground-scanning radar would detect and target massed, fast-moving Soviet armor columns striking with terrific shock into the heart of Europe. In Operation Desert Storm, however, the E-8As demonstrated versatility, transmitting data on everything from the movement of mobile Scud missile launchers to the location of concertina-wire barriers and traffic on previously undetected military roads.

Since then, program officials have concentrated on turning experimental models that flew with contractor personnel on board into a production program with a stable technical baseline and all-military crew. Performance verification testing on the program ended earlier this year, and the contractor, Northrop Grumman Corp., officially turned over the E-8A test craft to Air Force officials.

Now Northrop Grumman is working on a second lot of two E-8C production model aircraft. If all goes well, the program will get its full-rate production approval from the Pentagon this fall. Plans call for the Air Force to eventually acquire a fleet of some twenty E-8 airframes.

If the program negotiates its full-rate production checkpoint safely, the next step will be to set up the depot facilities and maintenance routines needed for support throughout the system's life cycle. "E-8 work is about to crest," says Mr. Robillard, and infrastructure development will gain in importance "as soon as the crest breaks."

Paperless Tech Support

Not that support has been ignored until now. Among other things, the Joint STARS program has already developed an electronic tech manual system that Hanscom officials claim is the most mature example of its kind anywhere in USAF. Such a paperless, laptop computer-based system has been a Holy Grail for Pentagon logisticians for some time, and officials from the V-22 Osprey tiltrotor project and other programs

have marched out to Hanscom to see the Joint STARS version in action.

Technical details for each Joint STARS aircraft will probably be slightly different, as each will be based on a used 707 airframe purchased from a different source. Bulkheads and other structural elements will vary from plane to plane.

Getting a portable computer memory large enough to hold the thousands of pages of data needed to maintain Joint STARS is not the manual system's biggest hardware problem, however. Officials are more worried about finding a screen that can be easily read on the flight line in all weather. "Color and resolution are really our limiting factors," says Col. James A. Davidson, Joint STARS director for System Support.

As with AWACS, Joint STARS will use previously flown aircraft for basic platforms, but this is not expected to cause any performance problems, say ESC officials. Using old planes saves money on an admittedly expensive program, and the 707s are workhorses, engineered to be tougher than today's airliners and thus fully capable of withstanding the stress of orbiting in a search pattern for eight to ten hours.

At its Lake Charles, La., facility, Northrop Grumman will rip apart 707s bought on the open market. Then workers will essentially build them over again, doing everything from rewiring to riveting to giving



Photo by Ross Harrison Koty

Capt. Carl Mallette checks an E-8's electronics at Northrop Grumman's Melbourne, Fla., facility. Joint STARS radars can cover almost 400,000 square miles of ground territory in a single eight-hour sortie.

the aircraft a complete paint job. Modern composite materials are added in certain areas.

"When we put them together with new parts, they are stronger than new," says Mr. Robillard.

Just Like Qantas

The exact configuration that Northrop Grumman uses matches a series of 707s that was sold only to Australia's Qantas Airways. Airplanes from other sources are being changed to match this series's specifications.

For all intents and purposes, Joint STARS is the entire market for old 707 aircraft, and program officials scour the world for possible buys. They have their eye on a batch owned by Canadian Forces, for instance; program officials consider these aircraft to be in top shape. Though freighters are preferred because they were built stronger to begin with, they were often used harder and maintained less carefully than models intended for passenger use.

After they are remanufactured in Louisiana, the prospective E-8Cs move to Northrop Grumman Melbourne Systems in Florida, where electronics are added and tested. The plane's main eye is a Norden System side-looking radar slung under the forward fuselage in a canoe-shaped fairing.

The radar's basic mode is wide-area surveillance, designed to find and identify slow-moving targets, such as convoys. Fixed targets are identified in a high-resolution synthetic aperture mode, which produces a map of ground regions. Bridges, airports, and buildings show up as in reconnaissance photographs. Powerful signal processors, used with the Doppler radar mode, could sort signals, distinguishing wheeled vehicles from higher-value tracked armor.

Secure data links beam this radar information to Ground Station Modules. These receiving stations can process the raw radar data on their

Photo by Ross Harrison Koty



SrA. Cory Petty examines a radar transmitter component in an E-3. Upgrades will enable the E-3's radar to detect aircraft with one-tenth the signature visible to today's radars, allowing the aircraft to spot tiny Cessnas and cruise missiles.

own and are intended to serve as Joint STARS's direct link to the US command-and-control structure and ground forces. The Army is solidly behind the aircraft and was in on its development from its 1970s beginnings as a Defense Advanced Research Projects Agency program, known then as "Pave Mover."

Upgrades to the basic system have already been funded. In particular, Joint STARS engineers are working on linking the aircraft to Constant Source, a stream of tactical intelligence information from other aircraft and a technical means that promises to help operators distinguish, say, mobile missile launchers from troop transports.

Whither Joint STARS?

Development engineers still face some basic challenges. Among them



While it was still in development, the E-8 Joint STARS was a star performer in the Gulf War. It enjoys strong support in the Army and in Congress and will achieve initial operational capability in 1997.



Photos by Ross Harrison Koty

Captain Mallette, a member of the Joint STARS combined test team, checks data at one of the E-8's ten operations consoles. Joints STARS will have direct links to ground forces and the US command-and-control structure.

is environmental friendliness. Joint STARS managers, as well as Air Force Materiel Command, are searching for something other than ozone-depleting Halon for Joint STARS's fire-fighting chemical. Program officials are also struggling to understand what the Pentagon's officially declared move away from use of military specifications [see "The End of the Line for Milspec?" p. 43] means for their electronics-heavy program.

The most profound question con-

fronting the Joint STARS program concerns the system's ultimate direction. Its original mission, policing the Fulda Gap and its immediate environs, is no longer relevant. Employment will not be a problem; its unprecedented ability to picture ground dispositions is in great demand.

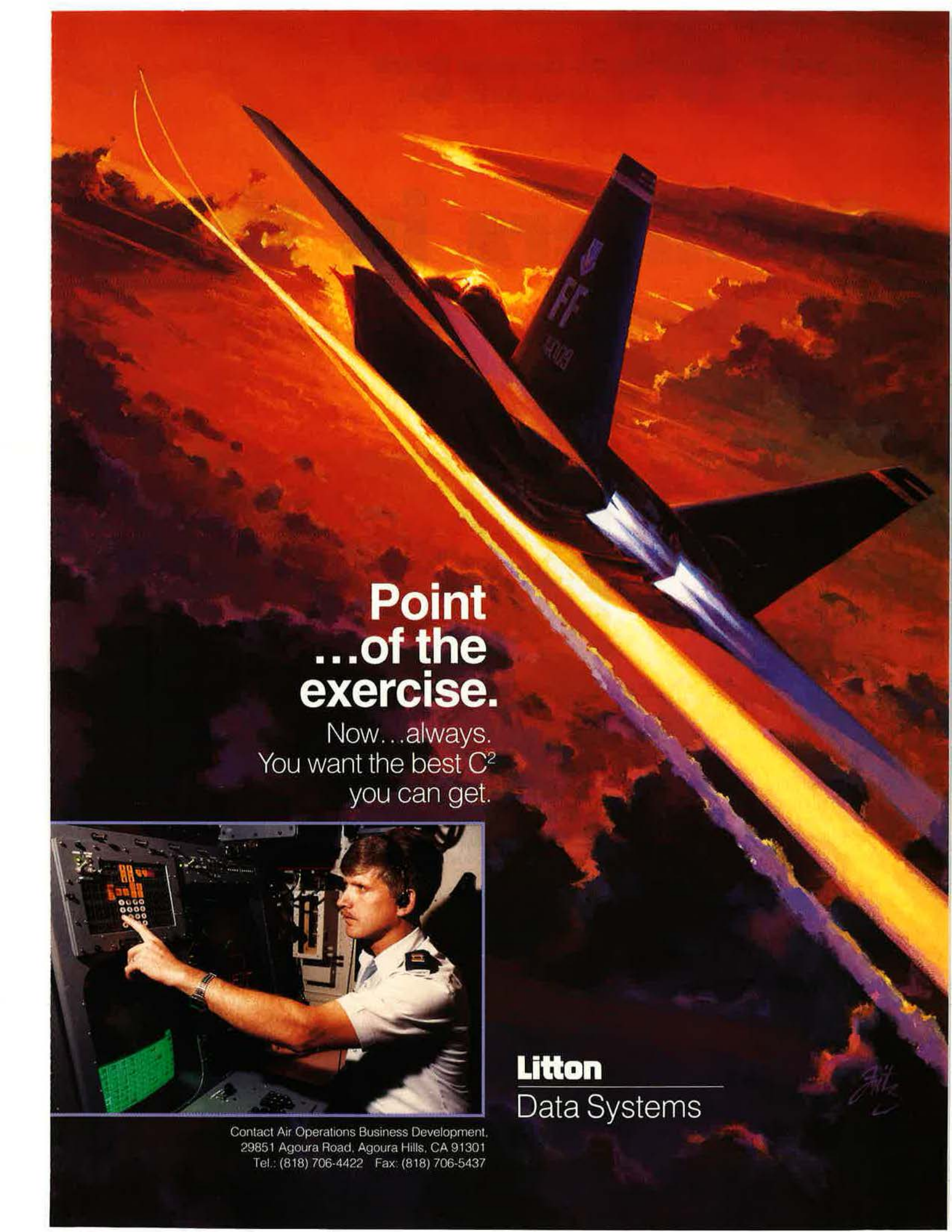
Theater missile defense, for instance, might well become a major Joint STARS mission, though searching for Scud launchers proved difficult in the Gulf War. On the other hand, the synthetic aperture mode of the Joint STARS radar proved more valuable than expected in that war, providing crucial information about infrastructure in an area of the world where maps are not always complete or reliable. Operators are still working on the right mix of radar modes and other information-gathering techniques.

"Our concept of operations develops with almost every test flight," says Mr. Robillard.

Even if the aircraft suffers from a slight identity crisis, its future seems assured. To hear US military officials talk, the country has fought its last war without bringing with it a Joint STARS aircraft or something very similar. Congress remains committed to a full complement of twenty aircraft, and if there are problems with the technology's reaching initial operational capability, they are not readily apparent.

"This is a program that had no fatal flaws," says Colonel Davidson. "The system works." ■

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



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The first B-1Bs in the Air National Guard are now flying at McConnell AFB, Kan.

Bombers in the Guard

By David J. Lynch

THE UNITED States Air Force embarked on a provocative expansion of the Total Force concept last July 1. That was the day it transferred ownership of ten B-1B bombers to the Kansas Air National Guard, the first time a reserve component unit had been given control of a long-range combat aircraft.

The moment passed almost unnoticed amid the rush of other post-Cold War events, but it was a milestone. It represented an important step in the service's attempts to make do with less money, and it hinted at broader changes to come. Some viewed the event as a microcosm of the promise and problems inherent in shifting the active-reserve force mix toward greater dependence on the Guard and Reserve.

As historic moments go, handing over a thick maintenance manual hardly qualifies as dramatic, but that is how the formal transfer of the B-1Bs occurred. After flying the first Guard-bound B-1B into McConnell AFB at Wichita, Kan., Maj. Gen. Donald W. Shepperd, director of the Air National Guard, turned over the owner's manual to Lt. Col. Russell T. Axtell, Jr., newly minted



The B-1 bearing a new insignia (opposite) signals a new role for the Air National Guard at McConnell AFB, Kan. In July the 184th Bomb Group, commanded by Lt. Col. Russell Axtell (above, center) became the first reserve component unit to be equipped with the bomber. Former fighter pilots like Lt. Col. Bob Murphy (right) and Maj. Bob Karslake have had to retrain as bomber pilots.



commander of ANG's 184th Bomb Group.

"Change is here," said Army National Guard Maj. Gen. James F. Rueger, adjutant general of the Kansas National Guard. "If you don't believe that, look outside." He gestured to a dull gray B-1 parked in the broiling sun.

The move was more than a year in the making. On May 27, 1993, the Air Force approved a series of force-structure changes intended to remake units based at McConnell. The announcement called for the 184th Fighter Group, which trained pilots for the single-seat, front-line F-16, to relinquish its fifty-four fighters, assume control of ten B-1Bs, and become the 184th Bomb Group. The F-16s and associated training mission were slated for reassignment to the 58th Fighter Wing at Luke AFB, Ariz.

At the same time, USAF identified the first four B-1Bs—later increased to six—that the Guard would receive. To get to the 184th, the bombers would literally move across the McConnell asphalt from the active 384th Bomb Wing, which controlled seventeen of the swept-wing bombers.

Two months later, Brig. Gen. Charles R. Henderson arrived at McConnell to assume command of the 384th and preside over its deactivation and the base's transition from an Air Combat Command bomber base to an Air Mobility Command refueling base.

Days of Future Past

As part of a service-wide restructuring, McConnell was to shift from serving as a key bomber base to hosting one of three continental US-based KC-135R air refueling wings. For McConnell, this change would not occur without irony. The base had carried out precisely the opposite transition just six years earlier, when the Air Force withdrew a refueling mission and moved its new B-1Bs there.

Until January 1, 1994, McConnell was the host base for seventeen B-1Bs and seventeen tankers. On New Year's Day, these bombers began to cycle out of the base to other locations, while the tanker fleet began to grow into what eventually will be four squadrons, containing forty-eight aircraft.

ANG's 184th Fighter Group was selected to receive the B-1Bs for a

host of reasons. First, USAF is engaged in a significant drawdown of its force structure. From a peak of thirty-seven tactical fighter wings in 1989, the service has shrunk to slightly more than twenty wings. With the need to train F-16 pilots consequently reduced, the demand for the services of ANG's instructor pilots ebbed.

Second, the Total Force concept envisions Guard personnel participating in just about every aspect of Air Force operations. In the past, Guard units have flown attack aircraft, fighters, tankers, and transports. As it became apparent that the 184th required a new mission, the proximity of McConnell's B-1Bs made the solution fairly obvious.

"The major reason for shifting it to the Guard was, as we look at the total force, we want to make sure that we have a balanced force," said General Shepperd.

General Henderson came to McConnell after having served on the Joint Staff in Washington, D. C., as chief of Nuclear Operations, Command and Control Division. In his new post, he presided over the potentially problematic transfer of one of the most advanced weapon sys-



B-1Bs sit on the flight line at Dyess AFB, Tex., where Air Guardsmen undergo training with active-duty bomb crews. Under the Total Force concept, ANG personnel will take part in every aspect of Air Force operations.

tems to a fighting force that had had no experience with them. He viewed the task as a straightforward one. "Our responsibility was to make sure our knowledge and resources were transferred in an organized and reasoned manner to the Guard," he said. "We were the principal training organization on how to schedule, employ, and maintain the airplane."

General Henderson and the other officers of the 384th identified seventeen major areas that would be critical to the transfer's success. An Office of Primary Responsibility on both the Guard and active-duty sides was designated for each. In October 1993, representatives of ACC, the National Guard, and AMC met at McConnell for a site-activation meeting that solidified planning for the transition.

The shift presented few initial logistics problems because the aircraft were to remain in their current hangars, which are well situated for their maintenance needs.

A Major Challenge

ANG faces a complex balancing act in trying to meet its maintenance requirements for ten B-1Bs amid the crowding and bustle of a forty-eight-aircraft KC-135 operation. "That's going to be a major challenge, especially during wintertime when you need conditions of a hangar for heavy maintenance," said General Henderson.

Brig. Gen. John Crawford, commander of the Kansas ANG, noted

that the B-1B maintenance area will be located across two active runways from the Guard facilities. Officials of the 22d Air Refueling Wing are working with the Guard on the required sharing procedures.

In April, the first Air Guardsmen returned from their initial B-1B training at Dyess AFB, Tex., and began flying with the active-duty bomber crews of the 384th. While at Dyess, the former fighter pilots received the same introduction to the B-1B that any raw active-duty

candidate would. Mixed with active-duty trainees in one of four twenty-four-man classes that would pass through Dyess that year, the Guard pilots received five months of instruction, including initial training of twelve sorties.

After two months of classroom work, the trainees were brought to the flight line. The first four flights were consumed with orienting the new pilots to the airplane. Then training moved into night operations, live drops on the Utah test range, air refueling, pattern flying, and safe recoveries after an emergency, according to Capt. Mike Shoultz, a B-1B pilot at Dyess.

In many ways, the Guard pilots could not have been better prepared to enter the B-1B course. As F-16 instructors, they were all highly trained aviators with more than 2,000 hours of flight time. All were former active-duty Air Force officers who had moved on to full-time Guard status. No so-called "traditional" Guard pilots are involved in the transition to date. A handful of airmen from the 384th left active duty to become full-time Guardsmen. They are flying as Offensive Systems Operators and Defensive Systems Operators. "That's smoothed the transition; we know these people," said B-1B commander Capt. R. G. McManus of the 384th.

As a result of their experience with offensive strike packages, Guard pi-



A technician moves a conventional modular bomb rack into position in the B-1B's internal weapons bay. ANG ground crews have been working on the "Bone" alongside their active-duty counterparts every day since March.

lots fit easily into the B-1B's new emphasis on conventional missions.

Learning to Ask

Still, the new B-1B pilots faced some potential difficulties. They were moving from a single-seat aircraft, where the pilot is in complete command, to a four-man cockpit, where "crew management" is a key skill. For the ANG pilots, the shift meant they had to ask crewmates for information that previously had been available at a glance.

Those involved in the training on both sides said the transition was uneventful. "It's been very easy for them," said Captain Shoults. "They're used to flying formation with other crews. The same considerations that are involved in taking care of your wingman go along with taking care of other crew members."

The final portion of the Dyess training involves an exam and simulator evaluation along with a checkride in which the new pilot is responsible for making all the decisions. On average, Captain Shoults said, this sortie lasts five to six hours. It entails live drops at test ranges in New Mexico or Utah and instrument flying along a low-level route into Colorado or west Texas at about 500 feet above ground level.

New pilots and their instructors agree that the toughest part of the B-1B training is the first night air refueling mission. Lt. Col. John Sanders, an ANG F-16 instructor turned B-1B pilot, said the much larger bomber is not as responsive as the highly maneuverable fighter. That means pilots accustomed to a quick and easy refueling hookup must learn to slide into position more gradually. "It takes a little more thought," said Colonel Sanders.

Kansas ANG Maj. Bob Karslake was brought up short by the B-1B's steep angle of descent in one training run. From an altitude of 15,000 feet, the bomber went into an automatic descent at an 8° angle until it reached 5,000 feet. Then the aircraft dove for the ground at a steeper 10° angle through thick cloud cover before leveling off at 1,000 feet.

"By itself, that was pretty eye-opening for me," said Major Karslake. "We hadn't flown an airplane with that capability."

General Henderson said pilots who return from Dyess are well schooled



Photo by Ross Harrison Kory

Maintenance crews have adjusted to the new aircraft. Here, crew chief TSgt. Steve Holderman, who formerly concerned himself with the care and feeding of the F-16's single engine, looks over one of the B-1's four F101-GE-102 turbofans.

in B-1B procedures, but there is still much more to be done before the transition is complete. Upon returning to McConnell, the Guardsmen are put through local checkrides, perform additional night terrain-following and formation flying, and place what they have learned at Dyess "in a mission context," said General Henderson. "The biggest challenge we have is that the mission and airplane are complex. This is a major transition from one complex system to another complex system."

What will be the mission of the Kansas ANG's 184th Bomb Group?

General Henderson sees no direct assumption by the 184th of his active-duty unit's mission, but he expects the Guard unit to be used from the outset of a conventional conflict. "We're organized as a total force; we train as a total force; we're going to war as a total force," General Henderson said. "This is the next step in that process."

Essential Guardsmen

Lt. Gen. Stephen B. Croker, commander of 8th Air Force, noted that Guard personnel are so deeply integrated into his headquarters that wartime operations would be impossible without their support. An estimated two-thirds of headquarters personnel as well as one-half of 8th Air Force's combat punch are represented by ANG units, General Croker said.

Under the multiple regional contingency scenario that forms the basis of current DoD planning, Air Force bombers would be used early in any future conflict to interdict enemy armored units. The aim would be to delay and destroy an enemy spearhead until CONUS-based ground units arrived.

Skeptics might doubt it, but General Croker insists that ANG pilots would be in on the action from day one. "We need 184 bombers to keep 100 deployed. We don't have 184 bombers. We have 100. Ten of these are going to be in the Kansas Air National Guard," he said. "In our concept, the Guard will be contributing from the first day of conflict."

For now, the Guard pilots are limited to conventional bombing missions. There is no legal prohibition against Guard personnel's being associated with nuclear roles and missions. Apart from the obvious political concerns about involving the National Guard with nuclear weapons, however, General Croker noted pragmatic difficulties, such as the need to complete the "personal reliability" programs required of the Air Force's active-duty strategic personnel.

He nonetheless praises the Guard concept without reservation. General Shepperd said he hopes to move to a mix of full-time and part-time Guard pilots assigned to B-1B duty. "There's no reason our traditional

pilots can't fly this airplane and participate in this mission," he said.

Once the first wave of Guard pilots returned to McConnell, active-duty pilots from the 384th began flying with them, sharing what they know of the aircraft and its capabilities. About twenty percent of the 384th's recent sorties involved training flights with the Guard.

The key milestone for the new pilots was a late summer "Global Power" sortie. Four times each year, McConnell sends at least two aircraft on a long-range practice run meant to demonstrate the B-1B's worldwide punch. Each mission lasts twenty to thirty hours and involves overwater flight and numerous air refuelings. There is usually a bomb run against a range in Europe or elsewhere as well as fighter-intercept exercises, often with US allies.



In a B-1B simulator, Capt. Preston Turner instructs Lt. Col. Greg Gardner of the Kansas ANG. The final portion of the five months of B-1B pilot training at Dyess involves simulator evaluation and a six-hour checkride.

Photos by Ross Harrison Kcty



Moving from the single-seat F-16 to the four-man B-1B takes some getting used to. Here, Capt. Jim Freeman of the Kansas ANG tests his skills as an offensive systems operator in a simulator at Dyess.

"It's a vivid demonstration of the Air Force's ability to respond," said General Henderson.

To get ready for the exhausting mission, pilots first complete a twelve-hour to fifteen-hour flight and participate in long-endurance flight training. There does not seem to be any magic about preparing for the grueling flights. A combination of diet, exercise, and flexible rest patterns is about all that can mitigate the effects of such long flights on alertness.

Beyond the Air Crews

Of course, so far as McConnell is concerned, the men in the cockpit are only part of the equation. Of equal importance are the ANG maintenance crews charged with learning quickly how to service a new and complex aircraft.

Maintenance crews began initial training in January; full-time work started in March when Guard and active-duty crew chiefs began working together closely. As the July 1 transition approached, Guard crew chiefs

were working alongside active-duty repair crews every day. As unscheduled maintenance chores arose, Guard personnel would be brought along to watch and learn. That happened in early summer, when a birdstrike led to the changing of five B-1 windshields. As individuals completed their training, they were pulled off F-16 duty to prevent safety problems caused by having people working on different aircraft.

Overall, ANG personnel approached the shift with little trepidation. "Most of us in the Guard have worked several different airplanes," said TSgt. Timothy Frawley. "An airplane is an airplane."

The B-1B and the F-16 are obviously very different. With a maximum operating weight of almost 240 tons, the bomber dwarfs the fighter. Individual components are much larger, repair jobs are more manpower-intensive, and, at a height of thirty-four feet, the B-1B is twice as tall as the F-16.

Like their cockpit counterparts, the maintenance crews consist of experienced, full-time personnel with substantial active-duty tenure. Sergeant Frawley, for example, spent four years on active duty working on KC-135A and R models before switching to F-4 and F-16 fighters during nine years with the Kansas ANG.

Along with experience, the Guard also boasts a stable work force. "We're here because we want to be

here, not because we're forced to be here by a four-year commitment," said Sergeant Frawley.

ANG officials are concerned about the adequacy of spare parts reserves and its impact upon readiness. They worry about keeping sortie rates high with a smaller maintenance staff than the active-duty unit enjoyed.

The Air Force is experimenting at Ellsworth AFB, S. D., with a program aimed at achieving a seventy-five percent mission capable rate through priority provisioning of spares. Early studies warned that ANG's mission capable rate could drop as low as thirty-five percent if sufficient spare parts were not made available. Unit leaders are aiming for a figure in the eighty percent range. "That is a possible problem for us," said Colonel Axtell.

The Guard units are expected to resemble active-duty operations in just about every way. Over the next several years, as a host of conventional system improvements is introduced to the B-1Bs, Guard aircraft are expected to be upgraded along with their active-duty brethren.

The Deployment Challenge

One new issue for the Guard unit will be deployment planning. As a training unit, the 184th never had to complete a large-scale mobilization and deploy to a faraway hot spot. "That's something that we have not done," said Colonel Axtell. "It's a whole new direction for the unit."

There are differing opinions as to the ultimate length of the transition. After October 1, when the 384th officially deactivates, a "stay-behind squadron" of roughly eighty active-duty servicemen from the 384th will remain at McConnell to steer the Guard unit through its first year of B-1B operations. For his part, General Shepperd foresees a two-year period before the entire Guard detachment is "up to speed." The Guard hopes to hang on to three instructor pilots from the 384th for one year. No final decision has been made.

The transition is not at all a one-way process. Although the principal concern of those involved was easing the Guard pilots' adjustment to

their new roles, active-duty pilots also are facing new challenges—and learning from their ANG counterparts in the process.

Today the B-1B pilot is called on to fly as part of a conventional strike package of electronic warfare, fighter, tanker, and airborne warning and control aircraft. The threat from enemy interceptors may be much greater than during a classic SIOP mission.

Under the new thinking, electronic warfare aircraft would probably enter a hostile area first, jamming surface-to-air missile sites and enemy radars. Then US fighters, in an offensive counterair role, would quickly establish air superiority. Finally, heavy bombers like the B-1B, light bombers like the F-111, and F-16s flying ground-attack missions would strike their targets before departing under a fighter escort.



Photo by Ross Harrison Kocy

Though it only involved ten aircraft, the transfer of the B-1B to the Kansas ANG is symbolic of the promise and the challenges of shifting to a force mix that relies more on the Guard and Reserve.

Pilots from the 384th say the Guard pilots have taught them about the tactics and other technical skills of a fighter pilot and given them new insights into the way combat aviators think. "They're helping bring things from the fighter world so we have more of a perspective," said

Capt. Rich Clark of the 384th. "Any time you fly, you've got to fly like you're going to fight."

Captain Clark sympathized with the ANG pilots since he, too, had moved to the B-1B from another aircraft. He flew for several years aboard KC-135s out of Loring AFB, Maine, and spoke of changing from a "technician/tactician" aboard that plane to a real aviator in the B-1.

For the Guard pilots, an almost unspoken element in the transition was a "cultural issue" in shifting from fighters to bombers. At the outset of the July 1 ceremony, the Air Force staged a flyby with a pair of F-16s followed by a B-1B rumbling along at low level. As the fighters roared past the crowd on the McConnell tarmac and rose into the sky, the Guard pilots kept their eyes fixed on the F-16s even as their new B-1B ap-

peared. Said General Shepperd, "The cultural hump to switch from fighters to bombers is a big deal."

The technical aspects of learning to fly a new airplane can be mastered in time, but the Guard pilots do have the look of someone leaving behind a first love.

"I miss the maneuverability in a fighter," said Lt. Col. Bob Murphy. Added Major Karlake, "Being a fighter pilot is primarily an attitude. . . . I will never lose that no matter what I fly." ■

David J. Lynch covers defense and aerospace matters for the Orange County Register in California. He is a former editor of Defense Week in Washington. His most recent article for AIR FORCE Magazine was "Space-power Comes to the Squadron" in the September 1994 issue.

The Clinton health plan may be dead in Congress, but it survives almost intact in the medical plan for the military services.

The Tricare Era in Military Medicine

By Bruce D. Callander

THOUGH President Clinton was unable to sell Congress on his ambitious health-care program for the entire nation, his original proposal will survive almost intact in the ambitious new program the services are laying on for the military.

The new system, called Tricare, is designed to provide universal coverage and offer a choice of managed care options to beneficiaries. Its goal is to keep costs low by letting the services contract with insurers to cover big groups of people in large regions. And it will emphasize greater use of primary care providers over more expensive specialists.

The new system also will include the one element that the President found hardest to sell on Capitol Hill—requiring employers or the government to pay most of the costs. The government, as employer of the military members, will pick up most of the tab for Tricare.

The new system will have no direct impact on the care of active-duty members. As always, they will be the prime focus of the services' own medical facilities. But members on active duty will be faced with choices in selecting Tricare options for their

families. When they retire, they will make such choices both for themselves and for their dependents.

Tricare will be up and running at a number of US locations within a year and will blanket the country by 1997. However, beneficiaries can expect some turbulence as the Defense Department implements new procedures and fine-tunes funding mechanisms. For those who have relied on care from bases being closed or realigned, there will be the added complication of adjusting to interim programs and then to Tricare.

Suspicious, Resentments

During the process, some user costs and copayments may change as the services struggle to cope with rising costs while trying to stay within their tight medical budgets. Service medical facilities are busy not only with setting up the system but also with explaining it to beneficiaries, some of whom are suspicious of any change and resentful of any cost increases.

Lt. Col. Jerome P. Luby, chief of Managed Care Policy in the office of USAF's Surgeon General, has those tasks in the Air Force. He said that parts of Tricare already will be fa-

Among active-duty personnel and retirees and their dependents, Tricare—a managed care system that combines military and civilian providers and resources—seeks to keep the idea of universal, affordable health care alive.



USAF photo by MSgt. Fernando Serna

miliar to beneficiaries who have participated in various health-care demonstration programs in recent years. Several ideas that have been road tested in these programs will be incorporated in the final version of the services' nationwide plan.

The all-services approach and the name Tricare itself, for example, have been used in a test program in the Tidewater area of Virginia, where the services have pooled their resources under the management of the Navy's Portsmouth Hospital. They have covered beneficiaries in the area with a combination of in-house facilities and civilian providers working under the traditional Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). Active-duty dependents from Langley AFB, Va., and USAF retirees throughout the region came under that system.

The new Tricare will combine the assets of all services, but it will cover twelve much larger Health Services Regions (HSRs), each headed by one service's medical center commander as "lead agent."

The commander of Naval Hospital Portsmouth also will be lead agent

for the Mid-Atlantic region (HSR 2), but that coverage now will include all of Virginia and North Carolina. Other regions will comprise even larger areas. HSR 6 will include most of Texas, parts of Louisiana, and all of Oklahoma and Arkansas. HSR 3 will blanket a dozen northern states.

Another previously tested approach, Catchment Area Management, also will be adapted to Tricare. Tested in the Southwest, that project gave local medical commanders more leeway in the use of both their own operations and maintenance money and CHAMPUS funds. They were encouraged to make greater use of the combined military facilities in their areas and to negotiate better discounts with civilian care providers by offering larger groups of participants.

Under Tricare, the services will contract with such civilian insurers as Blue Cross and Blue Shield and Aetna Foundation to provide services not available in the military facilities. One prime contractor will be responsible for each region but may subcontract with other insurers to provide added coverage.

Contracts will be written on a fixed-price, shared-risk basis, meaning that the carrier will operate the system for an agreed-on sum. If costs remain within that amount, the contractor will profit, but if costs exceed that ceiling, the contractor will be the first to lose money. Beyond a point, the services could share some of the loss, but they will share any savings up front.

Three Options

Another element of Tricare will be familiar to beneficiaries who have been covered under the demonstration project known as the CHAMPUS Reform Initiative. The CRI, first tested in California and Hawaii, allows participants to choose among three managed care options. Under different names and somewhat different conditions, those CHAMPUS options will emerge in the new program as Tricare Prime, Extra, and Standard. Here are their main features:

Tricare Prime. Beneficiaries must sign up for a year and pay enrollment fees based on grade and status. Under proposed schedules, dependents of E-4s and below would pay nothing, dependents of E-5s and

above would pay \$35 per year, and retirees and their dependents would pay \$50. These fees would double for full family coverage. Once enrolled, beneficiaries would make small copayments for services. For office visits to off-base providers, these could range from as little as \$5 for dependents of E-4s and below to \$10 for other active-duty dependents and \$15 for retirees. Hospital stays would cost active-duty dependents \$9.30 per day or \$25 (whichever is more) and retirees \$125 per day or twenty-five percent of the bill (whichever is less).

Tricare Extra. Beneficiaries will pay no enrollment fees but will be subject to CHAMPUS deductible payments. Proposed rates for office visits, lab tests, and other outpatient care would range from fifteen percent for dependents of active-duty members to twenty percent for retirees. Hospitalization would cost the same as under Tricare Prime.

Tricare Standard. Beneficiaries will be handled under traditional CHAMPUS rules and pay deductibles and copayments as they do now. They will pay no up-front costs as they would under Tricare Prime, but they

may pay more for the services they receive.

Besides the costs, the main difference among these options is in the choice of care providers. Tricare Prime beneficiaries are limited to using providers within the Prime network but potentially pay the least. Tricare Standard beneficiaries will have a wide choice of providers but will pay a greater share of their costs.

Colonel Luby said he probably would enroll in Tricare Prime as the best choice for his family. Based on findings from the CRI, large numbers of other families are likely to make the same choice, and therein lies a potential problem.

A RAND Corp. study of the CRI found that its Prime care option was the most popular with beneficiaries but the most costly to the government. This was true despite such cost-containment efforts as using primary care "gatekeepers" to limit referrals to specialists.

Cost is the problem that both the services and the beneficiaries may have to face as Tricare goes into operation. The services have just so much to spend. One alternative would be to charge the users more, but mili-

tary families traditionally have considered free or low-cost medical care to be one of their basic military entitlements. Many say that it was a major reason for their joining and for staying in service through periods of low pay and personal hardship. They feel that changing the rules now would be breaking faith after they have kept their part of the service contract.

Pay More or Get Less

Much as they may agree, officials note that the armed services are required to work within the funding Congress provides. If that funding does not cover everything they want, the beneficiaries' choices may come down to paying more or doing with fewer services.

The fee schedules for the various Tricare options are not final, officials said, and even when they take effect, they may have to be adjusted as the services gain experience with the plan.

Meanwhile, the basic outline of the program already is taking shape. The twelve regions have been mapped out and a lead agent named for each. The Air Force medical center commander at Wright-Patterson AFB, Ohio, for example, will be responsible for Region 5. The one at Keesler AFB, Miss., will be lead agent for Region 4; the one at Lackland AFB, Tex., for Region 6; and the one at Mather AFB, Calif., for Region 10. The Army will have lead responsibility in six regions and the Navy in two.

Basic to all of the proposals is the emphasis on managed care. The first contact for most beneficiaries will be with a primary care physician—a general practitioner rather than a specialist. That person will decide whether to treat the patient or call in a specialist.

Most patients in military facilities have gone through such an overall evaluation before being referred to specialists. Managed care, however, puts greater emphasis on primary care and avoids sending patients to specialists unless their expertise is clearly warranted.

When specialists are needed, Tricare will use a variety of means to provide them. Some patients who cannot be cared for by military physicians still will go to civilian providers as they do now under CHAMPUS, but Tricare also will

USAF photo by MSgt. Fernando Serna



As defense budgets decline, the military's health-care system will be directly affected. Tricare Standard beneficiaries who want a wider selection of doctors will pay more than those who choose from the Tricare Prime network of physicians.

Tricare Support Contracts Implementation Schedule

Region	Lead Agent	Scheduled Start
9	Naval Hospital San Diego, Calif.	February 1995
10	Travis AFB, Calif.	February 1995
12	Tripler Army Medical Center, Hawaii	February 1995
11	Madigan Army Medical Center (Fort Lewis), Wash.	March 1995
6	Lackland AFB, Tex.	May 1995
3	Eisenhower Army Medical Center (Fort Gordon), Ga.	May 1996
4	Keesler AFB, Miss.	May 1996
7	William Beaumont Army Medical Center (Fort Bliss), Tex.	May 1996
8	Fitzsimons Army Medical Center, Colo.	May 1996
1	National Capital Region	November 1996
2	Naval Hospital Portsmouth, Va.	May 1997
5	Wright-Patterson AFB, Ohio	May 1997

bring some civilian providers into military facilities to care for patients. An arrangement called "CHAMPUS recapture" allows managers to use CHAMPUS funds to bring in such civilian health-care practitioners when it is less expensive than sending patients to them.

Other civilian medical care providers will stay outside the military system but will be accessible through the insurer contractor responsible for the region. This also should hold down costs because the contractors must provide the services under the terms of their fixed-price agreements. Again, by acting for large groups of people, the contractor should be able to negotiate better rates.

Such approaches will call for a host of new monitoring and management arrangements, but the services already have experience dealing with large groups of people. Officials noted that the complex CHAMPUS system and a variety of controls over military beneficiaries have been in place for years. More recently, innovations such as the three CHAMPUS options, the Health Care Finder program, and the catchment area approach have been road tested in demonstrations.

The services are accustomed to keeping track of large forces deployed all over the world. In that sense, they may be better equipped to deal with the relatively small numbers of military beneficiaries than the rest of the government is to handle the millions who would be covered under a national health-care scheme.

A Nice Fit

Tricare also should mesh well with whatever national health program finally is adopted and implemented. Colonel Luby noted that the aim, from the beginning, has been to design a system consistent with the President's health-care proposals. He is confident that Tricare can adapt to whatever changes Congress makes in the final plan.

Under any national program, the services stand to gain in at least one respect. They may be able to pass more of their costs to third-party insurers. They already do so when they know that military beneficiaries are covered through their civilian jobs or such government programs as Medicare and Medicaid. With universal coverage or something approaching it, many more could gain such additional insurance.

In the case of older retirees and dependents, the services already stop providing care at age sixty-five when Medicare takes over. When younger beneficiaries are covered by employer insurance, the services often are able to tap the civilian insurers to pay more costs as supplemental providers.

It sometimes takes a little digging to find such companies, but the Defense Department is pursuing plans to make it easier. In the Fiscal 1995 defense authorization request, for example, the Pentagon asked Congress to give DoD access to the Medicare and Medicaid Data Bank. Employers are required to furnish that electronic bank with the names of

people covered in their health insurance plans, and Medicare and Medicaid use the information to find such third parties and bill them. The Defense Department said it could save substantially if it had the same access.

If such penny-pinching approaches seem out of character for the military, they are becoming more common as rising costs and tight budgets make the services more cost-conscious. The use of fixed-price, at-risk contracts is another example. It is a major departure from the cost-plus philosophy that once saw the government picking up the tab for major cost overruns. Under the Tricare arrangement, the services will have to pay more only when the contractors have put up their share, and it will get its cut of any savings "off the top."

Other money-saving opportunities are also being exploited. The Air Force has close working arrangements with the Department of Veterans Affairs, for example. USAF and the VA share resources and, in some cases, medical facilities. The Air Force and VA have even built two hospitals specifically for joint use.

When Bases Close

With all its potential, getting Tricare running throughout the country will be a major undertaking. For most beneficiaries, it gradually will replace whatever delivery system they have been using. For a sizable number, however, there will be other steps along the way.

These are people in areas where

bases are marked for realignment or closure under provisions of the Base Realignment and Closure legislation. At most of these BRAC sites, military medical facilities shut down along with other base activities. The problem is to take care of their patients until Tricare takes hold in their regions. Most are retirees, but some are dependents of active-duty members serving in other locations.

pital might be restored for retirees in that area. However, with no active-duty population to justify that move, both Homestead AFB and its hospital were marked for closure.

Because Homestead and several other bases were not covered by the CRI, the Pentagon worked out an elaborate Transitional Health Care Program (THCP) for military beneficiaries in those areas. It will cover

ries and Medicare eligibles within a forty-mile radius of a BRAC site) to get their medication from a military medical facility, a VA facility, through a network of community pharmacies, or by mail order.

The mail-order plan has been limited to Hawaii and six states on the East Coast, but it is being expanded. Active-duty beneficiaries pay \$4 and retirees \$8 for supplies of medication that last up to sixty days.

Under the local pharmacy plan, now being tested in a number of states, active-duty dependents pay fifteen percent of the cost of medication furnished under the retail pharmacy arrangement, and retirees and their dependents pay twenty percent. Similar prescription drug services are planned under Tricare options. Like other copayments, the cost of medication could rise, but it is likely to stay well below what most non-military beneficiaries pay.

The BRAC transitional programs are gradually being phased out as other programs take hold in areas involved. THCPs at Chanute AFB, Ill., Grissom AFB, Ind., and Wurtsmith AFB, Mich., were replaced in March 1994 by the Northern Region Fiscal Intermediary, a forerunner of what will become Tricare Region 5. The program at Myrtle Beach AFB, S. C., was to follow in June, leaving only the THCPs at Eaker AFB, Ark., and Homestead active.

As more bases close, additional transitional programs could be added. By next fall, Tricare should be operating in regions covering roughly half of the US. By 1997, the remaining regions of the continental US and Hawaii should be in business. Tricare will not include Alaska, but a similar program is being developed for that state. Further down the road, officials envision such a plan for US installations in Europe.

Some military old-timers who remember when they and their families enjoyed free care at any military facility may balk at the cost and the complexities. The view of military officials, however, is that they still will be getting the best medical bargain possible in today's world. ■



USAF photo by MSgt. Fernando Serna

Though some critics have reservations about Tricare, seeing it as too complicated and expensive, officials contend that the new system is the most logical, economical way to hold down rising health-care costs.

In areas where the CRI is already in place, such beneficiaries will continue to receive coverage under that program. To augment sites in California, Hawaii, and the New Orleans area, CRI contracts are being developed to cover Carswell ARB, Tex., and England AFB, La., which closed in 1992.

In two other locations, military medical facilities will also stay open even though the bases are being shut down. The hospital at Mather AFB will continue to serve nearby McClellan AFB, which has only a clinic, and a similar arrangement will save a military hospital in the Tidewater area of Virginia. In both cases, the justification for preserving the facilities has been that they are needed by active-duty members in the area. Neither will be kept open solely to cover dependents or retirees.

At one time, President Clinton told residents of Homestead, Fla., that if the hurricane-ravaged base there could not be rebuilt, at least the hos-

pital for two years or until Tricare contracts are in place.

The main element of THCP is a Beneficiary Service Center to advise patients on their health benefits. It maintains a Health Care Finder network and refers clients to providers who accept CHAMPUS and/or Medicare patients. The centers are off-base and staffed by government employees and volunteers.

As important to some beneficiaries as finding a doctor is obtaining free or low-cost pharmacy services. It took congressional help to find ways to supply medicines to patients not physically tied to a military facility, but THCP has worked out that problem as well.

Federal law now allows eligible persons (all CHAMPUS beneficia-

Bruce D. Callander, a regular contributor to AIR FORCE Magazine, served tours of active duty during World War II and the Korean War. In 1952, he joined Air Force Times, becoming editor in 1972. His most recent article for AIR FORCE Magazine, "The Wrights and Their Rivals," appeared in the August 1994 issue.

Previously, procurement people had to get a waiver if they didn't use military specifications. Under new policy, exactly the opposite applies.

WHEN Air Force program managers needed to update the avionics in the venerable F-111 attack aircraft, they decided to issue broad performance requirements rather than write legalistic contractual language larded with specifications for the exact dimensions of every widget.

instead specifying such items as the ingredients of fruitcake or how to sew buttons on shirts.

"Especially in electronics, you just can't afford to lock yourself in to today's solution by telling contractors exactly what to do through overly detailed milspecs," said Steve Clark,

By James Kitfield

The End of the Line for Milspec?

They knew that modern electronics was experiencing huge surges in capability every few years, driven by the advances in microprocessors whose power increases every decade by at least a factor of ten. The acquisition officials realized they couldn't keep pace with that technological revolution if their contractors were bogged down in countless pages of military specifications, or "milspecs." They wanted to see what would happen when a contractor tried to meet needs rather than "meet spec."

The Air Force was rewarded with an upgraded avionics suite so much simpler and lighter than its predecessor that the service had to install 100 pounds of lead in the nose of the F-111 just to keep the aircraft balanced.

Air Force Materiel Command officers said that as a metaphor for milspec, a hundred pounds of lead is only too apt: heavy, mostly worthless, weighing down a vital Air Force system. Today Defense Department milspecs number roughly 31,000 and run throughout approximately eighty percent of all military purchases. Some of them guide the production of critical items, but most do not,

chief of AFMC's Acquisition Reform Branch at Wright-Patterson AFB, Ohio. He noted that Defense Department purchases today account for less than five percent of domestic sales of advanced semiconductors and computers.

"We need to focus on functional requirements—form, fit, and function—and leave the design solutions to the contractors," said Mr. Clark. "If a landing gear meets all of our functional requirements, what do we care if it's made out of blue cheese?"

The Vision

The much-maligned milspec, because it in many ways defines the Pentagon's risk-averse and overly regulated acquisition system, is at the center of an acquisition reform movement. The vision that animates those reforms is of a single, integrated commercial and defense industrial base that draws strength and economies of scale from shared research, development, and production of defense and commercial products.

Pentagon officials view the indiscriminate use of milspecs as a barrier that must come down before they

can exploit that single, integrated American production base.

"We need to change our philosophy from one that relies on milspecs as a matter of course and instead state a preference for commercial standards, resorting to milspecs only when we have to ensure a capability unique to the military," said Lt. Gen. Richard E. Hawley, principal deputy to the Air Force's assistant secretary for Acquisition.

General Hawley calls acquisition reform in general, and an overhaul of the milspec culture specifically, one of the Air Force's top priorities. "There's simply no question," he said, "that the Air Force is going to have to find a way to develop and produce weapon systems quicker and more cheaply than in the past."

Most experts argue that the Pentagon has little choice but to reform its buying practices. Barring a massive infusion of funding or a large increase in efficiency—neither of which is a realistic expectation—all the armed services will confront a modernization crisis later this decade.

The Administration's Fiscal 1995 national defense budget request of \$263.7 billion, for instance, continues for another year the steady decline in defense spending that began in Fiscal 1988. Procurement has been hit especially hard; the \$43.3 billion requested for Fiscal 1995 represents a decline of 4.5 percent from last year. Under the Defense Department's current five-year plan, overall defense funding will fall an additional eleven percent, reducing defense spending to just three percent of the Gross Domestic Product in 1998.

The drop in defense funding has prompted Secretary of Defense William J. Perry to warn that the defense industrial base will shrink to one-half to one-third of the peak post-Vietnam size attained in the 1980s. Defense officials say the only way the services can modernize their forces in the future will be to piggyback on the commercial market.

"Once we've identified and pared down the 'military-unique' part of the defense base to an absolute minimum—and I think it will eventually be quite small—we want to position the Pentagon in the marketplace so that we're not the only customer for a particular technology," said R. Noel Longuemare, the principal deputy under secretary of defense for Acquisition and

Technology. Such a transition is necessary, he said, if the Pentagon hopes to make significant cuts in its huge infrastructure and overhead costs.

Perry's Attack

In June, even before acquisition reform bills had been completed and approved on Capitol Hill, Secretary Perry launched a public attack on the Pentagon's thousands of milspecs.

Under the previous policy, acquisition personnel were required to use milspecs in writing requests for proposal and contracts unless they had obtained signed waivers from top brass. Turning that policy on its head, Defense Department officials said that in the future acquisition personnel will need such waivers from the Milestone Decision Authority to use milspecs in acquiring new systems.

Mr. Longuemare explained, "Rather than go through 30,000 milspecs, we decided instead to 'zero base' the process, putting the onus on program managers to justify using milspecs in the first place. The reality is that we're still going to use milspecs, and in some instances they are still very appropriate. This just pushes us toward more carefully considering commercial standards."

Others have tried similar reform efforts, with little readily apparent achievement. Reformers are hopeful that a detailed implementation roadmap, the "Blueprint For Change," will allow the present assault on the entrenched milspec bureaucracy to succeed where others have failed. In announcing the milspec reforms, for instance, Mr. Perry endorsed eighty-eight recommendations of a Process Action Team on Military Specifications and Standards, formed in 1993 by Colleen Preston, the deputy under secretary of defense for Acquisition Reform. The recommendations would shear away much of the use of milspec in acquisition.

"Inside the Beltway [*i.e.*, in Washington], people too often come up with vague pronouncements about reform that are indecipherable by the time they get down to the working level," said AFMC's Mr. Clark, who served as an Air Force representative on the Process Action Team. "This time, for every recommendation in our Blueprint for Change, we list detailed steps for implementation."

Along the way, members of Ms. Preston's study team became the

acknowledged experts on the milspec phenomenon. They learned what was wrong with milspecs—and what was right.

They were surprised to find that many mispecs were useful. According to the Aerospace Industries Association, for instance, twenty percent of the standards used in the manufacture of commercial aircraft are borrowed from the military. Many of the standards adopted by the International Standardization Organization, a noted international leader in quality standards, originated as US milspecs.

Mr. Clark explained, "This is not all about \$600 hammers. A lot of standards and processes the Pentagon developed are now accepted international standards, used by countries around the world. The problem is, for every one of those, you can cite numerous examples of chocolate chip cookies with reams of milspecs."

Tiering Up

One major problem identified in the Process Action Team's report is a "tiering" phenomenon that resulted from milspecs being layered over the years. On average, the group found that each milspec referred to an additional eight milspecs, with the numbers growing exponentially with each tier. That, say experts, made it possible to burden a contract with tens and even hundreds of pages of milspecs at the punch of a couple of computer keys.

The Blueprint for Change exposes the foundations of the tiering system. "Risk aversion—a 'That's the way it's always been' attitude—and a belief that more references are better . . . contribute to the problem of unnecessary requirements and [excessive referencing]," according to the Blueprint. Its recommendations include making only those milspecs directly cited applicable to a contract. Second- and third-tier milspecs would be used for guidance only. Another recommendation is to eliminate milspecs that have not been used in five years.

Experts concede that in the initial stages the reform is likely to slow the acquisition process because it introduces a measure of uncertainty into what has always been a well-known procedure. "Engineers have long counted on references, and they probably never even read them," Mr. Clark said. "Now they're going to

have to pull them all up, understand the requirements better, and cite them in the primary document. That's going to take a lot of work."

Milspecs certainly will not die off completely. Program managers will not be expected to shop for the commercial equivalent of a nuclear propulsion system or a stealth aircraft. All of the services will receive "blanket waivers" for certain items, allowing the use of key milspecs without special Pentagon approval.

In the Navy, such waivers are likely to cover milspecs behind nuclear propulsion systems and torpedoes. For the Army, it will be depleted-uranium ammunition. The Air Force expects to receive a blanket waiver for the military standard on structural fatigue for aircraft and engines.

Beyond those specialized technologies covered by blanket waivers, Pentagon officials expect to see contracts written with a combination of performance-based specifications, commercial item descriptions, and a minimized set of unique military specifications and standards.

Mr. Longuemare noted that a majority of acquisitions would continue to have environmental, performance, or configuration requirements unique to the armed services.

"The reality," he said, "is that most products . . . the military needs are not available off the shelf. . . . Having said that, there's absolutely no reason you can't buy a product that fits those unique military needs, which is nevertheless designed, built, and tested using commercial processes."

Adopt Commercial Standards

Because it will alleviate the necessity for much of the testing and oversight conducted by the military, the adoption of commercial standards and processes is seen as critical to the milspec reform effort. In announcing his new policy on milspecs, for instance, Mr. Perry instructed acquisition officials to form partnerships with industry associations to replace military standards with nongovernment standards, to a reasonable extent. The services were also told to reduce direct oversight

by substituting process controls and nongovernment standards for testing and inspection.

"The present military approach essentially uses yesterday's model for factories, establishing checks and balances at each step of development and production to detect and throw out the inevitable scrap," said Mr. Longuemare, who was a Westinghouse Electronics executive before joining the Defense Department at the beginning of the Clinton Administration. "Today, however, commercial manufacturers can essentially build products without scrap by designing in wider margins for tolerances, and that eliminates the need for all the inspections and tests that go along with milspecs."

The Army cites its RAH-66 Comanche helicopter program as a prime example of this change. Rather than constructing unique standards for its T800 engine with milspecs as building blocks, the Army adopted Federal Aviation Administration certification standards.

"Those standards were very close to the military certification, and adopting them saved us a lot of money and time in up-front testing," said Lt. Gen. William H. Forster, military deputy to the assistant secretary of the Army for Acquisition. "Once we get the design just right, we'll add military certifications for the required power levels."

While the Army is generally acknowledged as leading the milspec reform effort—even issuing a recent request for proposal for a training helicopter that included no milspecs—experts say that similar success stories exist in all the services.

After the issuance of the Perry milspec directive, for instance, the Marine Corps Attack Helicopter Program Office deleted all references to specifications and standards in its RFP for an upgraded Integrated Weapons System for the AH-1 Cobra. One example of a deleted milspec: "The contractor will submit a Quality Assurance Plan in accordance with MIL-I-9858." In its place, the proposal stated, "The contractor shall organize, document, prepare proce-

dures for, and implement a management-driven system to provide maximum assurance that products conform to requirements."

"Our intent is to move as far as possible in the direction of accepting commercial standards for quality, while still being clear in our declaration of required performance and interfaces," said Dr. Allan Somoroff, deputy commander of Naval Air Systems Command. "Translating these technical requirements into a new language will take time and energy, however, and you need to bring the people in the contracting trenches into the process so everyone shares a vision of where you're going."

The Air Force cites the Joint Primary Aircraft Training System as a prototype for future procurement. According to AFMC officials, the RFP contains only sixty-four milspecs (compared to 216 for the F-22 fighter and more than 1,000 for the F-16 fighter). The request focuses instead on critical functional and performance requirements.

Likewise, the Air Force streamlined the contract for the Precision Lightweight Global Positioning System Receiver.

"There were no commercial products that did exactly what we wanted, but they were close enough that we waived most milspecs and regulations and were able to buy them for \$1,200 each," said General Hawley. A follow-up study revealed that the Air Force could have purchased a purely commercial product for \$900. The service estimated that had USAF opted for a traditional, milspec-laden purchase, the cost could have hit \$4,000.

There is no doubt that the transition will be slow and painful and that program managers won't willingly jettison the comfortable crutch of milspecs until service leaders demonstrate their commitment to the new way.

"The senior leadership of the Air Force needs to stand behind those people who are willing to waive milspecs and take that risk and to pat them on the back and reward them," General Hawley said. "Rather than flogging them when they occasionally stumble, as they will, we need to pick them up, brush them off, and tell them to march on. That's the only way we'll change our culture." ■

James Kitfield is the defense correspondent for Government Executive Magazine in Washington, D. C., and a regular contributor to AIR FORCE Magazine. His most recent article for this magazine, "The New Way of Logistics in Europe," appeared in the August 1994 issue.

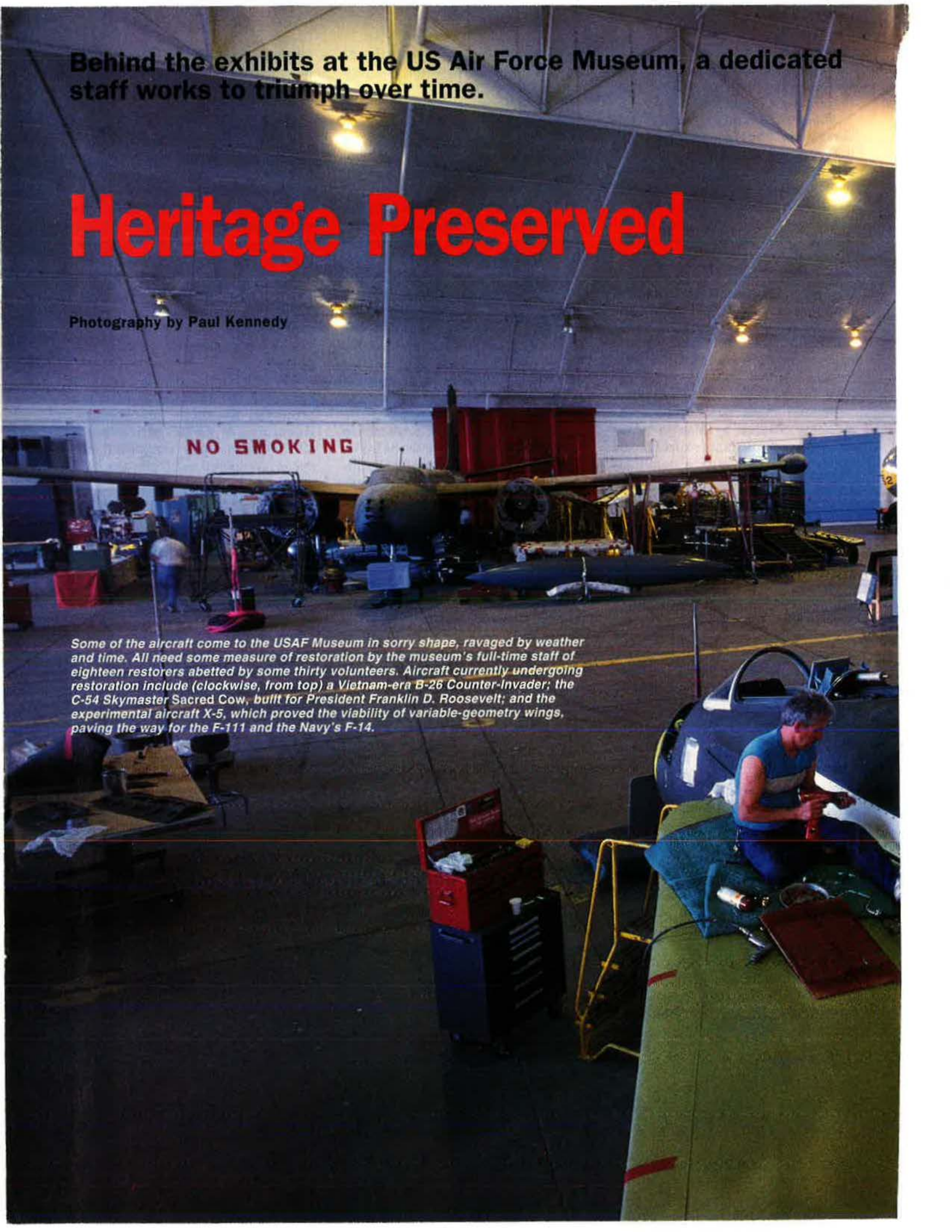
Behind the exhibits at the US Air Force Museum, a dedicated staff works to triumph over time.

Heritage Preserved

Photography by Paul Kennedy

NO SMOKING

Some of the aircraft come to the USAF Museum in sorry shape, ravaged by weather and time. All need some measure of restoration by the museum's full-time staff of eighteen restorers abetted by some thirty volunteers. Aircraft currently undergoing restoration include (clockwise, from top) a Vietnam-era B-26 Counter-Invader; the C-54 Skymaster Sacred Cow, built for President Franklin D. Roosevelt; and the experimental aircraft X-5, which proved the viability of variable-geometry wings, paving the way for the F-111 and the Navy's F-14.







Some of the museum's acquisitions are quite recent. The RF-4 Phantom II above saw service in the Persian Gulf War in a reconnaissance role. It also flew in Vietnam and most recently for the Alabama ANG's 117th Reconnaissance Wing, whose livery it still bears. An exhibit of the YF-117 (right) allows museum audiences a close look at the stealth technology that made its operational successor such an effective performer over Iraq.





The museum's collection is not limited to aircraft. Ambulances and staff cars, along with reams of detailed information to ensure exhibits' authenticity, fill the back rooms of the museum, awaiting their turn in the spotlight. Below are a 1937 Dodge staff car and a 1952 Dodge ambulance.

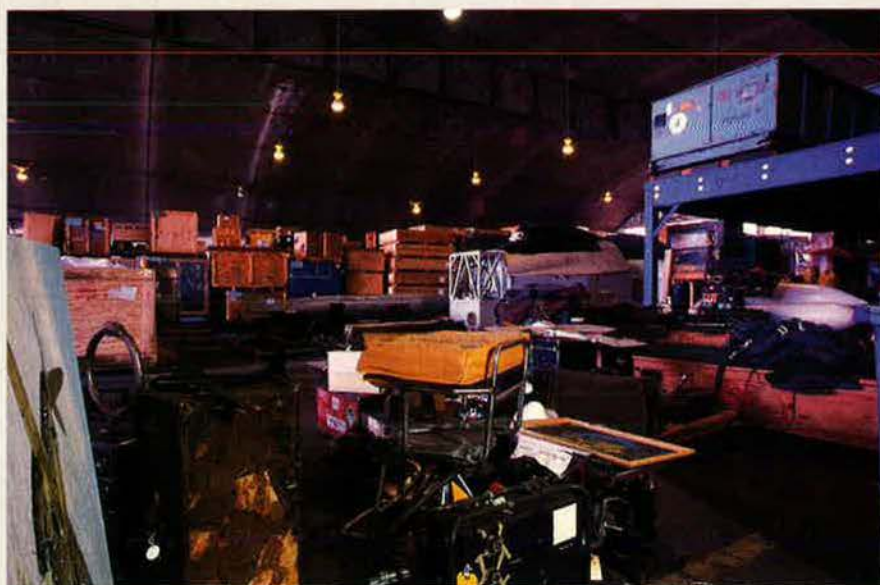


Two aircraft embodying the state of the art circa 1935, the Heinkel He-111 (left) and the Northrop A-17A, must undergo extensive restoration. Aviation advances overtook both planes rapidly. The He-111 was largely withdrawn from front-line service after the Battle of Britain, and the A-17 was deemed obsolete before the US entered World War II.

Sometimes no examples of an important aircraft survive. In that case, the museum turns to painstaking reproductions as with the Fokker Dr.1—the type flown by Manfred von Richthofen—in the background. The reproduction's markings are those it would have borne in April 1918. The museum staff overhauls powerplants as well, such as the BMW 132 E in the foreground, which powered a German Ju-52 transport during World War II.



Every day, the museum receives dozens of artifacts that must be examined, cataloged, and stored for future use and study. The uniforms above came from recently closed Air Force bases and await inspection to determine which ones are salvageable. At right is a small fraction of the museum's massive inventory.





FDR made the trip to the Yalta conference and back in 1945 aboard the Sacred Cow (above) and never used it again. His successor, Harry S. Truman, put it to good use. On board the C-54C in 1947, he signed the documents that created a separate Air Force. The aircraft will be ready for display by the fiftieth anniversary of the signing.

Once the restoration is complete, the aircraft go on display in one of the museum's many galleries. This North American F-86A Sabre (right) was flown to the museum in 1961. It stands in the Korean War section of the Airpower Gallery as a tribute to the success it had over the MiG-15 in the "Forgotten War."



AIR FORCE Magazine would like to thank the staff of the US Air Force Museum, whose cooperation made this photo story possible.

Despite its huge arsenal, Ukraine has yet to define its role on the global stage.

The Third Largest Nuclear Power

By Harriet Fast Scott

IN SOME ways, Ukraine might be compared to France. Ukraine is about the same size (233,000 square miles vs. France's 220,000) and has about the same population (fifty-two million against fifty-seven million). The capitals, Paris and Kiev, each have about 2.5 million residents. The armed forces of each nation number about 600,000, and both possess arsenals of nuclear weapons.

Unlike France, however, Ukraine is in far eastern Europe, and that has made all the difference. For more than a century, it was a part of Imperial Russia. After a brief period of independence (1918-21), for the next seventy years, it was a part of the Soviet empire, the second most populous and third largest of the fifteen republics of the Soviet state. Now Ukraine is again independent. It is the world's third largest nuclear power, possessing more weapons than are in the combined arsenals of Britain, France, and China.

Of all the changes caused by the collapse of the Soviet Union, the rebirth of an independent Ukraine was perhaps the most important. It has caused dramatic change in the strategic look of Europe, creating a new



Photos © Sergey Popsuevich / AviaData / Arms Communications

When the Soviet Union fell apart in 1991, Ukraine took possession of almost 1,000 military aircraft, including top-of-the-line MIG-29 "Fulcrums" (above, armed with AA-8 "Aphid" and AA-10 "Alamo" missiles, and opposite). Ukraine's gold and blue shield and trident have replaced the familiar red star in the aircraft's livery.



barrier to Russia's westward expansion as well as a potential source of nuclear-armed conflict in the heart of Europe. Moreover, Ukraine is in the midst of a severe political and economic crisis, whose outcome will have enormous consequences for European security.

Ukraine declared its independence on December 1, 1991. Independence had come a few times earlier in Ukraine's history, but it never lasted long. For centuries, Ukraine's extraordinary geopolitical vulnerability made it a battleground for warring tribes and princes who would raid from all points on the compass. Kiev, for example, was founded in 862, sacked by Mongols in 1240, absorbed by Lithuania in 1362, incorporated into Poland in 1569, conquered by Russia in 1654, and destroyed by Germany in 1943.

In the north, Ukraine is forested and marshy. In the south, the woods gradually disappear into grassy, treeless steppes. Between the forests and the shores of the Black Sea lies a wide belt of fabulously fertile soil called "the Black Earth." This treasure once made Ukraine the world's principal grain exporter. It also caught

the attention of less-well-endowed neighbors and attracted waves of invaders.

The most prominent feature of Ukraine is the Dnieper River. The 1,420-mile-long waterway—the third longest in Europe—cuts irregularly across Ukraine, giving it the shape of a heart broken in two. The Dnieper rises west of Moscow, flows south across Belarus and Ukraine, passes Kiev, and forms a long, lazy "S" before emptying into the Black Sea. It is navigable for almost its entire length.

The Russian Factor

The most critical aspect of Ukraine's national life is its continuing, unavoidable entanglement with Russia and Russians. Of the fifty-two million people living in Ukraine, 37.5 million, or seventy-two percent, are Ukrainians, but some 11.5 million are Russians, giving this ethnic group twenty-two percent of the population. (The remaining three million residents belong to a wide variety of ethnic groups.) Western Ukraine is at least seventy percent, and perhaps as much as ninety percent, Ukrainian. Russians live pri-

marily in the southeastern part of the country, and the three easternmost industrialized provinces are forty percent Russian. Crimea, Ukraine's southern peninsular region, is two-thirds Russian.

Non-Ukrainians have only a fuzzy notion about the complex relationship between Russia and Ukraine. In both nations, the populations are predominantly Slavic. A large portion of western Ukraine was part of Poland until this century, and much of the eastern portion belonged to Imperial Russia. The Ukrainian and Russian languages come from Old Russian, just as French and Spanish derive from Latin. However, many Russians cannot understand Ukrainian (and vice versa) without an interpreter.

Controversies between Ukraine and Russia are more often like blood feuds than like family spats. Culturally, politically, and socially, Russia developed in a distinctive way during the centuries of Mongol and Tatar overlords, while Ukraine, under Polish domination, was influenced more by western Europe. Even to the casual observer, Kiev's culture differs dramatically from Moscow's.



A MiG-29 patrols the skies over Mukachevo in far western Ukraine. Mukachevo is closer to Vienna, Austria, than it is to Ukraine's capital, Kiev—an indication of the size of the territory the Ukrainian military must defend.

The record of the relationship in this century has been particularly bloody.

When the Russian White Revolution toppled the Romanov dynasty in February 1917, Ukraine had been a part of the Russian Empire for more than 100 years. The dramatic political change in Moscow revived a strong Ukrainian nationalist movement. In July 1917, the first Ukrainian government was formed. Schools resumed teaching in Ukrainian.

Enter the Bolsheviks

Then came the Russian Bolshevik Revolution in October 1917. On November 20, Ukrainian nationalists in Kiev proclaimed the Ukrainian People's Republic, but on December 25, Bolsheviks went to Kharkov in eastern Ukraine and formed a Soviet government. When the Ukrainian government declared independence on January 22, 1918, the Bolsheviks overthrew that government, and Red troops overran Ukraine. In March, German troops drove out the Bolsheviks. The Treaty of Brest Litovsk, signed in March 1918 simply to buy time, gave Ukraine "independence" under a German-appointed puppet.

In October 1918, the Bolshevik leaders declared that the Party's main task was "unification of the Ukraine with Russia." Civil war raged throughout the old Russian Empire, and fierce fighting took place in Ukraine. The White forces ruled in Kiev for a time,

but Bolshevik forces eventually took over. With the Bolsheviks on the offensive, the Ukrainians, in a last-ditch effort to assert independence, reestablished the Ukrainian National Republic west of the Dnieper River. This gambit failed, and by March 1920, the Soviet occupation was complete.

Severe famine hit both Russia and Ukraine in 1921–22. American relief officials fed ten million peasants in Russia during these two years but were not told about famine in Ukraine until April 1922. According to historian Robert Conquest, the Great Famine of 1921–22 killed five million, including millions of Ukrainians.

A battered Ukraine officially became part of the USSR in December 1922 when the Soviet Union was formed. Russia and Ukraine had a brief honeymoon as Ukrainian writers and scholars returned from exile and were even given government posts. Expressions of Ukrainian culture were permitted, and there was a revival of the language. In 1927, US Army Col. Hugh Cooper, with his staff of American engineers, began constructing the world's largest power plant at Dnieperstroï for the Soviet government.

Then came a decade of ferocious Soviet treatment of Ukrainians. In 1928 agriculture was still private, and the Soviet government bought grain from the peasants. However,



One of Ukraine's MiG-23 "Floggers," a veteran of the USSR's war with Afghanistan, sits on the runway at Chervonogolinskoe Air Base near the Black Sea. Note outdated "Hero of the Soviet Union" markings on the plane's fuselage.



Ukraine has both Tu-22 "Blinder" (above) and Tu-22M "Backfire" supersonic, nuclear-capable bombers, which, along with its ballistic missiles, make Ukraine a nuclear force that cannot be ignored.

prices were so low that Ukrainian farmers would not sell to the Soviet government, which had to collect grain from them forcibly. Joseph Stalin blamed the fiasco on the kulaks—the more prosperous peasants—accusing them of hoarding.

Stalin's solution was simple. In December 1929, he decided to get rid of the kulaks as a class by collectivizing agriculture. Rather than collectivize, Ukrainian peasants slaughtered half of their cattle, two-thirds of their pigs, and three-fourths of their sheep. In those days, even owning a horse could make a poor peasant a kulak in the eyes of the commissars. Many kulaks were arrested and shot on the spot. Others were sent off to prison camps, where most of them died. An estimated 500,000 Ukrainians died in this upheaval.

Collectivization was followed in 1932–33 by another great famine. Stalin singled out Ukraine for special punishment. Six million there died from hunger. Ukrainian nationalism came under attack. Thousands of Ukrainian intellectuals were arrested and either shot or sent off to die slowly in prison camps.

Nazi "Liberators"

On June 22, 1941, Nazi Germany launched its invasion of the Soviet Union. Ukrainians initially welcomed the invading Germans as liberators. An "independent" Ukraine was established. Nazi brutality soon proved

Minister of Defense: General of the Army Vitaly Radetsky	
Personnel	600,000
Tanks	6,404
Armored personnel carriers	6,394
Artillery systems	3,052
Airplanes	2,431
Attack helicopters	285
Medium-range ballistic missiles	172
Heavy bombers	21
SS-19 ICBMs	130
SS-24 ICBMs	46
Cruise missiles	600

Figures are from *Armiya Magazine*, November 1993, and *Moscow News*, December 3, 1993.

a match to that of Stalin's henchmen, however, and many Ukrainians were carried off to Germany as slave laborers.

During their retreat in 1943 and 1944, the Germans applied a scorched-earth policy, blowing up dams, flooding coal mines, and ripping up railroad tracks as they left Ukraine. Fields bristled with thousands of unexploded mines. According to Moscow's statistics, more than twenty-six million Soviet troops and civilians died in that war. No breakout is given for Ukrainian losses, but the figure is certain to have run into the millions.

In the aftermath of the war, the Soviet government accused tens of thousands of Ukrainians of war crimes and carried out widespread shootings and deportations. Collectivization was reimposed. For years after the war, bands of armed Ukrainian National-

ists waged guerilla war against Soviet authority.

In 1954, Ukraine acquired an important new territory, the Crimean peninsula. Russians now claim that this "acquisition" resulted from Nikita Khrushchev's vodka-induced generosity. This gift had little significance so long as the Soviet Union existed. It was another matter when Ukraine became an independent republic. All of the best Black Sea ports of the former Soviet Union are now on Ukrainian territory, including Sevastopol, home of the Black Sea Fleet.

Ukraine recovered slowly from the devastation of World War II. It was not until 1955 that foreigners were even permitted to visit Kiev. They were appalled by the destruction there ten years after the war had ended.

Ukrainian Armed Forces

However, by early 1962 significant improvements had been made. For nearly thirty years, from 1953 until 1982, party leaders built up Ukraine's military-industrial complex. The number of Russians in Ukraine also increased from seven million in 1960 to 11.5 million in 1990.

In April 1986, radioactive material from the Chernobyl Atomic Energy Station spewed into the atmosphere, contaminating a large area of Ukraine and Belarus. Moscow responded to this calamity with complete silence. Because no warning had been issued, May Day festivities took place as usual in Kiev, only sixty miles south of Chernobyl, and thousands were contaminated with radioactive debris. It was the final straw for many Ukrainians. Rukh, the Ukrainian nationalist movement, began to press for Ukrainian independence.



Political and economic uncertainties, tense relations with Moscow compounded by a blood-soaked history, and an abundance of sophisticated military equipment, like this Mi-24 "Hind," combine to make Ukraine a potential flashpoint.

Trappings of Power

When the Soviet Union fell apart in December 1991, Ukraine took possession of everything on its territory. This included a military force of 700,000 personnel, approximately 6,000 tanks, and almost 1,000 military aircraft, most of which were the latest models. Almost overnight, Ukraine became the world's third most powerful nuclear state. It inherited 130 strategic SS-19 liquid-fueled missiles and 46 SS-24 solid-propellant systems, with a total of 1,264 warheads. In addition, its bomber force, which included Tu-160 "Blackjack" aircraft, could be armed with 650 air-launched cruise missiles.

At present, the military research, development, and production facilities of Ukraine and Russia are mutually dependent. Russia is heavily dependent on Ukraine for aircraft engines, avionics, and other electronic systems. Ukraine can produce all major categories of military equipment—missiles, transport aircraft, radars, fighters, warships, and armament—although variety is limited. Ukraine has the only shipyard capable of building aircraft carriers and had been the sole producer of the SS-18 ICBM and the SL-16 space launch vehicle. The sole final assembly facility for the SS-24 ICBM was in Pavlohrad. Zaporizhzhya produces aluminum, titanium, magnesium, and specialty steel needed for Russian military production.

Ukraine's new president, elected in a close runoff vote in July 1994, is fifty-five-year-old industrialist Leonid Danilovich Kuchma, an ethnic Ukrainian. He was brought up by his mother on a collective farm after the death of his father during the German blockade of Leningrad. When he completed his university studies in 1960, he began working in the space-launch vehicle branch of the local "Yuzhnyy" construction bureau.

At twenty-eight, Mr. Kuchma became the technical manager of testing at the Baikonur Space Center. In 1986, he became general director of the Yuzhnyy construction combine, which produced the Soviet SS-4, SS-7, SS-9, SS-18, and SS-24 ICBMs. As a representative of the more Russified and industrialized eastern Ukraine, the new president is said to favor greater cooperation with Moscow to revive a seriously flagging Ukrainian economy.

Ukraine is reducing its ground forces and has disbanded one tank division and five missile brigades. Command of the Black Sea Fleet is

still exercised jointly by Ukraine and Russia. At a meeting in August 1994, the two nations agreed that the ships of the fleet should be divided equally between the two states and that Russia would be able to lease facilities in Crimea, mainly in Sevastopol.

Whatever may be decided by Russia and Ukraine may well be frustrated by officers of the fleet, many of whom are determined that it should not be split up.

Tensions within Ukraine's military are generated by ethnic and language differences. The first Ukrainian Minister of Defense, Konstantin Mozorov, an ethnic Russian who speaks Ukrainian, pressed for Ukrainian to be required throughout the armed forces and took a hard line with Moscow.

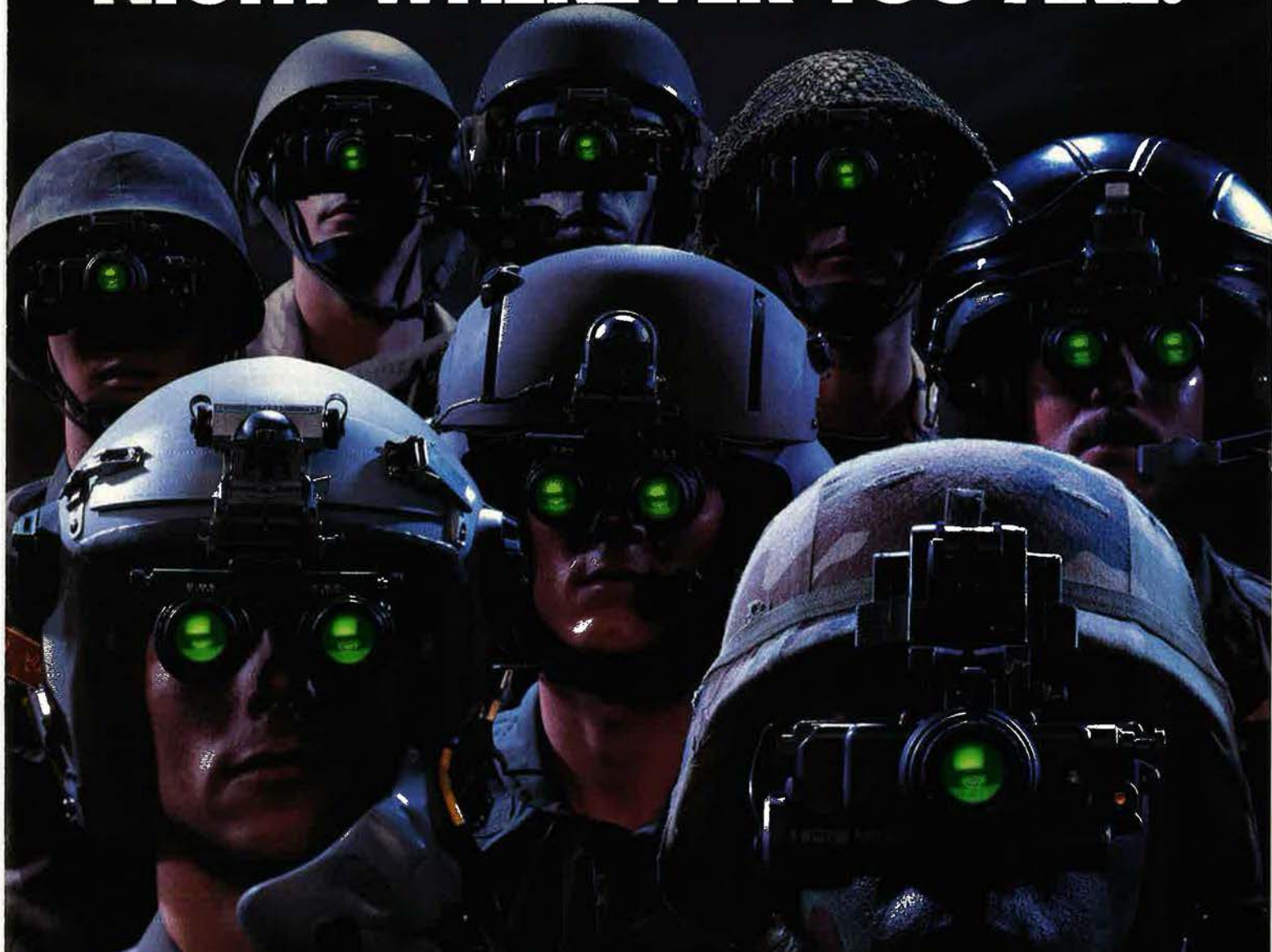
Vitaly Radetsky, Mozorov's replacement, is a Ukrainian who does not speak Ukrainian and is criticized for being too conciliatory toward Moscow. Approximately one-half of the officers in the Ukrainian forces are ethnic Russians who dominate the higher ranks.

As part of international agreements to maintain control of and reduce nuclear armaments, Ukraine has turned over all its tactical nuclear warheads to Russia. A beginning has been made in turning over its strategic nuclear weapons, but progress is slow.

There will continue to be great tension between the nationalist western portion of Ukraine and the Russified eastern portion. The czars of Moscow were known for their gathering of Russian lands, reassembling the territories lost over the centuries to various invaders. This activity also was a significant element of Imperial and Soviet government policy. As Ukrainian leaders well know, nationalists in Russia also have hopes of restoring the former Russian Empire. Without its force of nuclear weapons, Ukraine would be, to them, little more than another eastern European nation that would have to accommodate itself to Russian desires. ■

Harriet Fast Scott, a Washington, D. C., consultant on military affairs of Russia and other former republics of the USSR, is a member of the General Advisory Committee on Arms Control and Disarmament. Her translation and analysis of the Third Edition of Marshal V. D. Sokolovski's Soviet Military Strategy is a standard reference work, as are her four other books on Soviet military matters, written with her husband, Dr. William F. Scott. Her most recent article for AIR FORCE Magazine, "Rise of the Afghantsi," appeared in the August 1993 issue.

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Gallery of Middle East Airpower

By John W. R. Taylor and Kenneth Munson

Bombers

Su-24

The first 24 Su-24MKs ("Fencer-Ds") to bear Iranian insignia were delivered originally to Iraq but were flown to intended sanctuary in Iran during Operation Desert Storm and there treated as Iran-Iraq war reparations. They have been supplemented by 12 more, ordered directly by Iran. These each have 54 chaff/flares in wing fence dispensers, in addition to the usual 24 on the sides of the rear fuselage. The 15 aircraft serving with the Libyan Air Force were delivered in the spring of 1989, as a final supply of weapons from the former USSR before the United Nations embargo on military equipment for Libya ended such imports. Syria has ordered a total of 30.

Export Su-24MKs are generally similar to variable-geometry Su-24Ms of the CIS air forces. Standard equipment includes two superimposed radar scanners in the nose, for nav/attack and terrain clearance/ranging to airborne targets, a 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 10½ in (16° min sweep), 34 ft 0 in (69° max sweep), length 80 ft 8¼ in, height 20 ft 3¾ in.

Weights: empty 41,885 lb, gross 79,365–87,520 lb.

Performance: max speed at height Mach 1.35, at S/L Mach 1.08, service 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 17,635 lb of weapons, including up to four TV- or laser-guided bombs, conventional bombs (typically 38 x 220-lb FAB-100), 57-mm to 370-mm rockets, 23-mm gun pods, and such missiles as Kh-23 ("Kerry"), Kh-25ML ("Karen"), Kh-58 ("Killer"), Kh-25MP ("Kegler"), Kh-59 ("Kingbolt"), Kh-29 ("Kedge"), and Kh-31 ("Krypton"). Two R-60 ("Aphid") AAMs can be carried for self-defense.

Tu-16

Long after the Egyptian Air Force used Tu-16K-16 ("Badger-G") intermediate-range bombers to launch KSR-2 ("Kelt") rocket-powered ASMs during the 1973 Arab-Israeli War, about eight are still based at Cairo West, primarily for maritime missions. They cannot be regarded as a very formidable force. The same must be true of the similar number that Iraq possessed before the start of Operation Desert Storm, including, it is believed, four Chinese-built Xian B-6D uprated versions. There were no reports of Tu-16s being used in action against coalition forces, but they did launch Chinese C601 antiship missiles over the Persian Gulf during the war with Iran in 1988 and are believed to carry also the Mach 3 KSR-5 ("Kingfish") ASM. (Data for Tu-16K-26 "Badger-G Mod" carrier for "Kingfish.")

Contractor: Tupolev OKB, Russia.

Power Plant: two Mikulin RD-3M-500 turbojets; each 20,920 lb thrust.

Dimensions: span 108 ft 3 in, length 114 ft 2 in, height 34 ft 0 in.

Weights: empty 82,000 lb, normal gross 165,350 lb.

Performance: max speed at 19,700 ft 652 mph, service ceiling 49,200 ft, range with 6,600-lb weapon load 3,580 miles.

Accommodation: crew of six on ejection seats, including two pilots side by side, navigator/bombardier in nose, and rear gunner in tail turret.

Armament: seven 23-mm AM-23 guns, in twin gun turrets above front fuselage, under rear fuselage,



Tu-16K-16s, Egyptian Air Force



A-4 Skyhawk, Israeli Air Force

and in tail, with seventh gun on starboard side of nose; two KSR-5 ("Kingfish") ASMs underwing, or up to 19,800 lb of bombs in internal weapons bay.

Tu-22

Iraq and Libya were the only nations outside the former USSR to receive small batches of the original Tu-22, Tupolev's first supersonic bomber. About seven are thought to continue in Libyan service, primarily for surveillance over the Mediterranean. Five remaining in Iraq include Tu-22Ks ("Blinder-Bs") able to carry a Kh-22 ("Kitchen") ASM with a speed of Mach 4.6 and range of 185 miles at low altitude or 285 miles at height. Versions of the Kh-22 exist with a 2,200-lb high-explosive warhead for antiship use and with an antiradiation warhead.

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 1¼ in, length 139 ft 9 in, height 32 ft 9¾ in.

Weight: gross 187,390–207,230 lb.

Performance: max speed at 40,000 ft Mach 1.52, service 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), or Kh-22 ("Kitchen") ASM recessed in bay. Max weapon load 26,455 lb.

Fighters and Attack Aircraft

A-4 Skyhawk

Reequipment of Kuwait's two Skyhawk squadrons with F/A-18 Hornets in 1992–93 has left Israel as the only Middle East operator of this veteran attack aircraft. Several hundred, of various models, have been acquired over the years, of which about 120 remain in four active squadrons with a further 60 or more in storage. Principal versions are those that began life as

A-4H or A-4N models, dating from the late 1960s and early 1970s, respectively. Characterized by its saddle-back hump (for avionics and extra fuel), the A-4H also featured a zero/zero ejection seat, underwing spoilers to reduce landing run, and nosewheel steering. To these, the A-4N added a tail braking parachute, square-tipped vertical fin, and other detail improvements, but 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 station on each side (making six), lengthened nose and jetpipe, a chaff/flare dispenser just ahead of the brake-chute fairing, dual disc brakes, and an advanced Elta WDNS (weapon delivery and navigation system), which includes provision for launching Gabriel ASMs. The Israeli Skyhawk fleet also includes about a dozen TA-4H and -4J tandem two-seaters, and a further 10 TA-4Js have been promised by the US government. (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, service 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 (two seats in TA-4).

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

The Alpha Jet's design was undertaken initially to meet the requirements of the French and former West German Air Forces, but in addition to the 351 built for France and Germany, a further 75 were completed to meet orders from Egypt (45), Morocco (24), and Qatar (6). All three employ them for both advanced/weapons training and close-support duties; those of the Qatar Emiri Air Force equip No. 11 Squadron at Doha.

Egyptian Air Force Alpha Jets, most of which were license-assembled in that country by AOI (Arab Organization for Industrialization), are of two models. The first 30, designated **MS1**, are generally similar to the standard trainers built for the French Air Force and most export customers, but the final 15 were optimized for attack. Known as **MS2**, this version is equipped with 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 multiplex digital data bus, enabling the MS2 to designate targets automatically, fire guns or rockets in a dive, release retarded bombs in level flight, and toss-release free-fall bombs automatically.

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 10 $\frac{1}{4}$ 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, service 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

As related in the "World Gallery of Trainers" (*December 1993, p. 65*), the Magister is now more than 40 years old. It was the most successful European-designed first-generation jet trainer. Israel's original 80 license-built Magisters, known locally as **Tzukits**, have dwindled to about 45, and a replacement is being sought; Libya has about a dozen, Algeria about 20, and Lebanon about five. Designed for advanced (including weapons) training, the Magister was also eminently suitable for light ground-attack duties, and the Royal Moroccan Air Force still uses a portion of its approximately 22 Magisters in the counterinsurgency role.

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 9 $\frac{1}{2}$ in, height 9 ft 2 $\frac{1}{4}$ in.

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

Performance: max speed at 30,000 ft 443 mph, service 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

Known to Israeli pilots as the **Kurnass** ("heavy hammer"), the **F-4E** Phantom has been a mainstay of that country's air force since the first of an initial 44 were delivered in September 1969. Subsequent deliveries, under a series of Peace Echo and other program names, increased that total to nearly 210 by late 1976. Originally a mixture of new-build and former USAF aircraft, with or without the leading-edge wing slats that characterized the mainstream F-4E, they have suffered considerable attrition in Israel's several wars, but about 112 remain in active service with four squadrons at Hatzor (two), Tel Nov, and Ramat David. Some others are in store.

Improvements made over the years—though not necessarily to every aircraft—include addition of slats to nonslatted aircraft, TISEO (target-identification system electro-optical) sensors, radar warning receivers, a Litton LW-33 inertial nav/attack system, Elbit/Singer-Kearfott Jason weapon delivery system, and night attack capability. More recent is the **Phantom 2000** upgrade program to extend operational life and improve both maintainability and safety. New avionics include an Elbit mission computer, Kaiser-licensed wide-angle HUD, dual MIL-1553B data buses, multi-function electronic displays in both cockpits, HOTAS



Alpha Jet, Egyptian Air Force



F-4 Phantom 2000, Israeli Air Force



F-5E Tiger II, Bahrain Emiri Air Force (Peter Steinemann)



F-6, Egyptian Air Force (Denis Hughes)

(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 small strakes added to the engine air intake trunks to enhance maneuverability and stability. Redeliveries to the Israeli Defense Force/Air Force (IDF/AF) began in April 1989, and were completed in April 1994.

Iran began receiving 32 **F-4Ds** in September 1968, followed by 177 **F-4Es** between March 1971 and August 1979. Originally they equipped more than a dozen squadrons, but spares embargoes and attrition have made extensive inroads into this total, and estimates of those still operable vary from 50 to as few as 20. They have been used in recent years to attack Iranian rebels based across the border in Iraq. Egypt, which received the first of 35 early-model former USAF **F-4Es** in 1969, still has most of them with two squadrons at Cairo West, but they are reported to be in poor condition. (*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 $\frac{1}{2}$ in, length 63 ft 0 in, height 16 ft 5 $\frac{1}{2}$ in.

Weights: empty 31,853 lb, gross 41,487–61,795 lb.

Performance: max speed at height above Mach 2, average speed 580 mph, service 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. Alternative 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 air-to-ground attack, provision is retained for Shafrir, Python, Sidewinder, or Sparrow AAMs for self-defense.

F-5E/F Tiger II

Original versions of Northrop's lightweight, supersonic Freedom Fighter were the single-seat **F-5A** and the tandem two-seat **F-5B** trainer. In the Middle East/North Africa region, only the Royal Moroccan Air Force, with 10 **F-5As** and two **F-5Bs**, continues to deploy them in a combat role, although Saudi Arabia and Yemen each retain some for training.

Seven air forces in the region operate the single-seat **F-5E Tiger II** and its combat-capable two-seat counterpart, the **F-5F**. These versions, chosen in 1970 as America's IFA (international fighter aircraft) for export to friendly nations, have the Dash 21A/B version of the J85 engine, providing 22.5 percent more thrust than the A model's J85-GE-11; wings of 10 percent greater area, with full-span leading-edge maneuvering flaps; increased internal fuel tankage; a two-position nose-wheel leg, enabling angle of attack to be increased to shorten the takeoff run; and a runway arrester hook. Options included INS and a flight refueling probe. The first production **F-5E** flew on August 11, 1972. Morocco has about 20 **F-5Es** and four **F-5Fs**; Bahrain has eight **Es** and four **Fs**; around 25 percent of the 169 **Fs** received by Iran are thought to be operational; Jordan is estimated to have 52 **Es** and seven **Fs**, Saudi Arabia 61 **Es** and 21 **Fs**, Tunisia 15 **Es** and four **Fs**, and Yemen 10 **Es**. (*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 11 $\frac{1}{8}$ in over wingtip AAMs), length 47 ft 4 $\frac{1}{4}$ in, height 13 ft 4 $\frac{1}{4}$ 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, service 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 (two seats in **F-5F**).

Armament: two 20-mm M39A2 guns in nose (one in **F-5F**); AIM-9 Sidewinder AAM 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

China's **F-6** version of the Russian MiG-19 supersonic fighter-bomber was introduced into the Middle East by Egypt in 1979. Its Air Force first received 40 Shenyang-built **F-6s**, followed by others for assembly at the Helwan factory, near Cairo. Around 70 of these are believed to remain in service, plus six **FT-6** tandem two-seat trainers. Egypt also assembled about 40 **F-6s** for Iraq, but it is doubtful that many of these remain airworthy. Equally little is known about the current status of 16 **F-6s** once flown by Iran's Revolutionary Guard pilots. (*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 $\frac{1}{4}$ in, length incl probe 48 ft 10 $\frac{1}{2}$ in, height 12 ft 8 $\frac{3}{4}$ 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, service 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 (two in tandem in **FT-6** trainer).

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

As is too often the case with some Middle East inventories, it is difficult to be certain how many Iranian **F-14As** remain airworthy (perhaps about two dozen, according to one estimate) or how effective their armament may be. Seventy-nine of the 80 **F-14As** ordered in

1974-75 (differing from standard USN F-14As only in having slightly different ECCM for the AN/AWG-9 aiming and firing system for their AIM-54A Phoenix missiles) were delivered to the Shah's air force, along with 284 Phoenix AAMs and other missiles (AIM-7 Sparrows and AIM-9 Sidewinders). They were expected to be a powerful weapon for peace in the Middle East, but with the overthrow of the Shah their value soon diminished under the Khomeini regime. Iran's Islamic Air Force did not have the expertise necessary to maintain the Phoenix weapon system, and obtaining airframe and engine spares became virtually impossible.

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 1½ in (min 20° sweep), 38 ft 2½ 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, service 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 portion for additional Phoenix/Sparrows, and/or Sidewinder AAMs, or various missile/bomb combinations.

F-15 Eagle

The first Middle East customer for the Eagle was Israel, which received an initial 23 single-seat F-15As and two F-15B trainers in 1976-78, nine improved F-15Cs and six F-15Ds in 1981-82, 11 more (nine Cs and two Ds) in 1984, 20 ex-USAF As and five more Bs in 1991-92, five F-15Ds in 1992, and a further 10 surplus USAF F-15As in 1993. Israeli F-15s, F-16s, and F-4s, controlled by E-2C Hawkeye AEW&C aircraft, fought fierce battles with Syrian MiG-21s and MiG-23s over the Bekaa Valley in Lebanon in 1982. Eighty-five victories were claimed, 40 by F-15s, without loss in air combat.

The Royal Saudi Air Force has four squadrons (Nos. 5, 6, 13, and 42) of F-15Cs and Ds. Initial 1981-84 deliveries, plus two attrition replacements later, comprised 46 single-seat Cs and 16 tandem-seat Ds. These were augmented during the 1990-91 Persian Gulf campaign by a further 20 Cs and four Ds and by nine more Cs and three Ds delivered from August 1991 as attrition replacements. About 84 of these 98 remain in service. Since Operation Desert Storm, in which two of the 38 Iraqi aircraft to fall to F-15s in air combat were claimed by an RSAF pilot, they have taken part with other coalition forces in Operation Southern Watch patrols over southern Iraq.

Between 1995 and 1998, the RSAF will receive a further 72 Eagles, 24 optimized for an air-superiority role and 48 for air/ground attack. Designated F-15S, these aircraft will be generally similar to USAF's dual-role F-15E, though with a slightly lower radar and weapons capability. Their AN/APG-70 radars will be "detuned" to the performance level of the APG-63, some of the F-15E's ECM will be omitted, and a Martin Marietta Sharpshooter system will replace the AN/AQ-14 LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) targeting pod. Like other Saudi Eagles, the F-15Ss are not intended to have stores-carrying CFTs (conformal fuel tanks), but they will still be well armed: the contract includes supply of 900 AGM-65D/G Maverick ASMs, 600 AIM-9M/S Sidewinders, and 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 F110-GE-229 afterburning turbofans.

A similar dual-role model, designated F-15I, is on order for Israel (21, with four more on option) and will be delivered from 1997. Powered by F100 engines, these will have fully capable APG-70 radar and LANTIRN pods, with the latter possibly to be exchanged later for the Martin Marietta Sharpshooter system. (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 9¾ in, length 63 ft 9 in, height 18 ft 5½ in.

Weights: empty 28,600 lb, gross 44,630-68,000 lb.
Performance: max speed Mach 2.5, service 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 (two seats in F-15B/D).

Armament: one M61A1 20-mm multibarrel gun in starboard wingroot; four AIM-7 Sparrow and four AIM-9

Sidewinder AAMs (Rafael Shafrir 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

To date, nearly 450 F-16s have been delivered to or ordered by three Middle Eastern air forces, with Israel (260) and Egypt (175) the major customers. The first batch of Egyptian aircraft, comprising 34 F-16As and eight F-16Bs, was delivered from March 1982 with Pratt & Whitney F100-PW-200 engines and AIM-9L Sidewinder AAMs, as MiG-21MF replacements. Thirty-four F-16Cs and six F-16Ds, with F100-PW-220 engines, followed from August 1986. A third batch of 35 F-16Cs and 12 F-16Ds, for 1991-94 delivery, switched to F110-



F-16C Fighting Falcon, Israeli Air Force (P. R. Foster)



F/A-18C Hornets, Kuwaiti Air Force (Peter Steinemann)

GE-100 engines. Sparrow AAMs and Egyptian IFF introduced on these aircraft were also retrofitted to early models, and Mavericks became available for air-to-ground missions. The 46 additional F-16C/Ds (34 + 12) being delivered from spring 1994 are from license production by TAI of Turkey.

Eight of the 67 F-16As and eight F-16Bs with F100-PW-200 engines supplied to Israel from January 1980 were the first Fighting Falcons (Israeli name **Netz**: "falcon") used in combat. Escorted by six F-15s, they destroyed Iraq's Osirak nuclear reactor on June 7, 1981. In 1982 they shot down 44 Syrian MiG-21s and MiG-23s over the Bekaa Valley in Lebanon. Political embargo delayed until the end of 1986 delivery of the first 51 F-16Cs (**Barak**: "lightning") and 24 F-16Ds (**Brakeet**: "thunderbolt"), with F110-GE-100 engines. Some of these F-16Ds 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 third batch of 30 F-16Cs and 30 F-16Ds for Israel, together with Elta ECM instead of the usual Lorat Rapport. Deliveries began in July 1991. Beginning in August of this year, Israel is receiving 50 surplus USAF F-16A/Bs and has plans to order another 60 C/Ds (30 + 30) for mid-1997 delivery. 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. Six IDF/AF squadrons fly the F-16.

The Bahrain Emiri Air Force began equipping with eight F-16Cs and four F-16Ds in March 1990. These have General Electric F110-GE-100 engines and were supplied with Sparrow and Sidewinder AAMs, Maverick ASMs, Mk 20 Rockeye cluster bombs, GBU-10/12 laser-guided bombs, ALQ-131 ECM and laser designator pods, and ALE-40 chaff/flare dispensers. (Data for F-16C with F110-GE-100 engine.)

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

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

Dimensions: span over missiles 32 ft 9¾ in, length 49 ft 4 in, height 16 ft 8½ in.

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

Performance: max speed at height above Mach 2, service 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 (two seats in F-16B/D).

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, as listed above.

F/A-18C/D Hornet

In 1986, an attack on targets in Libya by four US Navy and Marine Corps squadrons (VFA-131 and -132, VMFA-314 and -323) marked the first combat deployment of this twin-turbofan fighter/attack aircraft, and the type is on regular service in the Mediterranean with units of the US Sixth Fleet. In September 1988, Kuwait placed

an order for 32 single-seat F/A-18Cs and eight two-seat F/A-18D combat-capable trainers, in a multi-million-dollar package that also included AGM-65G Maverick, AGM-84 Harpoon, AIM-7F Sparrow, and AIM-9L Sidewinder missiles. The first Kuwaiti Hornet was formally handed over in October 1991, and the first three two-seaters were accepted by No. 25 Squadron of the Kuwaiti Air Force in January 1992. The 40th aircraft was delivered in August 1993, the Hornet now also equipping No. 9 Squadron, Kuwait's Hornets, which have replaced its elderly A-4KU Skyhawks, were the first to be powered by the Dash 402 version of the F404 engine, which produces some 1,700 lb more thrust than the original Dash 400. A small follow-on order, possibly for 10, is believed likely.

Israel, too, is looking for an all-weather, multirole combat aircraft with night attack capability to replace the Kfir. Leading contenders are the LANTIRN-equipped F-16 and the F/A-18C/D, and two D model Hornets were evaluated in the spring of 1993 as a prelude to final selection. The IDF/AF requirement is for 40-48 aircraft. (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 3½ in.

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

Performance (F404-GE-402 engine): max speed at high altitude above Mach 1.8, service 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 (two seats in F/A-18D).

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

The Hawk has outgrown its original role as an advanced flying and weapons trainer for the UK's Royal Air Force to become an increasingly aggressive dual-role trainer/ground-attack aircraft (50/60/100 series) and single-seat multirole combat aircraft (200 series). The United Arab Emirates has standardized on the Hawk as its basic trainer, with Dubai contributing eight Mk 61s (5,700 lb thrust Adour 861 turbofan), equipping what is designated a fighter squadron, while Abu Dhabi's 15 similar Mk 63s have been upgraded to Mk 63A, with an Adour 871 and new "combat wing" with four stores pylons and wingtip AAMs. The UAEAF also has 18 Mk 102s, with Adour 871, combat wing, MIL-1553B data bus, HOTAS controls, HUD, color multipurpose CRT in each cockpit, radar warning receiver, and provision for an ECM pod, plus laser ranging and FLIR in the extended nose.

Five or six of the Kuwaiti 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 were in very poor condition and may be replaced. The Royal Saudi Air Force bought 30 Hawk Mk 65s for its own Nos. 21 and 37 Squadrons for light attack missions, and under its Al Yamamah II program it is expected to purchase a further 60 Hawks. Most will be single-seat Mk 205s, with Westinghouse APG-66H multimode radar, but some 100 series may be included. Oman is another customer for these latest versions, with deliveries of four Mk 103s and 12 Mk 203s starting in December 1993 and early 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 30 ft 9 3/4 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 632 mph, service 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

Jaguar International, first flown in August 1976, is the export version of the basic attack aircraft of which 403, including two-seat combat trainers, were built for the air forces of Great Britain and France. The only Middle Eastern customer was Oman, which ordered two batches of 12 (20 single-seat and four two-seat) in the late 1970s; the 21 that survive currently equip No. 8 and No. 20 Squadrons, based at Masirah, having been upgraded at the end of the 1980s with a Ferranti FIN 1054 inertial navigation system. They are employed in the air defense role as well as ground attack, in the former configuration carrying a pair of underwing AIM-9P Sidewinder AAMs.

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, service 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 (two seats in trainer).

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,



Hawk Mk 102, United Arab Emirates Air Force (Linda Jackson)



Jaguar International, Royal Air Force of Oman



Kfir C7, Israeli Air Force

Matra Magic, or similar AAM each side. Max external stores load 10,500 lb.

Kfir

When Israel's order for 50 Dassault Mirage 5Js was embargoed by the French government after the Six-Day War of 1967, Israel Aircraft Industries (IAI) first developed the Nesher, retaining the French Atar 9C engine. The Kfir was the second stage in this domestic development of the Mirage 5, in which the Atar turbojet was replaced by the larger US J79; associated airframe changes included a shorter and fatter rear fuselage, a large dorsal air scoop for afterburner cooling, strengthened landing gear, and a lengthened nose. Only 27 of the initial Kfir variant, the C1, were built before the appearance of the C2, which featured fixed canards, small nose strakes, and dogtooth wing leading-edges for improved maneuverability and shorter runway requirements. IAI produced 185 C2s (including a proportion of combat-capable TC2 tandem-seat trainers with longer noses), later upgrading most 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 thrust in afterburner mode.

About 95 Kfirs still equip four IDF/AF interceptor or attack squadrons; the rest have been stored or exported. IAI now offers potential customers 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 1 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, service 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 (two seats in TC7).

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

The L-39 advanced jet trainer/light attack aircraft has been in production since 1971, with 2,796 built by December 1993. Most of these (2,094) were trainer-only L-39Cs for the former USSR, but 393 have been supplied to the Middle East and North Africa, with Iraq (81), Libya (181), and Syria (99) the major customers. All three have the L-39Z0 version, which has increased stores-carrying ability on four (instead of two) underwing pylons and a reinforced airframe. Syria's fleet, which included 44 ZAs, remains at nearly full strength, but that of Iraq may have dwindled to as few as 20 through attrition in its long war with Iran, and their airworthiness is uncertain. Libya, too, is thought to have lost more than a few in its border conflicts with neighboring Chad, and in 1990 donated 10 of its L-39s to Egypt, but more than 100 probably remain. The fifth operator in the region is Algeria, whose Air Force received 32 of the L-39ZA specialized ground-attack/reconnaissance version, which has an underfuselage gun as standard in addition to the four underwing weapon stations.

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 placed a \$204 million order for 48 L-59Es, deliveries of which were due for completion earlier this year. Tunisia has 12 L-59s on order. (Data for L-59E.)

Contractor: Aero Vodochody Ltd, Czech Republic.

Power Plant: one Progress (Lotarev/ZVL) 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 11,883-15,432 lb.

Performance: max speed at 15,400 ft 537 mph, service ceiling 38,725 ft, T-O run 1,936 ft, landing run 2,527 ft, range (unarmed) with max internal/external fuel 1,243 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/F-7

More than 800 MiG-21s ("Fishbed"), including Chinese-built F-7s, are flown by seven air forces in the Middle East and North Africa. The Egyptian Air Force operates about 150 Soviet-built MiG-21s of some half a dozen versions from MiG-21F to MF, and up to 80 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. Some are MiG-21Rs with a locally designed underfuselage pack of three reconnaissance cameras. Syria still has about 180 MiG-21s, including PFs, MFs, and late-model MiG-21bis, in eight squadrons.

With so many Iraqi MiG-29s lost in the Persian Gulf War, the survivors of some 70 prewar MiG-21s and 80 F-7Bs are likely to have extended service lives. Iran ordered 100 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 WP7(BM) turbojet. Libya has at least 50 MiG-21s operational, with possibly more in store. Yemen has about 40 MiG-21Fs and 30 PFs, from the formerly separate northern and southern parts of the country, respectively, while three of Algeria's four interceptor squadrons have early-model MiG-21F/MFs (mostly the former), of which about 80 remain in service. (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 1/4 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, service 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

The **MiG-23MS** interceptor ("Flogger-E") is a single-seat variable-geometry aircraft 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, no IR sensor or Doppler, and armament of R-3S ("Atoll") or R-60 ("Aphid") AAMs and 23-mm GSh-23 gun. The lighter-weight **MiG-23ML** ("Flogger-G"), identified by a much 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 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 afterburning turbojet, armored cockpit sides, low-pressure tires, explosion-resistant fuel tanks, active and passive ECM, and six pylons under 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 85 MiG-23MS interceptors, 35 MiG-23BN light attack aircraft, and 15 MiG-23UB tandem two-seat trainers. Syrian Air Force squadrons have up to 90 MiG-23ML interceptors, 60 MiG-23BNs, and a few trainers. Of 20 MiG-23MSs and 70 BKs (some with in-flight refueling capability) equipping the Iraqi Air Force before Desert Storm, eight were shot down by F-15Cs, 12 fled to Iran (including a two-seater), and others were destroyed on the ground. They made little use of available weapons, including French Magic AAMs and Russian Kh-29 ASMs guided by French Altis laser-designation pods. Other operators are the Algerian Air Force, with about 60 MiG-23MS/BMs, and the Republic of Yemen Air Force, with around 25 MiG-23BMs. (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 3/4 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, service 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 (two seats in tandem in MiG-23UB trainer).

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

Four nations in North Africa and the Middle East have received this Mach 2.83 combat aircraft. Libya began with about five MiG-25R reconnaissance aircraft by 1978, probably flown initially by Soviet crews. They were followed within three years by 60 MiG-25P/PD single-seat interceptors for three air defense squadrons. The **MiG-25P** ("Foxbat-A") had Smerch-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 had 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, and an IRST and Sapfir-25 radar providing look-down/shoot-down capability comparable with early MiG-23 interceptors.

MiG-25Rs were observed in Algeria in 1979, supplemented later by enough MiG-25Ps and MiG-25PU ("Foxbat-C") two-seat trainers to equip a single squadron. About 20 Iraqi Air Force interceptors may have survived the Persian Gulf War. The fourth operator in the region is the Syrian Air Force, with about 30 MiG-25P/PDs and 8 MiG-25Rs. (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 1 1/4 in, length 78 ft 1 3/4 in, height 20 ft 0 1/4 in.

Weight: gross 76,985–80,950 lb.

Performance: max speed at height Mach 2.83, service ceiling 67,900 ft, T-O run 4,100 ft, landing run with



L-39 Albatros, Iraqi Air Force



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



Mirage 5SDE, Egyptian Air Force (Denis Hughes)

brake-chute 2,625 ft, range 776 miles supersonic, 1,075 miles subsonic.

Accommodation: pilot only, on zero-height/80–775 mph ejection seat (two seats in tandem in MiG-25PU trainer).

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

MiG-29

Iraq had 35 single-seat counterair/attack **MiG-29s** ("Fulcrum-A") and six **MiG-29UB** ("Fulcrum-B") combat trainers before Desert Storm. Half of these may still be serviceable. The four that sought refuge in Iran during the campaign were repainted in Iranian Air Force markings to join the single squadron of 14 MiG-29s acquired earlier by Tehran. Syria is reported variously to have 20, 40, or 48; a single three-squadron regiment with 12 aircraft per squadron seems likely. Both Syria and Iran would almost certainly like to have more.

The integrated weapon system of the MiG-29 includes an RP-29 coherent pulse-Doppler look-down/shoot-down radar ("Slot Back") with a search range of 62 miles and tracking range of 43 miles, collimated with a laser rangefinder, and an IRST with a fighter detection range of 9 1/4 miles. It operates in conjunction with the pilot's helmet-mounted target designator for off-axis aiming of AAMs, "Fences" forward of the dorsal tailfins house flare dispensers.

Contractor: Mikoyan OKB, Russia.

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

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

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

Performance: max speed at height Mach 2.3, at S/L

Mach 1.06, service 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 (two seats in tandem in MiG-29UB).

Armament: one 30-mm GSh-301 gun in port wing-root extension; six underwing pylons for R-27R1 ("Alamo-A"), R-60MK ("Aphid"), or R-73E ("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 basic **Mirage F1-C** is an all-weather, all-altitude interceptor with capability for VFR ground attack, while the **F1-E** is a multirole fighter/ground-attack/reconnaissance version; their tandem-seat, combat-capable trainer equivalents are the **F1-B** and **F1-D**, respectively. The large Iraqi fleet—the last of 110 F1-EQs and 18 combat-capable BQ trainers were delivered at the end of 1989—was equipped with Thomson-CSF Agave fire-control radar and Exocet ASMs and remains substantial despite heavy losses during the Persian Gulf War. Since that war, Kuwait has withdrawn and offered for sale the 14 Mirages (13 F1-CJs and a BK) that had survived in service with Nos. 18 and 61 Squadrons. The Qatar Emiri Air Force has sold to Spain the 12 F1-EDAs and the one remaining DDA that had served with its No. 7 Squadron. Jordan still has one squadron (No. 25) of 16 F1-CJs and one (No. 1) of 17 EJs, plus a pair of BJ trainers.

Two other air forces also fly a mix of F1s. Libya received 16 early **F1-AD** interceptors, 16 ED multiroles, and half a dozen BD trainers; Morocco has about 19 F1-CHs (down from an original 30 due to frequent clashes with Polisario guerrillas) and 18 (from 20) F1-EHs, plus a pair of F1-Bs. They are being refurbished by Dassault. Most export Mirage F1s, except those of Iraq, have one or another version of the French Cyrano fire-control radar. Some Moroccan aircraft have chaff/flare dispensers, and Iraq is reported to have adapted the Kh-29 "Kedge" ASM for carriage by its remaining F1s. (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 1 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, service 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 (two seats in F1-B/D).

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 antirunway bombs, rocket launchers, Altis 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 5

Dassault originally developed the Mirage 5 as a clear-weather, low-level, ground-attack derivative of its Mirage III interceptor, to meet the requirements of the Israeli Air Force. Israel's order for 50 was embargoed (leading IAI to develop the Kfir, which see), but three Arab states subsequently became Mirage 5 operators.

The Mirage 5 featured a much slimmer nose, accommodating both a range-only radar and the transfer of some avionics equipment from a bay behind the cockpit, the latter space being taken up instead by an additional fuel tank that increased internal capacity by 15 percent. Initial Middle Eastern orders, including batches of two-seat 5D trainers, emanated from Libya (53 5Ds and 15 5DDs) and Abu Dhabi (12 5ADs and three 5DADs). Both countries also later ordered the 5E strike version (Libya 32 5DEs, Abu Dhabi 14 5EADs), as did Egypt (51 5SDEs, plus six 5SDD trainers, with funding assistance from Saudi Arabia). Egypt's final batch, consisting of 16 5SDE2s, was of an upgraded version equipped with the same inertial nav/attack system and laser rangefinder as those fitted to its MS2 Alpha Jets; its earlier Mirage 5s have also recently undergone a midlife update program. Approximate numbers now in service are: Egypt 68, Libya 65, Abu Dhabi 23. All three nations also operate small numbers of the Mirage 5R photoreconnaissance version (which see).

Contractor: Avions Marcel Dassault-Breguet Aviation, France.

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

Dimensions: span 27 ft 0 in, length 51 ft 0½ in, height 13 ft 11½ in.

Weights: empty 15,212 lb, gross 20,500–29,760 lb.

Performance: max speed at 40,000 ft Mach 2.1, at S/L Mach 1.13, service ceiling 55,775 ft, T-O run 2,625 ft clean, 5,250 ft at max gross weight, landing run 2,295 ft, combat radius with 2,000-lb weapon load 404 miles lo-lo-lo, 808 miles hi-lo-hi.

Accommodation: pilot only, on ejection seat (two seats in 5D).

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 basic models of the Mirage 2000, and their primary differences, were outlined in some detail in the "Gallery of NATO Airpower" in the September 1994 issue of *Air Force Magazine*. So far as the Middle East is concerned, only the Mirage 2000E, essentially a single-seat multirole version of the 2000C interceptor, is currently operational in that area, although Qatar has recently ordered the upgraded 2000-5 for 1997 delivery as a Mirage F1 replacement.

Egypt became the first export customer when it ordered 16 single-seat 2000EMs and four two-seat 2000BMs in December 1981. These were delivered

558 jamming equipment. (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 11½ in, length 47 ft 1¼ in, height 17 ft 0¾ in.

Weights: empty 16,534 lb, gross 23,940–37,480 lb.

Performance: max speed at high altitude Mach 2.2, at low altitude 690 mph, service ceiling 54,000 ft, range with four 550-lb bombs 920 miles.

Accommodation: pilot only, on zero/zero ejection seat (two seats in 2000B and ED).

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); or a centerline 30-mm twin-gun pod.

Strikemaster

The 12 Strikemaster Mk 82/82As serving with No. 1 Squadron of the Royal Air Force of Oman are used mainly for training. They retain their attack potential, as do the 36 Mk 80/80As of the Royal Saudi Air Force, based at King Faisal Air Academy, Riyadh. First flown 27 years ago, the Strikemaster has docile handling qualities and an ability to fly from unprepared airstrips that originally made it an attractive low-cost ground-attack aircraft for the Middle East environment.

Contractor: British Aircraft Corporation, UK.

Power Plant: one Rolls-Royce Bristol Viper Mk 535 turbojet; 3,410 lb thrust.

Dimensions: span over tipstanks 36 ft 10 in, length 33 ft 8½ in, height 10 ft 11½ in.

Weights: empty 6,195 lb, gross 9,303–11,500 lb.

Performance: max speed at 18,000 ft 481 mph, service ceiling 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

A handful of the original fixed-wing Su-7BM ("Fitter-A") single-seat attack aircraft can still be seen in the

insignia of the air forces of Algeria and Iraq. Far more numerous, and effective, are the variable-geometry export derivatives of the Su-7 operated by these nations and by Libya, Syria, and Yemen. The first of these to enter service was the Su-20 ("Fitter-C"), with a 24,800 lb thrust Saturn/Lyulka AL-21F-3 afterburning turbojet. Algeria is believed to have received 32; Iraq had a few, of which four flew to Iran during Desert Storm.

When the Su-22M-3 ("Fitter-J") became available, with internal Doppler nav radar, a laser rangefinder in the intake centerbody, and a more powerful Tumansky engine, more than 40 were supplied to Iraq, 90 to Libya, 40 to Syria, and 20 to Yemen. The Iraqi aircraft were flown to Iran during Desert Storm and are still there. They are formidable Mach 1.74 attack fighters with heavy weapon loads. Inevitably for an aircraft with an ancestry dating back to the first sighting of an Su-7 in 1956, their age shows, but 8,820 lb of external stores can do a great deal of damage. (Data for Su-22M-3.)

Contractor: Sukhoi OKB, Russia.

Power Plant: one Tumansky R-29B3-300 turbojet; 25,350 lb thrust with afterburning.

Dimensions: span 44 ft 10½ in (30° min sweep), 32 ft 10¼ in (63° max sweep), length 62 ft 5 in, height 16 ft 0½ in.

Weight: gross 36,155–42,990 lb.

Performance: max speed at height Mach 1.74, at S/L Mach 1.1, service 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 (two seats in tandem in Su-7U/22U trainers).

Armament: two 30-mm NR-30 guns in wingroots, each with 80 rds; nine pylons under wings and fuselage for 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-25

The Sukhoi Su-25, known to NATO as "Frogfoot-A," is the CIS counterpart to USAF's A-10A Thunderbolt II. Its design emphasis was on survivability features that would enable it to attack ground targets at treetop height in the face of intense opposition. The pilot is seated high above the sharply sloping nose, in an all-welded cockpit of titanium armor. A total of 256 flares are packed into dispensers above the engine nacelles and tailcone for protection against ground-fired SAMs during eight attack runs. To enhance combat readiness, the turbojets will run on any fuel likely to be found in forward areas, including MT gasoline and diesel oil.

The Iraqi Air Force ordered 45 Su-25s. Seven of those delivered by 1991 were flown to Iran during Desert Storm, and two others were shot down en route by F-15Cs. An estimated 22 remain in service.

Contractor: Sukhoi OKB, Russia.

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

Dimensions: span 47 ft 1½ in, length 50 ft 11½ in, height 15 ft 9 in.

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

Performance: max speed at S/L Mach 0.8, max attack speed, airbrakes open, 428 mph, service ceiling 22,965 ft, T-O run 1,970–3,930 ft, landing run 1,312–1,970 ft, range 466 miles at S/L, 776 miles at height.

Accommodation: pilot only, on zero/zero ejection seat (two seats in tandem in Su-25UBK trainer).

Armament: one twin-barrel 30-mm gun in port side of nose; eight underwing pylons for 9,700 lb of air-to-surface weapons, including SPPU-22 pods for 23-mm guns with twin barrels that pivot downward, 57-mm to 330-mm rockets, Kh-23 ("Kerry"), Kh-25 ("Karen"), and Kh-29 ("Kedge") ASMs, laser-guided rocket-boosted bombs up to 1,450 lb, and 1,100-lb incendiary, antipersonnel, and chemical cluster bombs; two small outboard pylons for R-3S ("Atoll") or R-60 ("Aphid") self-defense AAMs.

Tornado

The Tornado was one of the stars of the Persian Gulf War, Royal Air Force detachments of the IDS (interdictor/striker) version being supplemented by other IDS aircraft of No. 7 Squadron, Royal Saudi Air Force, and from the latter's No. 66 Squadron, then forming. Iraqi airfields were attacked with JP 233 cluster weapons from low altitude, and later with Paveway laser-guided bombs from medium heights.

The original RSAF order for 48 Tornado IDSs was part of the Al Yamamah I agreement signed with the UK in 1985. One of these aircraft was lost in the war with Iraq, and work has begun on another 48 ordered in June 1993 under the follow-up Al Yamamah II, for delivery beginning in 1996. 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, some with each Saudi squadron, are configured for reconnaissance, and 14 of the original batch have dual controls.



Tornado ADV, Royal Saudi Air Force



AH-1S HueyCobras, Royal Jordanian Air Force (Peter Steinemann)

between 1986 and 1988; one of each is since believed to have been lost. Abu Dhabi's order comprised not only 22 single-seat 2000EADs and six 2000EDAD trainers but also eight examples of the 2000RAD reconnaissance model; they were delivered for Nos. 1 and 2 Squadrons between November 1989 and November 1990. The RAD aircraft are equipped as standard with a COR 2 multicamera pod but could be fitted instead with a SLAR 2000 side-looking airborne radar pod or a HAROLD long-range optical sensor pod. The EADs carry a 2,205-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 radar warning receiver and ELT/

Under Al Yamamah I, the RSAF also ordered 24 Tornado ADV (air defense variant) interceptors, which currently equip Nos. 29 and 34 Squadrons. 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. 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 1/2 in (25° min sweep), 28 ft 2 1/2 in (67° max sweep), length 54 ft 10 1/4 in, height 19 ft 6 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 Sidewinder AAMs; AGM-65 Maverick, AGM-88 HARM, ALARM, Kormoran, and Sea Eagle ASMs; cluster bombs; napalm; "smart," retarded, and conventional bombs up to 1,000 lb; rockets; incendiary and flare bombs.

Helicopters

AH-1 HueyCobra

In December 1971, the former Shah's Imperial Iranian Army Aviation placed an order for 202 Bell Cobra gunship helicopters. Of a variant known as the AH-1J International, powered by a 1,673 shp Pratt & Whitney Canada T400-WV-402 Turbo Twin Pac turboshaft unit, they were generally similar to the US Marine Corps AH-1J SeaCobra but incorporated some features of Bell's YAH-63 KingCobra (the AH-64 Apache's unsuccessful competitor) and an improved gun turret; most were adapted to carry the TOW antitank missile system. 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 still possess full operational capability. This lends credence to a 1992 report that Iran had regrouped its Army Cobras, Chinooks, and Bell 214 Isthans into a new airmobile force under the operational control of the Revolutionary Guard.

The 24 single-engine Cobras received by Jordan's No. 10 and No. 12 Squadrons, and an estimated 40 in Israel, are all believed to be similar to the US Army's AH-1F fully upgraded TOW version, equipped with an IR jammer, hot metal and plume IR suppressor, RWR, a low-air-speed sensor probe, a 20-mm three-barrel gun in an electrically powered undernose turret, automatic compensation for off-axis firing, a laser rangefinder and tracker, HUD, Doppler, and IFF transponder. Israeli HueyCobras also have a US-funded Rafael night targeting system. They have figured frequently in attacks on Hezbollah guerrilla forces based in southern Lebanon. (Data for AH-1F.)

Contractor: Bell Helicopter Textron, USA.

Power Plant: one Textron Lycoming T53-L-703 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, service 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 stubwing can carry four TOW ASMs; inner pylon can carry a pack of 7–19 x 2.75-in rockets.

AH-64 Apache

Since January 1984, nearly 800 of these formidable attack helicopters have been delivered to the US Army and Army National Guard, achieving IOC (initial operational capability) in July 1986. Nearly 300 took part in Desert Shield and Desert Storm.

Exports of the AH-64A began in January 1990 with a joint offer to Israel and Egypt, Israel placing an order for 18 two months later. The first two were delivered that September. All are now in service with the IDF/AF's No. 113 Squadron. Eighteen more, of 24 pledged, went to No. 127 Squadron in September 1993. The



AH-64 Apache, UAE (Abu Dhabi) Air Force



AS 532SC Cougar, Royal Saudi Navy (Press-Office Sturzenegger)

Israeli name for the AH-64 is **Petan** ("cobra"). Delivery of Egypt's 24 began earlier this year. They were preceded in April 1993 by 12, with Hellfire missiles, ordered for the Royal Saudi Land Forces in April 1991. In December 1991, Abu Dhabi of the UAE ordered 20, with Hellfires and Hydra-70 rocket armament, receiving the first six in October 1993 and the balance of 14 in 1994. Abu Dhabi is to receive a further 10 Apaches in 1996.

Contractor: McDonnell Douglas Helicopter Systems, USA.

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

Dimensions: rotor diameter 48 ft 0 in, fuselage length, tail rotor turning 51 ft 0 in, height 15 ft 3 1/2 in.

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

Performance: max speed at S/L 182 mph, service ceiling 21,000 ft, max range (internal fuel, including reserves) 253 miles, typical mission endurance (no reserves) 2 h 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 AGM-114 Hellfire antitank missiles and/or 2.75-in FFAR rockets in seven-rd M200 or 19-rd M260 launchers.

AS 330 Puma and AS 332 Super Puma/AS 532 Cougar

More than 700 AS 330 Puma military assault and civilian transport helicopters were built in France, the UK, Indonesia, and Romania. Manufacture by IAR in Romania continues. The typical AS 330H military export Puma is powered by two 1,400 shp Turmo IVB engines and carries 16 fully equipped troops, six litter patients and six seated casualties, or internal or external freight. The AS 330L differs in having 1,575 shp Turmo IVCs. Current Middle East inventories include Abu Dhabi (10 early 330C/Fs with Turmo IVB/A engines and 10 AS 330Ls), Algeria (five), Iraq (15 330Gs, including two VIP transports), Kuwait (seven 330Hs), Lebanon (nine 330Ls), Morocco (28 330Fs) and Tunisia (one). Six of those in Lebanon and 10 (plus another 10 on option) for Abu Dhabi are from the Romanian production line.

The AS 332 Super Puma (military designation AS 532 Cougar) differs in having a new power plant, updated 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. No. 9 Squadron of the Qatar Emiri Air Force has six AS 532SC Cougars for naval antiship/antisubmarine and SAR missions. This navalized version has a

folding tail rotor pylon, deck landing assist device, and mountings for Exocet missiles. The Royal Saudi Navy has 12 AS 532SCs, the Kuwait Air Force five, and Abu Dhabi seven. The basic transport version serves with Jordan's No. 7 Squadron (11 AS 532ULs) and Abu Dhabi (eight AS 532ULs, including two furnished as VIP transports). Oman's Royal Flight has two AS 332Ls for VIP use. (Data for AS 532SC.)

Contractor: Eurocopter SA, a Franco-German company.

Power Plant: two Turbomeca Makila 1A1 turboshafts; each 1,877 shp.

Dimensions: rotor diameter 51 ft 2 1/4 in, fuselage length 50 ft 11 1/2 in, height 16 ft 1 1/4 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, service ceiling 13,450 ft, range 540 miles.

Accommodation: crew of two or three; optionally, 21 passengers, nine litters and three seated persons, or freight.

Armament: options include two Exocet missiles or two lightweight torpedoes.

AS 365 Dauphin/AS 565 Panther

Main Middle Eastern customer for this French helicopter series 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 the side-loading of up to four casualty litters, accompanied by medical attendants. Four of the Royal Saudi Navy's 23 are AS 565MA Panthers, equipped for surveillance, search, and rescue; the rest are frigate-based AS 565SA Panthers, equipped with search radar and AS.15TT missiles for the antiship role. Israel acquired two basically similar ex-US Coast Guard HH-65As in 1985, which serve on board "Saar" class fast attack boats in a search-and-rescue role; they are to be followed by an undisclosed number of AS 565MAs ordered recently, which will receive an Elbit navigation and search radar suite. Tunisia and Dubai each have a single AS 565. (Data for AS 565SA.)

Contractor: Eurocopter SA, a Franco-German company.

Power Plant: two Turbomeca Arielle 1M1 turboshafts; each 749 shp.

Dimensions: rotor diameter 39 ft 2 in, fuselage length 39 ft 8 1/4 in, height 13 ft 0 3/4 in.

Weights: empty 4,987 lb, gross 9,370 lb.

Performance: max cruising speed at S/L 170 mph, hovering ceiling IGE 8,530 ft, combat radius 155–173 miles, max range 544 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

About 180 examples of this workhorse helicopter are in service with the air arms of Middle Eastern and North African nations: Dubai (Air Force six), Iran (Army 23, Navy 4), Israel (40), Morocco (Air Force 45), Oman (Air Force 19), Saudi Arabia (Air Force 8), and Tunisia (Air Force 36). Most of these are Agusta-built 205/205A/205A-1s, although Tunisia's inventory includes 18 ex-US UH-1Hs. They perform 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 Textron Lycoming T53-L-13B turboshaft; 1,400 shp.

Dimensions: rotor diameter 48 ft 0 in, fuselage length 41 ft 10 3/4 in, height 14 ft 5 1/2 in.

Weights: empty 4,800 lb, gross 9,500 lb.

Performance: max speed at S/L 138 mph, max cruising speed 127 mph, service 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: none.

Bell 212

By changing to a compact twin-turbine PT6T-6 power plant in the 212, Bell was able to provide 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 Huey series. Most 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**. Current operators are Bahrain (12), Dubai (one), Iran (Army 11, Navy 19 ASW), Iraq (five ASW/SAR), Israel (55), Libya (two VIP), Morocco (two), Oman (two VIP), Saudi Arabia (27 SAR and VIP), Sharjah Emiri Guard Wing of the UAE (four), and Yemen (five, plus one VIP). 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-Ferranti Seaspray search radar. Dubai has also ordered nine Agusta-Bell 412s, with four-blade (instead of two-blade) main rotor and increased performance. (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 4 3/4 in, height 14 ft 10 1/4 in.

Weights: empty 5,621 lb, gross 10,692 lb.

Performance: max speed at S/L 122 mph, max cruising speed 115 mph, service 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

Like the Bell 212, the 214 was developed as a derivative of the Bell 205/UH-1 with increased power and payload. Known originally as the HueyPlus, it flew for the first time in October 1970. Just over two years later, Iran ordered 287 Model 214As, 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 relatively small number of a commercial version of the 214A as the 214B **BigLifter** and continued with the stretched 214ST **SuperTransport**. This made its first flight in July 1979, with a new power plant and an 8 ft longer fuselage, seating four more passengers.

More than 300 of these various workhorse helicopters still operate in the Middle East, most of them with Iranian Islamic Army Aviation, plus a VIP 214B and eight 214Cs with the Air Force. Iraq is believed to retain most of an original 45 214STs. Dubai has four 214Bs, and Oman has about five Bs. (Data for Bell 214A.)

Contractor: Bell Helicopter Textron, USA.

Power Plant: one Textron Lycoming LTC4B-8D turboshaft; 2,930 shp.

Dimensions: rotor diameter 52 ft 0 in, fuselage length 49 ft 3 1/2 in, height 15 ft 0 in.

Weights: empty 7,460 lb, gross 11,480 lb.

Performance: max cruising speed at S/L 161 mph, service 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 highly successful **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 HellTOW sight, and a SFENA hybrid cockpit combining conventional instruments with electronic displays for TOW missile and communications control. Only five are configured currently to carry TOW.

Israel received the first four of an unspecified number of OH-58Ds in 1990, fitted with TV cameras, IR thermal imagers, and laser rangefinder/designators.

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 4 3/4 in, height 12 ft 10 1/2 in.



Bell 212, Bahrain Emiri Air Force
(Peter Steinemann)



BO 105, Bahrain Emiri Air Force
(Peter Steinemann)



McDonnell Douglas 500MD/TOW,
Israeli Air Force (Denis Hughes)

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

This twin-turbine light helicopter is in service with the air forces of Bahrain (five), Dubai (three), Jordan (two), and Sharjah (seven), primarily for VIP and communications duties. The major Middle Eastern operator is Iraq, with 30 estimated in service following losses in the Persian Gulf War. The first 10 Iraqi BO 105s, 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." Others followed, many from production in Spain by CASA, to a total of at least 60, and were seen missile-armed during Desert Storm. Iraq also acquired 26 Eurocopter/Kawasaki BK 117s, with a similar configuration but with more powerful turbines and improved performance. Sharjah has two BK 117s. (Data for basic BO 105 CB.)

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 3 1/2 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 150 mph, service ceiling 10,000 ft, range 345-634 miles.

Accommodation: pilot and four other persons; rear clamshell doors for loading two stretchers or freight.

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

CH-47C Chinook

Except for two Boeing-built Chinooks of about 50 equipping the Army of Iran, the **CH-47Cs** serving with air and land forces in the Middle East and North Africa were license-manufactured by Meridionali of Italy, an Agusta subsidiary. The Egyptian Air Force has 15,

Libya about 18 (Air Force six, Army 12), and the Royal Air Force of Morocco seven. Most of the Libyan CH-47Cs are used to support Army missile and radar sites from their bases at el-Kufra and Sebha. Iran's Chinooks are now believed to be part of an airborne helicopter force under the control of the Revolutionary Guard, which has been integrated with the regular Army.

In its standard transport role, the CH-47C carries 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 includes RWR, missile approach warning equipment, IR jammers, chaff/flare dispensers, and INS with GPS.

Contractor: Elicotteri Meridionali SpA, Italy.

Power Plant: two Textron Lycoming 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 7 3/4 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, service 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 and Yasur 2000

The MATA Helicopters plant of Israeli Aircraft Industries, with Elbit as avionics integrator, is upgrading the 30 **CH-53D**-standard (S-65C-3) heavy-lift helicopters of the Israeli Defense Force/Air Force under the designation **Yasur 2000**. Airframe life is being extended beyond the year 2000, together with 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, and new autopilot. The first flight of a Yasur 2000 took place on June 4, 1992; redeliveries began in February 1993. These aircraft have been supplemented by 16 earlier-vintage **CH-53As**, with lower-rated T64 turboshafts and reduced performance and payload, from US surplus.

At least one of the six **RH-53D** mine-sweeping helicopters delivered to the Iranian Navy during the reign of the Shah is believed to be serviceable. (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, service 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

Although these military export versions of the (originally Hughes) OH-6A have sold successfully in many parts of the world, comparatively few of the sales have been in the Middle East. No. 5 Squadron of the Royal Jordanian Air Force at Mafraq has eight unarmed **500MDs** for training, and a few are used by the Israeli Defense Force/Air Force in a liaison capacity, but the only combat-equipped Defenders are Israel's antitank **500MD/TOWs**, of which 30 were delivered from mid-1979. They carry a stabilized telescopic sight in a prominent turret on the port side of the nose. (Data for 500MD/TOW.)

Contractor: McDonnell Douglas Helicopter Systems, USA.

Power Plant: one Allison 250-C20B turboshaft; 3/5 shp.

Dimensions: rotor diameter 26 ft 4 in, fuselage length 25 ft 0 in, height 8 ft 10 1/4 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, service 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

The Mi-6 ("Hook") was the largest helicopter in the world when first flown, June 5, 1957. It is now outclassed by the Mi-26 but remains in service with four air forces in the Middle East/North Africa region. Algeria has four,

Egypt three, and Syria 10. Iraq is said to have received 15 to support construction and operation of its missile and radar sites, together with three Mi-10 ("Harks") heavy-lift flying cranes developed from the Mi-6. It is not known how many of Iraq's 450+ military helicopters survived Desert Storm.

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 10 1/2 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, service 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; and sling for max external freight load of 17,637 lb (normally with stubwings removed).

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

MI-8/17

Of at least 40 air forces worldwide that fly MI-8s and uprated MI-17s, six are in the Middle East/North Africa region. Equipped largely with standard military MI-8 armed transports ("Hip-C" and "E"), they are the air forces of Algeria (32), Egypt (about 50), Iraq (possibly 70 following Desert Storm), Libya (seven), Syria (at least 100), and Yemen (about 50). The Egyptian Navy has 10. These totals include MI-17s ("Hip-H") or MI-8s uprated as MI-8MT/MTV to MI-17 standard, 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-purpose 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 MI-8s are equipped for ECM ("Hip-J" standard) with small equipment boxes on each side of the cabin, or as communications jammers ("Hip-K") 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 10 1/4 in, fuselage length 59 ft 7 1/2 in, height 18 ft 6 1/2 in.

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

Performance: max speed at 3,280 ft 161 mph, max cruising speed 137 mph, service ceiling 14,765 ft, range with 24 troops 311 miles, cargo version 280-596 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 32-rd packs of 57-mm rockets or other stores ("Hip-C" standard), or triple stores rack each side for six similar rocket packs, and four 9M17P Skorpion ("Swatter") antitank missiles on rails above packs ("Hip-E" standard).

MI-14PL

The MI-14 shore-based amphibious helicopter has the basic airframe, power plant, and dynamic components of the MI-17. New features include a boat-type planing bottom of the kind designed by Sikorsky for the S-61, a sponson carrying an inflatable flotation bag on each side, 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, towed MAD bird stowed against the rear of the fuselage, and life raft. An autopilot/autohover system and autocontrol system are standard. The Libyan and Syrian MI-14s are under Navy direction for coastal surveillance. Syria is also believed to retain five veteran Kamov Ka-25PL ("Hormone-A") ASW helicopters alongside its Mi-14s (details in "Gallery of Russian Aerospace Weapons," March 1994, p. 65).

Contractor: Mil OKB, Russia.

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

Dimensions: rotor diameter 69 ft 10 1/4 in, fuselage length 60 ft 3 1/2 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, service 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

Most MI-24 helicopter gunships delivered to the Middle East and North Africa are of the basic MI-24D ("Hind-D") version, as described below, but Iraq is known to have some MI-24Vs ("Hind-E"). These carry up to 12 radio-guided, tube-launched 9M114 ("Spiral") antitank missiles in place of the less effective 9M17P Skorpions ("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



MI-6, Egyptian Air Force (Denis Hughes)



MI-8, Egyptian Air Force (Denis Hughes)



S-70A, Bahrain Emiri Air Force (Peter Steinemann)

boxes are optional. MI-25 and MI-35 are export designations for the MI-24D and MI-24V, respectively.

Iraqi MI-24s were first used against Iran in 1982. They took little part in Desert Storm, and 20 are estimated to remain available. Algeria is believed to have about 32, Libya 13, Syria up to 60, including 35 MI-35s, and Yemen 12. (Data for MI-24D.)

Contractor: Mil OKB, Russia.

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

Dimensions: rotor diameter 56 ft 9 1/4 in, fuselage length excl gun 57 ft 5 1/4 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, service 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 has been supplied to several Middle East customers.

The Royal Saudi Land Forces Army Aviation Command is the Middle East'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 13th 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. Eight more A-1Ls are required. Three other Middle East air arms operate the S-70A. No. 8 Squadron of the Royal Jordanian Air Force, based at Amman, acquired three S-70A-11s in 1986-87 (one since reported lost); two S-70A-21s, outfitted as VIP transports, were acquired by the Egyptian Air Force in 1990; and one S-70A was delivered to Bahrain, also in 1990.

Earlier this year, Israel began to replace its aging Bell 212s with 10 ex-US Army UH-60As, to which it has given the name *Nammer* ("tiger"). (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 1/4 in, height 16 ft 10 in.

Weights: empty 11,500 lb, gross 17,000-23,500 lb.

Performance: max cruising speed 173 mph, service 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 antitank 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

In its maritime versions, this three-engine, heavy-duty helicopter has 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. Iraq acquired 10 SA 321GVs in the 1970s, each equipped with ORB-31D radar in a large nose radome and armed with two Exocet antiship missiles. Six more were bought

in the early 1980s. Eight are thought to remain in service. Libya ordered eight SA 321Ms for SAR and logistical support in the early 1970s, followed in the 1980s by six maritime SA 321GMs with ORB-32WAS search radar. A total of about 10 of these are believed to remain available. (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 1/4 in, height 21 ft 10 1/4 in.

Weights: empty 15,130 lb, gross 28,660 lb.

Performance: cruising speed 155 mph, service 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 342 Gazelle

Nearly 40 nations have bought military Gazelles of various models, 11 of them in the Middle East and North Africa. Egypt imported 60 SA 342Ls and assembled another 30 locally, 12 of these serving with its Navy as antiship helicopters and most of the remainder as an Air Force antitank element. Iraq and Syria are each thought to have more than 50, Libya about 40, Morocco 24, Kuwait 15, Qatar 12, and Abu Dhabi 11, with smaller numbers operated by Jordan, Lebanon, and Tunisia. The predominant version is the SA 342L, and the great majority, as in Egypt, are equipped for antitank, antiship, or counterinsurgency duties, with only small numbers allocated to such nonbelligerent tasks as observation and liaison. (Data for SA 342L.)

Contractors: Aerospatiale, France, and Westland Helicopters, UK.

Power Plant: one Turbomeca Astazou XIVM turboshaft; 858 shp.

Dimensions: rotor diameter 34 ft 5 1/2 in, fuselage length 31 ft 3 3/8 in, height 10 ft 5 1/2 in.

Weights: empty 2,202 lb, gross 4,410 lb

Performance: max cruising speed at S/L 161 mph, service 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 two European licensees: Westland (UK) and Agusta (Italy). Westland delivered 34 to Egypt between 1973 and 1976, and 12 to Qatar in 1975-76 and 1982-83. Six of the Egyptian aircraft, of which five remain, were ASW/ASV Sea King Mk 47s for the country's Navy; the rest are of a model exclusive to Westland, the land-based Commando tactical transport. An initial Egyptian Air Force order for 24, partly funded by Saudi Arabia, comprised five Commando Mk 1s, minimally modified from the Sea King airframe, 17 tactical transport Mk 2s, and two VIP transport Mk 2Bs. Four electronic warfare Commando Mk 2Es, with Elettronica ECM and ESM, were acquired later. Qatar's Commandos are an equally varied mixture of three Mk 2A transports, one VIP Mk 2C, and eight Exocet-equipped antiship Mk 3s; the transports serve with No. 8 (Multirole) Squadron and the Mk 3s with No. 9 (ASV) Squadron.

Agusta's contribution includes three VIP AS-61s supplied to Egypt, two VIP AS-61As and 10 or more antisubmarine ASH-3Ds for Iran, one VIP and four utility AS-61Ts for Iraq, a single VIP AS-61A for Libya, and three similar aircraft for Saudi Arabia. (Data for Commando Mk 2.)

Contractor: Westland Helicopters, UK.

Power Plant: two Rolls-Royce Gnome H.1400-1 turboshafts; each 1,660 shp.

Dimensions: rotor diameter 62 ft 0 in, fuselage length 55 ft 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 IGE 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.

Reconnaissance and Special Mission Aircraft

Beechcraft 1900C-1

The Beechcraft 1900 is primarily a civil commuter, cargo, or executive aircraft, but among early military orders was a 1985 contract for six for the Egyptian Air Force: four for electronic surveillance and two for maritime patrol. All were of the 1900C-1 model, with a "wet" wing offering much better payload/range performance than the original design. Four aircraft were delivered in 1988 and two the following year. Equipment in the elint aircraft is classified, but a fifth and sixth EW aircraft were delivered to Egypt in September 1992. These 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 the US Army's latest RC-12 Guardrail Common Sensor aircraft.

The maritime pair are each equipped with weather radar, Dalmo Victor S-3075 electronic support measures, 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; the ESM equipment is thought to include a tailcone-mounted radar warning receiver.

Contractor: Beech Aircraft Corporation, USA.

Power Plant: two Pratt & Whitney Aircraft of Canada PT6A-65B turboprops; each 1,100 shp.

Dimensions: span 54 ft 5 1/4 in, length 57 ft 10 in, height 14 ft 5 1/4 in.

Weights: empty approx 9,850 lb, gross 16,600 lb.

Performance: max cruising speed at 8,000-16,000 ft 307 mph, service 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.

E-2C Hawkeye

Israel, the Hawkeye's first export customer, received four Group 0 E-2Cs in 1977-78; Egypt received five Group 0s from 1987, and a sixth, to upgraded Group II standard, was delivered in 1993.

The Hawkeye carries its radar and IFF antennas in a 24-ft-diameter disc above the center-fuselage, rotating at five to six rpm; the four vertical tail surfaces are made of glassfiber to avoid compromising the radar's efficiency. 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.

The AN/APS-125 radar systems 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. 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 ehp.

Dimensions: span 80 ft 7 in, length 57 ft 6 1/4 in, height 18 ft 3 3/4 in.

Weights: empty 39,373 lb, gross 53,267 lb.

Performance: max speed 389 mph, cruising speed for max range 298 mph, service 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 h 24 min, max endurance 6 h 15 min.

Accommodation: flight crew of two; three mission personnel.

Armament: none.

E-3A Sentry

In 1981, under the Peace Sentinel program, the Reagan Administration approved the sale of five Boeing E-3A AWACS aircraft to the Saudi Arabian government. They were delivered between June 1986 and September 1987. Operated by No. 18 Squadron of the Royal Saudi Air Force from Riyadh Military City Airport, and carrying one or more relief crews, 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.

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 325,000 lb.

Performance: max speed at 40,000 ft 530 mph, service 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 h, max endurance (unrefueled) 11 h.

Accommodation: flight crew of four; up to 13 specialist AWACS personnel.

Armament: none.

MiG-25R

Side by side with fighter versions of the MiG-25, Algeria, Iraq, Libya, and Syria operate small numbers of reconnaissance MiG-25Rs. 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, like their counterparts in CIS air forces, can presumably offer the same ability to make precision automatic attacks with bombs in all weather, day and night, at supersonic speed, and from heights above 65,000 ft, against targets whose geographic coordinates are known. Equipment includes an inertial navigation system, updated by Doppler. Range 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.



SA 342 Gazelles, Qatar Emiri Air Force (Peter Steinemann)



Beechcraft 1900C-1, Egyptian Air Force

Contractor: Mikoyan OKB, Russia.
Power Plant: two Soyuz/Tumansky R-15BD-300 turbojets, each 24,700 lb thrust with afterburning.
Dimensions: span 44 ft 0 1/4 in, length 78 ft 1 3/4 in, height 20 ft 0 1/4 in.
Weight: gross 81,570-90,830 lb.
Performance: max speed at height Mach 2.83, at S/L Mach 0.98, service 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

The 5R is a tactical reconnaissance version of the Mirage 5 fighter/ground-attack aircraft, recognizable by the different profile of a nose adapted to accept a pallet housing five (three oblique and two vertical) Omera 31 film cameras for all-altitude day and night photographic missions. It is operated by the air forces of Abu Dhabi (three 5RADs), Egypt (six 5SDRs), and Libya (eight 5DRs). (*Data generally as for Mirage 5.*)

RC-12D and EU-21A/D

The RC-12D is a sigint/elint aircraft using the airframe of the Beechcraft Super King Air 200. Similar to the Guardrail RC-12s operated by the US Army for battlefield intelligence-gathering, they are characterized by numerous large dipole antennas sprouting above and below the wings. Five were supplied to the Israeli Defense Force under FMS. Israel also has nine much older aircraft for similar duties, in the form of three ex-US Army EU-21As (converted U-21As) and six EU-21Ds (ex-U-21Ds); these combine the unpresurized fuselage of the Beech Queen Air 65-80 with the wings of the King Air 90. (*Data for RC-12D.*)

Contractor: Beech Aircraft Corporation, 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, service 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

The only undisputed Middle East operator of reconnaissance Phantoms is Israel, whose 18 RF-4Es, delivered in 1970-76, had the standard pack of oblique/panoramic cameras and SLAR/IR sensors in a modified nose. These were intended to be supplemented by a unique 22-ft-long, 4,000-lb underbelly pod for the huge 1,228-lb General Dynamics HIAC-1 high-altitude, high-resolution camera, but this so degraded the aircraft's performance that the pod did not become operational. Instead, three Israeli F-4Es 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 the HIAC 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. Redelivered in 1978, and still in use (though one has reportedly been lost), the F-4E(S) offers a reconnaissance capability as good as that of any comparable system in the world. A handful of Iran's original 16 RF-4Es may still survive. (*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, service 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

Ten RF-5Es constitute the only dedicated tactical reconnaissance unit of the Royal Saudi Air Force. Capable of round-the-clock operation, the single-seat TigerEye differs from the standard F-5E Tiger II fighter in having a longer nose of modified shape. A KS-87D oblique camera is installed as standard, which can be combined with one of three interchangeable nose pallets: one with a single LOROP (long-range oblique photography) camera, one with one medium- and one low-altitude pan camera, and a third that adds a Texas Instruments RS-700 series infrared linescan to the two pan cameras. The Royal Moroccan Air Force has a single example of the earlier RF-5A. (*RF-5E data generally as for F-5E, except as follows.*)

Dimensions: length 48 ft 0 3/4 in.
Performance: combat radius with three drop tanks and two AIM-9 Sidewinder AAMs 403 miles (lo-lo-lo), 610 miles (hi-lo-hi).



An-12, Algerian Air Force
(Press-Office Sturzenegger)



Boeing 707-320, Israeli Air Force
(Press-Office Sturzenegger)



L-100-30 Hercules, Air Force of Kuwait
(Peter Steinemann)

Transports and Tankers

An-12

An-12s ("Cubs") are rather like DC-3/C-47s in that they continue to be seen performing stalwart service alongside turboprop transports expected to replace them long ago. Fewer than a dozen remain in service with air forces in this region, with an estimated five in Algeria, five in Iraq, and one in Yemen. Their major shortcoming has always been the lack of an integral rear-loading ramp/door. Instead, the bottom of the rear fuselage is made up of two longitudinal doors that hinge upward inside the cabin to permit direct loading from trucks or air-dropping of supplies and equipment. Sixty paratroops can be dispatched via this exit in less than one minute.

Contractor: Antonov OKB, Ukraine.
Power Plant: four ZMKB Progress AI-20M turboprops; each 4,190 ehp.
Dimensions: span 124 ft 8 in, length 108 ft 7 1/4 in, height 34 ft 6 1/2 in.

Weights: empty 76,235 lb, gross 134,480 lb.
Performance: max speed 385 mph, normal cruising speed 354 mph, service ceiling 33,500 ft, T-O run 2,575 ft, landing run 2,756 ft, range with 39,680 lb payload 900 miles, with max fuel 4,225 miles.

Accommodation: crew of six; 44,090 lb of freight, 90 troops or 60 parachute troops. Built-in freight-handling gantry with capacity of 5,070 lb.
Armament: two 23-mm NR-23 guns in manned tail turret. Provision for bombs.

An-24/26

The first of these short-range, twin-turboprop transports to fly, in April 1960, was the An-24 ("Coke"). By the time production ended in 1978, about 1,100 had been built, the final versions with 2,515 ehp AI-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. The

freighter had a belly cargo door at the rear of the cabin, with an electrically powered winch and conveyor to facilitate loading. Not content with this makeshift arrangement, 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-improved access, to create the An-26 ("Curl"). With uprated turbojets, it offered increased performance and payload. More than 1,000 were built, and derivatives are still in production in China.

At least six of Iraq's An-26s are thought to have survived Desert Storm. Libya has 10. Syria's two An-24s and four An-26s operate in civil markings but are available to the military. The theoretically unified Yemen Air Force had a total of 13 An-24s and An-26s before its North/South war began. (*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 9 1/2 in, length 78 ft 1 in, height 28 ft 1 1/2 in.

Weights: empty 32,518 lb, gross 52,911 lb.
Performance: cruising speed at 19,685 ft 270 mph, service 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 707-320

Tanker/transport, elint, and other versions of this veteran airliner serve with half a dozen air forces in the region. The largest fleets are those of Iran and Israel, each with about 14, including four (Iran) or five (Israel) converted to flight refueling tankers; eight tankers, illogically designated KE-3A, serve with No. 18 Squadron of the Royal Saudi Air Force. These tanker versions can transfer up to 123,190 lb of fuel to fighters or other aircraft 1,150 miles from their bases. The Royal Moroccan Air Force has a short-fuselage 707-138 tanker, converted in-country by AMIN. Israeli conversions were undertaken by IAI's Bedek Aviation Division, which has also converted six other 707s for elint/ECM duties with the country's air force. Other 707-320s serve as transports with Egypt (one VIP), Israel (three), Libya (one VIP), Morocco (one), and Saudi Arabia (two VIP). (*Data for basic 707-320, except where indicated.*)

Contractor: Boeing Company, 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, service ceiling 39,000 ft, T-O to 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.

C-130 Hercules

Up to 30 older C-130Es still serve with the Air Forces of Iran, Israel (12), and Saudi Arabia (nine), but most Hercules in service in the Middle East are current-production C-130Hs or L-100s. Standard-length C-130Hs are operated by Abu Dhabi (five), Algeria (10), Egypt (19), Iran (about 10), Israel (eight or nine), Jordan (four), Libya (nine), Morocco (15), Oman (three), Saudi Arabia (28), Tunisia (two), and Yemen (two). Egypt and Saudi Arabia also each have one VC-130H VIP transport; Israel has three KC-130H hose/reel tankers, Morocco (two), and Saudi Arabia (eight); Egypt has two (unofficially "EC-130H") converted for electronic warfare/elint duties, Israel one 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 (two H-30s), Kuwait (four L-100-30s), and Saudi Arabia (six L-100-30s). Three of Saudi Arabia's C-130Hs and one L-100-30 are outfitted as AEHs (airborne emer-

gency hospitals), Israel calls its C/KC-130s by the name **Karnaf** ("rhinoceros") and its EC-130 **Yanshuf** ("eagle owl"). (Data for current basic C-130H.)

Contractor: Lockheed Aeronautical Systems Company, 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 374 mph, service ceiling 33,000 ft, T-O run 3,580 ft, landing run 1,700 ft, range with max payload 2,354 miles, with max fuel incl external tanks 4,891 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/four in H-30), or up to 42,673 lb of light armored vehicles/artillery, supply pallets, or other cargo.

Armament: none.

CN-235 M

Initial export customer for the military version of this twin-turboprop, general-purpose transport was Saudi Arabia, whose first two aircraft were the first production CN-235s of the Spanish production line. Configured as VIP transports, they were delivered in February 1987, followed two months later by two standard transports. These early aircraft were **Series 10s** with 1,700 shp CT7-7A engines; later production aircraft, with Dash 9C engines, are designated **Series 100** and **200**. Morocco and Abu Dhabi each ordered seven Series 100s, including one to VIP standard. (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 recovery).

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, service 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

To assess the strength of Iran's transport force is no easier than to estimate its fighting strength. There could be a mix of 10 **Mk 400M** and **Mk 600** Friendship/Troopships in the Air Force, two of each version in the Army Air Force, and two of each available to the Navy. Both the Mk 400M and Mk 600 are fitted with 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, and the four Mk 400Ms modified by Fokker for target towing may still be available.

Most of Algeria's F27s were transferred to the country's civil airlines a decade ago, but two Mk 400Ms and one Mk 600 appear to have been retained by the Air Force for transport use and for maritime surveillance on behalf of the Navy. (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.

Performance: normal cruising speed at 20,000 ft 298 mph, service 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.

G222

Libya's decision to purchase a large fleet of Italian-built G222s was frustrated initially by a US embargo on the aircraft's standard General Electric T64 turboprops and US avionics. Aeritalia engineered a revised version, designated G222T, with Rolls-Royce Tyne turboprops and UK/French equipment. Twenty were delivered, from 1981. Within five years, these were



CN-235 M, Royal Saudi Air Force

spending long periods on the ground because of an Italian embargo on spares. Libya was not permitted to take up its option on further G222Ts and decided to buy An-26s instead. Only the single standard G222 of the Dubai Air Force appears to have experienced a normal military transport flying life in this region. (Data for G222T.)

Contractor: Aeritalia SpA, 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 1¼ 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 201 Arava

The Israeli Air Force has 10 standard IAI 201s, used as both light transports and for operational conversion of pilots assigned to transport units. Of more interest are the elint conversions, currently four in number. At



IAI 201 Arava, Israeli Air Force



Ii-76TD, Libya (Press-Office Sturzenegger)



Skyvan 3M, Royal Air Force of Oman

least two configurations have appeared. One of these has a number of 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 underfuselage location to allow it to scan through a full 360°.

Contractor: Israel Aircraft Industries, 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, service 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.

Ii-76 and Adnan 1

Ii-76s are the workhorses of the CIS air transport forces. Many others fly in the markings of Aeroflot and its successors. Similarly, those exported, especially to nations in the Middle East/North Africa region, often spend their time in the insignia of national airlines that make aircraft and crews available to the military when needed. **Ii-76Ms**, with a rear gun turret but no weapons installed, arrive at civil airports on commercial business, while turretless **Ii-76Ts** may be called in to haul military cargoes. Typically, Jamahiriya Libyan Arab Airlines has a mix of 21 Ii-76Ts and Ms; Syrianair has two of each version. Before Desert Storm, Iraqi Airways operated a fleet of around 30 Ii-76Ts and Ms, mainly for military duties, of which 15 were flown to sanctuary in Iran. This total may include two of the three AEW&C conversions produced in Iraq under the name **Adnan 1**; the third 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 Ii-76 but can be identified by two large strakes under the rear fuselage. Iraq also developed an in-flight refueling tanker version of the Ii-76, with a single hose/drogue pack at the base of the rear loading ramp. A further Ii-76 operator in this region is the Algerian Air Force, which took delivery of four standard transports in 1989. (Data for Ii-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.

Skyvan 3M

This little transport has a 6 ft 4 in square cabin cross section, rear loading, and low floor, enabling it to handle a surprising variety of awkwardly shaped loads or cabin installations. The Royal Air Force of Oman has 15, of which eight are standard transports; the other seven are equipped with Racal ASR 360 surveillance radar for maritime patrol and search and rescue. The Sharjah Emiri Guard Air Wing of the United Arab Emirates has a single Skyvan 3M, plus a Shorts 330 UTT, similar in configuration but much larger, with seats for up to 33 troops, or 30 paratroops and jumpmaster, or accommodation for 15 litters and four seated personnel in an ambulance role. (Data for Skyvan 3M.)

Contractor: Short Brothers plc, UK.

Power Plant: two Garrett TPE331-2-201A turboprops; each 715 shp.

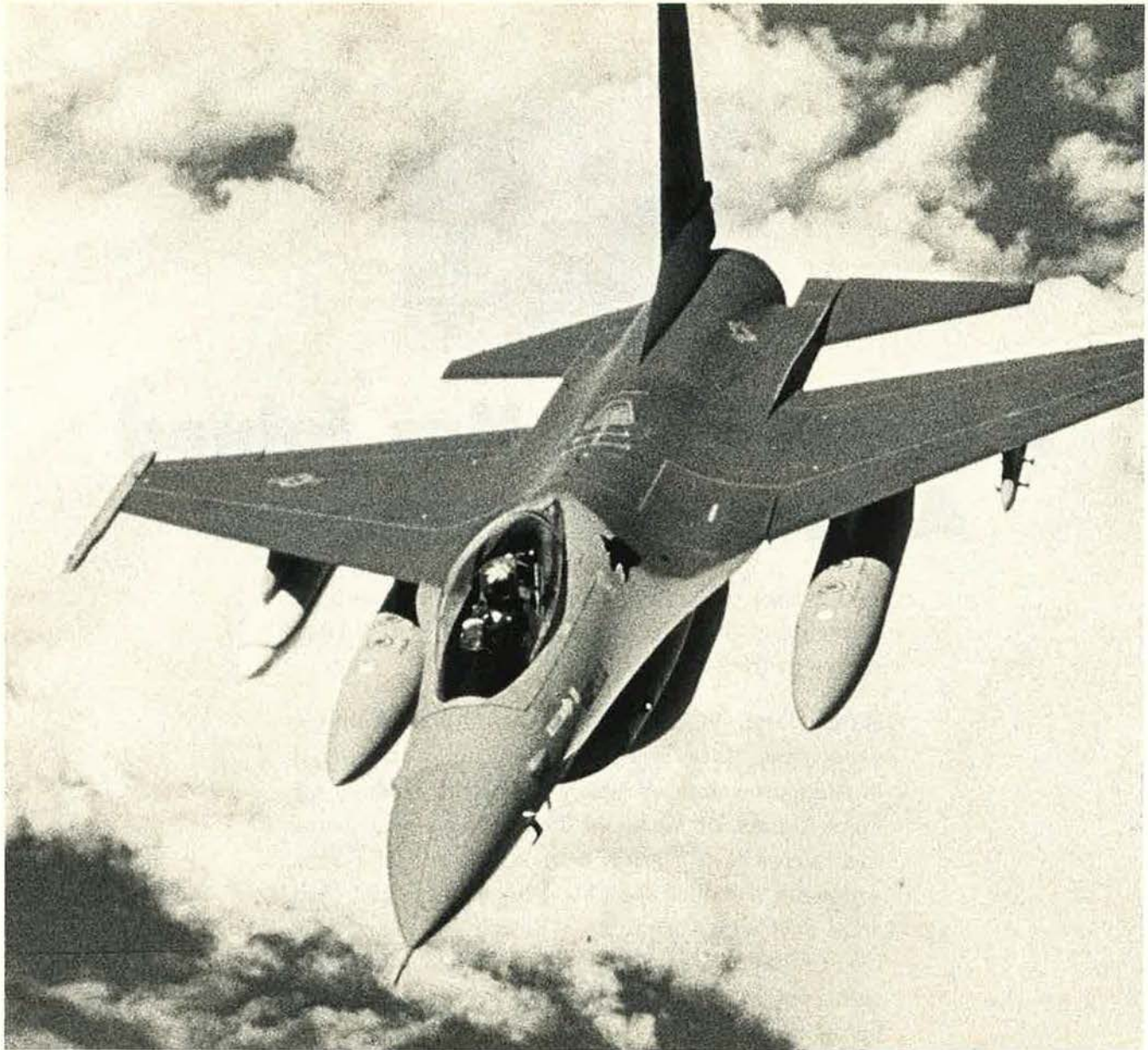
Dimensions: span 64 ft 11 in, length 41 ft 4 in, height 15 ft 1 in.

Weights: empty 7,400 lb, gross 13,700-14,500 lb.

Performance (at 13,700 lb gross weight): max cruising speed at 10,000 ft 202 mph, service 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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By John L. Frisbee, Contributing Editor

A Wing and a Prayer

With a dead pilot, a badly wounded copilot, and the instrument panels blown away, the B-29 crew prayed for a miracle that would get them to Iwo Jima.

JULY'S "Valor" told of the survival of a B-29, commanded by Lt. William F. Orr, that was severely damaged during the June 1, 1945, incendiary raid on Osaka, Japan [see "Beating a Stacked Deck," p. 74]. On the same mission, a B-29, K-37, of the 330th Bomb Group based at North Field, Guam, endured an equally terrifying experience.

While K-37's crew waited on the hardstand for a 2:47 a.m. take off, the aircraft commander, Capt. Arthur Behrens, took Chaplain Paul Shade aside and told him, "Paul, I'm not coming back from this one." His prophetic words did not include the crew.

K-37 arrived over the initial point at about 11:00 a.m. Before bombs away, the aircraft was hit by what probably was a barrage of heavy flak. The flight engineer, MSgt. Charles Whitehead, remembers a number of almost simultaneous explosions. There was "a blinding flash inside the airplane, a tremendous roar, and a violent concussion." The left side of the nose was blown away, killing Captain Behrens instantly, shattering the left arm of copilot 2d Lt. Bob Woliver and blinding his left eye. Sergeant Whitehead's shoulder was perforated by bits of metal.

Destruction on the flight deck was cataclysmic. The aircraft commander's instrument panel was destroyed, and the copilot's panel was left with only a magnetic compass and the needle and ball. The left control column was snapped off a foot above the floor, the flight engineer's panel and the radio knocked out, and the hydraulic system ruptured. Shattered glass, hydraulic fluid, and blood covered the floor of the flight deck. Sergeant Whitehead looked through a large hole in the top of the fuselage

to see barrels of the four .50-caliber guns in the upper front turret twisted "like pieces of spaghetti."

K-37 immediately went into a spiraling dive from 20,000 feet. The dazed copilot, Lieutenant Woliver, recovered his faculties enough to pull out with his good right arm at an estimated 10,000 feet. There was undetermined damage to the flight controls, leaving the B-29 in a nose-down attitude. Keeping the nose up required heavy back pressure on the control column. The B-29 now was over water, headed toward China. Bomb bay doors could not be opened to jettison the bomb load.

Not knowing K-37's location, navigator 2d Lt. Robert Fast computed a heading for Iwo Jima as best he could. During the four-hour flight, Lieutenant Woliver never left his seat, though periodically he became so weak from loss of blood that he could not control the aircraft. During these periods, either Sergeant Whitehead or bombardier 2d Lt. John Logerot took over the control column. With no instruments working, power settings, speed, altitude, and fuel consumption could only be guessed at. The course Lieutenant Woliver was flying would have missed Iwo Jima by 100 miles, but it did avoid the front that Bill Orr's crew had to penetrate.

As they headed for a probably fatal ditching somewhere in the Pacific, Lady Luck smiled on K-37. A P-61 Black Widow night fighter based at Iwo was on a radar calibration flight. The P-61's radar operator, Lt. Eric Shulenberger, picked up an emergency signal from the B-29's identification, friend or foe system. When the Black Widow came up on K-37 from the right side, all appeared to be well—four turning and no sign

of damage. Then pilot Maj. Arthur Shepherd swung the P-61 to the other side of the B-29 where they could see half of K-37's nose shot away. With hand signals, the P-61 crew got Woliver on a heading for Iwo Jima.

Lieutenant Woliver knew he could not land the airplane in his weakened condition, with partial sight, no instruments, and no brakes. He ordered the crew to bail out over the island. Woliver himself was too weak to get out of his seat and leave through the nose wheel well. Lieutenant Logerot, suffering from flash burns, stayed with the damaged plane, got Woliver out the wheel well, and was the last to leave K-37. He was awarded the Silver Star for his heroism. The tower at Iwo ordered the P-61 to shoot down K-37, which continued to fly erratically near the island. It took nearly all its ammunition to send the B-29 bearing Captain Behrens's body into the sea.

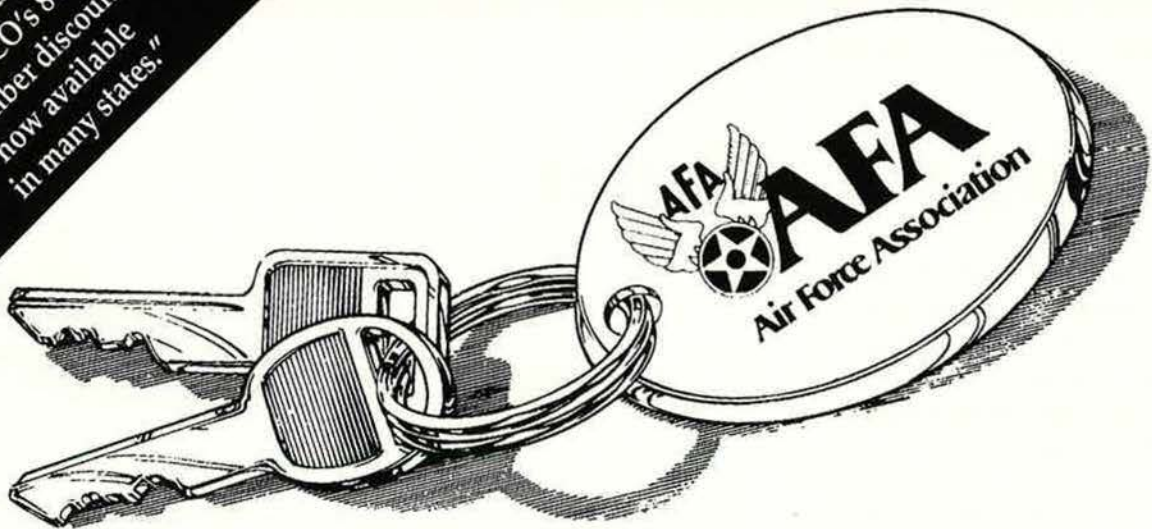
Lieutenant Woliver, who had stayed at his post despite grave wounds and saved the lives of his crew, was awarded the Distinguished Service Cross. He retired as a lieutenant colonel and died in 1988.

The ordeal of Woliver and the crew of K-37 is a story not only of individual valor but of shared courage by an aircrew in the face of almost certain disaster. The fulfillment of Capt. Arthur Behrens's premonition that he alone would not return from the Osaka mission is an intriguing encounter with the mysteries of human intuition. ■

Thanks to Don Murray for telling us about this mission and to crew members Charles Whitehead and Robert Fast for providing details.



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The Air Force Academy's 33d Squadron earns the AFA Trophy.

The 33d Finds the Winning Formula

OF ALL the awards given during graduation week, the Air Force Association Trophy is the one most coveted by the cadets because it recognizes overall excellence across the full spectrum of academic, athletic, and military achievement."

So said Air Force Academy Superintendent Lt. Gen. Bradley C. Hosmer in announcing that the 33d Squadron—known as "the Ratz"—had won the AFA Trophy for the first time in the unit's history. General Hosmer, the top graduate in the Academy's first graduating class, went on to sum up the story of the 33d's trip to the top at the thirty-fifth annual black-tie salute dinner.

The event, sponsored in cooperation with AFA's Colorado Springs/Lance Sijan Chapter, recognizes one of the Academy's forty squadrons as the best, based on achievements in three areas.

In a competition that stresses the total cadet experience, the 33d ranked in the top three squadrons militarily and athletically and placed high in academics. Accepting the AFA Trophy on behalf of his unit, Fall Squadron Cadet Commander Tracy West attributed the win to the unit's ability to do many small things well.

"These little things were part of something bigger," Cadet West said. "The determining factor in our success was the development of a winning attitude in everything we did. This winning attitude was the force that wouldn't let us quit. It wouldn't

By James A. McDonnell, Jr.

allow us to accept below-average work."

He went on to emphasize that the award itself was not a prime goal. "We did a good job to satisfy the hunger . . . [caused by] this winning attitude, and awards reinforce that what we were doing was right. Our attitude, combined with a great deal of teamwork, is our winning formula, plain and simple."

General Hosmer, who has since retired, remarked that the Ratz showed "cohesion, character, and unity of effort" to win the trophy. He noted that the win provided the whole cadet wing with an example of teamwork at its best.

Gen. Robert C. Oaks, commander in chief of US Air Forces in Europe, was this year's traditional "returning graduate." He too pointed out that teamwork was what it took to bring home this award. General Oaks retired last summer, and this was his last major address at the place where it all began for him. Like General Hosmer, he graduated in the first Academy class, thirty-five years ago, and he told the cadets that one of the most important lessons he took away

from his Academy experience is that teamwork gets the mission accomplished.

General Oaks noted that the squadron is the basic Air Force unit. He said the cadets' experience this year would serve them well as they move into an Air Force that, as much as it will change, will always place a premium on working together.

Cadet West echoed this theme, saying the win "brought me a great deal of satisfaction and pride. However, I was but a single piece of a complex puzzle. It took the efforts of everyone you see out here tonight to make this happen. Of course, we had some strong individual performers, but to win an award of this magnitude takes the efforts of the entire unit. We did it." ■



October 28, 1994

An Air Force Association National Symposium
Los Angeles Airport Marriott Hotel, (310) 641-5700

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To make reservations at the special AFA \$97.00 rate, identify yourself as a member of AFA when you call the LA Marriott.

For symposium information twenty-four hours a day, call (800)-727-3337, ext. 2030.

Coming in 1995: A comprehensive review of air warfare capabilities, a major AFA National Symposium in Orlando, Fla., February 23-24.

Now in its nineteenth year, this in-depth update on the US Air Force, its commands, and its future aerospace requirements is one you won't want to miss. The symposium will focus on how USAF's capabilities and requirements will affect national security and the defense industry in the years ahead.

Participants include Hon. Sheila E. Widnall, Secretary of the Air Force; Hon. Clark G. Flester, assistant secretary of the Air Force (Acquisition); Gen. Ronald R. Fogleman, CINC, USTRANSCOM; Gen. Robert L. Rutherford, commander, PACAF; Gen. Joseph W. Ashy, CINC, USSPACECOM; and Lt. Gen. Stephen B. Croker, commander, 8th Air Force, ACC.

In response to requests for a "streamlined" format, this year's symposium schedule is as follows:

- 8:00 a.m. Continental breakfast
- 9:00 a.m. Keynote address and three speakers
- 11:30 a.m. Sit-down luncheon
- 1:00 p.m. Two speakers
- 3:00 p.m. Adjourn to allow participants to prepare for the black-tie charity ball in the evening at the Century Plaza Hotel (separate registration required).

REGISTRATION FORM

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October 28, 1994

Registration closes October 18, 1994. No refunds can be made for cancellations after that date.

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My check covering the symposium fee of \$250 for AFA individual or Industrial Associate member, payable to the Air Force Association, is enclosed. The fee includes one luncheon ticket. (Fee for nonmember is \$300.)

— Mark here for an extra guest luncheon ticket, and enclose an additional \$40.

Books

Compiled by Frank Oliveri, Associate Editor

Ambrose, Stephen E. *D-Day June 6, 1944: The Climactic Battle of World War II.* Simon & Schuster Inc., 1230 Avenue of the Americas, New York, NY 10020. 1994. Including photos, notes, appendix, and index, 655 pages. \$30.00.

Bailey, Beth, and Farber, David. *The First Strange Place: Race and Sex in World War II Hawaii.* The Johns Hopkins University Press, 2715 N. Charles St., Baltimore, MD 21218-4319. 1994. Including photos, notes, and index, 270 pages. \$14.95.

Bonn, Keith E. *When the Odds Were Even: The Vosges Mountains Campaign, October 1944–January 1945.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340. 1994. Including notes and bibliography, 284 pages. \$24.95.

Boyne, Walter J. *Clash of Wings: World War II in the Air.* Simon & Schuster Inc., 1230 Avenue of the Americas, New York, NY 10020. 1994. Including photos, appendix, bibliography, and index, 415 pages. \$25.00.

Bradin, James W. *From Hot Air to Hellfire: The History of Army Attack Aviation.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340. 1994. Including notes, maps, index, photos, and glossary, 272 pages. \$21.95.

Brown, Ewing Franklin. *The Weathermen Let Them Fly: Story of the 8th Air Force 18th Weather Squadron.* 8th Air Force Historical Society, c/o Art Swanson, 65 Beddington Lane, Strasburg, PA 17579. 1994. Including notes, appendix, photos, and bibliography, 110 pages. \$13.95.

BUILDER, Carl H. *The Icarus Syndrome: The Role of Air Power Theory in the Evolution and Fate of the US Air Force.* Transaction Publishers, Rutgers–The State University, New Brunswick, NJ 08903. 1994. Including notes and index, 299 pages. \$39.95.

Cox, Gary P. *The Halt in the Mud: French Strategic Planning From Waterloo to Sedan.* Westview Press, 5500 Central Ave., Boulder, CO 80301-2877. 1994. Including bibliography and index, 258 pages. \$44.95.

Dickson, Paul. *War Slang: American Fighting Words and Phrases from the Civil War to the Gulf War.* Simon & Schuster Inc., 1230 Avenue of the Americas, New York, NY 10020. Including index, 403 pages. \$25.00.

Dorr, Robert F. *F-86 Sabre: History of the Sabre and the FJ Fury.* Motorbooks International, P. O. Box 2, 729 Prospect Ave., Osceola, WI 54020. 1993. Including photos, appendix, bibliography, and index, 144 pages. \$24.95.

Doyle, Robert C. *Voices From Captivity: Interpreting the American POW Narrative.* University Press of Kansas, 2501 W. 15th St., Lawrence, KS 66049-3904. 1994. Including photos, notes, bibliography, and index, 370 pages. \$35.00.

Goldstein, Donald M.; Dillon, Katherine V.; and Wenger, J. Michael. *D-Day Normandy: The Story and Photographs.* Brassey's (US), Inc., 8000 Westpark Dr., McLean, VA 22102. 1994. Including photos and index, 180 pages. \$30.00.

Gray, Mike. *Angle of Attack: Harrison Storms and the Race to the Moon.* Penguin Books, 375 Hudson St., New York, NY 10014. 1994. Including bibliography and index, 304 pages. \$11.95.

Green, Bill. *The First Line: Air Defense in the Northeast 1952 to 1960.* Wonderhorse Publications, P. O. Box J, Fairview, PA 16415. 1994. Including photos and index, 480 pages. \$49.95.

Guertner, Gary L., ed. *The Search for Strategy: Politics and Strategic Vision.* Greenwood Publishing Group, Inc., 88 Post Rd. W., Box 5007, Westport, CT 06881. 1993. Including notes and index, 328 pages. \$59.95.

Hahn, Walter, and Maitre, H. Joachim, eds. *Paying the Premium: A Military Insurance Policy for Peace and Freedom.* Greenwood Publishing Group, Inc., 88 Post Rd. W., Box 5007, Westport, CT 06881. 1993. Including index, 200 pages. \$49.95.

Hammel, Eric. *Air War Europa: America's Air War Against Germany in Europe and North Africa,*

1942–1945. Pacifica Press, 1149 Grand Teton Dr., Pacifica, CA 94044. 1994. Including index, 571 pages. \$55.00.

Hoffman, Jon T. *Once a Legend: "Red Mike" Edson of the Marine Raiders.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340. 1994. Including notes, 427 pages. \$24.95.

Horne, Alistair, and Montgomery, David. *Monty: The Lonely Leader, 1944–45.* HarperCollins Publishers, 10 E. 53d St., New York, NY 10022-5299. 1994. Including photos and index, 381 pages. \$25.00.

Infield, Glenn. *Big Week: The Classic Story of the Crucial Air Battle of WWII.* Brassey's (US), Inc., 8000 Westpark Dr., McLean, VA 22102. 1993. Including bibliography and index, 125 pages. \$15.00.

Johnsen, Frederick A. *Douglas A-1 Skyraider: A Photo Chronicle.* Schiffer Publishing Ltd., 77 Lower Valley Rd., Atglen, PA 19310. 1994. 112 pages. \$19.95.

Litoff, Judy Barrett, and Smith, David C. *We're in This War, Too: World War II Letters From American Women in Uniform.* Oxford University Press, 200 Madison Ave., New York, NY 10016. 1994. Including photos and index, 272 pages. \$25.00.

Menarchik, Douglas. *Powerlift—Getting to Desert Storm: Strategic Transportation and Strategy in the New World Order.* Greenwood Publishing Group, Inc., 88 Post Rd. W., Box 5007, Westport, CT 06881. 1993. Including bibliography and index, 197 pages. \$49.95.

Nolan, Keith William. *The Magnificent Bastards: The Joint Army-Marine Defense of Dong Ha, 1968.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340. 1994. Including appendix, glossary, and bibliography, 371 pages. \$24.95.

Polmar, Norman; Warren, Mark; and Wertheim, Eric. *Dictionary of Military Abbreviations.* Naval Institute Press, 2062 Generals Hwy., Annapolis, MD 21401. 1994. 307 pages. \$23.95.

Reisman, W. Michael, and Antoniou, Chris T., eds. *The Laws of War: A Comprehensive Collection of Primary Documents on International Laws Governing Armed Conflict.* Random House, 201 E. 15th St., New York, NY 10022. 1994. Including chart and index, 448 pages. \$13.00.

Samuels, Richard J. *"Rich Nation, Strong Army:" National Security and the Technological Transformation of Japan.* Cornell University Press, Sage House, 512 E. State St., Ithaca, NY 14851-0250. 1994. Including notes, references, and index, 455 pages. \$35.00.

Siuru, Bill, and Busick, John D. *Future Flight: The Next Generation of Aircraft Technology.* Second Edition. TAB Books/McGraw Hill, Inc., Blue Ridge Summit, PA 17294-0850. 1994. Including photos and index, 194 pages. \$18.95.

Snow, Donald M., and Drew, Dennis M. *From Lexington to Desert Storm: War and Politics in the American Experience.* M. E. Sharpe, Inc., 80 Business Park Dr., Armonk, NY 10504. 1994. Including bibliography and index, 367 pages. \$19.95.

Thornborough, Anthony M. *Sky Spies: Three Decades of Airborne Reconnaissance.* Sterling Publishing Co., Inc., 387 Park Ave. S., New York, NY 10016-8810. 1994. Including photos, glossary, and index, 160 pages. \$24.95.

Wallis, Rodney. *Combating Air Terrorism.* Brassey's (US), Inc., 8000 Westpark Dr., McLean, VA 22102. 1993. Including bibliography and index, 176 pages. \$30.00.

Weisgall, Jonathan M. *Operation Crossroads: The Atomic Tests at Bikini Atoll.* Naval Institute Press, 2062 Generals Hwy., Annapolis, MD 21401. 1994. Including photos, notes, bibliography, and index, 415 pages. \$31.95.

Wilson, Theodore A., ed. *D-Day 1944.* University Press of Kansas, 2501 W. 15th St., Lawrence, KS 66049-3904. 1994. Including photos, notes, glossary, and index, 420 pages. \$22.50.



National Report

Blute Leads the Charge

Rep. Peter Blute (R-MA) organized a bipartisan group of 24 House members, who sent a blistering letter to then Secretary of the Smithsonian Institution Robert McCormick Adams on August 10.

Peter Blute (R-MA)
Jack Quinn (R-NY)
Mike Crapo (R-ID)
John McHugh (R-NY)
Steve Buyer (R-IN)
Tim Hutchinson (R-AR)
Stephen Horn (R-CA)
Bill Paxson (R-NY)
Tillie Fowler (R-FL)
David Levy (R-NY)
Martin Hoke (R-OH)
Dick Armey (R-TX)
Scotty Baesler (D-KY)
Tim Holden (D-PA)
Nathan Deal (D-GA)
Jay Dickey (R-AR)
James Traficant (D-OH)
Charles Canady (R-FL)
Ron Klink (D-PA)
Susan Molinari (R-NY)
Dick Swett (D-NH)
Peter King (R-NY)
Duncan Hunter (R-CA)
Rob Portman (R-OH)



Photo by Paul Kennedy

Grass Roots Efforts Make a Difference on Enola Gay

On June 21, Dr. Michael Neufeld stated that the May 31 version of the script for "The Last Act: The Atomic Bomb and the End of World War II," the planned 1995 exhibit featuring the *Enola Gay*, the B-29 that dropped the atomic bomb on Hiroshima, was a "finished product, minor wording changes aside." Neufeld is one of two curators overseeing the exhibit. Fortunately, AFA's combined efforts at the national and local levels have forced the museum to reexamine and revise its script yet again.

After the March 15 special report and the article in the April issue of AIR FORCE Magazine, many members of AFA wrote to their congressmen and to the Smithsonian Institution. On Capitol Hill, grass roots contacts led to the involvement of members of both the House and the Senate.

In August, two groups in the House succeeded in forcing the museum to reconsider its plans.

Second Group Meets with Museum Director

Also on August 10, another group of six House members met with National Air and Space Museum Director Martin Harwit and other Smithsonian officials. Congressmen Tom Lewis (R-FL) and Sam Johnson (R-TX) expressed their outrage in separate press releases. Members of this group included:

Tom Lewis (R-FL)
Sam Johnson (R-TX)
Duncan Hunter (R-CA)
Robert Dornan (R-CA)
Henry Bonilla (R-TX)
Joseph McDade (R-PA)



By Daniel M. Sheehan, Assistant Managing Editor



Rep. Rick Santorum (R-Pa.) (seated, center) attended the Pennsylvania State Convention in July. He is flanked by National Director Robert Carr and MSgt. Scott Fales. Standing are (from left) National Director Judge John Brosky, Pennsylvania President Raymond Hamman, and Jim McDonnell of the National Headquarters staff.

State Conventions

In the runup to the National Convention in September, Missouri, Oregon, Pennsylvania, and Oklahoma held their state conventions with an informative mix of AFA, military, and legislative speakers.

Missouri AFA convened at Whiteman AFB in June with an impressive panel of speakers headed by Gen. Ronald R. Fogleman, commander of Air Mobility Command and commander in chief of US Transportation Command, and Rep. Ike Skelton (D-Mo.), chairman of the Military Forces and Personnel Subcommittee of the House Armed Services Committee. State President John Politi conferred awards on outstanding chapter members Earl Uhler, Central Missouri Chapter; Stanley Chambers, Harry S. Truman Chapter; Marcia Stevens, Spirit of St. Louis Chapter; Maj. Dana Dunmire, Central Missouri Chapter; and Gene Itschner, Ozark Chapter. Former National Vice President (Midwest Region) and current National Director Earl D. Clark, Jr., also attended

the convention, which Mr. Politi termed "a huge success."

USAF Chief of Staff Gen. Merrill A. McPeak returned home to Oregon to be the featured speaker at that state's convention in July. General McPeak took "Roles and Missions of the Air Force" as his topic and also attended a meeting of local business leaders. Oregon President Bob Furrer presented General McPeak with a framed poster of the 1994 Portland Rose Festival Air Show, held in conjunction with the convention, as a token of appreciation for his participation. Portland Chapter President Tom Stevenson, host of the convention, assisted Mr. Furrer, who has since left office, with the presentation.

In Pittsburgh, the audience at the Pennsylvania State Convention enjoyed a mix of military and legislative speakers. First, Rep. Rick Santorum (R-Pa.) gave his perspective from his seat on the House Ways and Means Committee. MSgt. Scott C. Fales then enthralled the crowd with his firsthand account of the fighting in Mogadishu, Somalia, a year ago [see "He-

roes at Mogadishu," June 1994, p. 28]. Sergeant Fales, one of AFA's Outstanding Airmen of 1993, earned a Silver Star for gallantry in a firefight in the Somali capital last October.

National Director Judge John G. Brosky served as master of ceremonies. National Director Bob Carr and incoming State President Raymond Hamman, who succeeds Robert C. Rutledge, helped present a full slate of awards.

State President Larry Williams presented Oklahoma's Person of the Year Award to Enid Chapter Secretary and Program Chairman Oscar Curtis at the state convention in Enid. Mr. Curtis's specialty is recruiting Community Partners, and his success has made the Enid Chapter the leader in Community Partners throughout AFA. This award is just the latest in a string of local and national awards earned by Mr. Curtis, who has also received two national Medals of Merit, the Arthur Storz Award, and two Exceptional Service Awards.

Lt. Gen. Eugene E. Habiger, vice commander of Air Education and Training Command, Randolph AFB, Tex., was the guest speaker. He discussed changes in USAF training and their effect on nearby Vance AFB, an AETC base.

Chapter News

The **Prescott (Ariz.) Chapter** joined forces with a local chapter of the National Association for Uniformed Services on a worthy mission. Prescott Chapter President John M. Holley and George H. Stone, chairman of the NAUS, traveled to Phoenix to meet with Sen. John McCain (R-Ariz.), ranking minority member on the Senate Armed Services Committee's Military Readiness and Defense Infrastructure Subcommittee.

The purpose of the trip was twofold: to thank Senator McCain for his outstanding support of veterans and the active-duty military and to ask him for his continued support.

Mr. Holley, who also serves on the faculty of Embry-Riddle Aeronautical University's Prescott campus, later presented a state Merit Award to one



Colorado Springs/Lance Sijan Chapter President Thomas Costello (left) and Falcon Foundation Fundraising Chairman Lt. Col. James Hargrove, USAF (Ret.), attended the unveiling of a statue dedicated to Gen. of the Air Force H. H. "Hap" Arnold in front of the US Air Force Academy hall that bears his name.

ter's speakers bureau and editing its newsletter. State Vice President and Chapter President Ed Fox and Frank Perry, a member of the chapter's Executive Board, presented the award. The ceremony received extensive coverage in the local press.

In Illinois, **Chicagoland-O'Hare Chapter** President John S. Hoff and former Illinois State President Dick Asbury conferred at a state meeting in Rantoul. The two men used the D-Day meeting as an opportunity to discuss their World War II experiences as P-51 pilots.

On the Education Front

AFA chapters are increasing their already strong support of aerospace education, particularly through AEF's "Visions" program, which promotes interest in science and technology among elementary school students in conjunction with *USA Today*, and through support programs for local AFROTC and AFJROTC detachments.

of his colleagues at the university. Lt. Col. Warren R. Priddy accepted the award from Arizona AFA in honor of his work with AFROTC Det. 028, which recently hosted a national enclave of the Arnold Air Society in Scottsdale, Ariz.

National Director and **Ogden-Wasatch (Utah) Chapter** member Nate H. Mazer and Life Members Jules G. Teck and James M. Chastain of the **Barry Goldwater (Ariz.) Chapter** and the Ogden-Wasatch Chapter, respectively, saw to it that AFA was well represented at recent ceremonies at Hill AFB, Utah. A memorial sundial was unveiled there, honoring the men and women of Fifth Air Force who served with distinction during World War II, the Korean War, and the Vietnam War. Mr. Teck, a Fifth Air Force veteran, delivered the call to assemble and read the Roll of the Departed. The Fifth Air Force Memorial Foundation expressed special thanks to Mr. Chastain, who designed the sundial and spearheaded the project, and Mr. Mazer, who dispensed valued advice and assistance.

Close ties between chapters and local governments help AFA get its message out and further its mission. Nobody exemplifies the benefits of these ties better than Edgar Wolf, Jr., a Life Member affiliated with the **Brig. Gen. Frederick W. Castle (N. J.) Chapter**. Long instrumental in chapter activities, Mr. Wolf was recently honored by Cherry Hill Township, N. J., for more than thirty years of



Alabama State Vice President Donald C. Brown (left) presents the Douhet-Mitchell International Airpower Award to Col. Michael T. Probasco for his paper "Joint Force Air Component Commander or Coordinator?" during Air War College awards ceremonies. The award is sponsored by AFA and the Sons of Italy.

service to the community, including stints on the township council and many local boards and committees.

Also honored for helping to spread AFA's message was **Heart of the Hills (Tex.) Chapter** Vice President (Communications and Public Affairs) Harold M. Branton. Mr. Branton received a National Citation for more than eight years of service to the chapter, including running the chap-

The **Fort Wayne (Ind.) Chapter** is fortunate to have CAP Lt. Col. Gene Foster working on its behalf. An indefatigable promotor of aerospace education, Colonel Foster succeeded in establishing several thriving programs at local schools. Chapter President Ted Huff praised his motivational skills and noted that three elementary schools and a high school now have aerospace education programs thanks

to him. Colonel Foster also was instrumental in establishing the first AFJROTC detachment in the area.

For his work in aerospace education, Colonel Foster has received Indiana's highest civic award, the Sagamore of the Wabash, from Governor Evan Bayh; the AEF President's Award; and Fort Wayne Mayor Paul Helmke's proclamation of a Gene Foster Day. Chapter Vice President (Communications) Gene Royer points to Colonel Foster's work with the Pleasant Center Elementary School as a model for other programs around the nation.

Florida AFA sponsored a convention for AFJROTC cadets under the auspices of the Kitty Hawk Air Society. Nova McConnico was named Cadet of the Year and received a \$250 award from Florida Vice President (Aerospace Science) Karl V. Price. Fourteen AFJROTC units attended the dining-in, held at Embry-Riddle Aeronautical University's Daytona Beach, Fla., campus. Brig. Gen. (Maj. Gen. selectee) Robert S. Dickman, commander of 45th Space Wing, spoke at the convention.

Supporters of AEF have also been active in New Jersey. **Mercer County Chapter** President Chuck Johnson presented an AFA Medal and Citation to AFJROTC Commander Capt. James Colbert during ceremonies at Jackson Memorial High School and to AFJROTC Lt. Col. Charles R. Rabbarran at Plainfield High School. The Mercer Chapter was also represented by Vice President (Veterans Affairs) Vince Fairlie and member Marcy Johnson.

The **Sal Capriglione (N. J.) Chapter** continues its support for the "Visions" program, spreading the word at a recent meeting of the Academy of Aerospace Education in Old Bridge, N. J. Chapter President Martin T. Capriglione donated \$100 to academy founder Francis P. Harselak. New Jersey Chairman of the Board Delores Vallone and *USA Today's* Zygmunt Wozniak staffed an information booth touting the "Visions" program and AFA memberships.

At the university level, few chapters can match the record of support the **Central Florida Chapter** has achieved. Chapter President Richard A. Ortega reports that the chapter supported Det. 159 at the University of Central Florida to the tune of \$13,000 in the 1993-94 academic year, including \$10,000 in scholarship grants. The chapter also donated sixteen two-year memberships in AFA to cadets to supplement the one-year membership they receive under the AFA Salute Program. The

chapter "is proud to be able to continue to assist the cadets of Det. 159 as they strive to become the future leaders of the US Air Force," Mr. Ortega said.

As the other half of the education equation, teachers deserve recognition as well. The **Colorado Springs/**

Chapter named Joy Demmler Pueblo's Outstanding Aerospace Teacher of the Year. Chapter Secretary Roxie Ann Pettit also presented an award to Joe Rohlena as the city's Outstanding Aerospace Student of the Year.

San Bernardino Area (Calif.)



The Enid Chapter held a reception to mark the acquisition of forty works of art by the 8th Flying Training Squadron at Vance AFB, Okla. From left, 8th FTS Commander Lt. Col. Charles Stallworth II, Chapter President Dennis Lakely, Secretary Oscar Curtis, and Art Project Officer Capt. Paul Eberhart stand before a work by Keith Ferris.

Lance Sijan (Colo.) Chapter rewarded teacher Nancy Romine with a scholarship to the US Space Foundation's graduate course "Getting Comfortable Teaching With Space" from Chapter Vice President (Aerospace Education) Chuck Zimkas. Astronaut Ron Segal spoke at the ceremony.

Earlier, the chapter named Kevin Lundmark as the recipient of its annual Jim Irwin Memorial Scholarship. Mr. Irwin's widow, Mary, handed Mr. Lundmark the \$1,000 award. Chapter President Tom Costello praised his academic excellence, leadership abilities, and community service.

As an innovative means of reaching out to young people, the Sijan Chapter sponsored a science fiction short-story contest. With a prize of a \$100 savings bond and a matted photo of the space shuttle, the contest drew responses from students who might not otherwise be receptive to AFA. The contest was won by Trevor Kearns, a student at Cheyenne Mountain High School. He collected his prize from Mr. Zimkas.

Also in Colorado, the **Mel Harmon**

Chapter Vice President Lane Stafford did the honors at the San Bernardino High School Awards Assembly, congratulating Cadet Capt. Monica Galvan on earning an AFA Award.

Outstanding AFJROTC Cadets Lt. Lucy Strickland and Lt. Travis Pope received their awards from **On Wings of Eagles (Fla.) Chapter** President William Gemmill. Local dignitary Hernando County Sheriff Thomas Mylander was also present at the awards ceremony.

Coming Event

November 12, **Southeast Regional Conference/Workshop**, Myrtle Beach, S. C.

Have AFA/AEF News?

Contributions to "AFA/AEF Report" should be sent to Dave Noerr, AFA National Headquarters, 1501 Lee Highway, Arlington, VA 22209-1198. ■

AFA Mourns the Passing of Five Stalwarts

In recent months, AFA has been hit hard by the deaths of five people who helped make the association successful.



Lt. Gen. Glen W. Martin, USAF (Ret.), used his platform as a columnist for the San Antonio *Express-News* to support active-duty and retired military causes for more than a decade before his death last June at seventy-eight. An engineer by training, General Martin joined the Army Air Corps in 1939. After the outbreak of World War II, he rose through the ranks to colonel, seeing action in both the European and Pacific theaters.

After the war, he remained with the newly independent Air Force as the first assistant executive to the Secretary of the Air Force. After holding several positions with Strategic Air Command and Pacific Air Forces, he retired in 1973 as SAC's vice commander in chief. The Distinguished Service Medal, the Legion of Merit with oak leaf cluster, and the Distinguished Flying Cross with oak leaf cluster were among his many decorations. Besides his membership in the

On July 30, **Edward A. Stearn**, longtime national director and AEF board member, died in California at sixty-nine. Mr. Stearn, who held virtually every state and local office, was instrumental in the success of two of AFA's champion fund-raisers, the Los Angeles Air Force Ball and the Bob Hope AFA Golf Tournament, helping garner money for the Scholarships for Children of American Military Personnel, which awards scholarships to children of killed, wounded, or captured US servicemen.

AFA's Man of the Year for 1977, Mr. Stearn served as National Chairman of the Board in 1985-86, on the Executive Committee, and as National Vice President (Far West Region). After his hitch in an Army construction battalion in the Pacific during World War II, Mr. Stearn had a highly successful career as an executive with Avco Industries, working on the Minuteman missile among other systems, and with other defense-related companies. During nearly three decades in AFA, Mr. Stearn displayed a genius for organization and motivation, helping to consolidate several chapters and build others from the ground up. His good work will be missed.

Alamo (Tex.) Chapter, he belonged to the Aircraft Owners and Pilots Association and The Daedalians.

Col. James W. Wright, USAF (Ret.), a national director for eight years and former National Vice President (North-east Region), died last spring. A member of AFA since 1956, Colonel Wright held most state and regional offices and was New York State Man of the Year for 1965. After seven years of active duty ending in 1946, he joined the Air Force Reserve and worked for General Motors before his retirement to Florida.

Col. John T. McCoy, USAF (Ret.), pilot, aviation artist, and historian, died at eighty-five in New York in July. After service in Eighth and Ninth Air Forces during World War II, Colonel McCoy worked as an aviation artist for Rand McNally. His work was published in *AIR FORCE Magazine*,

Look, and *Esquire*. He was a founding member of the Iron Gate (N. Y.) Chapter and received a Presidential Citation in 1993. He also belonged to the Wings Club and the Army-Navy Club.

Finally, it is with great sadness that National Headquarters Staff notes the passing of **Rolla F. Gray**, a key member of the support staff since 1971. He was forty-nine. Though he worked mostly behind the scenes, Mr. Gray was instrumental in getting things done for AFA. Besides making sure that printing and mailing operations ran smoothly, he was a key coordinator at every National Convention for more than two decades. Mr. Gray was a bulwark of support to every department at AFA's headquarters, and, through all manner of staff shakeups and personal adversity, he was a constant—ready to assist the workings of the association in any way he could.

Unit Reunions

RF-101 Pilots. May 18-20, 1995, at Shaw AFB, S. C. **Contact:** Charles L. Lustig, 2353 Mt. Vernon Dr., Sumter, SC 29154. Phone: (803) 499-4098.

4th Ferrying Group, Ferrying Division, Air Transport Command (World War II). May 11-13, 1995, in Nashville, Tenn. **Contacts:** Col. Robert P. Crow, USAF (Ret.), 125 Valleywood Dr., Athens, GA 30606. Phone: (706) 543-5481. Raoul Castro, 911 St. Andrews Dr., Upland, CA 91786. Phone: (909) 985-9316. Fax: (909) 988-9316.

7th Bomb Wing, Carswell AFB, Tex., 1948-58, B-36 era. April 21-23, 1995, at the Ramada Hotel in Fort Worth, Tex. **Contact:** Richard S. George,

P. O. Box 330279, Fort Worth, TX 76163-0279. Phone: (817) 292-4932.

Aviation Cadet Class 42-B. April 27-May 1, 1995, in Nashville, Tenn. **Contact:** Leo J. Bolster, 171 Charleston Park, Nashville, TN 37205. Phone: (615) 298-5030.

Aviation Cadet Class 42-D, Luke, Mather, and Stockton Fields. April 23-25, 1995, at the Las Vegas Inn, Nev. **Contact:** Col. Eugene O. Godfrey, USAF (Ret.), 9 Woodmont Ct., Medford, NJ 08055. Phone: (609) 654-9084.

Pilot Class 45-C, Western Flying Training Command (World War II). Fiftieth-anniversary reunion,

May 4-6, 1995, in Colorado Springs, Colo. **Contact:** Maj. S. J. Wigley, USAF (Ret.), 3212 Center St., Oklahoma City, OK 73120-2406. Phone: (405) 751-0187.

49th Fighter Group Ass'n. April 27-30, 1995, in Colorado Springs, Colo. **Contact:** Col. Budd H. Butcher, USAF (Ret.), 97 Woodbridge Dr., Colorado Springs, CO 80906-4470. Phone: (719) 540-0241.

53d Weather Reconnaissance Squadron (AFRES). Fiftieth-anniversary reunion, October 14-15, 1994, at the Broadwater Resort Hotel in Biloxi, Miss. **Contact:** Maj. C. D. Lipscombe III, AFRES, Public Affairs, 53d Weather Reconnaissance

sance Squadron (AFRES), Keesler AFB, MS 39534-2453. Phone: (601) 377-3480.

Class 70-06, Williams AFB, Ariz. April 21-23, 1995, in Chandler, Ariz. **Contacts:** Ron Orr, 14938 Sunrise Dr., Bainbridge Island, WA 98110. Phone: (206) 842-7931 or (205) 969-3727 (R. Conner Warren).

506th Fighter Group. April 19-22, 1995, at the Statehouse Inn in Montgomery, Ala. The 15th and 21st Fighter Groups are also invited. **Contact:** John J. Grant, 500 Palm Springs Blvd., #813, Indian Harbour Beach, FL 32937. Phone: (407) 777-7660.

517th and 7100th Air Police Squadrons, Wiesbaden, Germany. May 12-14, 1995, in San Antonio, Tex. **Contact:** Rowland D. Garver, 182 E. Fifth St., Peru, IN 46970-2340. Phone: (317) 473-7184.

556th Reconnaissance Squadron. March 31-April 2, 1995, at the San Remo Hotel in Las Vegas, Nev. **Contacts:** Donald J. Chase, 3923 N. 111th Plaza, Omaha, NE 68164. Phone: (402) 493-5612 or (800) 522-7366 (Giles Robb).

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.

586th Bomb Squadron, 394th Bomb Group, 9th Air Force (World War II). June 9-15, 1995, in Rochester, N. Y. to form the 394th Bomb Group Association. **Contact:** Lt. Col. John C. Beale, USAF (Ret.), 4206 Shadow Oak Woods, San Antonio, TX 78249. Phone: (210) 493-0221.

613th, 847th, and 848th Squadrons, 511th Aircraft Control and Warning Group (1947-61). March 24-26, 1995, in New Orleans, LA. **Contact:** CMSgt. Richard A. Nell, USAF (Ret.), 16012

Big Ridge Rd., Biloxi, MS 39532-2758. Phone: (601) 392-6519.

801st Medical Air Evacuation Squadron (1943-53), April 29-30, 1995, in Kansas City, Mo. **Contact:** Col. Michael J. Hughes, USA (Ret.), 6715 S. 110th East Ave., Tulsa, OK 74133-2678. Phone: (918) 250-1346.

6916th Security Squadron, 1045th Operational Evaluation and Training Group, Detachments 1 and 2, and 7499th Support Group. May 4-7, 1995, in San Antonio, Tex. **Contact:** Col. Michael J. Rega, USAF (Ret.), 306 Sunrise Canyon Dr., Universal City, TX 78148. Phone: (210) 659-8904.

Thomasville Airfield. Seeking contact with members of the 59th Fighter Group, 59th Reconnaissance Group, and the 339th Base Unit who served at Thomasville AAF, Ga., between 1943 and 1945 and are interested in having a reunion. **Contact:** Col. Samuel A. Owens, USAF (Ret.), 125 Bayview Dr., Suite A, San Carlos, CA 94070. Phone or fax: (415) 595-4344. ■

Bulletin Board


Seeking contact with **1502d ATW Carp Rodeo** team members who won the event at Scott AFB, Ill., in July 1962 and two C-124 crews and ground support personnel who participated. **Contact:** Maj. Joe Lodrige, USAF (Ret.), P. O. Box 62, Gorum, LA 71434.

Seeking contact with members of **Pilot Training Class 60-E**. **Contact:** Lt. Col. Elwyn D. Whitsitt, USAF (Ret.), P. O. Box 635, Olney, TX 76374.

Collector seeks **postcards** of USAF aircraft and cities and countries around the world. **Contact:**

Gregory Whitmire, 7711 Baggins Rd., Hanover, MD 21076.

Seeking information on the movement of **P-40 Kittyhawks** through Koepang, Timor Island, in January-February 1942. **Contact:** Lt. Col. Tom



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Bulletin Board

Culbert, USAF (Ret.), 73 Fendall Ave., Alexandria, VA 22304.

For a memorial in Sarospatak, Hungary, seeking information on a **15th Air Force B-17** pilot killed in a crash in Hungary about October 23, 1944. His crew (who bailed out and were captured) may have included a bombardier named Horvat or Horvath. **Contact:** John C. Rucigay, 14 Ashley Dr., Ballston Lake, NY 12019.

Seeking the whereabouts of **SSgt. Robert J. Robinson**, originally from Oklahoma, who was stationed at the Parks AFB, Calif., comptroller's office from about 1953 to 1957. He knew Barbara Grisel. **Contact:** Shawn M. Robinson, 2532-D 62d Ave. E., Tacoma, WA 98424.

Seeking anyone who served in North Africa in February 1944 with **2d Lt. Morton S. Lines**, 760th Bomb Squadron, 460th Bomb Group. **Contact:** Larkin L. Lyell, 2581 Aspinwall St., Sarasota, FL 34237.

Seeking information on and photos of **B-52 and KC-135 simulators** built inside railcars and USAF-operated rail equipment. **Contact:** MSgt. Andrew M. Bauer, USAF, 4127 Prairie View Dr., Rapid City, SD 57701.

Seeking contact with crew members of a **B-26** bomber that made an emergency landing at Taejon, Korea, in July 1950 after an attack by an enemy fighter aircraft. **Contact:** Col. Robert A. Coffin, USAF (Ret.), 11826 S. W. Courtly Manor Dr., Arcadia, FL 33821.

Seeking **James S. Randall**, radio operator on Arthur Weisleder's crew, 424th Bomb Squadron,

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

307th Bomb Group, 13th Air Force. The crew served on Morotai Island, Indonesia, and at Clark Field, the Philippines. Randall's last known address was Syracuse, N. Y. **Contact:** Walter H. Pierson, 717 Running Creek, Seguin, TX 78155.

Seeking information on the 440th TCG **C-47A #42-92717** that appeared on the front page of the *Detroit Free Press* June 2, 1994. **Contact:** William Reid, 1600 Prairie, Essexville, MI 48732.

Seeking information on a **Rivet Amber RC-135** reconnaissance plane from the 6th Strategic Wing that disappeared in the Aleutian Islands with Sgt. Charles Dreher aboard, en route to Eielson AFB,

Alaska, June 5, 1969. Also seeking contact with **Sgt. William Kunkel** of the 6th SW. **Contact:** Charleen Barutha, P. O. Box 520, Kewaskum, WI 53040.

Seeking information on and location of leather and color patches for the **37th and 39th Fighter-Interceptor Squadrons**. **Contact:** Alan C. Angel, 2345 McCrea Rd., Thousand Oaks, CA 91362.

Seeking the whereabouts of **William Davis**, who was stationed at Vandenberg AFB, Calif., in 1969 and had a daughter, Patricia. **Contact:** William E. Snoderly, 8730 N. Himes Ave., Apt. 617, Tampa, FL 33614.

For a book, seeking information, photos, unit insignia, and anecdotes on **Cessna** aircraft used by US or foreign military services, particularly the older aircraft. **Contact:** Walter P. Shiel, 1408 Russell Bend Rd., Weatherford, TX 76086.

Seeking the whereabouts of **SSgt. Stephen Radash**, who was with the 3919th Air Police Squadron, RAF Fairford, UK, in the early 1950s. **Contact:** Gillian Pooley, Old Burren, Ashford Rd., Tenterden, Kent TN30 6LL, UK.

Seeking **Dr. Roy Ring White**, who was stationed at Howard AFB, Panama, in 1990. **Contact:** Ann Edens, 535 E. Main St., Chester, NJ 07930.

Seeking contact with **Burton L. Harris, Laurei Howell, John McEntee, Robert McEntire, George Liesenfelder**, and other military personnel stationed at Hq. 26th Air Division (Defense), Roslyn, N. Y., 1949-58. **Contact:** Virginia S. Taylor, 903 Sandwich Rd., E. Falmouth, MA 02536.

Eagle Grant Scholarship Winners: SSgt Dean A. Toth, McConnell AFB, Kansas—SSgt Lee E Aokley, Sheppard AFB, Texas—MSgt



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Seeking the whereabouts of **Sgt. Richard L. Bradbury**, **TSgt. George J. Chambers**, and **Sgt. Talmadge R. Conley**, who were stationed at RAF East Kirkby, UK, 1954-56. **Contact:** MSgt. George J. McNally, USAF (Ret.), 123 School Rd., Bethel, PA 19507.

Seeking patches and pins from squadrons, detachments, or competitions and photos of refuelings, especially of the **SR-71 Blackbird**. **Contact:** Jay E. Heald, 29 Broad St., Plattsburgh, NY 12901.

Seeking contact with Air Force units stationed in the **Persian Gulf** area for patches and insignia to be used in a museum collection. Please include donor's name and full address. **Contact:** Roland L. Recker, Military Veterans Museum, Inc., P. O. Box 511, Neenah, WI 54957-0511.

Seeking contact with World War II veterans of the **45th Troop Carrier Squadron**, 316th Troop Carrier Group, stationed in Cottesmore, UK, 1943-45. **Contact:** Edwin S. MacGregor, 838 Meigs Rd., Santa Barbara, CA 93109-1521.

Seeking contact with or information about American or Chinese P-40 aviators or ground crew who were involved in starting the **Flying Tigers** before Gen. Claire Chennault was. **Contact:** Jim Floyd, 720 Valparaiso Blvd., Niceville, FL 32578.

Seeking information on **Second Air Force**, with headquarters in Washington and Colorado during World War II; **Sioux City AB**, S. D.; the **393d Bomb Group**; and the **583d Training Squadron**. **Contact:** John Softcheck, 154 First St., Grindstone, PA 15442.

Seeking information on **1st Lt. Robert R. Svenson**, a bomber pilot killed in action near Hillesheim, Germany, December 25, 1944. Also seeking infor-

mation on the 668th Bomb Squadron, 416th Bomb Group. **Contact:** Eric C. Svenson, Sr., 2030 Midway Dr., Twinsburg, OH 44087.

Seeking information on **Lt. Arne Eugene Nelson**, of Omaha, Neb., who was in the 457th Fighter Squadron, 506th Fighter Group, in the Pacific during World War II and stationed at Camp Wallace and Aloe Field, Tex.; Camp Davis, N. C.; and Page Field and Dale Maby Field, Fla. **Contact:** Susan Nelson Fitta, 1622 Lee St., Kaufman, TX 75142-3354.

Seeking information on C-47 crews who resupplied an American battalion August 10, 1944, at **Mortain, France**. Also seeking contact with fighter pilots who flew missions at Mortain at that time. **Contact:** Maj. Mark J. Reardon, USA, 2802 S. Columbus St., Apt. A-2, Arlington, VA 22206-1424.

Seeking the whereabouts of **Roy Adams**, **John Devaney**, **Howard Fisher**, **John Henderson**, **Svend Knakkegaard**, and **Joseph Quinn**, of the 430th Squadron, 502d Bomb Group, 315th Bomb Wing, 20th Air Force, Northwest Field, Guam. **Contact:** Byron W. Kinney, 2028 Hollywood Ct., Wilmette, IL 60091.

Aviation museum seeks B-52 and KC-135 aircrews from Eglin and Homestead AFBs, Fla., who participated in **Chrome Dome** and **Arc Light** missions. **Contact:** Henry L. Marois, Jr., Florida Military Aviation Museum, P. O. Box 17332, Clearwater, FL 34622.

Seeking information on **2d Lt. Harold John Steffen, Sr.**, a navigator with the 401st Bomb Squadron during World War II and a lieutenant colonel with the 441st Tactical Fighter Wing during the Vietnam War. **Contact:** Carrol Steffen, 2625 39th Ave., S., Minneapolis, MN 55406.

Seeking information on or contact with anyone who served with the **903d AQM Aviation Detachment**, Esler Field, La., in the Army Air Forces from July 1942 to May 1943. **Contact:** Peter J. Dowd, 406 Orleans St., Monroe, LA 71201.

Seeking the whereabouts of **SSgt. Walter L. White**, who was stationed at Ubon RTAFB, Thailand, in 1966. **Contact:** Alexander H. Smith, 1501 Ivywood Dr., Apt. #8, Oxnard, CA 93030.

Seeking contact with aircrew who flew Martin B-10Bs with the **28th Bomb Squadron**, USAAC, out of Camp Nichols, the Philippines, 1937-40. **Contact:** Christian Cureton, P. O. Box 549, Red Oak, TX 75154.

For a celebration in 1995, seeking contact with flight instructors and ground personnel who trained **French cadets** in the US during World War II. **Contact:** Robert P. Gillotte, 3924 Parkman Dr., Columbia, SC 29206.

Seeking the whereabouts of **1st Lt. Buren S. Folsom**, **Lt. Joe Ehlinger** (or Elliger), and **Lt. Wendell J. Martin**, who were stationed at Fort Knox, Ky., and Pine Camp, N. Y., during World War II. **Contact:** "Dutchie" Kaden Sunday, Rte. 2, Box 275, Hunt, TX 78024.

For the Hill Aerospace Museum, Utah, seeking aviation goggles, helmets, oxygen masks, and other items from **World War I** to present. Especially seeking **British World War II** items. **Contact:** Col. William L. Evans, USAF (Ret.), 4390 N. 125 W. Ogden, UT 84414.

Seeking the whereabouts of **Lt. Col. and Mrs. Mack (Opal) McClanahan**, who were at Wright-Patterson AFB, Ohio, in 1961. **Contact:** E. Wayne Mansfield, R. R. 1, Box 383A, Belton, KY 42324.

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50-54	\$89.06	\$134.54	\$49.04
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PLAN & TYPE OF COVERAGE REQUESTED

Plan Requested AFA CHAMPLUS® PLAN I (for military retirees and dependents)
(check one) AFA CHAMPLUS® PLAN II (for dependents of active-duty personnel)

Coverage Requested Inpatient Benefits Only
(check one) Inpatient and Outpatient Benefits

Person(s) to be insured (check one) Member & Spouse
 Member Only Member & Children
 Spouse Only Spouse & Children
 Children Only Member, Spouse & Children

PREMIUM CALCULATION

All premiums are based on the attained age of the AFA member applying for this coverage. Plan I premium payments are normally paid on a quarterly basis, but, if desired, they may be made on an annual (multiplied by 4) basis. Plan II premiums are payable annually ONLY.

Quarterly (annual) premium for member (age _____) \$ _____

Quarterly (annual) premium for spouse
(calculate based on member's age, not age of spouse.) \$ _____

Quarterly (annual) premium for _____ children @ \$ _____ \$ _____

Total premium enclosed \$ _____

If this application requests coverage for your spouse and/or eligible children, please complete the following information for each person for whom you are requesting coverage.

Names of Insured Dependents Relationship to Member Date of Birth (Month/Day/Year)

(To list additional dependents, please use a separate sheet.)

In applying for this coverage, I understand and agree that (a) coverage shall become effective on the last day of the calendar month during which my application together with the proper amount is mailed to AFA, (b) only hospital confinements (both inpatient and outpatient) or other CHAMPLUS-approved services commencing after the effective date of insurance are covered and (c) any conditions for which I or my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within 6 months prior to the effective date of this coverage without medical treatment or advice or having taken prescribed drugs or medicine for such conditions. I also understand and agree that all such pre-existing conditions will be covered after this insurance has been in effect for 12 consecutive months.

Date _____, 19 _____ (Member's Signature) 10/94

Application must be accompanied by a check or money order.
Send remittance to: Air Force Association, Insurance Division,
1501 Lee Highway, Arlington, VA 22209-1198.

GET CHAMPLUS® PROTECTION NOW

Pieces of History

Photography by Paul Kennedy

WASPs



Memorabilia courtesy Air Force Museum, Wright-Patterson AFB, Ohio, and Neelie Nagel

"Air Transport Command is establishing group of women pilots for domestic ferrying . . . If you are immediately available and can report at once at Wilmington at your own expense for interview and flight check . . . bring two letters recommendation proof of education and flying time." So read a September 6, 1942, Western Union

telegram, and nearly 25,000 women did not hesitate to apply to join the Women's Airforce Service Pilots (WASPs). Shown here in the cockpit of a P-39Q Airacobra—typical of the planes WASPs flew—are photographs of three of the 1,074 women pilots who won their wings and flew sixty million miles for USAAF during World War II.



The T-Bird II from Lockheed Aeronautical Systems Company/Aermacchi s.p.a./Rolls-Royce plc/Textron Aerostructures.

T-Bird II. Non-developmental masterpiece.

The T-Bird II is nearly identical to the 180+ MB-339s already delivered to eight countries—the few minor differences being an improved environmental control system, noise reduction, and avionics upgrades.

MB-339 trainers are still being produced. Their training qualities include high student tolerance, no maneuver restrictions, wide performance envelope, and textbook handling characteristics. These add up to one of the finest safety records and highest user satisfaction for any training aircraft. The T-Bird II shares in, and builds on, this legacy.

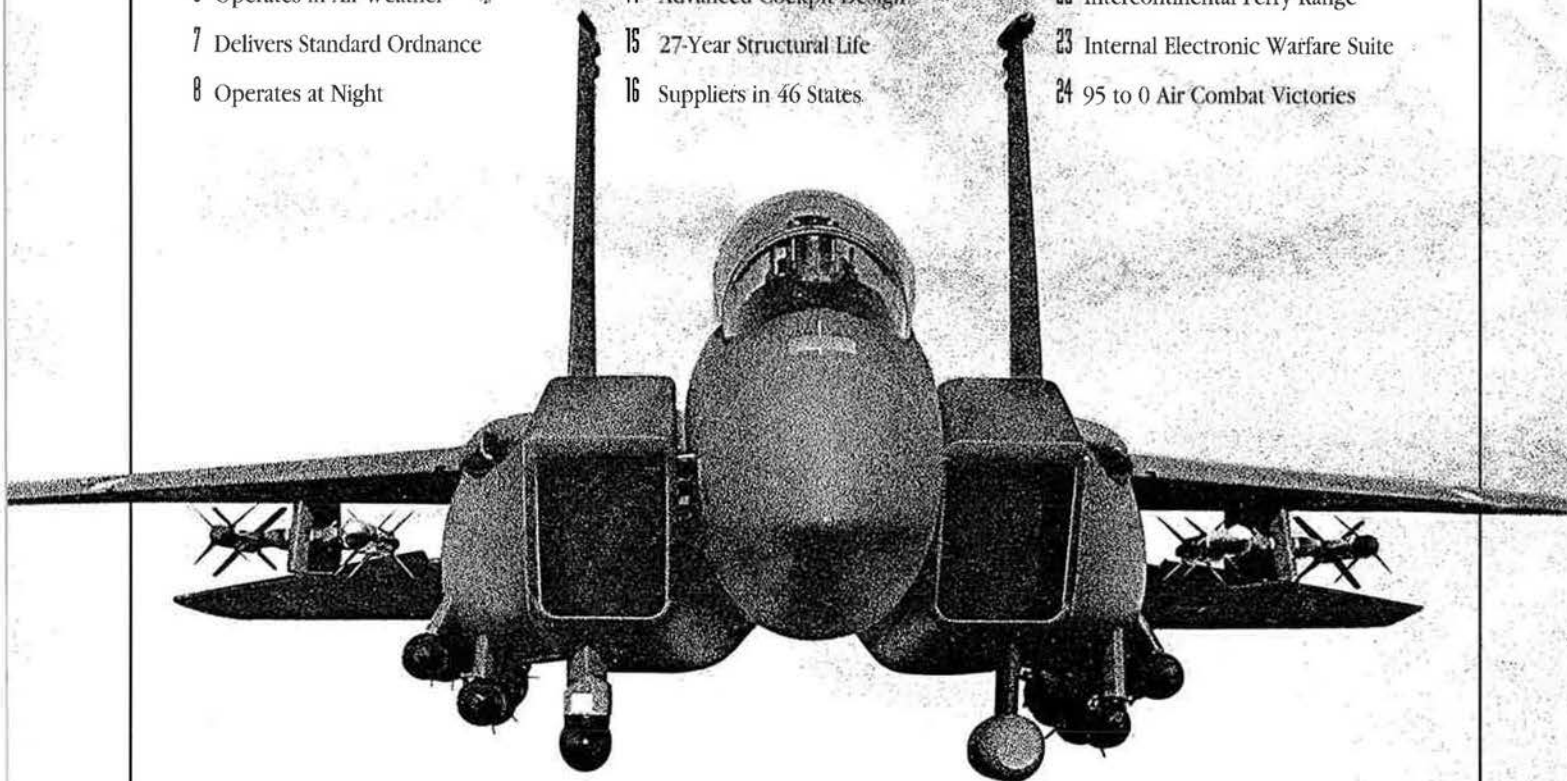
MB-339s have so far trained more than 1,500 student pilots and flown well over 300,000 hours. No other JPATS competitor can come close to the T-Bird II in claiming to be: an in-production aircraft with an extensive history as a trainer, "off-the-shelf" or "non-developmental."

Lockheed leads.

 **Lockheed**

F-15E

- 1 Backbone of the Interdiction Force
- 2 Carries up to 23,000 lb. of Payload
- 3 Delivers Precision-Guided Munitions
- 4 Long Range - 800 mi. Radius of Action
- 5 Round-the-Clock Operations With High Fly Rates
- 6 Operates in All Weather
- 7 Delivers Standard Ordnance
- 8 Operates at Night
- 9 Deep Strike of High-Value Targets
- 10 95.5% Mission-Capable Rates in Operation Desert Storm
- 11 Infrared Accurate Targeting Sensor
- 12 High Resolution Radar Ground Maps
- 13 99% Made in the U.S.A.
- 14 Advanced Cockpit Design
- 15 27-Year Structural Life
- 16 Suppliers in 46 States
- 17 Safest Fighter in USAF History
- 18 USAF's Most Modern Fighter
- 19 Capability to Grow to More Missions
- 20 Unequaled Air Superiority
- 21 Carries 4 Medium-Range and 4 Short-Range Air-to-Air Missiles
- 22 Intercontinental Ferry Range
- 23 Internal Electronic Warfare Suite
- 24 95 to 0 Air Combat Victories



In An Era When Every Plane Must Count, Nothing Counts More Than The F-15E Eagle.

These days every defense dollar has to count. So go ahead, count.

Here are twenty-four good reasons to fund the F-15E. Start with the fact that this is America's only fighter capable of performing long-range, air-to-ground missions while providing its own air defense. That fact alone not only makes this aircraft a smart strategic choice, it makes it the most prudent choice for the Air Force.

And that's something you can count on.

MCDONNELL DOUGLAS

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