AUGUST 1993/$3

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

In Aviation's Attic

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GRUMMAN

August 1993, Vol. 76, No. 8

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

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Editorial

By John T. Correll, Editor in Chief

The Revolution Isn't Over

In a burst of good feeling this summer, the Department of Defense decided to let Russian military attachés roam the Pentagon unattended, provided they wear their uniforms and building passes and stay out of restricted areas. It was part of "ongoing efforts to improve the US-Russian military relationship"—and another indication of how Russia's image in the West has been transformed since the bungled Moscow coup, two years ago this month, set the Soviet Union to toppling. The relationship today emphasizes friendship, cooperation, and support.

The Cold War lasted longer than the average American has been alive. When it ended, so did the omnipresent danger of massive global conflict. It would be an enormous relief if we could stop worrying about the Russians altogether. Unfortunately, there are three kinds of reasons why we cannot.

Global instability. After the first Russian revolution, Lenin and Stalin destroyed the social and economic institutions of old Russia and replaced them with the totalitarian state. That left little to build on, seventy years later, when the Soviet empire expired. The former republics are still mired in primordial muck. Even Russia, the biggest and strongest, has not settled on basic principles of government. Regional leaders, for example, want to conduct their own foreign policy.

Borders and territory are in dispute, notably along the Black Sea. Russian forces have had at least one skirmish—resulting in the loss of an Su-27 fighter—with Georgia. Intermittently, Russia has seemed on the brink of fighting with Ukraine, which now says it may keep the nuclear weapons left there by the Soviet regime. Ukraine, a shaky new state worried about its independence, would thus be the world's third-ranking nuclear power.

The Commonwealth of Independent States is virtually dead. The member nations abolished the joint military command this summer and went their separate ways. Russia sees itself as "guarantor of peace" in the land of the former Soviet Union, but if the other nations agree about anything, it is their fear of Russian domination. Ukraine and the new nations of eastern Europe would welcome ties with the United States, but Russia would almost certainly perceive such arrangements as a threat.

On the second anniversary of the coup, the former Soviet Union is still mired in primordial muck.

The entire Eurasian landmass is ripe for trouble, which may or may not remain local. It is difficult to guess when or how the balance of power might stabilize. Sooner or later, the affairs of this vast area will intersect with the security and interests of the United States.

Military power. Except for its nuclear weapons, Russia is in no condition at the moment to threaten Europe or the United States. It has not, however, disarmed to the extent that many Westerners believe. Estimates of current military strength differ. US intelligence says that Russian forces number less than two million. Defense Minister Pavel Grachev, however, says the total will drop to 2.1 million by 1995. General Grachev looks ahead to a "building-up of the armed forces" a few years from now, with emphasis on mobility, long-range high-accuracy weapons, electronics, strategic nuclear forces, and military space systems.

In 1992, Russia produced twenty bombers, 150 fighters and attack aircraft, 675 tanks, and at least forty-five strategic ballistic missiles. A fighter prototype with stealth features, the MiG 1-42, is ready for flight-testing. Sukhoi is reported to be working on a new medium-range bomber to replace the Tupolev "Badger" and "Blinder." Additional airlift is a priority for the Russian Air Force.

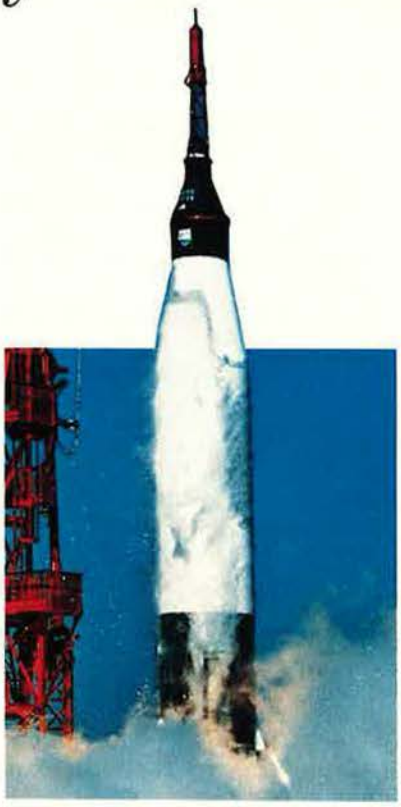
We may think the Russians have shuffled off into the sunset, but a different picture emerges when the Russians themselves talk about their plans and aspirations. Their latest military doctrine restores the emphasis on large-scale offensive operations, banned in 1987 on orders from President Mikhail Gorbachev. Russian line forces may be in ragged shape, but they haven't quit.

Arms proliferation. In June, the US objected to the sale of Russian rocket engines to India, which ostensibly wanted them to launch weather and communications satellites. The concern was that the systems might be used for military payloads. The Defense Intelligence Agency told Congress that both "Russia and Ukraine increasingly are authorizing export of sensitive dual-use space-launch, chemical, and biological technologies as they attempt to save their weapons facilities and prevent unemployment."

Desperate for cash, the Russians are marketing arms aggressively. China has bought Su-27 fighters and SA-10 air defense missiles. Iran has taken delivery on the first of three Russian submarines. MiG-29s and MiG-27s are selling well. Potential buyers for the Tu-22 "Backfire" bomber include Iran and North Korea. Military experts are available, too. Russia maintains 700 military advisors in Libya and 2,400 in Syria. About 200 Russian experts are said to be in Iraq in a "private capacity."

As we celebrate the end of the Cold War, let us remember that the second Russian revolution is not over yet. The new Russian state is unstable and volatile. The armed forces have not rolled up their flags and stacked arms. Russian weapons are flooding the world market. Cordial relations with Russia are much to be desired, but this would be a poor time to relax too much. ■

The Friendship 7 wasn't the only revolutionary mission launched in 1962.



That same year, Magnavox embarked on a rather revolutionary mission of its own. We launched a comprehensive quality program. Today, that program has evolved into the Magnavox Total Quality Management system. Through MTQM, our employees, customers, and suppliers work in teams to ensure the quality of Magnavox products and services.

Magnavox initiated its quality system decades before such programs gained worldwide acceptance. In fact, Magnavox was the first contractor to win the "Quality Excellence Award" from the U.S. Department of Defense. In 1911, people looked to Magnavox for quality in electronic systems and equipment. Over 80 years later, they still do.

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Letters

May Issue Miscues

I am afraid there is a grievous error in your list of winners of the Hughes Achievement Trophy in the May 1993 Almanac *[p. 127]*. The winners for 1992 were the "Proud Lions" of the 59th Fighter Squadron, Eglin AFB, Fla., not the 58th TFS, as you have listed.

Lt. Col. Jim Davis,
USAF
Newport, R. I.

I just received my Almanac issue, which I look forward to every year. I was not disappointed—you did a superb job. With the Air Force changing so fast, the Almanac is the only way I am able to keep up.

I would, however, like to correct some captions that I believe were erroneous or misleading. While the student and instructor pilot depicted in the Air Training Command report *[p. 76]* may have been photographed at Sheppard AFB, Tex., the T-38 Talon pictured belongs to the 64th Flying Training Wing, based at Reese AFB, Tex.

The second error appears in the "Gallery of USAF Weapons." On p. 141, the photograph of the Combat Shadow is of an HC-130P, not an HC-130N as stated.

Frank H. McCurdy
Houston, Tex.

Having been an avid fan of AIR FORCE Magazine for years, I thought I needed to point out an error in the 1993 Almanac. In the report from US Air Forces in Europe *[p. 83]*, a photograph depicts SSgt. Mark Hatcher working in February 1992 during Operation Provide Hope, which airlifted humanitarian aid to the former Soviet Union.

As officer in charge of aerial delivery for the 5th Mobile Aerial Port Squadron, I supervised Sergeant Hatcher. The 5th MAPS belonged to the 313th Tactical Airlift Group at RAF Mildenhall, UK, until January 16, 1993, and then reported directly to the 362d Airlift Support Group at Rhein-Main AB, Germany. We inactivated April 6, 1993.

We were never USAFE assets; we were Air Mobility Command assets. The position of the photo gives the impression that 5th MAPS was a USAFE unit.

Please devote a little more attention to detail and a little respect to a proud unit with forty years of heritage.

Capt. Christopher Scharven,
USAF
RAF Mildenhall, UK

In the Almanac's listing of former Chiefs of Air Force Reserve *[p. 49]*, Maj. Gen. Rollin B. Moore occupies that position from the inception of the office, August 1, 1968, to January 26, 1972. That is incorrect. General Moore was never Chief of Air Force Reserve. He served as commander of Hq. Air Force Reserve, stationed at Robins AFB, Ga.

When the law creating the Office of Air Force Reserve was implemented in 1968—replacing the Office of the Assistant Chief of Staff for Reserve Forces—Maj. Gen. Thomas E. Marchbanks, Jr., was appointed Chief of Air Force Reserve. He served until his untimely death in 1972. He was succeeded by Maj. Gen. Homer I. "Pete" Lewis after an interim period during which Brig. Gen. Alfred Verhulst temporarily held the position.

I served as Chief of Information to Maj. Gen. Curtis R. Low, assistant chief of staff for Reserve Forces, and then in the same position under both Tom Marchbanks and Pete Lewis.

AIR FORCE Magazine's records should be corrected to reflect this information, and due credit should be given to General Marchbanks, who successfully got the whole thing off the ground.

Col. Milton E. Mitler,
USAF (Ret.)
Falls Church, Va.

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

As always, I thoroughly enjoyed the May issue, but it left me with several questions.

I know that the Arnold Air Society chapter at The Citadel, The Military College of South Carolina, awarded a scholarship in the name of Roland Wooten and billed him as South Carolina's only ace. He served in World War II, yet he does not appear in "AIR FORCE Magazine's Guide to Aces" *[p. 54]*. Did the Arnold Air Society at The Citadel err, or did you?

Also, I was under the impression that Lt. Gen. Raymond Reeves was commander of Alaskan Air Command from 1963 to 1965. In "USAF Leaders Through the Years" *[p. 50]*, Maj. Gen. James C. Jensen is listed as AAC's commander from 1963 to 1966. Where did I make my mistake?

Lt. Col. Marvin E. Burris,
USAF (Ret.)
Jamestown, S. C.

I have a few questions about the Almanac, specifically about "The Active-Duty Fleet" chart on p. 44.

How can there be an F-106 that is under three years old? Did we start making them again?

How can all the F-117s be under three years old when they were operational in the early to mid-1980s? If this information is classified, say so, but don't list incorrect data in your chart.

What is a V-18?

Donald L. Logston
Oviedo, Fla.

I always look forward to receiving your magazine, especially the annual USAF Almanac.

I was disappointed in the coverage of surface-to-air (SAM) missile systems in "The Gallery of USAF Weapons" *[p. 133]*. It failed to mention the Stinger missile system, used by Air Force personnel in Korea.

The Stinger has been employed since 1984 to provide base defense

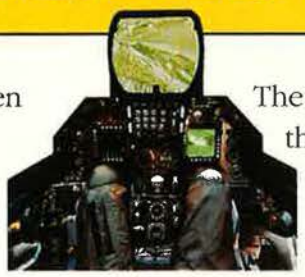
TIMES CHANGE. SO DO F-16S.

The world has seen some dramatic changes since the first F-16 was introduced. The Berlin Wall has come down. The Soviet Union and Warsaw Pact have been dissolved. And new potential trouble spots have emerged.

Dramatic changes in weapon technology have also taken place. Fighter aircraft have improved radar capabilities, faster computers and more advanced weapons.

Through the years the F-16 has proven it can truly stay ahead of the threat.

Its ability to continually adapt new avionics and weaponry has led to an incredible service record, including 65 aerial dogfight victories, with no losses.



F-16 (Night Attack) Cockpit

The F-16 was the workhorse of Desert Storm. It flew 13,500 missions and had the highest readiness rate of any fighter in theater. With LANTIRN and GPS, F-16s were the premiere scud hunters.

The F-16 we're building today incorporates literally hundreds of new state-of-the-art technologies. The entire cockpit has been modernized. Engine thrust has been increased 25%, and there is a choice of the world's two best fighter engines manufactured by Pratt & Whitney and General Electric.

Pratt & Whitney F100-PW-229

We've added beyond-visual-range firepower with Sparrow and AMRAAM radar missiles, night/all weather attack and autonomous precision attack with LANTIRN, IIR Mavericks, and laser guided bombs; anti-radar attack with HARM; and anti-ship with Penguin.

While the F-16's combat capability has been significantly enhanced, it was not done at the expense of operation and support costs. In terms of reliability, maintainability, readiness and lifecycle cost, the F-16 remains the best frontline fighter in the world.

And that's something we never intend to change.

General Electric F110

Lockheed
Fort Worth Company

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Letters

against high-speed, low-level, ground-attack aircraft.

More volunteers are needed for this special-duty program, and its inclusion in the Almanac certainly would help spread the word.

MSgt. Ronald D. Barnes, USAF
Fort Bliss, Tex.

In the Almanac's "Guide to Air Force Installations Worldwide" *[p. 113]*, I read with interest that Plattsburgh AFB, N. Y., is the "oldest active military installation in the US, established 1814."

As a graduate of the United States Military Academy (Class of 1957), I would like to point out that the Academy was founded in 1802 at West Point, N. Y. It is a military installation; it is still active; and it predates Plattsburgh AFB by twelve years.

There may be other older military installations.

Robert P. Bateman
New Carlisle, Ohio

In the Almanac's list of winners of the Gunsmoke competition *[p. 131]*, the 1950 winner is unidentified. As a lieutenant, I won that competition in an F-86 Sabre. Needless to say, I was disappointed to be called "Unknown"—even though that's a lot nicer than other things I've been called.

Gen. John W. Roberts, USAF (Ret.)
San Antonio, Tex.

I have noted that AIR FORCE Magazine misspelled my name in its list of William Tell Top Guns *[p. 131]*. In 1980, I (along with Lt. Col. Maurice Udell) won the Top Gun Award. My name is David S. Miller (not Davis S. Miller, as printed in the magazine).

David S. Miller
Friendswood, Tex.

■ *Readers Davis, McCurdy, Scharven, Mitler, and Bateman are correct. We would particularly like to thank General Roberts for helping us fill the gaps in our lists of competition winners.*

Colonel Burris's letter allows us once again to clarify our criteria for listing aces. We rely on Air Force Aerial Victory Credits, *published by the Air Force Historical Research Agency, which updates the list as new information becomes available. This list credits Lt. Roland F. Wooten, Jr., with three confirmed victories, short of the required five. Space constraints prevent us from listing any World War II ace with fewer than 14.5 victories.*

With regard to Colonel Burris's second question, the confusion arises because General Reeves was commander in chief of Alaskan Command, a unified command that oversaw all Army, Navy, Air Force, and Marine Corps operations in Alaska, while General Jensen commanded Alaskan Air Command, a component of Alaskan Command.

The mysterious "new" F-106 that puzzled Mr. Logston is not new at all, but, because it was flown by NASA for decades, its age in "Air Force years" is much younger than its chronological age. "Air Force years" also enter into the equation for the F-117. It only emerged from the "black" world in 1991, and the Air Force dates the F-117's age from that emergence.

The V-18 is an Air Force Academy jump plane whose full designation is UV-18 (the chart lists no prefixes). The G-3, G-4, G-7, and G-9 (which also caused some confusion among readers) are Academy aircraft as well—part of its glider program.

We strive for accuracy in the Almanac issues, and we appreciate comments from readers that help us achieve that goal.—THE EDITORS

Comprehensive Training

Peter Grier brought up some good points in "The New Look in Training" *[April 1993, p. 46]*. It's no wonder Air Force technical training is so "diffused," considering the widespread career field consolidations and cross-utilization of personnel over the past few years. Specialists in my avionics field maintain twelve major systems and a number of minor systems. There is a certain amount of technological overlap, but each system has its peculiarities. It takes time to train for those peculiarities, a fact you can't escape if your goal is to produce a high-quality technician.

The slower skill progression proposed by General McPeak will allow some of the time required. The "roadmaps" referred to by General Viccellio will help supervisors manage the training of personnel in other specialties—a common situation in a flight-line environment.

There will be a lot of disappointed commanders and supervisors, though, if they don't understand the capabilities of newly assigned graduates of initial-skills courses. They may be "useful on the job as soon as they arrive at their first operational assignment," but they certainly won't be fully trained. A sound job-qualification program will still be necessary to get them ready to perform independently. Commanders and supervisors must ensure that ap-

prentice airmen are not used outside their specialty at the expense of continued specialty training.

Everyone must understand that technical training is as important to the mission as flying training is. It takes more than the ability to swap a black box to be a technician, and it takes more than a hand on the stick and a hand on the throttle to get a jet off the ground. Air Force leadership is moving us in the right direction. Continual education and training is the way to continuous quality improvement.

MSgt. Ken Monk,
USAF
Keesler AFB, Miss.

In Defense of Air Defense

With reference to Clarence J. Romero's April 1993 letter concerning the Air Guard and KC-135s *["The Optimal Force Mix," p. 4],* I feel compelled to reply.

Mr. Romero, obviously, is retired from active duty. His distaste for the Air Guard is obvious, but his version of reality is about twenty years old. The reason the Air Guard has been given front-line equipment is because it does as good a job or better than the active-duty force. For example, of the more than 200 tankers assigned to Operation Desert Storm, the highest tanker sortie rate (100 percent) was achieved by the Washington and Wisconsin ANGs flying from Cairo West.

Also, Congress likes the Air Guard because it can do the job for significantly less money. How? A large part of the military budget goes to retirement pay. A Guardsman doesn't receive retirement pay until age sixty. Even if Mr. Romero put in thirty years, he probably retired no later than age fifty-two. He'll collect at least eight years more retirement pay than a Guardsman.

One possible rationale is that he put up with more, which I am sure he did. Surprisingly, though, I log almost twice as many flying hours a year as my active-duty counterpart down the ramp. . . .

I am tired of reading uninformed people's arguments about the abilities of active-duty vs. the Guard and Reserve. There are pros and cons to each. . . .

Do we need twelve air defense units to protect the US? I am not sure, but Pearl Harbor might not have happened if there had been an alert commitment. Is the cold war really over, Mr. Romero? There are still thousands of nuclear weapons aimed at the US. The Russian "Bear-H" bombers are still making almost weekly practice ALCM strikes on Alaska. Tell the active-duty Alaska-based F-15s or the Alaska ANG tankers that intercept the Bears that it's over, and you might hear a few laughs.

With political instability in Russia right now, we should think twice before eliminating our only air defense of the US. The shortest distance to the US from Russia is over the Pole and through Canada.

Now for the subject dearest to me—eliminating the navigator from the KC-135. Desert Storm proved the worth of the navigator, even to doubting pilots. The -135s provided many *ad hoc* rendezvous during Desert Storm, mostly due to the navigators' skills.

The -135s provide cargo and passenger hauling capability to various users. Their rapid response to various worldwide combat air refueling missions dictates that the navigator must be on the aircraft. Machines cannot replace humans. I fully support the GPS, but the INS is still the primary piece of navigation equipment on the -135. The beauty of the GPS is that it can update the INS very accurately anywhere in the world. The KC-10 does an amazing job of navigating, but if you want to know about task saturation, talk to a KC-10 crew. The navigator makes a difference.

The KC-135R is a very good plane, but why would anyone pay to take off thrust reversers? You talk of lean and mean, but the Reserve and Guard -135Es can go places the -135R can't because of thrust reversers. The -135E costs $4.7 million per copy, while the -135R costs $23.1 million per copy. To retrofit a -135R with reversers will cost more than $5 million per aircraft. . . .

Ike Isaacson
Medical Lake, Wash.

Misidentified Pilot

As you reported in "Shooting With Style at William Tell" *[February 1993, p. 32],* the 120th Fighter Group from Great Falls, Mont., participated in William Tell 1992 with ADF F-16As. In spite of an antiquated gunsight, thorough and dedicated training against the Aerial Gunnery Target System gave us the edge we needed to win Profile 2, the aerial gunnery event.

Capt. Duane J. Kautzmann, num-

Air Force Association
Comparative Statement of Revenues and Expenses

	Year ended	
General Fund	**Dec. 31, 1992**	**Dec. 31, 1991**
Revenue		
Aerospace development briefings	$1,200,498	$ 1,289,360
Building operations	621,507	747,722
Convention	330,157	382,064
Data processing services	19,062	29,236
Industrial Associates	156,850	164,816
Insurance programs	3,864,302	3,511,250
Investment	305,032	419,095
Magazine	1,657,202	2,074,355
Membership	3,207,537	2,991,875
Patrons	230,568	222,665
Other	526,633	651,446
Total revenue	**12,119,348**	**12,483,884**
Expenses[1]		
Aerospace development briefings	476,086	551,223
Building operations	790,895	811,959
Convention	779,834	932,271
Data processing services	134,468	121,459
Industrial Associates	117,537	123,813
Insurance programs	4,090,739	3,931,437
Magazine	1,680,880	2,067,611
Membership	3,562,270	3,490,616
Patrons	234,771	262,116
Total expenses	**11,867,480**	**12,292,505**
Excess (deficit) of revenue over expenses	**$251,868**	**$ 191,379**
Life Membership Fund		
Revenue from investments	691,689	579,076
Less: transfer to General Fund for annual dues and other costs	769,897	629,048
Net income (loss), Life Membership Fund	**$(78,208)**	**$ (49,972)**

Treasurer's note: The figures presented herein have been extracted from audited financial statements submitted previously to the Board of Directors of the Air Force Association.

[1] Expenses include chapter commissions, state commissions, and other direct support for field units totaling $548,101 in 1992 and $583,314 in 1991.

ber four in our lineup, received the highest score in the event and was recognized as the meet's "Top Shooter." However, he is not pictured on p. 36 of the article as the caption states.

I appreciate your inclusion of a picture of me in your magazine and only wish you had identified me correctly.

Maj. Michael J. McDonald,
Montana ANG
Great Falls, Mont.

Northern Ireland's Status

I have just read "Britain's Defense Shakeup" *[April 1993, P. 50]* and wish to comment.

The otherwise comprehensive and concise writing was flawed by the passage: "the British Army occupation force rotates . . . through Northern Ireland." Surely author Stewart Powell is aware that Northern Ireland has been a part of the United Kingdom since 1922. It is incorrect and irresponsible to refer to the British Army as an army of occupation.

Such a grave error goes a long way toward explaining why so many Americans, including your President, exhibit fundamental misunderstandings about the status of Northern Ireland. When such misinformation is published, the ignorance surrounding this issue is not surprising.

D. C. Thomas
Naples, Italy

Tribute to Quesada

The brief obituary of Lt. Gen. Elwood "Pete" Quesada *[April 1993 "Aerospace World," p. 23]* brought to mind the references to him contained in the book *Overlord (D-Day and the Battle of Normandy 1944)*, by Max Hastings.

General Quesada was described as one of only two senior Allied air force officers (the other was British) who "distinguished themselves by an absolute commitment to assisting the armies, undiminished by personal hostilities and jealousies. . . . Quesada may claim to have done more than any other airman in the Allied ranks to originate and refine techniques of ground-to-air cooperation and put them into practice."

He established a close relationship with the Army's Gen. Omar N. Bradley. In cooperation with Bradley, he was the first to mount aircraft radios in tanks and establish forward air controllers to direct strikes from the ground front.

Many other accomplishments were attributed to this aviation pioneer. It is important that current generations act on the present with their vision to the future without forgetting the sacrifices and contributions of the aviation pioneers, who were also young once and met the challenges of their day with dedication and determination.

Lyle M. Jones
Stuart, Fla.

Remembering MacDonald

"Valor: Super Ace" *[March 1993, p. 85]* has special meaning for me. As a major and assistant air attaché, I had the honor of working for Col. Charles MacDonald in Stockholm, Sweden, where he was the USAF air attaché. Charles Lindbergh visited Charlie MacDonald in Stockholm in 1953, where they had a grand reunion. The ending of the story should read: Col. Charles MacDonald, USAF (Ret.), currently resides in De Funiak Springs, Fla.

Col. Burt Rowen,
USAF (Ret.)
Schertz, Tex.

Uncompromising deSeversky

John T. Correll's "One Air Force" *[April 1993, p. 2]* helped me remember another advocate of "One Air Force," the late Maj. Alexander deSeversky.

In 1955, while stationed at March AFB, Calif., I attended a meeting of AFA's Riverside County Chapter. Major deSeversky was the featured speaker. He began his speech in the following manner: "Gentlemen, we have the Army Air Force, the Navy Air Force, the Marine Corps Air Force, the Coast Guard Air Force, and the Air Force." He also said that any vehicle that lifts off from either the ground or water enters the air, and, once it is in the air, should be under Air Force control and belong to the Air Force.

I am sure that he would have strongly disagreed with the US Air Force basic doctrine that was quoted in the editorial and would have regarded it as an unacceptable compromise.

Maj. Bernard G. Stein,
USAF(Ret.)
Ellington, Conn.

Air Force Association Balance Sheet

	December 31, 1992			December 31, 1991		
Assets	**General Fund**	**Life Membership Fund**	**Total**	**General Fund**	**Life Membership Fund**	**Total**
Current assets						
Cash plus marketable securities at lower of cost or market	$3,996,619	$8,942,020	$12,938,639	$ 3,330,872	$ 8,753,443	$ 12,084,315
Receivables, prepaid expenses, etc.	1,233,829	335,092	1,568,921	1,672,834	433,175	2,106,009
Fixed assets (land, building, etc.)	12,199,926		12,199,926	12,383,740		12,383,740
Funds on deposit and other assets	5,530,178		5,530,178	4,907,874		4,907,874
Total assets	**$22,960,552**	**$9,277,112**	**$32,237,664**	**$22,295,320**	**$9,186,618**	**$31,481,938**
Liabilities and fund balances						
Current liabilities (including payables, accrued expenses, etc.)	$3,484,890		$3,484,890	$ 2,461,426		$ 2,461,426
Deferred revenue (including advance membership dues and magazine subscriptions)	1,088,476		1,088,476	1,374,446		1,374,446
Long-term debt	5,580,000		5,580,000	5,925,000		5,925,000
Fund balance						
Unrestricted	11,145,924		11,145,924	10,903,834		10,903,834
Designated	1,661,262		1,661,262	1,630,614		1,630,614
Restricted		9,277,112	9,277,112		9,186,618	9,186,618
Total liabilities and fund balances	**$22,960,552**	**$9,277,112**	**$32,237,664**	**$22,295,320**	**$9,186,618**	**$31,481,938**

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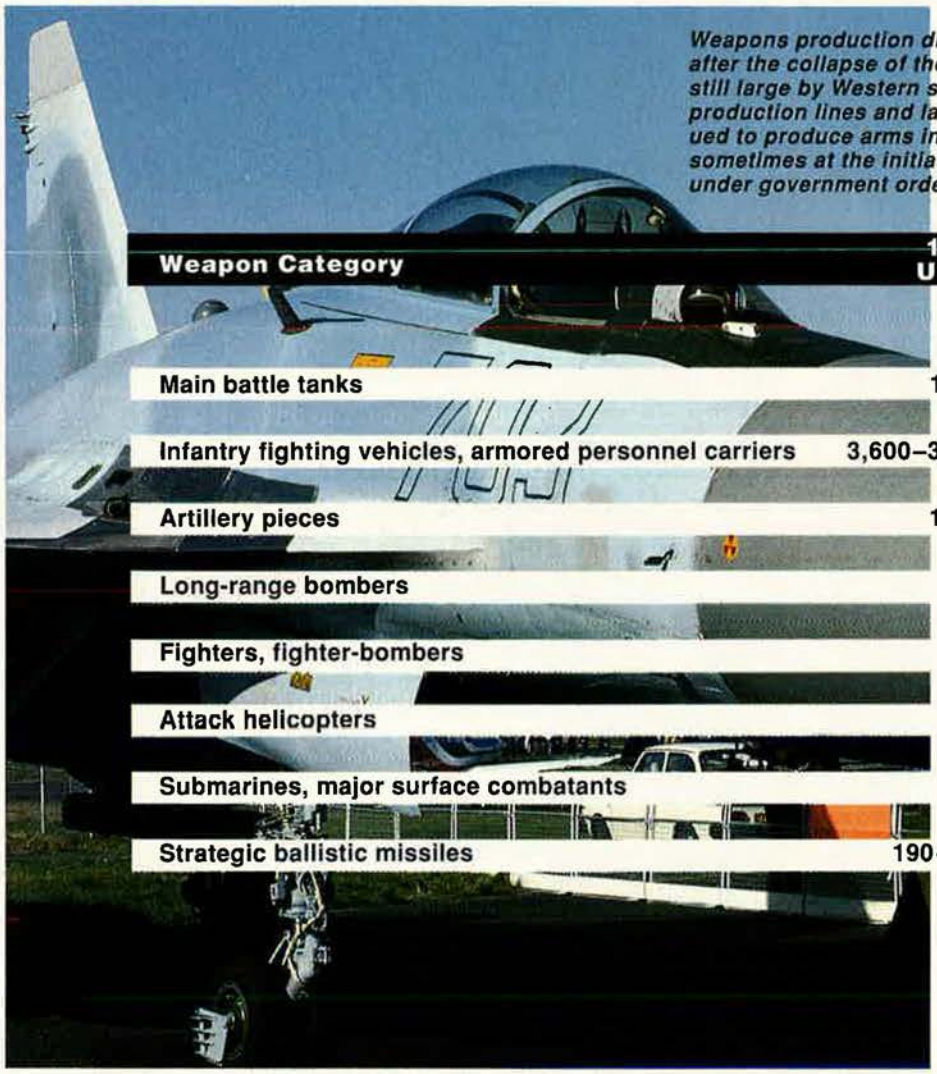
The Chart Page

By Tamar A. Mehuron, Associate Editor

The Drop in Russian Arms Production



Weapons production dropped dramatically in 1992, the year after the collapse of the old Soviet Union, though output is still large by Western standards. Some plants idled arms production lines and laid off workers. Other factories continued to produce arms in order to keep workers employed, sometimes at the initiative of local managers and sometimes under government orders.

Weapon Category	1990 USSR	1991 USSR	1992 Russia
Main battle tanks	1,300	1,000	675
Infantry fighting vehicles, armored personnel carriers	3,600–3,900	2,100	1,100
Artillery pieces	1,900	1,000	450
Long-range bombers	35	30	20
Fighters, fighter-bombers	575	350	150
Attack helicopters	70	15	5
Submarines, major surface combatants	20	13	8
Strategic ballistic missiles	190–205	145–165	45–75

Russia accounts for ninety percent of the arms exports of the combined former republics. Russian exports, such as a major Su-27 "Flanker" deal with China, provide hard currency to the Russian Federation and enable the defense infrastructure to continue production. Russia is pushing arms sales to such big Third World countries as China and India. Moscow can no longer afford the cold war practice of providing large, subsidized arms shipments to poor Third World countries, such as Afghanistan and Nicaragua.

Source: Joint Economic Committee of Congress, June 11, 1993, statement by William Grundman, Defense Intelligence Agency.

Capitol Hill

By Brian Green, Congressional Editor

The New Military Poor

Senator McCain continues his campaign against "slash and burn" reductions that hurt the troops and damage morale.

SEN. John McCain (R-Ariz.) warned that the lag in armed forces pay threatens to create yet another class of impoverished Americans. He calls this group "the new military poor."

Out where the troops work and live, reported the senator, times are bad, and Clinton Administration proposals to effectively cut service wages will only make matters worse. Senator McCain, a prominent member of the Senate Armed Services Committee, warned, "A 'slash and burn' approach to cutting the defense budget hurts people and local economies [and] undermines morale and our national security."

The Clinton Administration would freeze military pay, and that of all other federal workers, in Fiscal 1994 and would limit raises from Fiscal 1995 to Fiscal 1997 to one percent less than the Employment Cost Index.

"What President Clinton proposed was a cumulative process of annual cuts," Senator McCain noted, saying that the plan would reduce funds for military personnel by $11.6 billion through 1998.

He contended that, as a result of the chop, compensation to US servicemen and -women will fall further behind pay in the private sector. Senator McCain said that the majority of active-duty members will have an increasingly tough time maintaining even a modest, middle-class living standard.

According to the senator's calculations, military pay over the past decade fell 7.8 percent behind inflation and 11.7 percent behind private-sector increases. The proposed cuts, he said, would mean that growth in military pay will fall another ten percent behind inflation and 19.9 percent behind growth in private-sector pay during 1993–97.

Senator McCain argued that the situation is made more critical by the current insufficiency of military pay for many troops. He cited figures showing that 602,000 of 1.75 million active-duty military personnel earn less than $20,000 a year, even when housing and allowances are added in. Some 20,000 enlisted members and their families are now eligible for food stamps. "These are not the people who should bear a special burden in deficit reduction," he said.

If a $30,000 annual income is used as the benchmark of middle-class status, said the senator, then 283,000 Air Force men and women fall short. That is sixty-four percent of the total active-duty force and a whopping seventy-seven percent of USAF's enlisted personnel. The total for all services is 1.1 million, nearly two-thirds of today's military force.

"Men and women who volunteer to serve their country not only have a right not to be poor; they have a right to decent pay," said Senator McCain.

Pay problems only compound uncertainty fueled by the huge US military retrenchment, which will reduce the force by another 400,000 troops by 1998. "Many will be forced to leave the service so that domestic programs can be funded that will create fewer jobs than they destroy or fund programs with little or no benefit to either our economy or our security," the senator contended. These cutbacks, he noted, will have "a disproportionate effect on minorities, who have far fewer civilian opportunities."

These pressures are eroding the military's combat capability, claimed Senator McCain, who sits on subcommittees that deal with personnel and readiness. "No matter how dedicated and patriotic our men and women in uniform are, this already is having an impact on military readiness. Military capability is a function of morale even more than it is a function of material and technology. A military force is only as effective as its personnel, as their motivation, and as their career structure," he said. Recent testimony by the service chiefs indicates general agreement with the senator's assessment, suggesting that readiness is on the "ragged edge" and trending downward.

Deputy Secretary of Defense William Perry recently testified that providing a military pay raise in Fiscal 1994 could potentially harm readiness even more. A raise, he argued, would cost anywhere from $700 million to $1 billion in outlays. In combination with other potential shortfalls, DoD could end up $5 billion short in outlays, money that would have to be made up by cutting other defense budget accounts. Likely sources, he said, include additional personnel cuts and reductions in operations and maintenance funding. "Actions such as these . . . would threaten the readiness, unit cohesion, and morale of America's armed forces," he said.

The cost of restoring a full cost-of-living pay raise, said Senator McCain, could be made up by cutting unneeded procurement spending. The amount—only about $1 billion to $3 billion a year—is modest, he argued, and well worth it. The former naval aviator suggested that killing "useless expenditures like paying $2.14 billion for a third Seawolf [submarine]" or protecting "one small part of the industrial base at the cost of over $3 billion for each new submarine . . . would largely eliminate the need for military pay cuts."

Senator McCain's arguments resonated among influential members of Congress. Rep. Ike Skelton (D-Mo.), chairman of the Military Forces and Personnel Subcommittee of the House Armed Services Committee, opposed the proposed pay freeze. A freeze, he said, "is absolutely the worst signal for the American people to send to military personnel at a time when they are being called on to do more with less and less, when the turmoil of downsizing continues ad infinitum, and when it seems like not a year goes by when we do not put sizable numbers of troops in imminent danger." Rep. John Murtha (D-Pa.), chairman of the House Appropriations Committee's Defense Subcommittee, also opposed the pay freeze and sought to provide funds for a raise in the FY 1994 defense appropriations bill. ■

Washington Watch

By James W. Canan, Senior Editor

Shooters in Space

Star Wars may not be as dead as it looks. The need to intercept ballistic missiles is intensifying. Control of space may be critical as well.

From the looks of things, space weapons are on their way out. Their development reached its zenith in the Strategic Defense Initiative, the Reagan Administration's program in pursuit of a space-oriented defense of North America against Soviet ICBMs. They went into decline as the cold war ended and the Soviet Union broke up, and now their downfall seems assured.

SDI, also known as "Star Wars," is no more. In its place at the Pentagon is the Ballistic Missile Defense program, focusing on the development of landbased antiballistic missiles (ABMs) for deployment at home and abroad. Space antiballistic missiles are on the shelf.

But maybe not forever. Reports of their death may be premature. They still have a substantial cheering section in the national defense arena. If their rooters are right about the mounting ballistic missile threat to the US, space weapons will almost certainly make a comeback.

The Air Force is in the vanguard of the space weapons constituency. Its leaders keep insisting that the US has no choice but to arm itself with spacebased ABMs. They also claim that the US must build and deploy antisatellite (ASAT) weapons to safeguard space systems crucial to the success of its combat forces, as Operation Desert Storm amply demonstrated. Without such weapons, the nation is headed for big trouble, the Air Force says.

Critics of space weapons contend that the Air Force argument went out with the cold war. They may have a point, but the argument sounds more and more like sweet reason in the face of the ballistic missile buildup now in progress around the world.

To be sure, there is no longer a monolithic Soviet Union to menace the US with swarms of ballistic missiles from land and sea and with well-tested, operational ASATs, but many other nations have such weapons—or the know-how to build such weapons—in hand or in store. Some also have, or are expected to acquire, warheads of mass destruction.

The Air Force's message: Spacebased ABMs would be the only weapons capable of intercepting oncoming ballistic missiles and reentry vehicles at the ranges—and in the numbers—required to keep friendly troops and home territory out of harm's way. Ground-launched ABMs cannot cover enough sky to do the whole job that will be required, and they should be deployed as stopgaps only.

A case in point is the landbased ABM system of missiles and radars planned for deployment in South Dakota in the mid- to late 1990s. Its interceptor missiles should be able to protect most of the continental US against a limited ICBM attack. Even at its utmost, though, that system will not fully cover the heavily populated US east and west coasts—the regions most likely to be targeted by terrorist nations bent on ballistic-missile blackmail—or Alaska and Hawaii. Additional ABM systems would have to be built elsewhere on US soil to fill the gaps.

Terrorizing Washington

A barrage of incoming ICBMs, warheads, and decoys would tax any given system of landbased ABMs to the extreme. All it would take to devastate the nation's capital, say, is one "leaker" with nuclear or chemical warheads. All it would take to terrorize the nation's capital—and likely the US at large—is the threat of such a leaker. The Iraqi Scud attacks on Israel, which riveted a worldwide TV audience through most of one night, are reminders enough.

USAF argues that space interceptors, in providing globe-girdling coverage of any and all ICBM launches against the US and its allies and overseas forces, would solve the bicoastal problem and then some.

Lt. Gen. Thomas S. Moorman, Jr., vice commander of Air Force Space Command, stated the case at an aerospace conference last spring in Washington. "On the defense side," he said, "space will ultimately have to play in ballistic missile defense. Groundbased, terminal defense just isn't going to be adequate for very long if the threat continues to grow like we think it will.

"Shooting warheads down over your own territory, after the [missiles] have deployed decoys and everything else, just doesn't pass the common sense test. If I shoot down a chemical warhead and disperse the contents within fifty miles of my defenses, whose cause have I helped, mine or my enemy's?"

The missile menace already has the makings of an international nightmare. Ballistic missiles are on the rise in more and more nations outside the former Soviet Union. They threaten US forces, allies, and interests in many regions and may very well threaten the US itself before this century is out. The need to erect ABM defenses, first overseas and then in the US, is no longer at issue and is regarded as increasingly urgent in national security circles.

This was the motivation for Defense Secretary Les Aspin's mid-May dismantling of SDI, a move that signaled, as he put it, "the end of the Star Wars era."

Mr. Aspin declared, "We have a different need for a ballistic missile defense—not the massive program of spacebased weapons that Ronald Reagan envisioned. Saddam Hussein showed us that we need a ballistic missile defense for our forces in the field. That threat is here and now. We have made theater ballistic missile defense our first priority to cope with the new dangers in the post–cold war, post-Soviet world."

Ballistic missiles have already been launched in anger—by Iraq and Iran in their war of 1982–88 and by Iraq against Israel and allied coalition targets in Saudi Arabia during the Persian Gulf War of early 1991.

Shot At by Scuds

Air Force Gen. Charles A. Horner, who commanded US and allied coalition air forces in that war, well remembers. "I was shot at by Scud missiles," he declares. "To me, that's the number one lesson learned from Desert Storm—that ballistic missiles are a threat, one we don't have the capability to defend against."

He recalls that "the debris fell on us" when US Patriot missiles shot down Scuds over allied coalition territory and that "we would have been in serious trouble" had the warheads in those Scuds contained "some obnoxious material," such as chemical agents, and had they been fuzed by the Patriot intercepts.

Currently in command of US Space Command, Air Force Space Command, and North American Aerospace Defense Command, General Horner has become a crusader for ABM systems, especially those in space that would be capable of "pushing the intercept envelope out over enemy territory."

Nowadays, he warns, "any nation can purchase weapons of mass destruction and the missiles to deliver them," and ICBM technology is accessible to any nation that can afford it. Much ICBM technology is the same as, or closely akin to, the technology of space-launch vehicles. This means that nations with boosters powerful enough to launch long-range ballistic missiles will also be able to launch space systems, such as communications satellites and surveillance satellites, that would greatly enhance their military power in the US mold.

"Imagine the consequences," says Gen. Merrill A. McPeak, Air Force Chief of Staff, "if Iraq had possessed a space reconnaissance capability in 1990. Saddam Hussein would have tracked the movement and disposition of our forces as we prepared to attack. Any element of surprise would have been lost, and many more American casualties would have resulted."

The Pentagon claims that more than forty nations now have space research and development programs and that at least one-third of them are operating full-up satellite systems or some sort of hardware on orbit.

The spread of ballistic missiles is a more immediate and pressing problem. Thirty-four nations now possess such missiles, including the former Soviet states of Russia, Ukraine, Belarus, and Kazakhstan. Russia has by far the most ballistic missiles, but Ukraine alone has more than 1,500, including 176 ICBMs. A dozen or so nations are developing new generations of ballistic missiles with advanced, highly accurate guidance systems.

A US Senate delegation returned from a trip to the former Soviet Union late last year warning of "the rising threat of an unauthorized launch" from that part of the world.

US officials expect Russia to continue developing new single-warhead ICBMs permitted under the START II Treaty, including land-mobile, silo-based, and submarine-launched varieties. There have been random reports that Russia has exported nuclear weapons on the sly. US officials say there is no evidence of this, but they acknowledge the live possibility.

Missiles Amok

Elsewhere around the globe, Iraq and Libya, among others, are clearly intent on acquiring missiles with enough range to reach North America, US officials claim. Just a few years into the next century, as many as fifteen Third World nations will be capable of deploying, or will have deployed, such missiles. Eight Third World nations will have nuclear weapons know-how, observers predict.

Nations bent on bullying their neighbors would not need ICBMs, nuclear or otherwise, to tip regional power balances in their favor. Relatively short-range ballistic missiles with powerful chemical or biological agents on their business ends would serve the purpose, as would such missiles with powerful, precision guided nonnuclear warheads.

Ballistic missiles make an impact without ever taking flight. Nations possessing them are in a position to intimidate and blackmail have-not neighboring nations. As such missiles and nuclear warheads proliferate, the blackmail factor will go global. For Third World nations, the ability to produce ballistic missiles will also be seen as proof of technological and industrial prowess and, thus, of economic as well as geopolitical power.

Among missile-muscular nations, North Korea is the most worrisome to the US and its Far East friends. North Korea's Scuds do not qualify as ICBMs but are a present danger to much of east Asia. They can easily reach South Korea and US forces and bases there. North Korea is said to be developing longer-range ballistic missiles capable of striking Japan.

Iran, modernizing its air, ground, and sea forces, reportedly is on the hunt for nuclear and ballistic-missile technologies in the West, in China, and in the states of the former Soviet Union. Iran is said to have stockpiled Scuds from Libya, Syria, and North Korea and may now be manufacturing them. Israel deployed the French-built 500-km Jericho ballistic missile in the late 1960s and has now developed the Jericho II missile with roughly three times as much range—enough to reach all Arab capitals and Tehran. All of Israel is well within range of Saudi Arabian, Syrian, and Iraqi ballistic missiles.

China, possessor of ICBMs that can reach the continental US, has sold a variety of missiles to several nations, including Silkworm antiship missiles to Iran and 3,000-km ballistic missiles to Saudi Arabia. Beijing agreed to honor the guidelines of the international Missile Technology Control Regime (MTCR) agreement, which constrains sales of medium-range and long-range ballistic missile systems and technologies, but US monitors of MTCR compliance are always on the lookout for Chinese exports that disregard it.

The Indian subcontinent fairly bristles with ballistic missiles. Bitter rivals India and Pakistan possess such missiles with sufficient range to strike each other's capitals. India, a member of the nuclear club, also fields an intermediate-range ballistic missile, the Agni, first tested in 1989. The 2,500-km Agni, technological cousin to India's sophisticated space-launch vehicles, can reach much of the territory of India's longtime adversary China.

South America has become a ballistic missile breeding ground. Brazil, among the top five arms-exporting nations, reportedly has developed and is marketing highly advanced ballistic missile technologies derived from those of its Sonda sounding rockets. Aided by western European aerospace companies, Argentina and Egypt have developed the Condor II ballistic missile with advanced guidance and propulsion systems akin to those of the very accurate US Pershing II missile.

US officials deem it likely that a number of Third World nations, including Iran and Libya, will build the infrastructure and acquire the technical expertise needed to build ICBMs and space-launch booster rockets over the next ten years.

In such a world, strategic nuclear deterrence, hallmark of the cold war superpower standoff, may no longer be sufficient protection against nuclear attack. Noting this, Mr. Aspin said, "We don't know whether a balance of terror will work with renegade states. That's why [we] need defense. Defense is not based upon balance of

power. Defense means you can protect yourself by shooting down an incoming missile."

Deadly Potential

Mr. Aspin has long been concerned about the deadly potential of rogue nations in possession of nuclear warheads and delivery systems. He saw Iraq's nuclear-weapons program as sufficient reason for US leadership in the Persian Gulf War and for air strikes on the Iraqi heartland. More than a year ago, as chairman of the House Armed Services Committee, he warned that the US may have to take military action, with international approval, against any number of Third World nations acquiring nuclear weapons.

The Defense Secretary's reorganization of the ballistic missile defense hierarchy to focus on the development of ground-launched interceptors is consistent with his stance while serving in Congress. Two years ago, he switched from opposition to support of antiballistic missiles. On his cue, the House broke with its past and authorized the development and procurement of ABMs, clearing the way for Congress to pass the Missile Defense Act of 1991 and for deployment of landbased ABMs in overseas operational theaters and in the US.

The Missile Defense Act put spacebased ABMs in abeyance. It provided only modest funding to continue the development of space rockets called Brilliant Pebbles, and even less for the development of high-power spacebased lasers. Thus it "knocked the 'star' out of 'Star Wars,' " an SDIO official said at the time.

Now, in signaling, as he put it, "the end of the Star Wars era," Mr. Aspin seems to have marked the end of the line for space weapons—but perhaps not. His end-of-SDI announcement dealt with the pacing of space weapons programs but pointedly did not slight their potential or rule them out in the long run.

"These changes," said the Defense Secretary, "represent a shift away from a crash program for deployment of spacebased weapons designed to meet a threat that has receded to the vanishing point—the all-out surprise attack from the former Soviet Union."

Following Mr. Aspin's announcement, one national television news anchorman summarily proclaimed that "the US has given up the idea of putting weapons in space." Many space weapons champions share that view. They go so far as to accuse the Clinton Defense Department of forfeiting the nation's future security in abandoning the idea of an umbrella space defense.

Others who favor space weapons aren't so sure about that. Sensing Aspinian sleight of hand, they suspect that the Defense Secretary, a canny political operative on occasion, may have given SDI an alias and lowered its profile to hide it from political snipers, not to make it disappear. They see his motives as twofold—to clear the way for undistracted development of ground-launched interceptors and to buy time for the measured development of space-weapons technologies unburdened by Star Wars political baggage.

"What Aspin has done," says an Air Force space official, "is to politically back away from space weapons without actually doing anything to hinder their progress. They may even be in better shape than they were at the end of the Bush Administration."

The goals of the Ballistic Missile Defense Organization (BMDO) are, first, to develop and deploy landbased ABM missile systems to defend overseas theaters; second, ditto for landbased systems to defend the US. Its "third priority," said Mr. Aspin, "will be the follow-on technologies that offer some promise in both tactical and strategic defense," including space-weapons technologies. "The [BMDO] program will shift from research to the development and acquisition of systems," he asserted.

Promoting Brilliant Pebbles

The Brilliant Pebbles space-weapons program had been losing momentum ever since the Missile Defense Act of 1991 swung the Pentagon more in the direction of landbased ABMs. Early this year, the Air Force tried to persuade Mr. Aspin to give Brilliant Pebbles new life and to look more favorably on space weapons in general.

General Horner led the way. In a letter to Mr. Aspin and in congressional and public forums, the US military space boss appealed for the development of space ABM and ASAT weapons. He predicted that the ballistic missile threat will worsen and warned that North America could come under the gun within ten years.

"Ultimately we could face an undeterrable adversary with nuclear ICBMs," General Horner declared.

He also proposed that the US collaborate with other nations, notably Russia, in developing international ABM systems. Such systems would enable participating nations to eliminate or sharply reduce their nuclear arsenals, he contended.

"Ballistic missile defense is fundamental to modern warfighting and . . . to getting rid of the scourge of nuclear weapons," General Horner asserted.

"I get into a little trouble when I talk about the spacebased aspects of ballistic missile defense," he said. "Some people argue that they don't want weapons in space. I understand that. I don't want weapons in space, either. The trouble is, [those people] miss the point. The real weapon in space is the warhead on the ballistic missile. The interceptor in space is the 'anti-weapon.' It is not a weapon against people on Earth. It is to defend people on Earth from the weapons in space."

Air Force leaders warn that the space arena will soon be up for grabs and that the US must take steps to defend its vital assets—satellites providing communications, reconnaissance, surveillance, weather, and navigation data—in that so-called "fourth combat medium." They maintain that the US must also have the means of preventing hostile nations from employing space systems for warfighting purposes.

More and more nations are developing or employing space systems. Many without indigenous space programs now have, or are expected to gain, access to the communications and remote-sensing databases of spacefaring nations, including the US. "As many as thirty countries may have some sort of spaceborne remote sensing capability by the end of this decade," General McPeak predicted.

At the moment, US ASATs seem out of reach. The Army killed its program for a ground-launched ASAT last May, coincidental with the demise of SDI. The Air Force, under budget pressure, had previously scrapped its development of a fighter-launched ASAT.

To all appearances, the pleas of Air Force leaders in behalf of space weapons went for nothing in Defense Department decision-making domains. ASATs are unmentionables. Brilliant Pebbles has been turned into a no-name, no-urgency technology exploration program.

There are indications, though, that the Air Force got through to Mr. Aspin more effectively than meets the eye. He reportedly passed the word that the slowdown of spacebased ABMs, on which the Pentagon has spent a cool $8 billion plus over the last ten years, should not be seen as their abandonment.

Air Force leaders kept their peace about space weapons in the immediate aftermath of Mr. Aspin's move against SDI. They let it be known, however, that they had no intention of backing away from those weapons, that they would resume sounding off, and that world events would eventually bear them out. ■

Aerospace World

By Frank Oliveri, Associate Editor

Aspin Names "Invasion Stoppers"

Future US forces must rapidly stop an invasion in order to achieve victory and limit the damage from an all-out enemy attack. So said Defense Secretary Les Aspin in a speech at National Defense University, where he unveiled a key conclusion of his "Bottom-Up Review" of defense plans.

Mr. Aspin outlined a four-part plan to halt an attack—"two parts low-tech, two parts high-tech." The low-tech parts are airlift and prepositioning of war supplies. The high-tech parts are smart antitank munitions and "electronic battlefield surveillance."

History has shown that there is little time to deploy significant forces in time to stop an invasion. The US has repeatedly failed to anticipate attack. Because of this, the "high-tech" response is paramount.

Speed will be essential, he said, for three reasons. "First, the sooner we stop the invasion, the less likely will be the capture of critical facilities, such as ports, oil fields, or our ally's capital. Second, if the invasion is not stopped quickly, our ally might be driven to surrender, greatly complicating efforts to oppose the aggressor. Third, . . . the more progress the enemy makes and the more territory he captures, the greater the price to take it back."

Future air and missile forces will be able to destroy vast numbers of armored vehicles from air, land, and sea, he said, adding that Sensor-Fuzed Weapons that seek enemy targets could be deployed in B-2 bombers and F-15E and F/A-18 fighters. These and other weapons would be directed using sophisticated battlefield surveillance. In this respect, said Secretary Aspin, the Air Force's E-8 Joint STARS aircraft would be a key system.

General Sacked for Anti-Clinton Remarks

The Air Force ruled that Maj. Gen. Harold N. Campbell, Air Force Materiel Command's deputy chief of staff for Plans and Programs, violated Article 88 of the Uniform Code of Military Justice when he uttered disparaging remarks about President Clinton. He was asked to retire—and did—after receiving a severe written reprimand and a fine of about $7,000.

Article 88 proscribes public expressions of contempt by military personnel toward civilian leaders. General Campbell had criticized the President in a speech at Soesterberg AB, the Netherlands.

General Campbell is a highly decorated veteran of the Vietnam War, where he served two combat tours and flew 200 combat missions. In the wake of the sacking, Gen. Merrill A. McPeak, Air Force Chief of Staff, stated, "General Campbell has served his country honorably over a thirty-two-year career. However, General Campbell's conduct was wrong and cannot be tolerated. Speaking on behalf of the entire Air Force, we understand the need for absolute respect up and down the chain of command."

Congress Warned of Hollow Force

The Air Force's top personnel officer warned Congress that defense cuts have put the US on the road toward a "hollow force."

Lt. Gen. Billy J. Boles, deputy chief of staff for Personnel, used the politically charged term in May testimony before the Senate Armed Services Committee. He meant that the United States may suffer a repeat of the late 1970s, when US forces superficially seemed strong but in fact had been hollowed out and lacked necessary training, parts, and supplies.

General Boles addressed the danger that the military might lose a key ingredient of success—high-caliber men and women.

"Today," said the General, "we're asking these high-quality people to stay in an organization that promises them long hours, family separations, base closings, uncertain career tenure, a pay freeze next year, and pay caps the next two or three years."

General Boles said those who wanted to separate have left and those who remain want to stay. He added that it is likely that 5,500 troops will have to be retired or separated in 1994.

While Air Force personnel are upbeat, "they're worried, too," General Boles said. "To a greater or lesser

In a demonstration this spring comprising six test flights, an F-16 from Eglin AFB, Fla., delivered precision guided munitions. The tests evaluated technologies for the Joint Direct Attack Munition program. Above, the first PGM, equipped with an Inertial Navigation System/Global Positioning System guidance unit, is released.

degree, each of them is anxious about a myriad of issues and changes happening all around them, which they believe they have no control over. . . . I'm afraid we could lose this precious, positive morale in the very near future if we're not careful."

McPeak Views Balkan Operations

General McPeak, USAF Chief of Staff, flew on a C-130 mission from Aviano AB, Italy, to Sarajevo, Bosnia, and then flew with the 37th Airlift Squadron out of Rhein-Main AB, Germany, on an airdrop mission over the war-torn region.

The May missions were a part of the General's on-scene evaluation of the Air Force's Operation Provide Promise. Through mid-June, the US had flown 1,240 missions into Sarajevo, delivering 14,275 tons of supplies since flights began in July 1992. Some 5,064 tons of food and medical supplies have been airdropped into the region in 655 additional flights.

"It's hard to translate to laymen how hard these drops are when you consider how small the drop zones are," General McPeak said. "[The crews] are using every bit of talent, skill, and training."

Troops Rescue Icelandic Fisherman

The crew of an Air Force rescue helicopter, flying 250 miles out to sea, located an ailing Icelandic fisherman, plucked him from his boat, and transported him to a hospital in Reykjavik.

The man was suffering from internal bleeding. After he was stabilized, he was brought topside from three levels below deck. The thirty-six-year-old fisherman was listed in critical condition in the intensive care unit six hours after arriving at the hospital. He later recovered.

The May rescue was the third save by an Air Force helicopter crew this year. Capt. Thomas Couch, pilot of the 56th Air Rescue Squadron's HH-60, said the evacuation went smoothly: "We had great crew coordination, good weather, and tanker and communications help from an HC-130 aircraft crew" of the 71st Rescue Squadron, whose home base is Patrick AFB, Fla.

SrA. Charles Stiefken, a pararescueman, and Navy Lt. Joseph Costa, a flight surgeon, said their first rescue went much as their training led them to expect.

"At first, when being lowered down the swinging cable to the rolling ship, I couldn't help but hope I didn't get smashed against the bow," Airman Stiefken said. "But I was able to quickly focus on the job and run through a mental checklist of how to treat the patient."

Other crew members were copilot Capt. Bernard Willi, flight engineer Sgt. Paul Balcom, and pararescueman SSgt. Lee Shaffer.

ACC Names B-2 Pilots

Gen. John Michael Loh, commander of Air Combat Command, selected eight pilots to fly operational B-2 bombers. The first B-2 pilots will be assigned to the 509th Bomb Wing at Whiteman AFB, Mo., which will become the home of the Stealth bomber.

The first two B-2 pilots, Lt. Col. Tony Imondi and Lt. Col. John Belanger, are flight-testing the B-2 at Edwards AFB, Calif., where they are temporarily assigned to the combined test force as operational test and evaluation pilots. They will form the initial instructor pilot cadre, joined by Capt. Jimmy D. Smithers and Capt. Richard Vanderburgh, who are assigned to Edwards as B-2 aircrew training system development managers. Captain Smithers is scheduled to enter B-2 pilot training in July, followed by Captain Vanderburgh.

The other four pilots are Maj. James F. Whitney Jr., B-2 program element manager, Washington D. C.; Capt. David L. Anderson, chief, B-1B evaluation flight, McConnell AFB, Kan.; Capt. Steven M. Tippets, F-16 flight commander, Mountain Home AFB, Idaho; and Capt. Paul S. Land, B-2 aircrew training system development manager, Edwards AFB. These four will be trained by the initial instructor pilot cadre in the first formal B-2 qualification course at Whiteman AFB in early 1994.

US Halves Europe Strength

By the end of 1993, US force strength in Europe will have dropped to 162,000 personnel—about fifty percent of what it was before the current defense drawdown began, said Gen. Charles G. Boyd, the deputy commander in chief of US European Command.

Today US military strength stands at about 173,000 personnel (105,000 Army, 55,000 Air Force, and 13,000 Navy), or fifty-three percent of original forces. The additional 11,000 US troops will be withdrawn by October 1. The goal is to have no more than 100,000 US troops in Europe at the end of 1996.

General Boyd told the House Armed Services Committee's Subcommittee on Readiness that the US has made large reductions in its European basing infrastructure. He stated that realignment and closure have affected 649 sites, or about forty-seven percent of the total occupied at the start of the drawdown in January 1990. The US plans to return 585 bases fully to host nations, partially return sixty, and place four in standby status.

Joint STARS Evaluation?

The General Accounting Office, an arm of Congress, claims that the US needs another overall review of the Air Force E-8A Joint STARS battlefield surveillance plane. The Pentagon does not fully agree with that assessment.

The E-8A issue turns on the need, if any, for a special kind of Pentagon review, called a Cost and Operational Effectiveness Analysis. A GAO report claims that the COEA for the Joint STARS program no longer can be considered valid because it was done in 1985. The agency contends that such factors as the threat, likely operational environment, and cost estimates have changed in the interim.

Frank Kendall, DoD's director of Tactical Systems, said that the Pentagon agreed with some of GAO's findings but disagreed with others. While he agreed that the European theater has changed since 1985, Mr. Kendall argued that the changes do not invalidate the earlier analysis. He said DoD officials are reviewing the need for another analysis. Under Secretary of Defense for Acquisition John M. Deutch approved low-rate production of the E-8A in May.

B-52Hs Modified for New Role

In June, the first B-52H to be modified for a conventional role was delivered to Boeing Defense & Space Group in Wichita, Kan. Installation of the conventional enhancement modification program began immediately.

The program provides for the transfer of the conventional capability of B-52Gs, which are being retired, to the H models of the venerable long-range bomber. The modification will enable the H to accommodate Have Nap and Harpoon missiles and the universal bomb bay adapter. The new version of the B-52G will sport integrated conventional stores management and Global Positioning System terminals.

Banked but Not Forgotten

"Banked" pilots who have little or no access to active flying missions but who wish to keep their skills fresh are getting help from local Air Force Reserve and Air National Guard units.

Three USAF second lieutenants—Chris Colley, Jason Crandall, and John Miner—completed pilot training at Columbus AFB, Miss., in December 1992

but found no pilot openings. They were assigned as acquisition officers at Standard Systems Center at Maxwell AFB, Gunter Annex, Ala.

They are staying in flying trim by working with the 187th Fighter Group, part of the Alabama ANG, which operates F-16A fighters. The three banked lieutenants have taken part in tactical reconnaissance and air-superiority missions.

Col. Scott Mayes, commander of the 187th, said, "We try to offer these young flyers the opportunity to maintain a connection with the flying business so they're ready to fly when their tour ends at SSC."

High Tempo Pinches Reserve

The high operational tempo of the Air Force Reserve may take a toll on recruiting and retention efforts, the Chief of the Air Force Reserve said.

Maj. Gen. John J. Closner III told the House Armed Services Committee that Reservists are exceeding the regular minimum of thirty-nine training days per year, averaging eighty days. Reserve aircrews served from 100 to 175 days.

"Pressures from families and employers will eventually have an effect, and we will lose good people," General Closner said.

Civilian Dress OK for Some Flights

Air Force personnel can now wear civilian clothes when traveling on DoD-owned or -controlled planes flying on international routes, the service announced in May.

The announcement noted that clothing still should be neat, clean, and appropriate for the occasion and the customs of the foreign destination. The service said examples of inappropriate attire include ripped, torn, frayed, or patched clothing; tank tops, shorts, short shirts, undergarments worn as overgarments, swimsuits, and sandals; and any garments that are revealing or bear obscene, profane, or lewd words or drawings.

Air Force grooming regulations have not changed and still apply. Uniforms still must be worn on domestic flights.

Recruit Quality Dips

The Defense Department has begun to worry about the caliber of new recruits now entering the four armed forces, said a top Pentagon personnel official.

Air Force Lt. Gen. Robert M. Alexander, deputy assistant secretary of defense for Military Manpower, was acting assistant secretary during Senate testimony in May. He told the Senate panel that the quality of recruits has declined.He noted that the Pentagon uses special indicators in assessing the quality of the force. Recruits with a high school diploma who score above average on the Armed Services Vocational Aptitude Battery (in categories I–IIIA) are most desired. Such recruits tend to stay in service longer and perform better.

In 1993, General Alexander said, "quality has declined somewhat." High school diploma graduates in categories I–IIIA dropped from seventy-four percent of recruits during 1992 to sixty-four percent in the first half of 1993.

Medical Benefits Erode

Despite the Pentagon's aggressive management effort to protect health-care benefits, uniformed personnel perceive a gradual erosion in benefits, a top Pentagon medical official said in May.

Rear Adm. (Dr.) Harold M. Koenig, deputy assistant secretary of defense for Health Affairs, said that confusion regarding health-care benefits contributes to the perception.

"It's a very painful thing for us . . . to answer the mail about entitlements," Dr. Koenig told the House Armed Services Committee's Subcommittee on Military Forces and

Personnel. He said military personnel must constantly be reminded that the defense health program is subject to changes in the law.

"There is a problem here of interpretation," said the Admiral. In the services, there is "medical care for life," he explained, "but that easily gets reinterpreted as free medical care for the rest of your life. We spend an incredible amount of effort trying to reeducate people that that isn't their benefit."

The medical portion of the Pentagon's proposed $250.7 billion 1994 budget is $15.3 billion, a 2.4 percent reduction from the amount allocated in 1993.

Some $9.4 billion of the amount covers the Defense Health Program Appropriation, funding medical operations and maintenance. CHAMPUS is funded at $9.1 billion and procurement at $273 million.

CHAMPUS Will Pay More

Following a recent policy change, CHAMPUS will pay more civilian healthcare costs for those covered by a health maintenance organization.

This translates into fewer out-of-pocket expenses for families when an HMO limits the reimbursement on certain types of treatment. CHAMPUS at one time could not pay the difference in some cases, which left families using HMOs responsible for payment.

HMOs are now considered identical to primary health insurance coverage, meaning that CHAMPUS can share the cost of HMO care, including user fees after the HMO has paid its share of medical costs. CHAMPUS will share the cost of only the part of the fee not covered by the HMO. This would include emergency services received outside the HMO's normal service area.

People whose claims were submitted before March 3 and processed under the old rules can ask CHAMPUS contractors to reprocess or adjust their claims involving HMO coverage.

New Uniform Policy

The second line of two-line name tags will be deleted after October 31 as one of a number of changes approved by the Air Force Uniform Board.

Individuals must cover the cost of the changes.

Air Force Chief of Staff Gen. Merrill A. McPeak also approved proposals to:

- Adopt the Marine Corps–style women's neck tab, which has a hook-and-pile fastener underneath the back of the collar.
- Develop, fit, and wear-test new women's pants.
- Replace the fastener of men's and women's cummerbunds with a metal fastener with adjustable elastic on both sides instead of the current hook-and-pile closure.
- Authorize an optional long-sleeve black turtleneck shirt under the Battle Dress Uniform.
- Allow individuals to tie in a knot and tuck inside the ribbon on the back of the Security Police beret.
- Reposition the aircrew-style name patch half an inch above the left breast pocket on BDUs and field jackets.
- Return officer collar rank and enlisted sleeve chevrons to BDUs when the aircrew-style name patch is worn.
- Establish "wear-no-earlier-than" dates as new uniform items are introduced into the inventory.

Senior Staff Changes

RETIREMENTS: M/G Donald G. **Hard;** L/G John E. **Jaquish;** B/G Owen W. **Lentz;** M/G David C. **Morehouse;** B/G Jimmey R. **Morrell;** M/G Richard D. **Smith;** L/G Richard J. **Trzaskoma.**

CHANGES: M/G James G. Andrus, from C/S, AFSOUTH, NATO, Naples, Italy, to Cmdr., 3d AF, USAFE, RAF Mildenhall, England, replacing M/G Charles D. Link . . . **B/G (M/G selectee) Richard C. Bethurem,** from Comdt. of Cadets, USAF Academy, Colorado Springs, Colo., to Dir., Plans, DCS/P&O, Hq. USAF, Washington, D. C., replacing M/G (L/G selectee) John G. Lorber . . . **B/G Billy J. Bingham,** from Dir., Intel., J-2, Hq. PACOM, Camp H. M. Smith, Hawaii, to Ass't Dep. Dir., Ops., NSA, Fort Meade, Md., replacing M/G (L/G selectee) Thad A. Wolfe . . . **B/G Sebastian F. Coglitore,** from Cmdr., 30th Space Wing, AFSPACECOM, Vandenberg AFB, Calif., to Dir., Space Prgms., Ass't Sec'y of the Air Force for Acquisition, OSAF, Washington, D. C., replacing retired M/G Donald G. Hard . . . **M/G William B. Davitte,** from Special Ass't to DCS/Personnel, Hq. USAF, Washington, D. C., to Dir., Personnel Plans, DCS/Personnel, Hq. USAF, Washington, D. C., replacing B/G (M/G selectee) Charles T. Robertson, Jr.

M/G Thomas E. Eggers, from Dep. CINC, Hq. USSOC, MacDill AFB, Fla., to Spec. Ass't for Mobility Modernization, Hq. AMC, Scott AFB, Ill. . . . **B/G Patrick K. Gamble,** from Cmdr., 58th FW, ACC, Luke AFB, Ariz., to Comdt. of Cadets, USAF Academy, Colorado Springs, Colo., replacing B/G (M/G selectee) Richard C. Bethurem . . . **B/G Jeffrey R. Grime,** from Dep. Dir., Legislative Liaison, Hq. USAF, Washington, D. C., to Cmdr., 4th Wing, ACC, Seymour Johnson AFB, N. C., replacing B/G (M/G selectee) Eldon W. Joersz . . . **B/G John W. Handy,** from Cmdr., TACC, Hq. AMC, Scott AFB, Ill., to Dir., Ops. and Log., J-3/J-4, Hq. USTRANSCOM, Scott AFB, Ill., replacing M/G Edwin E. Tenoso . . . **B/G Hal M. Hornburg,** from Dir., Ops., DCS/P&O, Hq. USAF, Washington, D. C., to Vice Dir., Operational Plans and Interoperability, J-7, Joint Staff, Washington, D. C.

B/G Howard J. Ingersoll, from Cmdr., 62d AW, AMC, McChord AFB, Wash., to Cmdr., 60th AW, AMC, Travis AFB, Calif., replacing B/G John B. Sams, Jr. . . . **B/G (M/G selectee) Eldon W. Joersz,** from Cmdr., 4th Wing, ACC, Seymour Johnson AFB, N. C., to C/S, AFSOUTH, NATO, Naples, Italy, replacing M/G James G. Andrus . . . **M/G Charles D. Link,** from Cmdr., 3d AF, USAFE, RAF Mildenhall, England, to Dir., Plans and Policy, J-5, Hq. USEUCOM, Stuttgart-Vaihingen, Germany, replacing retiring M/G John M. Davey . . . **B/G Lance W. Lord,** from Cmdr., 90th MW, ACC, F. E. Warren AFB, Wyo., to Cmdr., 30th Space Wing, AFSPACECOM, Vandenberg AFB, Calif., replacing B/G Sebastian F. Coglitore . . . **Col. (B/G selectee) Richard C. Marr,** from Cmdr., 43d ARW, AMC, Malmstrom AFB, Mont., to Cmdr., 62d AW, AMC, McChord AFB, Wash., replacing B/G Howard J. Ingersoll.

Col. (B/G selectee) John F. Miller, Jr., from Exec. Officer to the C/S, Hq. USAF, Washington, D. C., to Cmdr., 49th FW, ACC, Holloman AFB, N. M., replacing B/G (M/G selectee) Lloyd W. Newton . . . **B/G (M/G selectee) Lloyd W. Newton,** from Cmdr., 49th FW, ACC, Holloman AFB, N. M., to Dir., Ops., J-3, Hq. USSOC, MacDill AFB, Fla., replacing M/G William A. Studer . . . **B/G (M/G selectee) Tad J. Oelstrom,** from Cmdr., 86th FW, and Cmdr., Kaiserslautern Mil. Community, Hq. USAFE, Ramstein AB, Germany, to Vice Cmdr., 9th AF, ACC; and Dep. Cmdr., USCENTAF, Shaw AFB, S. C., replacing retired B/G Harold H. Rhoden . . . **Col. (B/G selectee) Jeffrey S. Pilkington,** from Dep. Dir., Ops., Hq. USAFE, Ramstein AB, Germany, to Cmdr., 86th FW, and Cmdr., Kaiserslautern Mil. Community, Hq. USAFE, Ramstein AB, Germany, replacing B/G (M/G selectee) Tad J. Oelstrom . . . **B/G (M/G selectee) Charles T. Robertson, Jr.,** from Dir., Personnel Plans, DCS/Personnel, Hq. USAF, Washington, D. C., to Vice Dir., Joint Staff, Washington, D. C.

B/G John B. Sams, Jr., from Cmdr., 60th AW, AMC, Travis AFB, Calif., to Cmdr., TACC, Hq. AMC, Scott AFB, Ill., replacing B/G John W. Handy . . . **B/G Raymond A. Shulstad,** from Vice Cmdr., ESC, AFMC, Hanscom AFB, Mass., to Vice Cmdr., ASC, Hq. AFMC, Wright-Patterson AFB, Ohio, replacing B/G Dennis K. Hummel . . . **B/G Floyd K. Tedrow,** from Cmdr., Chanute TTC, ATC, Chanute AFB, Ill., to Dir., Log. and Security Assistance, J-4, Hq. PACOM, Camp H. M. Smith, Hawaii . . . **M/G Edwin E. Tenoso,** from Dir., Ops. and Log., J-3/J-4, Hq. USTRANSCOM, Scott AFB, Ill., to Dir., Ops., DCS/P&O, Hq. USAF, Washington, D. C., replacing B/G Hal M. Hornburg . . . **Col. (B/G selectee) Gary A. Voelliger,** from Cmdr., CADRE, Hq. AU, Maxwell AFB, Ala., to Cmdr., 43d ARW, AMC, Malmstrom AFB, Mont., replacing Col. (B/G selectee) Richard C. Marr.

SENIOR EXECUTIVE SERVICE (SES) CHANGES: Louis K. Dumas, from Dir., Tech. and Industrial Support, Sacramento ALC, AFMC, McClellan AFB, Calif., to Exec. Dir., Sacramento ALC, AFMC, McClellan AFB, Calif. . . . **Alan K. Olsen,** from Assoc. Dir., Maintenance, Hq. USAF, Washington, D. C., to Dir., AFBDA, Arlington, Va. . . . **Ronald L. Orr,** from Dir., Tech. and Industrial Support, Ogden ALC, AFMC, Hill AFB, Utah, to Assoc. Dir., Maintenance, Hq. USAF, Washington, D. C., replacing Alan K. Olsen . . . **Gerald L. Yanker,** from Dep. Dir., Log., Hq. AFMC, Wright-Patterson AFB, Ohio, to Exec. Dir., Oklahoma City ALC, AFMC, Tinker AFB, Okla. ■

Pentagon Forms Readiness Panel

Secretary of Defense Aspin formed a task force in May to monitor readiness during the US military drawdown.

The Pentagon chief said, "Right now, we've got the best, most ready force in the world; Operation Desert Storm showed that. To keep it that way, we're going to have to do something that has proved very, very difficult in the past: . . . maintain readiness during a major drawdown of our forces."

The task force was formed to help Mr. Aspin understand readiness issues, but it will not take responsibility away from the services. The service chiefs will be consulted as the panel draws on all sources when gathering advice for Mr. Aspin. Even so, the announcement came as a surprise to the six members of the Joint Chiefs of Staff, who had not been informed of the purpose of the panel. Mr. Aspin later called this "an oversight."

Former Army Chief of Staff Gen. Edward C. Meyer, who in the late 1970s coined the evocative term "hollow force" to describe the faltering state of his service, will chair the panel.

Other members of the panel: Gen. Larry D. Welch, USAF (Ret.), former Air Force Chief (1986–90); Gen. Maxwell Thurman, USA (Ret.), former commander in chief of US Southern Command; Gen. Joseph J. Went, USMC (Ret.), former Assistant Marine Corps Commandant; Adm. Robert Long, USN (Ret.), former commander in chief of US Pacific Command; Gen. Julius Beckton, USA (Ret.), former commanding general of the Army's VII Corps; and Lt. Gen. Herbert Temple, USA (Ret.), former chief of the National Guard Bureau.

Mission Capable Rates to Worsen

Air Force Materiel Command has succeeded in reducing the size of its equipment inventory. However, that success will have a negative impact on the Air Force's fighting capabilities.

That is the gist of recent testimony by AFMC Commander Gen. Ronald Yates to the Senate Armed Services Committee's Subcommittee on Military Readiness and Defense Infrastructure.

"The congressional emphasis on inventory reduction is understood," he said. "We've taken it to heart and have achieved significant reductions. However, we are not sufficiently able to replace condemned parts needed to support our existing structure."

Restrictions limit the command's ability to buy consumable repair parts to fix assets at its depots or wings. General Yates predicted that mission capability will drop by about six percent by Fiscal 1995–96, "but the drops become greater with each passing year of restrictions," he said.

20,000 Troops Venture Forth

Ocean Venture 1993, an exercise that included more than 20,000 US service members and forces from Britain, France, and the Netherlands, took place in May around the island of Puerto Rico.

The forces simulated an attack from the sea and sky against an imaginary enemy. US forces included units from Air Combat Command's 8th, 9th, and 12th Air Forces, the Second Marine Expeditionary Force, the Army's XVIII Airborne Corps, the Navy's Second Fleet, US Transportation Command, and the US Coast Guard.

USAF and US Navy pilots flew battlefield air interdiction and air-superiority missions for the landings. Air Force aircraft also provided command and control for the paratroopers and strategic airlift to bring in friendly forces.

Titan Booster Completes Test

The Air Force successfully test-fired the Titan IV Solid Rocket Motor Upgrade booster in June at the Phillips Laboratory Astronautics Directorate at Edwards AFB, Calif.

The test, the fourth in a series of five, lasted 140 seconds, generated energy equaling 1.7 million pounds of thrust, and was conducted with the booster's internal temperature stabilized at 90° Fahrenheit prior to firing. With the upgrade, the Titan IV will be more reliable and will increase its lift capability by twenty-five percent.

Judge Advocate Awards Announced

The Air Force has announced the winners of the 1992 Judge Advocate General Awards.

Maj. Keith J. Klein, Bolling AFB, D. C., will receive the Albert Kuhfeld Award for Judge Advocate of the Year; Lt. Col. Lester W. Shiefelbein, Los Angeles AFB, Calif., the Reginald C. Harmon Award for Reserve Attorney of the Year; Lyndon B. James, RAF Mildenhall, England, the James O. Wrightson, Jr., Award for Civilian Attorney of the Year; Sentiff C. Busby, Maxwell AFB, Ala., the Harold R. Vague Award for Legal Services Civilian of the Year; SSgt. Cherri A. Duval, Moody AFB, Ga., the Steve Swigonski Award for Paralegal Airman of the Year; and TSgt. Dorothy E. Bowman, Shaw AFB, S. C., the David Westbrook Award for Reserve Paralegal of the Year.

USAF Selects Master Sergeants

The Air Force selected 6,319 technical sergeants for promotion to master sergeant during the most recent cycle. A total of 31,125 were considered, making the overall selection rate 20.3 percent.

The average score for selectees was 338.29 points, based on 34.6 points for time in grade, 33.08 points for time in service, 132.41 points for performance reports, 8.21 points for decorations, 66.34 points for the promotion fitness examination, and 71.76 points for the specialty knowledge test.

Average time in grade was 4.52 years, and average time in service was 15.29 years.

Two F-16s Crash, One Pilot Dies

F-16s crashed in two separate incidents on May 18. One pilot ejected safely, but the other was killed in the crash.

Capt. Luis F. Jordan of the 18th Fighter Squadron at Eielson AFB, Alaska, died when his F-16C crashed in a remote area sixty miles east of the base.

Maj. Scott G. Anderson of the 422d Test and Evaluation Squadron at Nellis AFB, Nev., suffered minor injuries after ejecting safely from his F-16, which crashed about forty miles northeast of Las Vegas.

Both were on training missions. Both incidents are being investigated.

USAF Develops New Listing

The Air Force is developing a new enlisted quarterly assignment listing system to improve advertisement of special-duty positions and other unique enlisted assignments, the service said in May.

Equal Plus should be ready for testing this summer and should expand the capabilities of the Equal System, which is currently being used. The original program was designed primarily for rotational assignments, but it did not work well for advertising special-duty positions or unique requirements.

Equal Plus will contain the following information: Air Force Specialty Code; required rank; duty titles; special-duty name and code; reporting date, location, tour type, qualifications, and application procedures; job or requisition numbers; and volunteer-by date.

NASA F/A-18 Makes Test Flight

A NASA F/A-18, modified to test the newest and most advanced system technologies for civilian and military aircraft, made its first research flight on May 21 at NASA's Ames Dryden Flight Research Facility, Edwards AFB, Calif.

The flight tested an electric actuator that has two small computers to monitor the position and control of one of the aircraft's ailerons. The actuator takes signals from the aircraft's flight-control computer and translates them into mechanical actions that move control surfaces, such as flaps, ailerons, and rudders. The new smart actuator should require less wiring and will be more reliable than the existing mechanical actuators.

Later the aircraft program will look at the use of optical systems on future aircraft.

Reserve Changes Approved

The Air Force Reserve will gain its first B-52 bomber associate unit and modernize its F-16 fighter fleet as part of recent force-structure changes.

Nearly forty percent of the Reserve's flying units will feel the impact of the recent moves, which include relocating two out of three KC-10 associate units, converting one F-16 fighter unit to KC-135 tankers, eliminating the Reserve A-10 fighter-training school, moving one C-130 airlift group, changing C-130 aircraft authorizations at four locations, and changing C-141 aircraft authorizations at two locations. In addition, five aerial port units and one aeromedical evacuation squadron are scheduled to inactivate in mid-1993.

News Notes

- In May, SMSgt. Stevan E. Cross of Travis AFB, Calif., was named 1993 Air Force First Sergeant of the Year. Sergeant Cross, of the 60th Aerial Port Squadron, was recognized for outstanding work and leadership qualities exhibited as a first sergeant. He is authorized to wear the Air Force recognition ribbon.
- The Air Force completed its fourth consecutive successful flight test of the production AGM-130 Standoff Weapon System in May. The Rockwell-built weapon was launched from an F-15E at Eglin AFB, Fla., from an

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altitude of 3,000 feet at 500 knots true airspeed, 14.5 nautical miles away from a simulated command-and-control center target.

■ NASA's Magellan spaceprobe dipped into the atmosphere of Venus in May in a first-of-its-kind aerobraking maneuver, lowering the spacecraft's orbit so that it could start a new experiment. The aerobraking technique used the drag created by Venus's atmosphere to slow the spacecraft and send Magellan into a circular orbit.

■ Defense Secretary Les Aspin appointed Paul G. Kaminski chairman of the Defense Science Board for a term that began on May 14 and will run until December 31, 1995. Mr. Kaminski succeeds John S. Foster, Jr., who had served as chair of the DSB since January 1990. The board advises the Secretary of Defense, the Chairman of the Joint Chiefs of Staff, and the under secretary of defense for Acquisition on scientific, technical, manufacturing, and other matters.

■ The Air Force said in May that it plans to realign its intelligence community by redesignating Air Force Intelligence Command at Kelly AFB, Tex., as a field operating agency and combining its operations with those of the Air Force Intelligence Support Agency, currently headquartered in Washington, D. C. The new agency will be headquartered at Kelly.

■ In May, Joint Chiefs of Staff Chairman Gen. Colin L. Powell approved the Armed Forces Expeditionary Medal for Operation Restore Hope. The established opening date for those eligible is December 5, 1992. No closing date has been determined. The area of operations for Operation Restore Hope is defined as the total land area and airspace of Somalia; that portion of Kenya's land area and airspace east of 38° east longitude; the Gulf of Aden; and the portion of the Indian Ocean north of 5° south latitude and west of 55° east longitude.

■ A Patriot missile with an enhanced guidance system hit a surrogate tactical ballistic missile target in May at the White Sands Missile Range in New Mexico, said Raytheon Corp. The test was the second of three for the enhanced Patriot.

Purchases

■ The Air Force awarded Lockheed Corp. a $68.2 million cost plus fixed-fee contract for the Global Positioning System to be added to the F-117 Ring-Laser Gyro Navigation Improvement Program. Expected completion: September 1996.

The Air Force awarded CFM International, Inc., a $187 million firm fixed-price contract for a total of fifty-nine F108-CF-100 engines (fifty-six installed, three spares) for use on KC-135R aircraft. Expected completion: February 1996.

The Air Force awarded Lockheed Fort Worth Co. an $11 million cost plus fixed-fee contract for development and demonstration of the Have Yak counter–cruise missile technology for use on F-15 and F-16 air defense fighters. Expected completion: June 1996.

Obituary

Donald K. "Deke" Slayton, one of the original Mercury astronauts, who took part in the historic rendezvous with a Soviet Soyuz 19 spacecraft, died of cancer in June at his League City, Tex., home. He was sixty-nine. Mr. Slayton, an Air Force major, was a combat veteran of World War II. Just before he would have become the fourth US astronaut to fly through space, physicians found a mild irregular heart palpitation that grounded him for eleven years. He eventually passed a physical in 1970 that allowed him to return to flight status; in 1975 he took part in the historic docking. He is survived by his wife, son, and two grandchildren. ■

The Air Force is braced for more cuts, although it is hard to figure where to take them.

Forty Percent Down—and Dropping

By Robert S. Dudney, Executive Editor

Falling Force Structure

Force Element	1992	1993	1994	+/-
Fighter wings, active-duty	16.3	16.1	13.3	-3.0
Fighter wings, Guard and Reserve	13.4	12.3	11.0	-2.4
Long-range bombers	242.0	201.0	191.0	-51.0
Strategic missiles	912.0	787.0	667.0	-245.0

BY MOST standards—level of outlays, troop strength, inventories, force structure—the modern Air Force buildup peaked around 1986 or 1987. The service has now absorbed six straight years of cuts. Its budget has plunged forty percent, for a real drop of more than $50 billion from Reagan Administration highs.

Air Force leaders are bracing for additional austerity, though it is hard to see where they can cut the basic program much more.

Take, for example, the active-duty aircraft inventory. The service has lost 2,036 of the 7,245 airplanes it had in 1987, or twenty-eight percent of the fleet. Over the same period, the Air Force parted with one-third of its active-duty fighter force structure, forty percent of its heavy bomber fleet, and a quarter of its intercontinental ballistic missile force.

Air Force active-duty strength has dropped to 445,000 troops, down 162,000 from 1987's cold war high of 607,000, for a net loss of one out of every four airmen. The Air Force has closed or soon will close eighteen US air bases. It has shut down twenty-two big overseas installations, bringing home 57,000 troops. Fund-

ing for new weapons has fallen sixty percent.

Most of this shrinkage took place in the Reagan-Bush years, *before* President Clinton entered office. Already "the cuts have been very deep," said Gen. Merrill A. McPeak, the USAF Chief of Staff, in a recent Senate hearing. "Where we go from here really comes on top of that very substantial drawdown."

General McPeak added, "It will not surprise me if we drop below 400,000 people in uniform. . . . The last time we were at 400,000 was in 1948, before the Berlin Airlift."

The Chief of Staff was speculating about what might happen during the period covered by the Pentagon's Fiscal 1994–99 six-year defense program, now the subject of a comprehensive Pentagon review. The USAF program for Fiscal 1994—starting October 1—was a known quantity. Specifics for 1995–99, however, had to await completion of the Clinton Administration's "Bottom-Up Review of Defense Needs and Programs" in July.

Secretary of Defense Les Aspin launched the review "to yield detailed guidance for reshaping defense." The review was just one factor, however. The debate will continue through the fall and winter, culminating in February with the formal release of a new defense program for 1995–99.

The 1994 Air Force program, proposed by Secretary Aspin in March, seeks $76.5 billion, a reduction of $2 billion from the level of the 1993 budget enacted by Congress. The new plan devotes $13.7 billion to research and development, $19.6 billion to procurement, $23.8 billion to operations and maintenance, $17.6 billion to military personnel, $1.1 billion to construction, and $1.0 billion to housing.

Operations Up, Investment Down

The 1994 program emphasizes current operations over investment in the future force. Current operations would consume $42.4 billion, or 55.2 percent of the budget. Only $34.4 billion, or 44.8 percent, will be spent on research, procurement of new arms, and the like. USAF documents show that this gap is slowly widening year by year.

The Air Force is determined to maintain a well-trained, well-supplied, high-quality force. The top priority, said General McPeak, is "today's readiness"—meaning flying hours to keep pilots sharp, spare parts to keep aircraft working, and money to keep maintenance depots humming.

In 1994, the Air Force will continue an operational tempo that generates roughly the same number of flying hours per month for each aircrew as in 1993. Flying time for active tactical aircrews will decline slightly, from 19.8 to 19.5 hours a month, but USAF officers claim the impact will be negligible. In the reserve component, tactical crews will see little change.

On the airlift side of the flying force, USAF will provide 26.9 flying hours per month to crews, down slightly from twenty-eight hours per month this year.

Flying hours will go up for strategic aircraft pilots. Last year, bomber and tanker pilots got about eighteen hours of flying time per month. In 1994, the figure will increase slightly to 18.3 hours per month, reflecting the new emphasis on preparation for conventional theater conflict.

Gen. Michael P. C. Carns, the Vice Chief of Staff, said Air Force involvement in joint exercises will grow. The number of joint exercises in which USAF participated, he reported, grew from ninety-nine in 1990 to 138 this year and will jump again in 1994 to 183. In addition, the number of foreign nations with which the Air Force exercises has grown from fifty to about seventy.

The Air Force program similarly seeks to maintain the service's current high state of materiel readiness. General Carns reported, "Our mission capable rates remain high," and said the Air Force intends to hold on to that current strength.

According to the General, the 1992 mission capable rate was 83.4 percent for all combat and training aircraft. The picture improved to 85.3 percent through the first quarter of 1993. Combat-tasked fighter units typically average a mission capable rate of at least ninety percent, said General Carns, while the total number of aircraft rated "not mission capable–supply" remains steady at 7.4 percent.

The Air Force is committing serious money to fund spare parts for aircraft. The service plans to spend $556 million in this area, about the same as in previous years despite reduction in force size. General Carns said that, according to Air Force projections, USAF fighters can fly more than ninety percent of their required wartime sorties with spare parts on hand.

The service also plans to spend about $1 billion on new aircraft support equipment and facilities.

The Aircraft Program

(Selected major systems. Current $ millions for procurement, RDT&E)

Aircraft System	1992	1993	1994
B-2 bomber	$3,845.6	$3,899.6	$1,723.4
C-17 transport	2,145.5	2,241.5	2,573.3
C-130H transport	394.0	409.9	54.9
E-8 Joint STARS	463.5	932.3	728.6
F-15E fighter	820.7	93.0	125.0
F-16 fighter	1,385.3	821.9	913.6
F-22 fighter	1,606.8	1,925.0	2,252.0
JPATS trainer	—	—	41.5
KC-135 tanker	557.9	100.1	—
MH-60G helicopter	27.9	31.1	0.5
T-1A trainer	160.8	172.4	164.2

Worries About Depots

Depot maintenance, by contrast, could be a problem. Force structure cuts have reduced requirements, but the service still is not able to provide 100 percent of needed funds. According to General Carns, the unfinanced portion of the Fiscal 1994 depot-level maintenance program is $278.4 million. This represents a funding rate of eighty-one percent, which the General reluctantly termed acceptable "over the short term."

Even after factoring in base closures and other reductions in infrastructure, the backlog of property maintenance and repair will exceed $2.3 billion.

General Carns warned, "Our backlogs are rapidly approaching the break point."

Far and away the most important factor in sustaining force readiness, say Air Force officers, is the ability to recruit and retain high-caliber servicemen and -women to fix the equipment, fly the planes, manage the logistics, and train the troops. This, they say, is especially vital in a period of stagnant modernization, when the force will have to do more with less.

The force itself will certainly be smaller. The Bush Administration's Base Force plan called for service strength to level off at 430,000 in 1995. The Clinton Administration has already cut further and faster than the Bush Administration. For 1994, USAF was under orders to cut active-duty end strength by another 19,200, dropping from 444,900 today to 425,700 by September 30, 1994.

However, Air Force officers are concerned about the reemergence of a problem not seen for more than a decade—slack recruiting. Even with a requirement for fewer new troops each year, the service has had trouble filling quotas. The percentage of new recruits holding high school diplomas also has dropped.

Observed Air Force Lt. Gen. Robert Minter Alexander, the Pentagon's second-ranking military personnel official, "Midway through Fiscal 1993, we find, for the second consecutive year, that interest in joining the armed forces continues to decline among American youth. This might point to emerging recruiting problems."

Thus far, the Air Force has not had difficulty retaining experienced service personnel and wishes to keep it that way. In an effort to improve the quality of life for its troops, the Air Force will spend a billion dollars this year on family housing and another $1.1 billion on base construction.

This is expected to have only modest impact. The big problem for the Air Force stems from President Clinton's call to freeze military pay in 1994 and to limit future increases to levels much lower than once expected. Similar limitations on cost-of-living allowances for military retirees could also hurt retention. Many in Congress were pressing to overturn the President's pay and benefits proposals.

Endangered Systems

The Air Force program contains a respectable array of new weapon systems. General McPeak maintains that, when it comes to modernization, USAF faces a serious challenge: It has canceled or curtailed all of the true cold war arms programs.

In the General's view, those that remain are the must-have systems—"critical programs needed to meet the modernization requirements of the post–cold war Air Force, a force that will be mostly CONUS-based and configured for rapid response anywhere in the world." However, finding the money for even such a modest wish list is not assured.

Under current plans for 1994, the Air Force would spend a total of $7.3 billion to procure aircraft. This is a steep drop from $10 billion available for aircraft programs this year.

In the current budget round, airlift—specifically, the C-17 transport—had the highest priority. The Air Force

The Budget Drop

(Current $ billions)

Category	1992	1993	1994
Military personnel	$21.4	$20.3	$17.6
Procurement	23.3	22.0	19.6
Research & development	12.9	13.2	13.7
Operations & maintenance	22.8	21.1	23.8
Military construction	1.2	1.1	1.1
Family housing	1.1	1.2	1.0
(Offsetting receipts)	–.4	–.4	–.3
Total USAF budget	**$82.3**	**$78.5**	**$76.5**

Fewer Air Force People

(Strength in thousands)

Force Category	1992	1993	1994	+/–
Active Air Force	470.3	444.9	425.7	–44.6
Air Force Reserve	81.9	82.3	81.5	–0.4
Air National Guard	119.1	119.3	117.7	–1.4
Civilians	214.4	206.6	198.7	–15.7
Total Air Force	**885.7**	**853.1**	**823.6**	**–62.1**

program called for buying six of the new lifters at a total cost of about $2.6 billion. Though purchases of the aircraft had slowed, the Air Force still planned to procure 120.

As the C-17 is phased in, the total capacity of the US airlift fleets will grow from forty-eight million ton-miles per day to fifty-three million ton-miles per day. If the Air Force does not purchase additional C-17s beyond the 120 planned, capacity will return to forty-eight million ton-miles per day when the C-141 fleet retires.

Earlier this year, Pentagon officials found serious fault with the management of the airlifter program. Under Secretary of Defense for Acquisition John Deutch, the Pentagon's top acquisition official, set August as a deadline for completion of a major new Pentagon review of the program.

Searching for possible alternatives to a straight buy of C-17s was one principal focus of the Bottom-Up Review. It looked at restarting the C-5 production line, extending the service lives of USAF's existing C-141 transports, and buying commercial wide-body jets or used aircraft from the airlines.

At a Senate hearing last May, General McPeak remarked, "We're looking at all the options to figure out how to provide the best airlift support for the nation.... Right now, the program we're on procures 120 C-17s. All the studies that we've done to date indicate that's the most cost-effective way to meet the nation's mobility requirement."

USAF's next big fighter modernization program is the stealthy successor to the F-15, the F-22, which was set to enter production in 1996. The Air Force's 1994 budget provides ample funding—$2.3 billion—to continue the engineering and manufacturing development of the aircraft. Initial operational capability will be achieved just after the turn of the century.

Fewer F-22s?

There is no doubt that the F-22 is the Air Force's fighter of the future. The program appeared headed toward one significant change, however. Though the Air Force held firm initially to its plan to procure 648 of the hot new twin-engine air-superiority fighters, others thought a reduction was in order.

One prominent straw in the wind at midsummer was that the total fighter buy would drop by about one-third, to 442 aircraft. Under a new force-structure plan, said defense officials, the Air Force might maintain only four wings of F-22s. Each would require 100 aircraft for operations, training, and the maintenance pipeline, with a central reserve of forty-two aircraft to replace losses.

The numbers might rise again later, should the Air Force decide to procure ground-attack variants of the F-22. General McPeak stated that the aircraft will be given the ability to carry and deliver advanced air-to-ground munitions, making it "a backup precision ground-attack system" to complement its F-117s, F-15Es, and other attack aircraft.

Elsewhere in fighter production, the Air Force program finances a buy of another twenty-four of the most advanced Block 50 F-16s, at a cost of $914 million. The 1993 F-16 buy was to have been the last, but Lockheed continues to produce the airplane for the Air Force and foreign customers. Secretary Aspin wants to keep F-16 production going to preserve a vital part of the defense industrial base.

The Air Force would like to resume production of the F-15E to provide a sufficient number for the existing force structure, but the Pentagon nixed the idea this year.

In 1993, the Air Force made its last planned purchase of stealthy B-2 bombers, buying four. The 1994 budget contains $1.7 billion for initial B-2 spares, construction, continued research, and procurement of associated items. The Air Force will enhance the conventional capability of the B-2, which can carry sixteen precision guided weapons.

According to service budget documents, the Air Force plans to spend $1.1 billion on modifications to more than thirty in-service aircraft. With new procurement money tight for years to come, outlays for such modifications could be expected to rise. One key focus of these modifications was the B-1B bomber, which is rapidly becoming the conventional, theater warfare backbone of the long-range bomber fleet. Lt. Gen. John Jaquish, USAF's principal deputy to the assistant secretary of the Air Force for Acquisition, said 1994 money will purchase deferred support equipment, interim contractor support, and aircraft modifications, including the first conventional capability improvements.

The 1994 program also focuses on providing new and more powerful armament for bombers to use in theater war scenarios.

"Something Interesting"

"B-1s and B-2s need precision guided munitions," said General McPeak. "These aircraft can provide flexible conventional response within hours from bases located in the United States, but we must ensure that, when they reach the target, their weapons have the required accuracy to do something interesting."

One key to this enterprise is the

Space and Satellites

(Selected major systems. Current $ millions for procurement, RDT&E)

Individual System	1992	1993	1994
Cheyenne Mountain Upgrade	$ 158.3	$ 183.7	$ 167.2
Defense Meteorological Satellite Program	134.3	52.8	61.4
Defense Satellite Communications System	69.3	38.0	57.9
Defense Support Program Satellites	115.8	336.3	525.9
Medium Launch Vehicles	286.7	306.4	203.9
Milstar Satellite Program	1,042.4	1,138.6	973.2
Global Positioning System	353.1	230.5	207.0
Space Boosters	428.2	490.2	801.3
Spacelifter	48.7	9.4	53.9

AGM-137 Triservice Standoff Attack Missile (TSSAM), a stealthy, conventionally armed cruise missile capable of both air and ground launch. The air-launched version is being developed for Air Force and Navy fighter and bomber aircraft. The Air Force plans to load it on the B-2, B-52, and F-16, at minimum. The TSSAM could be used to strike high-value land and sea targets with either a unitary warhead or multiple submunitions. The Air Force this year will spend nearly $196 million developing this weapon.

The Air Force also intends to spend $112.4 million in R&D money to further develop the Joint Direct Attack Munition and Joint Standoff Weapon systems. The two are expected to enhance current precision strike system capabilities by providing the ability to precisely attack high-value fixed, relocatable, or moving land and maritime targets.

The Air Force bought two Joint Surveillance and Target Attack Radar System (Joint STARS) battlefield surveillance and command aircraft in 1993. It will buy one, for $704 million, in Fiscal 1994 as it continues to ramp up to a total fleet of twenty aircraft.

The Air Force program continues its recent strong attention to space forces. In General McPeak's view, "We must upgrade our space systems to provide global situation awareness and correct shortcomings in launch infrastructure."

The Chief of Staff noted that the Air Force is launching new satellites at the rate of about one per month. USAF has forty-two satellites on orbit, he added.

The Air Force wants to spend $526 million for another Defense Support Program bird. DSP satellites provide worldwide missile attack warning and surveillance. The Air Force wants to buy another four Global Positioning System spacecraft to go in its twenty-four-satellite constellation. The Air Force plan calls for spending about $1 billion on the highly advanced Milstar communications satellite system.

Finally, work on space-launch systems is funded to the tune of more than a billion dollars.

Air Force Weapons

(Selected major systems. Current $ millions for procurement, RDT&E)

Missile System	1992	1993	1994
AGM-129A Advanced Cruise Missile	$231.3	$119.8	$ 84.8
AGM-130A air-to-ground missile	93.5	82.9	75.9
AIM-120A Advanced Medium-Range Air-to-Air Missile	576.3	663.3	579.7
AGM-88 High-Speed Antiradiation Missile	110.3	215.1	—
AGM-142 Have Nap Air-to-Ground Missile	37.1	23.6	—
AGM-137 Triservice Standoff Attack Missile	—	—	195.9
Precision guided munitions	—	30.1	112.4
Sensor-Fuzed Weapon	108.7	17.7	89.5

In 1994, the Air Force program continues to de-emphasize strategic nuclear forces. Though they still have nuclear strike capability, USAF heavy bombers are turning increasingly to the conventional mission.

ICBM Blues

The Air Force budget finances no new long-range strategic nuclear missile program, committing zero dollars to this task for this first time since the dawn of the ICBM era more than three decades ago. Funds are provided, however, to begin the upgrading of the Minuteman system. The budget provides $184.3 million for this purpose. Fiscal 1994 procurement funding also will help prepare for downloading the Minuteman III from a multiple-warhead to a single-warhead configuration to conform with provisions of the START Treaty.

Production of the stealthy AGM-129A Advanced Cruise Missile, once projected to hit 1,000 weapons, ended with orders for only 460 missiles. The Air Force has included $84.8 million this year to help wrap up the program.

The USAF program will accelerate and expand already planned force structure cuts. Under the last Bush Administration blueprint, strategic missile wings were to have contained 802 Minutemen by the end of 1993. The ICBM force will instead drop to 787 by the end of 1993 and to 667 by the end of 1994. Under the current arms agreement, the ICBM force will go down to only 500 missiles in a few years, and the Minuteman III will be the only ICBM in service after 2003, when the last Peacekeeper is to be retired.

The fleet of long-range bombers will shrink again in 1994, dropping to 191 aircraft of all types. This marks a drop of fifty-one bombers since September 1992.

The number of Air Force fighter and attack wings also continues to decline. One year ago, the Air Force planned to have 27.4 fighter wing equivalents by the end of Fiscal 1994 and 26.5 by the end of Fiscal 1995. Fifteen of these wings would be in the active-duty force and the rest in the Air National Guard and Air Force Reserve. The new 1994 plan envisions keeping only 24.3 wings—13.3 in the active force and eleven in the Guard and Reserve.

The Air Force inventory of transport and tanker aircraft will hold steady for at least another year.

During the drawdown, while the active-duty force has declined in size by about one-fourth, there has been little change in the size of the Air Reserve Component. At the end of 1994, the Air National Guard will have 117,700 members (a one-year loss of 1,600) and the Air Force Reserve will have 81,500 members (a loss of 800).

Asked in a Senate hearing to assess the current active-reserve mix of forces, General McPeak maintained, "It's okay except in the fighter force." He said that "the only place we're out of balance in active and reserve ratio in the Air Force is in the fighter force because we are cutting the actives so rapidly that it has gotten out of balance with the reserve force.

"We have protected our Guard and Reserve because they provide a great capability for the nation," said the Air Force Chief of Staff. "However, as the cuts continue, our Reserve component will finally have to participate." ■

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Forty missions over the Gulf with A-10 pilot Shanghai Sheehy.

To War in a Warthog

By Alfred Price

In A-10 No. 81-0964, Capt. Todd "Shanghai" Sheehy shot down an Iraqi Mi-8 "Hip" helicopter during the Persian Gulf War. The aircraft bears a little Iraqi flag to commemorate the encounter. Opposite, a "Warthog" from the 442d Fighter Wing, Richards-Gebaur AFB, Mo., flies into the sunset.

IN THE decade and a half leading up to the Persian Gulf War, the Air Force A-10 community worked hard to hone its skills in the difficult business of providing close air support (CAS) for ground forces. During Operation Desert Shield, seven squadrons with 144 of the ungainly attack planes went to Saudi Arabia, where they formed the 354th Tactical Fighter Wing (Provisional) based at King Fahd International Airport.

Capt. Todd "Shanghai" Sheehy of the 511th Tactical Fighter Squadron flew forty combat missions in the A-10 "Warthog." His experiences provide valuable insight into the employment of the aircraft and illustrate anew that in war one must learn to expect the unexpected.

For instance, the Warthog force was used only sparingly in the CAS role but proved more versatile and better able to survive over enemy territory than many expected. During the forty-day conflict, the A-10 force was credited with destroying 987 tanks, 926 artillery pieces, 1,355 combat vehicles, and a range of other targets—including ten fighters on the ground and two helicopters shot down in air-to-air engagements. The A-10 force, flying

Photo by Randy Jolly / Arms Communications

more than 8,000 combat sorties, suffered only five A-10s destroyed (a loss rate of .062 percent). Twenty of these aircraft returned with significant battle damage, and forty-five others returned with light damage that was repaired between sorties.

Like many A-10 pilots based at King Fahd IAP, Captain Sheehy spent the first day of the war—January 17, 1991—at cockpit readiness. Some A-10s took part in the initial air strikes, but most of the Warthog force was held on the ground at readiness to counter any incursion by Iraqi troops into Saudi Arabia.

Captain Sheehy flew his first combat mission on the second day of the war. Part of the definition of the CAS mission is "an air action against hostile targets . . . in close proximity to friendly [ground] forces." Because hostile and friendly ground forces were not then in close proximity, the A-10 force was used in a role for which it had never been intended—battlefield air interdiction missions against targets in enemy rear areas.

It was dark when Captain Sheehy and his wingman, Capt. Scott "Sparky" Johnston, walked out to their planes at 4:30 a.m. Each Warthog carried the standard armament load: six Mk. 82 500-pound bombs with radar airburst fuses, one infrared-guided Maverick missile and another with TV guidance, two AIM-9M Sidewinder missiles for self-protection, and 1,200 rounds of ammunition for the internally mounted 30-mm cannon.

A Rude Awakening

The pilots started their engines, and Captain Sheehy called the 511th's operations center for his task. He was told to head for a position off the coast of Kuwait and call "Blacklist," the Marine Direct Air Support Center, for his target assignment.

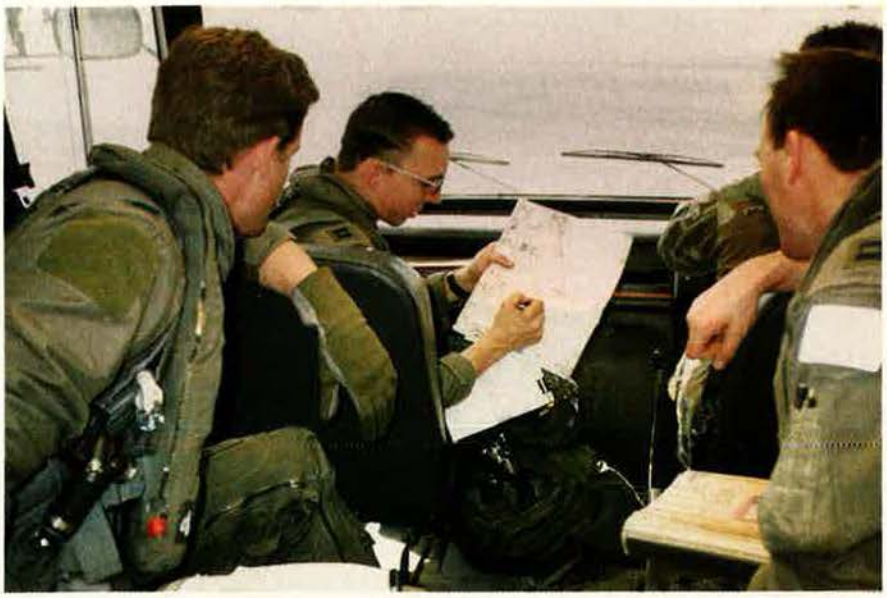
Moments later, the pilots' calm was rudely shattered.

"I had just called the ground controller for taxi clearance," said Captain Sheehy, "when over the Guard frequency came a broadcast 'Alarm Red! Alarm Red! Alarm Red!' I had already had the crew chief pull the chocks from my wheels, but none of my weapons were armed. On hearing the alarm, my crew chief unplugged from the jet, closed the ladder door, and ran for cover as he pulled on his gas mask."

An attack on the base was imminent, but the broadcast did not state the nature of the threat. The first Scud missile fired against Saudi Arabia was speeding toward nearby Dhahran, but so far as Captain Sheehy was concerned, the threat might easily have been bombers sweeping in to attack the base at low altitude. The greatest fear was a gas attack, and Captain Sheehy's first move was to turn off his plane's environmental control system to keep outside air out of the cockpit.

The pilot eased on power to edge the Warthog out of its revetment, but, as he pushed the rudder pedal to turn the plane, it continued straight ahead. The nosewheel steering had failed. As malfunctions go, this was minor, and he was able to steer the plane using differential application of the brakes, but it was a problem that he could have done without at that moment.

"There I was, on my first combat sortie, with a thousand thoughts running through my mind. The base was under attack. Were planes about to drop bombs, or was it a Scud missile? Would we be able to repel the attack? Would the Patriot missiles protecting our base work as advertised? There was all of that to think about, as well as the normal cockpit tasks of getting the aircraft off the airfield.



After flying three combat sorties, Captain Sheehy briefs the next "shift" of pilots on Iraqi defenses and likely targets in Kuwait. One of those likely targets may have been the tank below, hit on the road to Basra by coalition forces.

Flying over water at 22,000 feet, the raiding aircraft ran parallel to the Persian Gulf coast as the A-10s made their way to the target area. The sun was rising, revealing a fine day with clear skies below the aircraft and a thin layer of cirrus above them at about 27,000 feet. Captain Sheehy called "Blacklist" and was informed that his target was an artillery site just inland from the pier at Mina Sa'ad in Kuwait.

Captain Sheehy located the pier without difficulty, and the pilots prepared to attack with bombs. Unfortunately, the layer of cirrus above them presented a contrasting backdrop for the dark planes, and, as Captain Sheehy acquired his target, the Iraqi antiaircraft gunners acquired the Warthogs. As the planes headed toward the coast, the leader's attention was diverted by an urgent call from his wingman.

"To add to that, it was dark, and as a day fighter unit we did not practice a lot of night operations. I had not flown a sortie from that base at night; I had never even taxied there at night before. With an attack imminent, all lights had been turned off, and I had to use my taxi light to find my way. And my nosewheel steering didn't work. So my first combat mission was definitely not going very well."

Getting Their Attention

Captain Sheehy reached the holding point beside the end of the runway and stopped, waiting for an arming crew to remove the safety pins from his weapons. Nobody stirred. Jiggling the throttles and the brakes, he pointed the taxi light at the arming crew's bunker and repeatedly flashed it on and off to get their attention. Eventually, he succeeded.

"It was an eerie sight when the arming guys came running out in full chemical warfare gear, gas masks, suits, gloves, boots, flak vests, and helmets. They probably set a world record for arming an A-10. Then, as quickly as they had arrived, they were back in the bunker."

Once he was airborne, Captain Sheehy looked around for his wingman's strobe light. By then, the on-alert F-15s from Al Kharj were also streaming into the air, and strobes seemed to light all over the sky.

"It was a beautiful clear night with a lot of stars," remembered Captain Sheehy. "The blinking strobe lights of the fighters blended with the stars to create the illusion of every aircraft in the coalition racing north to meet the enemy. As Sparky joined up off my left wing, my heart rate began to return to normal. Suddenly there was a large flash over my right shoulder. . . . I thought it was either a Scud impact or a Patriot intercepting a Scud [in fact, a Patriot had detonated close to the incoming Scud]. I began to worry about what my squadron mates and my air base would look like when I got back. Had the missile landed there? Did it have a chemical warhead?"

Photo by Michael Longe

Heavy Puffies

"He called, 'Heavy puffies [antiaircraft artillery rounds exploding] below us!'" said Captain Sheehy. "They were big white balls with dark gray centers. We figured they were 57-mm rounds, and they could reach us at our altitude. We could see the muzzle flashes, and the guns were right on the coast, between us and our target. We tried to come in from different directions, but the flak followed us. Putting our noses down that chute with those gunners watching us just didn't seem like the smart thing to do."

Captain Sheehy moved to what appeared to be a safe distance from the

coast and tried to lock a Maverick missile on to a target, but there was insufficient image contrast to use the weapon. As if to emphasize the point that things could turn sour at any moment, his wingman gave a sudden "Break right!" call to avoid an upcoming SAM. Captain Sheehy did as he was told, punching out chaff and decoy flares.

"As I looked out the side of the canopy," said the A-10 pilot, "I saw a glowing orange ball with a long white smoke trail streaking toward me from the pier. I rolled out to put the missile off my right wing and kept the flares coming. I was greatly relieved to see the missile moving aft across my canopy, which meant that it was not guiding on me any longer. The smoke trail abruptly stopped, and I watched the missile fall into the Gulf."

Captain Sheehy moved further from the coast and pondered what to do next. The A-10s were starting to run low on fuel. Captain Sheehy called "Blacklist" and informed the controller that he had been unable to hit the assigned target. He said he was returning to base and hoped to be back later. When the pair reached King Fahd IAP, Captain Sheehy was delighted to find that his earlier worries about the attack on the base were unfounded.

"The base was still there, and, in the light of day, everything was fine," he remembered, "but I still had no nosewheel steering. So after I landed, I turned off the runway and stopped.

Photo by Geoffrey Pearce / Arms Communications

Captain Sheehy is still flying A-10s, now with the 75th Fighter Squadron, 23d Wing, Pope AFB, N. C. The Warthog (whose official nickname is Thunderbolt II) has come into its own in the close air support role during the past decade.

At the end of my first combat sortie, my plane was towed back to the parking ramp with all the bombs and missiles still loaded—not exactly what I had planned."

Later that morning Captain Sheehy took off in another A-10. He and Captain Johnston returned to their original target and took advantage of the higher sun to deliver a quick, accurate attack, apparently unobserved by enemy gunners.

Captain Sheehy's next twenty-four sorties were against Iraqi artillery positions and vehicles situated well back from the border. On his twenty-seventh combat sortie, on February 15, 1991, he led Lt. Jay Keller from the forward operating base at Al Jouf. The A-10s were briefed to go to a point a few miles from Mudaysis Airfield in southwest Iraq, where enemy planes had been found hidden in revetments in the desert. Captain Sheehy destroyed an Su-20 "Fitter" with cluster bombs and cannon fire and headed away from the area, climbing back to 20,000 feet.

As he did so, he heard the controller in the E-3 Airborne Warning and Control System aircraft trying to contact some A-10s that had departed the area. Captain Sheehy told the controller that he and his wingman were available, and he was informed of a low and slow contact thirty miles to the northeast. Captain Sheehy started in that direction and commenced a shallow descent. Soon afterward, the A-10 pilot saw a small cloud of dust and a dark object moving across the desert. Leaving Lieutenant Keller above to cover his attack, Captain Sheehy rolled inverted and pulled into a forty-five-degree dive.

The men of Captain Sheehy's Desert Storm unit, the 511th Tactical Fighter Squadron "Vultures," pose after the war with the aircraft of their commander, Lt. Col. Mike O'Connor, who designed his plane's nose art.

Hip Shot

"As I got closer, I identified it as an Mi-8 'Hip' helicopter moving fairly quickly, very low to the desert floor," said Captain Sheehy. "I took aim and started shooting at about 8,000 feet, firing about 300 rounds of 30-mm. As I recovered from the dive and circled

Photo by Randy Jolly / Arms Communications

It may be ugly, but the A-10 is a welcome sight to ground troops in a tight spot. In the Gulf War, Warthogs performed little CAS but shone in interdiction, proving more versatile and surviving better over enemy territory than many expected.

back around, I observed that the helicopter appeared to be smoking. Jay radioed that it looked like some of the bullets impacted the tail section. I rolled back into the dive [and] fired about 200 more rounds into the Hip, bottoming out of the dive at about 4,500 feet."

As Captain Sheehy climbed away, he glanced back and saw a cloud of black smoke rising from a new fire on the ground. That marked the point where the helicopter had gone down.

The ground war opened on February 24, 1991, and Captain Sheehy went into action in the CAS role on February 26. He and Captain Johnston were scrambled to assist US Marines moving on Kuwait City and under fire from enemy artillery. There were also reports of Iraqi tanks moving against them. As the Warthogs neared the battle area, they had to descend to 5,000 feet to keep below the "petroleum overcast," the layer of thick black smoke from burning Kuwaiti oil wells.

"Visibility decreased to about three miles, and, even thou gh it was midday, under the clouds it was more like dusk," said Captain Sheehy. "The scene below us was amazing: thousands of coalition vehicles in columns moving north. We could even see the corridors that had been cut through the barbed wire barriers and minefields as the columns bottled up at these chokepoints before moving northward again. Our guys were definitely on the offensive."

Captain Sheehy made contact with the pilot of the F/A-18 airborne forward air control (FAC) plane, who briefed him on the whereabouts of the Iraqi artillery and AAA defenses.

The A-10s were handed to the ground FAC to get final clearance to attack. It took the latter several minutes to transmit the exact positions of friendly forces in the area to Captain Sheehy, but that was an essential part of the operation. The fundamental axiom of the CAS mission is "Better to kill no targets at all than risk accidental hits on friendly forces." Captain Sheehy was then directed to the offending enemy artillery positions and given clearance to attack.

"I moved our orbit further north until I could see the muzzle flashes from the self-propelled artillery vehicles that were pounding our guys' positions. I directed Sparky to a trail formation, and we set up our switches to deliver Mavericks. I rolled into a shallow dive and locked on to one of the revetted artillery vehicles with an IR Maverick."

This Iraqi weapon had already fired several rounds, and on the TV monitor in the A-10 cockpit the vehicle appeared white-hot—a perfect target for an IR missile. Captain Sheehy launched the Maverick from three miles and turned away. After it made impact, he observed several large secondary explosions around the revetment. Captain Johnston delivered a similar attack on another of the Iraqi guns. The A-10s pulled clear and orbited while the FAC assessed the situation.

"He reported good hits and said the artillery barrage had stopped," said Captain Sheehy. "Sparky and I moved closer and observed operators of the guns abandoning their vehicles and running south. I reported this to the FAC, and he directed us to turn our attention to the tanks reported moving south down the coastal highway. We found and identified the tanks and quickly dispatched the lead two with TV Mavericks.

"Fuel was getting low, and the FAC had a set of AV-8B Harriers waiting, so we safed up our armament switches and pressed back to King Fahd. The FAC had kind words for us as we departed, saying that teams were rounding up prisoners who had abandoned the artillery."

That was the last time Todd Sheehy went into action and the only time he did so in the CAS role. During his remaining missions, he flew to the battle area, orbited, and returned with all his ordnance. By then the coalition forces were advancing so rapidly that the FACs usually refused to clear attacks because of the risk of hitting friendly forces. Captain Sheehy never had to put the A-10's ruggedness to the test, for his aircraft never took a hit of any kind.

The slow-flying A-10 was never designed to go deep into enemy territory to seek out targets. Because its primary CAS mission was denied it for most of the conflict, interdiction made up the bulk of its sorties. Still, no military person would assert that every future conflict can be so well controlled. The A-10 is surely among the ugliest planes ever built, but, to a platoon of grunts cut off, pinned down, and taking losses, one of the most beautiful sights in the world is the approach of a pair of Warthogs with full ordnance and fuel for forty-five minutes on task. The *most* beautiful sight is six pairs. ■

Alfred Price flew with the Royal Air Force for sixteen years. He has published some three dozen books, including The Spitfire Story, The Last Year of the Luftwaffe, *and* Battle of Britain: The Hardest Day. *His most recent article for* Air Force *Magazine, which appeared in the December 1992 issue, was "Tornado in the Desert."*

Afghanistan War veterans now hold most of the top military posts, and they're still mad as hell.

Rise of the Afghantsi

By Harriet Fast Scott

THE AUGUST 1991 Kremlin putsch pitted top leaders of the Soviet armed services, mostly World War II veterans in their late sixties, against what has come to be called the "Afghan Platoon"—Afghanistan War veterans in their early to mid-forties.

That time, the Afghanistan vets won.

The "Afghantsi" prevented the old-timers from throwing military support to the coup-plotting "Emergency Committee," even though one of its key members was Defense Minister Dmitri Yazov. Great courage was displayed by Afghan veterans, from the current Russian vice president down to the troops defending Boris Yeltsin's "White House."

The Afghantsi have been winning ever since. The force of those titanic 1991 events has pushed them into command of Russian military affairs. They are filling most of the top posts in the uniformed services and the Defense Ministry.

"When you analyze recent armed forces appointments," said one Russian general, "you see that virtually all these military chiefs come from the airborne forces or are Afghan veterans."

Some features of the Afghan group are known. Its members are bitter about the destruction of the army in Afghanistan. They aim to rebuild Russia's pride in its military forces. They face many of the problems that confronted US military reformers in the aftermath of the Vietnam War.

Questions about them remain, however. In the political struggle in Russia, will the Afghantsi remain aloof, or support one political side? Could they split the armed forces, making Russia again a civil war battlefield? "They are staunch, tough people, and that's fine," said one general. "That is how they should be, as long as they are just doing their job."

The emergence of the Afghantsi stems in part from sheer numbers. At the time of the coup, the active-duty force contained nearly 66,600 Afghan veterans, of whom 200 were generals and 50,000 were lower-ranking officers. The rest were senior enlisted troops.

Because the war ended almost five years ago, the number of Afghan War veterans in the active-duty force is declining. However, the Afghantsi have their own organization—the Union of Veterans of Afghanistan—uniting 200,000 ethnic Russian vets with 150,000 more in the other ex-

Soviet lands, guaranteeing their political influence.

In 1992, the Afghantsi formed the People's Patriotic Party, boasting 100,000 members who support democratization of society and market-based economic reforms. In the 1989 and 1990 elections for People's Deputy posts, dozens of Afghantsi officers were elected. Others have been appointed to high positions.

Beyond the publicly active group lay another huge, silent mass. Official figures claim that Soviet armed forces dispatched only 546,200 servicemen to Afghanistan, but few believe these figures. Some Russian sources, in fact, claim the number topped 1.5 million. In addition to the soldiers, thousands of civilian specialists went to the war.

Black Tulips

Part of these veterans' shared experience is the physical devastation many suffered in Afghanistan.

Soviet authorities long withheld a public accounting of the dead. Under strict wartime censorship, the body count could only be surmised by the number of "black tulips"—the grim name given to the zinc coffins used to return the war dead. In 1991, the authorities reported that 13,826 Soviet military personnel died and more than 50,000 were wounded. The figure for killed in action later rose to 13,833.

In December 1992, *Krasnaya Zvezda* investigators reported that, in addition to the killed and wounded, 281,000 soldiers caught some kind of infectious disease. Some 368,000 Afghan veterans were registered at medical clinics. Doctors determined that 174,500 of these needed continued clinical treatment.

Even before the Communist regime collapsed, some senior officers were speaking out. These are the bitter words of one Afghantsi general: "Hundreds of thousands of people returned not only crippled but psychologically broken. Some came into conflict with authority; others became deeply passive, sometimes using drugs; still others joined gangs of bandits.

"A million and a half of my peers could turn into a lost generation, people without a future—especially when the totalitarian regime that lightly tossed them into a 'struggle against counterrevolution' can just as easily turn away from their needs."

Almost immediately, doubts about the purpose of sending troops to Afghanistan arose. Top Soviet leaders—Marshal Nikolai V. Ogarkov, the Chief of the General Staff, and his deputies, Gen. Col. Sergei Akhromeyev and Gen. of the Army Valentin Varennikov—opposed the move. Once the official decision to send in troops was made in December 1979, however, they got on board.

Soviet soldiers shipped to Afghanistan expected to be home in a few weeks, but more than nine years passed before the last troops limped back into the USSR. There was little cel-

The Afghantsi Counterrevolt

Gen. Pavel Grachev reported that, after the August 19, 1991, declaration of an emergency situation, he was summoned to Defense Minister Dmitri Yazov's office. Yazov ordered General Grachev to move his nearest airborne division into Moscow.

General Grachev was worried. What was the reason for such a move? He carried out the orders but did not convey any sense of urgency to the division commander.

At 6:00 a.m., Russian President Boris Yeltsin called General Grachev from the Russian White House, using an open line. "What's happened over there, Pavel Sergeievich?" asked Yeltsin.

General Grachev briefed him on the "State Committee for the Emergency Situation" that had just been formed.

"What tasks have been assigned to you?" Yeltsin asked.

"To guard the TV tower, the state bank and treasury, the mayor's building, and the White House," said the General.

At the mention of the White House, Yeltsin demanded to know whether General Grachev had the resources "to guard this building."

General Grachev felt relief. Yeltsin was ordering him to guard the building. Now he was committed to Yeltsin and Russia's Parliament. "The building will be guarded," he said.

Still, the situation was far from clear. When Moscovites blockaded a battalion of paratroopers on their way to the White House, General Grachev's deputy, Gen. Maj. Alexander Lebed, another Afghan veteran, walked to the building and spoke with Yeltsin. It was agreed that henceforth his troops would report directly to the Russian government.

On August 20, at 2:00 p.m., General Grachev was called to the Ministry of Defense and ordered to move his troops closer to the White House and be ready for more decisive actions. For the first time, the fatal word "storm" was used.

He was told that, at midnight, he was to move his troops forward. Knowing such a move could easily set off civil war, General Grachev was determined to avoid it.

In the afternoon of August 20, the Air Force Commander in Chief, Marshal of Aviation Yevgeni Shaposhnikov, told Yazov that he must order the troops to leave Moscow.

"How?" Yazov asked.

"Return the troops to their barracks now," said Marshal Shaposhnikov. "Declare this committee illegal."

Yazov said nothing.

Then, said Marshal Shaposhnikov, "I tried and failed to contact several people, but finally got hold of General Grachev. After a long talk, we found we were of one mind. We agreed to refrain from bloodshed even if threatened with death."

Midnight came and went. About 2:00 a.m. on August 21, the commander of the KGB Alpha force called. He told General Grachev his men were not willing to lead any assault on the White House. General Grachev replied that his paratroopers would not move, either.

At this point General Grachev called a friend, Gen. Boris Gromov, first deputy of the Ministry of Internal Affairs. Gromov, whom General Grachev described as "that old Afghan wolf" because of his long, cunning service in the war, said, "Internal Troops will not be moved anyplace."

In this way did the Afghan Platoon revolt.

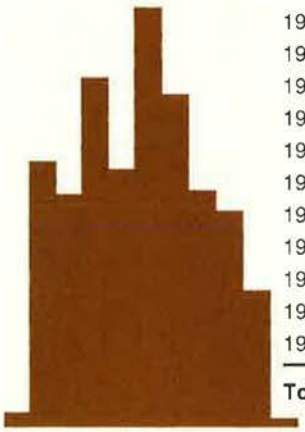
Later that morning, the Ministry of Defense dispersed the troops. The general danger had passed.

General Grachev later observed, "It was a 'palace coup.' " He was comparing the coup attempt with the actions of the elite Alpha KGB troops, aided by paratroopers, who stormed the palace of Afghan leader Hafizullah Amin in December 1979. The intent then was not to change the whole government but to topple the undesirables in Kabul. The August 1991 attempt was to get rid of Yeltsin and others who threatened the leadership.

In Kabul, the paratroopers and the Alpha force did as they were told. Nearly twelve years later, in Moscow, they did not.

What caused these elite forces to back off? Was it simply that they could not bring themselves to kill their own countrymen? Or was it the recollection of disaster caused by their Afghan experience?

A Decade of Dying



Year	Killed
1979	86
1980	1,484
1981	1,298
1982	1,948
1983	1,446
1984	2,343
1985	1,868
1986	1,333
1987	1,215
1988	759
1989	53
Total	**13,833**

How the Pain Was Distributed

Category	Killed	Wounded	Invalid	Total
Military (officer)	1,979	7,132	unknown	9,111
Military (nonofficer)	11,854	42,853	6,669	61,376
KGB agents, personnel	572	unknown	unknown	572
MVD agents, personnel	28	unknown	unknown	28
Unspecified personnel	20	unknown	unknown	20
Total	**14,453**	**49,985**	**6,669**	**71,107**

Soviet armed forces recorded a total of 417 troops as prisoners of war or missing in action. Of these, only 119 were released. Ninety-seven returned home, while twenty-two remained abroad.

ebration. Many sordid details of the war in Afghanistan surfaced only after the war ended. Some returning officers were badly treated.

Playing Their Role

When the USSR began to break up in the late 1980s and early 1990s, an increasingly desperate Kremlin turned again and again to units filled with Afghanistan War veterans to stamp out domestic dissent. These units appeared in Alma-Ata, the Baltics, central Asia, the Transcaucasus, and Moldova.

On the surface, the Afghantsi seemed to be playing their assigned role without dissent. In May 1991, General Varennikov, Commander in Chief of Soviet Ground Forces, addressed a crowd of 700 veterans of foreign wars in the great hall of the Central Home of the Soviet Army. General Varennikov, who had supervised Afghan operations for nearly a decade, singled out for special attention one member of the crowd—Gen. Lt. Pavel Grachev, Commander of Airborne Troops and an authentic Afghanistan War hero.

Underneath the surface, however, there was turmoil and growing dissatisfaction within Afghantsi ranks. When Afghantsi were told to come to Moscow in August 1991, they finally said no to the Kremlin.

Here was a strange twist of fate: In the wake of the failed coup, General Varennikov was arrested for his role in the plot. General Grachev, on the other hand, was promoted for defending Russian President Boris Yeltsin.

The failed coup was the making of many Afghantsi. After the leaders of the putsch were arrested, for example, General Grachev rocketed to the leadership of the Soviet armed forces. He was named First Deputy Minister of Defense and appointed chairman of the State Committee of the Russian Republic for Defense and State Security. Eight months later, he was named to the new post of Russian Minister of Defense.

At that point, the Afghan Platoon began in earnest to take over the armed forces. In June 1992, Russia named three of its four deputy ministers of defense. Two had been in Afghanistan, and the third was a paratrooper, a combat field whose members feel a natural affinity with Afghan vets.

Named deputy minister in charge of personnel training and assignments was Gen. Col. Valery Mironov, who during 1979–82 commanded the 108th Motorized Rifle Division, one of the first units of the 40th Army to enter Afghanistan.

Gen. Col. Georgi Kondratyev was from 1986 until the end of the war in early 1989 the first deputy commander of the 40th Army in Afghanistan. He was named to the deputy minister post in charge of handling "hot spots" within the territory of the former Soviet Union—southern Russia, the Transcaucasus, Moldova, and central Asia.

A third deputy minister post was taken by Gen. Col. Vladimir Toporov, who spent twenty years in airborne troops. He commanded a division from 1984 to 1987 and, later, an army. He is now in charge of providing for the support of ex-Soviet troops withdrawn from abroad. He is not known to be an Afghan veteran.

Not long after the announcement of these first three appointments, Moscow named a fourth deputy defense minister, a top figure in the Afghan War. Gen. Col. Boris Gromov served three tours in Afghanistan, his last as the commander of all Soviet forces during 1987–89. General Gromov is a troubleshooter for withdrawals from Germany, Poland, the Baltics, the Transcaucasus, and other areas outside of Russia. He oversees arms reductions.

Gripes From the Home Office

The late Gen. Victor Dubynin, an outspoken officer, was General Grachev's first deputy and Chief of the General Staff. He served three years in Afghanistan. In 1984, General Dubynin began his assignment as first deputy commander of the 40th Army. In a year and a half, General Dubynin carried out fourteen major operations, some lasting a month or more. He eventually became the sixth overall commander of the "Limited Contingent of Soviet Forces."

What did he hear from Moscow during these years? "Dissatisfaction, constant reproaches," the General once stated. "Getting into that war was a tragic mistake. . . . As soon as I arrived, I felt the hopelessness and the senselessness of the war. I urged the Minister of Defense and the Chief of the General Staff to start troop withdrawal. I even sent in plans."

The reply, essentially, was "It's none of your business."

General Dubynin died unexpectedly in November 1992. He was replaced as Chief of the General Staff by Gen. Col. Mikhail Kolesnikov, who appears to have an Afghan connection. From 1988 to 1990, he was chief of staff of the Southern Theater (TVD), one of three theater headquarters secretly established in September 1984. Located in Baku, this TVD became responsible for Afghanistan as well as other regions in the Middle East.

The Leningrad Military District is headed by an Afghanets, Gen. Col. Sergei Seleznev, formerly deputy commander of the 40th Army in Afghanistan. The Ural Military District is commanded by Gen. Col. Yuri Grekov, chief of staff of the 40th Army during 1986–88. Another Afghanets, Gen. Lt. Victor Sorokin, is on duty in Abkhazia, the breakaway Georgian republic where more than 1,000 have already been killed. Gen. Maj. of Aviation Valery Ochirov has been in the Air Forces since 1969. He became a Hero of the Soviet Union for service in Afghanistan, where he commanded a helicopter squadron. General Ochirov now is deputy commander of Ground Forces Aviation.

Another Afghanets in high places is Gen. Lt. Alexander Lebed, who was General Grachev's deputy at the Russian White House during the coup. He has since become commander of the 14th Army, the Russian force in Moldova. In June 1992, the situation in Moldova threatened to explode after a series of attacks left 700 ethnic Russians dead in the enclave of Pridnestr. The 14th Army was assigned the task of protecting the Russians in the area.

Long before that, however, General Lebed had engaged in operations on the troubled Russian periphery. In 1988, as a division commander, he was sent to Sumgait, Tbilisi, Baku, and other "hot spots" inside the old Soviet Union. Recalling those tense days and nights much later, the General had this to say: "It was always the same: No written orders. No concrete task. No explanation of what 'order' means and how it was to be achieved. Never any explanation of the difference between martial law and a state of emergency. Give an order to shoot, and you're wrong. Don't give an order to shoot, and you're still wrong."

Arms and Politics

General Lebed has a reputation for being a blunt, outspoken man, and he makes no bones about the relationship between the military and politics. "It is nonsense to say the Army must stay out of politics," he said. "The housing problem is politics. Transferring officers to other armies is politics. Transfer to a new post is politics. The relationship to the Army in a number of regions is pure politics."

Many Afghantsi have begun to move openly into positions of political influence.

Russia's current vice president, Alexander Rutskoy, was a pilot who served two tours in Afghanistan. An Afghan rebel Stinger missile nearly cost him his life in 1986. He ejected from his Su-25 close support aircraft at 300 feet and was rescued by Afghan government forces. Paralyzed, he had many difficult months of rehabilitation, yet he returned to Afghanistan as deputy commander of the Air Force of the 40th Army. He was again shot down in August 1988, but again evaded capture and survived.

Colonel Rutskoy won election as a People's Deputy in 1990. When Yeltsin ran for President of Russia in 1991, Colonel Rutskoy was his running mate. His courageous actions during the coup led to his promotion to general major of aviation on August 23, 1991.

Gen. Maj. Alexander Kotenkov, another leading Afghanets, is chief of President Yeltsin's State Legal Directorate. General Kotenkov went into Afghanistan in 1979 with the 40th Army. In 1983, at the height of both the Afghan War and the cold war, he dared to write that Soviet troops were fighting against the Afghan people, not international imperialists.

General Kotenkov is also chairman of the 350,000-member Union of Veterans of Afghanistan. "This is a serious, influential force," he said. "With their training, their cohesion, Afghantsi are attractive to any adventurist." He added that the UVA is trying to make sure that it is never enlisted by an adventurist and that it continues to wield strong political clout.

Helping Its Own

General Kotenkov was once shocked to meet a friend in a hospital who for six years had been unable to get a prosthetic device. This convinced General Kotenkov that the returning Afghantsi needed both medical and social rehabilitation. The UVA bought wheelchairs and spent nearly half a million dollars on medical aid. It operates two private rehabilitation centers. With the help of a Russian firm, it has begun to produce a new generation of prostheses. More than seventy veterans have been sent abroad for treatment.

In March 1993, the people of Ingushetia elected Gen. Maj. Ruslan Aushev as their first president. General Aushev is Ingush by nationality. He was wounded during his second tour in Afghanistan. Gen. Maj. Alexander Tsalko, another veteran of the Afghanistan War, was for a while the chairman of a military deputies group formed by members of the Congress of People's Deputies. General Tsalko and others stirred up a hornet's nest when they published a draft military reform plan.

One of the few Afghantsi to suffer serious ignominy is Gen. Col. Igor Rodionov, who in 1985 commanded the Limited Contingent. A year later, he contracted severe hepatitis. In May 1988, he became commander of the Transcaucasus Military District. In Tbilisi in April 1989, soldiers armed with sharpened shovels moved in to break up a demonstration. More than twenty unarmed demonstrators were killed, including sixteen girls and women in their teens and early twenties. Public reaction was swift and overwhelmingly negative.

Rightly or wrongly, General Rodionov was blamed for the tragedy. He was reassigned as Commandant of the Military Academy of the General Staff. Since then, he has been one of the leading figures in preparing a new Russian military doctrine, which could leave a lasting impact on the Russian military establishment. ■

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, "The Semi-States of Mother Russia," appeared in the September 1992 issue.*

WE CAN'T PREDICT THE FUTURE, BUT WE CAN PREPARE FOR IT.

The world bristles with MiG-29 and Su-27 upgrades readily available to those with hard currency. What's more, the new century promises to find even more advanced fighters in the hands of tomorrow's regional aggressors.

Yet, by the year 2000, the air superiority fighters in the current U.S. inventory will be approaching thirty years old. The challengers will be much younger.

The solution is the F-22 Advanced Tactical Fighter. A long range, high Mach fighter with supercruise, thrust vectoring, and revolutionary F119 engines. A front-line fighter with low radar cross section. A lethal first-look, first-shot, first-kill fighter with an unmatched agility. A supportable fighter with greatly reduced maintenance demands. A deployable fighter with greatly reduced tanker and airlift requirements. A robust and reliable fighter built to last.

The F-22 program is on track–which means American air superiority will exist tomorrow and well into the future.

Flight surgeons fly periodically for two reasons: to experience the pilot's world and to avoid looking like the enemy.

The Docs and the Jocks

By Frank Oliveri, Associate Editor

THE Air Force maintains about 4,000 doctors on active duty. Some 800—approximately twenty percent—are flight surgeons. Though few in number, flight surgeons perform one of the Air Force's most critical support functions.

It might not always seem that way. For the pilot, the flight surgeon may well represent his worst nightmare. "The Doc" passes judgment on who is and who is not physically fit to fly in Air Force aircraft, and, as such, he has the power to utter the unloveliest of phrases: "You're grounded."

For that reason, if no other, the relationship between aircrews and their flight surgeons could not be more delicate and potentially explosive. However, there *is* more. A flight surgeon also has the power to say to a grounded pilot, "Go fly again."

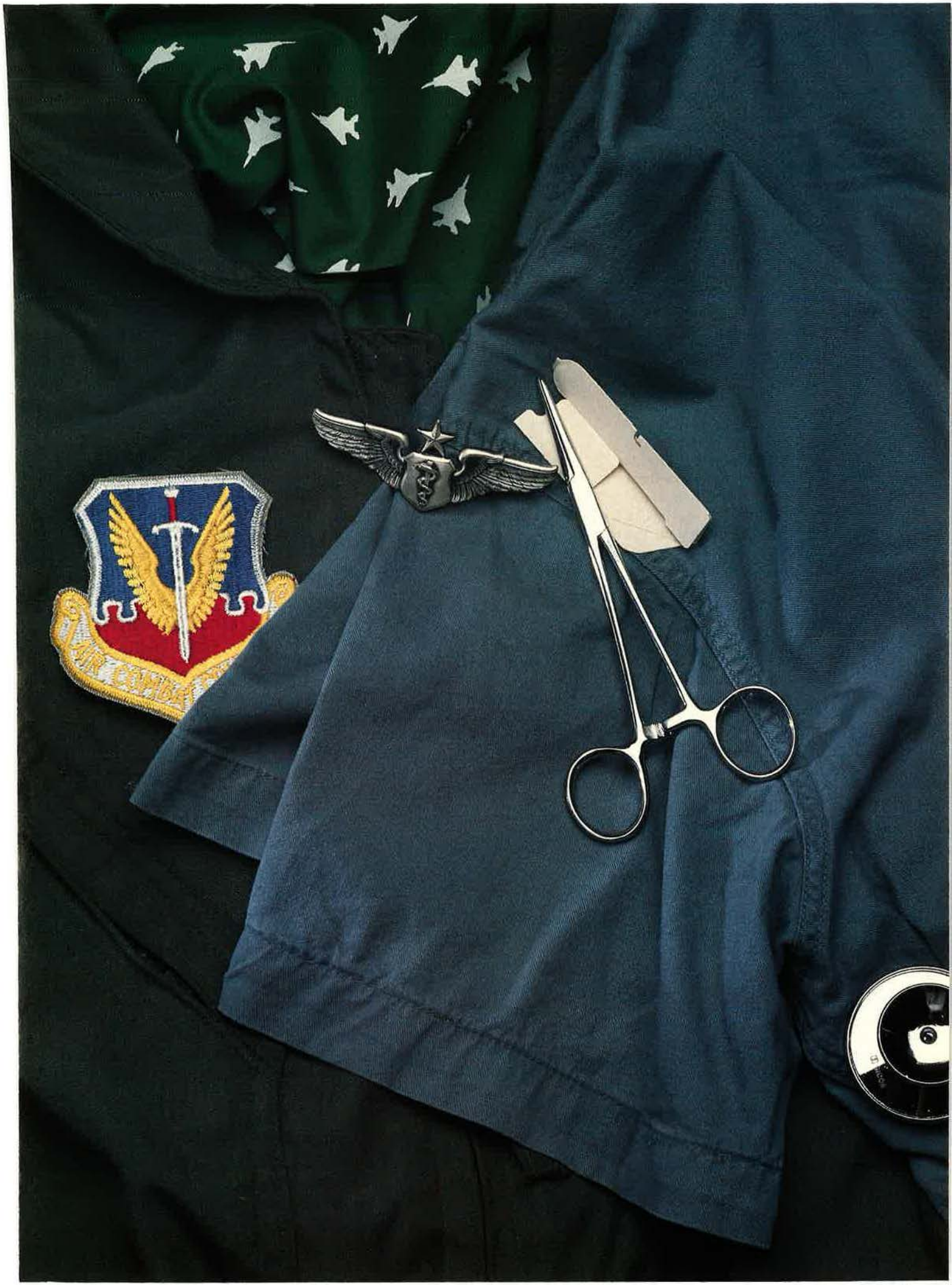
Take the case of a forty-year-old C-5 pilot, a lieutenant colonel, who recently came to his flight surgeon with chest pains. It was not typical heart pain, but it sounded close enough to the real thing to cause concern. The flight surgeon was sufficiently troubled to question the pilot's fitness to fly.

The flight surgeon conducted several sophisticated evaluations, which revealed moderate coronary artery disease—forty percent narrowing of one artery. He then consulted Air Force medical records compiled over many years into a single data bank. The records indicated that, for a person of the pilot's type, the artery problem increased the chance of a heart attack by only 0.5 percent per year for the next ten years.

The evaluation convinced the Air Force to let the pilot return to flight status. He would be tested annually and would repeat a special cardiac test every three years, but he would be flying an airplane rather than a desk.

Every pilot piles accolades on his maintenance crew or fellow pilots, but he makes no mention of the person

Photos by Paul Kennedy



in charge of his health and safety—the flight surgeon. Lt. Col. (Dr.) Chris Heinrichs is the director of the Aerospace Medicine Primary Course at the US Air Force School of Aerospace Medicine (USAFSAM) at Brooks AFB, Tex. He tried to explain the pilot's unease.

"The aircrew wants to fly," said Colonel Heinrichs. "When they come into your office, they're on flying status. So the best they can do is leave the way they came in. You can only hurt them. You can't make them better."

This situation is faced by every flight surgeon at every Air Force base. It transcends differences in fighter, bomber, and transport pilots' personalities. In this respect, if in no other, they are identical.

"Pilots tend to avoid telling us what is wrong," Colonel Heinrichs said. "As a general rule, they tend to minimize. They are generally healthy to start with. They want to be healthy, and they demand of themselves that they are healthy."

This dynamic was recognized as far back as 1922, when the Army founded the School of Aviation Medicine, later renamed the US Air Force School of Aerospace Medicine. USAFSAM is the Air Force's sole training institution for aerospace medicine, with a program that includes flight medicine, aerospace physiology, military public health, bioenvironmental engineering, and aerospace nursing.

Into the Cockpit

The strength of the relationship between pilot and flight surgeon is nearly as important as the medical knowledge the physician possesses. How well the relationship functions directly affects readiness, and the Air Force felt it had to bridge the gap. One way to do this was to have the two work together, permitting them to form a bond. Putting flight surgeons in the cockpit was the logical answer.

Today, therefore, every flight surgeon must periodically go aloft, for two basic reasons: to experience the pilot's world and to avoid looking like the enemy.

"You could tell this person, 'You can't fly,' " said Colonel Heinrichs, "but if you don't fly and experience the environment, whether it's the change in altitude and Gs for the small aircraft or time zone problems, it's hard to make an evaluation of his medical condition."

As for the second reason, Colonel Heinrichs emphasized its indispensability.

"When you see them at the squadron or at a safety meeting or a Friday beer call, you get an awful lot of 'Oh, by the way,' and things come out," said the Colonel. "If you were in the office and they had to come over to see you, they never would. By integrating into the squadron, you get that [contact]. Rapport is tremendously important to doing the job."

To stay current, flight surgeons must fly a minimum of four hours a month. That is only about one-fifth of the regular minimum requirement for flight crews, but enough for surgeons to function in the back seat on a fighter or a crew station on a bomber or transport.

No Joyrides

These are, to say the least, not joyrides. Flight surgeons fly on actual training missions, including night flying.

Some flight surgeons fly in units where they drop bombs, but that takes more training. Capt. (Dr.) Matthew Ricks of the 335th Fighter Squadron, 4th Wing, Seymour Johnson AFB, N. C., is a typical example.

"We get eight to twelve flying hours a month," said Captain Ricks. "We become fairly closely tied with the

operational side of the house. The F-15E flight surgeons are actually being sent out to Luke [AFB, Ariz.,] for three weeks for academics in the back seat of the F-15E, and then they send us through a mini-checkout program, basically making us mission support–type personnel."

Flight surgeons associated with KC-10 aircraft located at Seymour Johnson go through an executive checkout program. They learn about flying the KC-10 and get a fair amount of flight hours in the seat behind the pilot.

"A lot of them are pretty good at it," Colonel Heinrichs said, "and they're pretty proud of that." However, there is a line beyond which the flight surgeon should not go, he said. "That's not why you are there."

As an example, Colonel Heinrichs noted that he flew in F-4s for a number of years, flying at night but not at low level at night. "The F-4 flew very low and fast, so you often flew in a valley where the terrain is higher on both sides," he said. "Well, that's fine during the day, but, at night, the skill to avoid the mountains depends on the skill to read the radar in the back seat. So I could fly night missions, but not night at low level. That made sense to me. I was never going to get good enough to do that."

How serious does all this get?

In February, an F-16D from the 18th Fighter Squadron at Eielson AFB, Alaska, was part of a four-ship fighter formation practicing close air support operations in a joint air attack training mission. The two-seat F-16D crashed, killing the pilot and the flight surgeon who was riding in the back seat.

Captain Ricks reported that some 4th Wing flight surgeons flew F-15E combat sorties during the Persian Gulf War. As Weapon System Officers, the flight surgeons helped destroy Iraqi targets on the ground and were prepared to switch over to air-to-air configuration for combat if necessary.

Captain Ricks has racked up one combat sortie, patrolling the no-fly zone over Iraq earlier this year. "When I was there in January to March of this year, the general who was the wing commander did not want us flying combat sorties," Captain Ricks said. "Right at the end of our tour we got a new general, and he said, 'You can go up.' . . . I think it was a bigger deal for the squadron . . . than it was for me."

Captain Ricks has about 100 hours in the F-15E and more than 100 hours in the F-16D. "Flying is the best part of my job," he said. "I get a kick out of taking care of patients, but not every doc is getting to go up and fly in the Air Force's premier jet."

One might wonder about the rationale for putting a flight surgeon in a combat situation. The reason for this, said Captain Ricks, is "understanding what they're going through, what they're thinking when people are shooting . . . AAA or surface-to-air missiles at [them]. Just the adrenaline rush."

The Right Stuff

What does it take to become a flight surgeon?

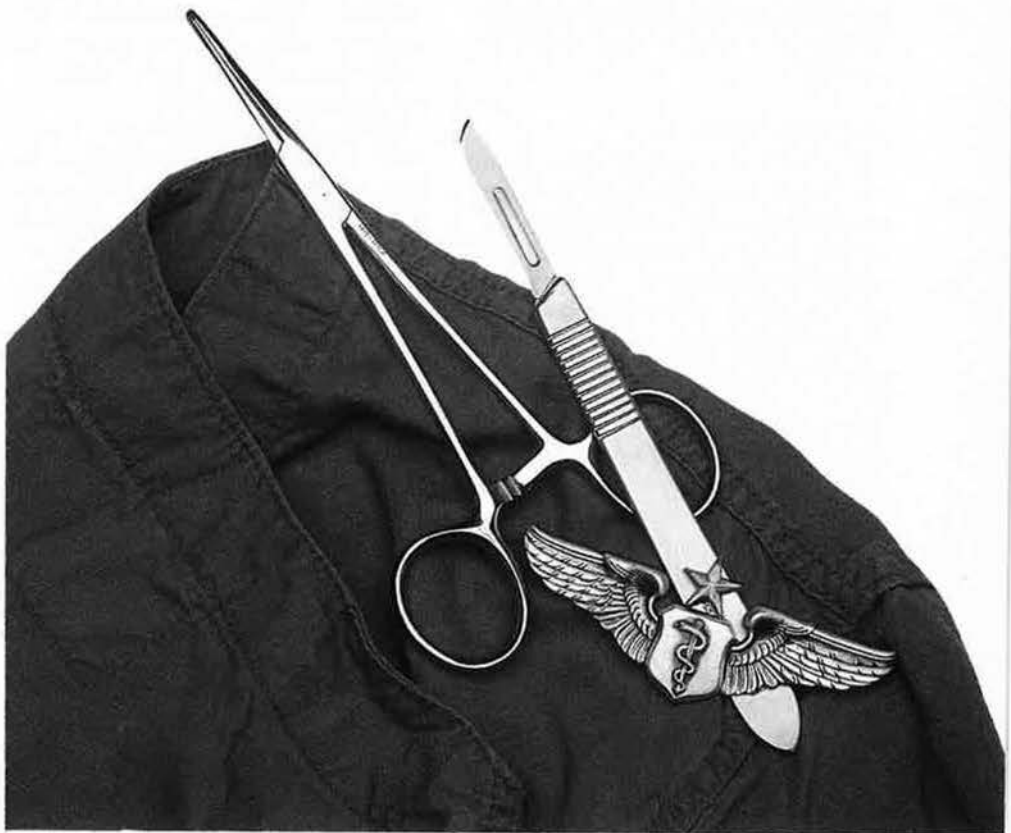
First, the individual must become a medical doctor. Then the physician is sent off to USAFSAM, where he or she undergoes seven weeks of training in flight, acceleration, and altitude physiology, among other things.

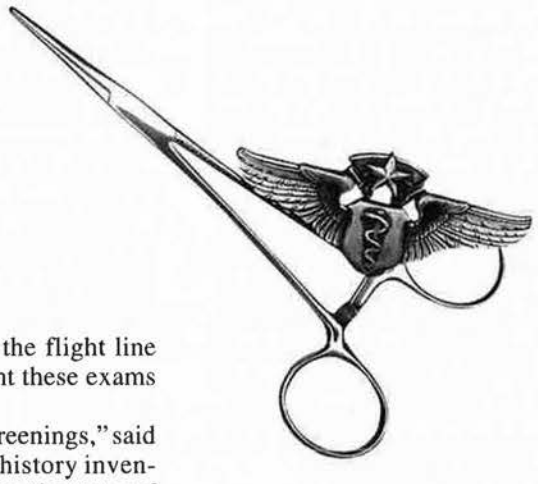
Doctors learn how the normal body reacts in an abnormal environment. Courses cover such maladies as air embolism and spatial disorientation, human factors in aircraft accidents, medications and the pilot, emergency escape, parachuting, and "communicating with the breed—flight surgeon aircrew briefings."

There are four basic requirements: pass the academic course, experience the altitude chamber, undergo survival training, and achieve medical qualification. Colonel Heinrichs acknowledged that there is a lot to learn in a seven-week course.

Theoretically, the student becomes a flight surgeon upon completion of the course. "In reality, the course rates you as a flight surgeon," said Colonel Heinrichs, "but . . . you're not a real flight surgeon until six to twelve months later, after you've been doing it a while."

Col. (Dr.) Kenneth R. Hart, commander and dean of USAFSAM, said that flight surgeons are the general practitioners of a base and practice preventive medicine, an area with broad implications for force readiness. They





examine the people on the flight line annually and supplement these exams with flight physicals.

"We do cholesterol screenings," said Captain Ricks. "We do history inventories so that people use the type of equipment they should be using to prevent long-term damage to the liver, kidney, lungs, and hearing."

The pilots "live in an environment that is very hazardous," said Colonel Hart, himself a pilot. "We have to be very careful not to create a problem that's going to destroy everything we have done, so we've gotten involved in preventive medicine."

Flight surgeons must treat pilots differently from other patients, Colonel Hart said. For example, various types of medicine normally taken for certain illnesses might well interfere with the talents and skills developed by a pilot. While a regular person can work with a cold, a pilot would be grounded.

And *Only* Three

The Air Force is quite strict about this. It has determined that its flyers may, without seeing a flight surgeon, remain on flying status while taking only three medications—aspirin, Tylenol, or Afrin. "If they self-medicate on top of that, they have to come in and see us to make sure they are able to fly," stated Captain Ricks. "If they've taken an over-the-counter cold medication, we won't let them fly for twenty-four hours."

Some medications may be taken to treat long-term medical problems, such as acne. The flight surgeon typically will put a pilot on the medication and ground him or her for two weeks to a month to see how he or she responds to the medication. If the pilot does well, then he or she can get a waiver from higher headquarters and continue to fly while taking the medication.

Aeromedical services encompass flight medicine, bioenvironmental engineering, and military public health.

"The bioenvironmental engineers actually go out and survey shops, find out what kind of chemicals people might be exposed to or noise hazards," said Captain Ricks, "and then they pass that information on to the military public health people."

Those professionals then decide whether workers are receiving unacceptably large doses of toxins, develop ways to track their exposure, and measure the results.

Flight surgeons also assist in accident investigations to ascertain the human factors responsible. They test the pilot to make sure no medication or alcohol was in his or her system.

Most accidents are caused by human factors—defined as a pilot's mistake in the cockpit. It could be entering incorrect information into a computer, misperceiving an event, or developing bad flying habits.

Some of the most highly qualified flight surgeons work in the Clinical Sciences Division (CSD) of the Armstrong Laboratory Aerospace Medicine Directorate of USAFSAM. Col. (Dr.) William Wolfe explained that CSD takes charge of the cases of pilots or other flyers who, like the C-5 pilot with the artery problem, have been prohibited from flying for medical reasons.

"They come here and get evaluated," said Colonel Wolfe. "About seventy-five percent are returned to the force. They are observed closely, but they return to the flying force. It saves the Air Force millions of dollars a year."

The CSD has two main thrusts. One entails the hands-on evaluation of aviators to determine their fitness for flying. If aviators show signs of a serious medical problem—chest pain, lightheadedness, or visual problems—they are closely evaluated. In the second CSD responsibility, the flight surgeon makes recommendations to the surgeon general regarding flight restrictions—if appropriate—follow-up treatment, and what type of follow-up evaluation is needed.

Both USAFSAM and Armstrong Lab are part of the Human Systems Center at Brooks AFB. HSC is the Air Force advocate for integrating and maintaining the human side of Air Force systems and operations.

Having a centralized area for this type of research creates a huge database. For aerospace medicine, there is no comparable resource in the world. The range of conditions on which data have been collected is broad. Lt. Col. (Dr.) Gerald Saboe, chief of Professional Services at CSD, said neuropsychiatric, ophthalmologic, cardiovascular, and vestibular conditions, among others, are dealt with regularly.

"We don't see sick people here," said Colonel Saboe. Rather, he said, the unit tries to establish and measure the residual effects, if any, of a health problem. This search focuses on any problem that might increase flying risk.

The Air Force spends millions to train the typical aircrew member. About 900 aviators—mostly majors and lieutenant colonels—go through CSD every year. With a return rate of seventy-five percent, the Air Force recovers the skills of close to 700 pilots and navigators per year.

"That's an important result from the research that we do on an ongoing basis," Colonel Saboe said. "As we study these individuals, we can break out different subclassifications of the disease to say, 'Yes, originally we thought this was dangerous, but we have studied it long enough, and we realize that we can let them back to fly.' " ■

A-10 Thunderbolt II

Big Winner in Desert Storm
Big Winner in Gunsmoke 1991
Watch for Gunsmoke 1993

The A-10 Thunderbolt II was a big Winner in Operation Desert Storm and it's a big winner again in the Gunsmoke 1991 competition, both in the overall team standing and in individual Top Gun standing.

In Desert Storm the A-10 flew over 200 sorties a day with a record of spectacular results. In Gunsmoke 1991 it ranked number one in team standings. And congratulations to the 175 TFG, 354 FW, 442 TFW and Lt. Colonel Richard Disrud, the number 1 Top Gun A-10 Pilot.

The Grumman supported A-10 Thunderbolt II — always a winner.
Grumman Aircraft Systems
Bethpage, NY 11714

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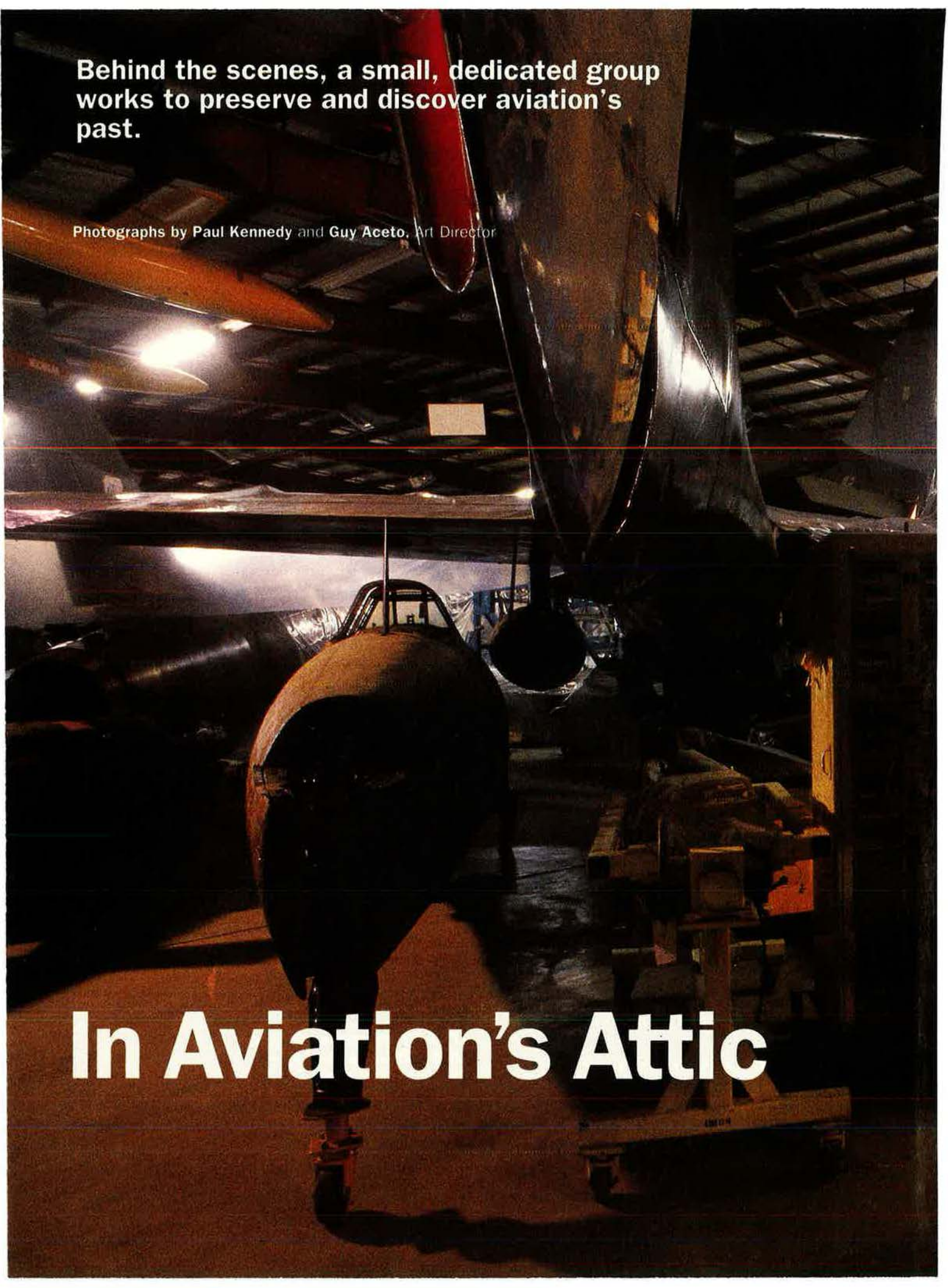


Behind the scenes, a small, dedicated group works to preserve and discover aviation's past.

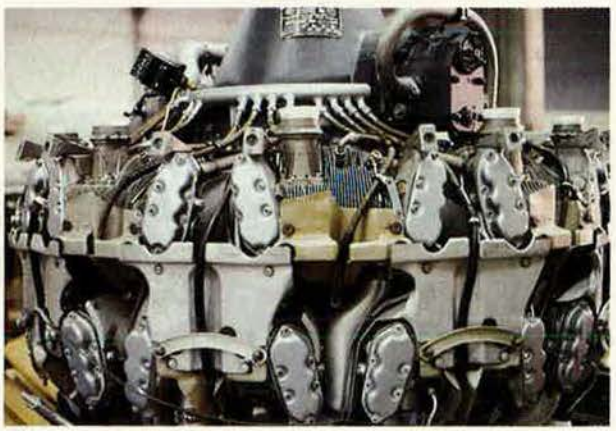
Photographs by **Paul Kennedy** and **Guy Aceto**, Art Director

In Aviation's Attic

Photos by Paul Kennedy

Behind the scenes at the National Air and Space Museum in Washington, D. C., the job of storing and preserving aviation's heritage goes on at the Paul E. Garber Preservation, Restoration, and Storage Facility. Located in Suitland, Md., the facility houses more than 160 aircraft, as well as engines, propellers, spacecraft, and other flight-related objects. A small, dedicated staff performs painstaking restorations with the attention to detail usually associated with an archaeological dig. At left, restoration technician Robert McLean works on a rare Aichi M6A1 Seiran, a Japanese floatplane originally designed to bomb the Panama Canal in World War II—a mission that was never carried out. In the background are the tail surfaces of the B-29 Enola Gay.

Enola Gay ***is in the ninth year of an intense restoration project scheduled to be completed in time for the fiftieth anniversary of its famous mission, the August 1945 bombing of Hiroshima. With the completion of the cockpit and bomb bay sections (see cover photo), restoration moves on to the rest of the huge aircraft. At right, intern-turned-volunteer Avi Ostchega works on the aircraft's flap carriage. Below, right, is one of*** Enola Gay***'s four Wright R3350 engines, looking as fresh as it did almost fifty years ago.***



Staff photo by Guy Aceto

The wide range of aircraft in the collection makes for some strange bedfellows. On the previous pages, a Nakajima B6N Tenzan "Jill" rests beneath the wing of its erstwhile foe, a P-61 Black Widow night fighter. Other items include an engine from a German He-162 jet, as well as computer banks and crates of aviation-related equipment. Target drones hang from the ceiling, making the most of the space available.

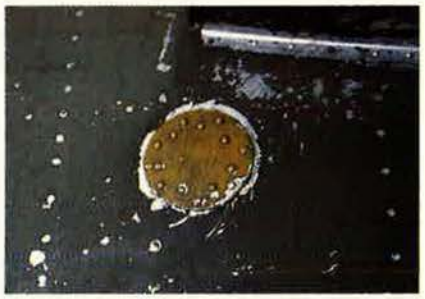
Photos by Paul Kennedy

Staff photo by Guy Aceto

The waiting line for restoration is long but distinguished. Above, a BT-13 fuselage rests beside a Ryan PT-19 trainer. These classic trainers reside next to some of the world's rarest aircraft. To the right of the trainers is the McDonnell Douglas XHJH-1 Whirlaway, the first twin-engine, twin-rotor helicopter. The yellow aircraft at the rear is a rare C-64 Noorduyn Norseman utility transport from World War II.

At left, a Focke-Wulf TA-152, a high-altitude version of the famous FW-190, displays the colors it wore at the end of World War II. Every inch of every aircraft is documented, and detailed records are kept on the history of each airframe. Whether it is as rare as this Focke-Wulf or as commonplace as the PT-19 (3,658 built), each airplane is treated as a valued artifact waiting to tell its part of aviation history.

Photos by Paul Kennedy

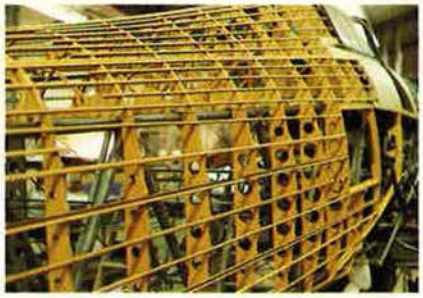


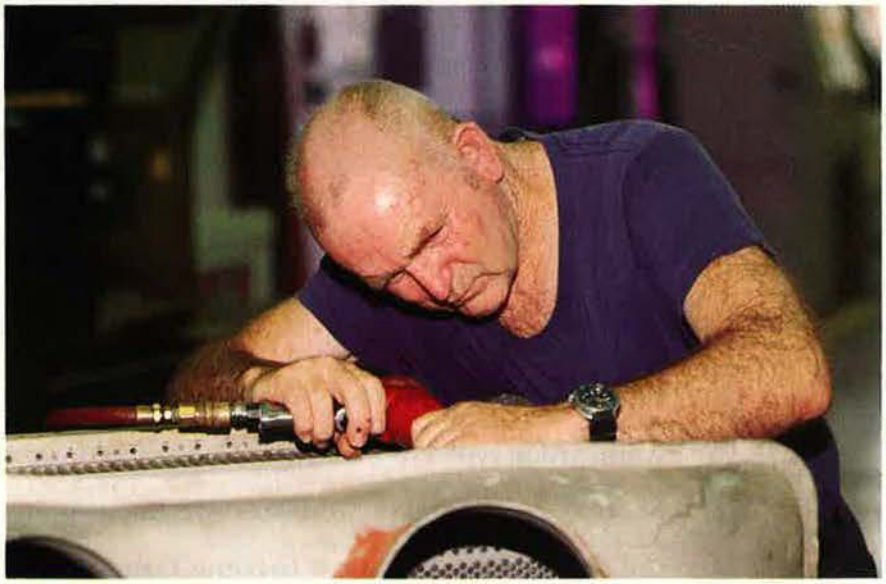
The legendary B-26 Marauder **Flak Bait** *flew more than 200 combat missions in World War II, more than any other aircraft. The tailgunner's position (top, on the left) is cocooned in plastic to protect its original paint. A once-proud warrior, it rests beside a former enemy, a rare Japanese Nakajima C6N Saiun "Myrt" reconnaissance aircraft. Above, holes from the antiaircraft fire that gave* **Flak Bait** *its name are still clearly visible.*

Among the well-known aircraft stored at the facility is the B-17D above (center), **The Swoose**, *which survived the December 8, 1941, attack on Clark Field in the Philippines. To its right is* **Caroline**, *John F. Kennedy's 1960 presidential campaign plane. To its left is an F-105D whose last assignment was with the Washington, D. C., Air National Guard.*

Photos by Paul Kennedy

At left, restoration technician Will Lee works on the electrical system of a Hawker Hurricane IIC. The aircraft is about two years from completion. On average, an aircraft requires roughly four years and 50,000–80,000 man-hours to restore. The pace is methodical and meticulously planned. The restoration of an aircraft gives many insights into the construction methods of its time. Interns from various universities go through a ten-week program, gaining valuable knowledge and providing welcome assistance to the full-time staff of thirteen. Below, technician Charlie Parmley applies his expertise to the restoration of Enola Gay.





Staff photo by Guy Aceto

Congress has approved the construction of an annex to the Air and Space Museum to be located near Dulles Airport in northern Virginia. The annex will house the collection and the restoration facilities. The new, larger quarters will enable many of the aircraft, currently viewed only by appointment, to be displayed to the public.

AIR FORCE *Magazine would like to thank Bill Reese and the entire staff of the Paul E. Garber Facility and Dianne Kanauka of the Air and Space Museum for the opportunity to photograph the facility and some of its less accessible areas.*

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A Checklist of Space Systems

Edited by Tamar A. Mehuron, Associate Editor

Compiled with the assistance of Space and Missile Systems Center and Phillips Laboratory, Air Force Materiel Command

Atlas Launch Vehicles Program Office

Atlas E
Missile program primarily to support Defense Meteorological Satellite Program (DMSP) and National Oceanic and Atmospheric Administration satellites. Four remaining refurbished Atlas E boosters will be launched from Vandenberg AFB, Calif. **Contractor:** General Dynamics (GD). **Status:** Operational.

Atlas II
Program to provide medium launch vehicle for communications satellite launches, such as the Defense Satellite Communications System (DSCS) and other payloads. **Contractor:** GD. **Status:** Production.

Defense Meteorological Satellite Program Office

Defense Meteorological Satellite Program
DMSP provides meteorological, oceanographic, and solar-geophysical weather data for DoD operations and high-priority programs. The data are transmitted to fixed and mobile receiving terminals worldwide. **Contractors:** General Electric (GE), Westinghouse, Hughes, Aerojet, Harris, Lockheed. **Status:** Operational.

Delta Launch Vehicles Program Office

Delta II
Program that provides medium launch vehicle currently used for launching Navstar Global Positioning System (GPS), space test payloads, BMDO[1] experimental payloads, NASA scientific payloads, and commercial payloads. **Contractor:** McDonnell Douglas. **Status:** Operational.

MILSATCOM Joint Program Office

Air Force Satellite Communications System
Program that provides high-priority command-and-control communications for US strategic forces. System is integrated into other spacecraft. **Contractor:** Classified. **Status:** Operational.

Defense Satellite Communications System
Worldwide satellite network providing survivable, antijam, secure, high-data-rate communications for DoD, State Department, and other US government users. DSCS III satellites provide super-high-frequency communications primarily for high-capacity fixed users. **Contractors:** GE, TRW. **Status:** Operational.

Milstar
Program to produce the next-generation satellite communications system to provide worldwide, jam-resistant, survivable, command-and-control communications for the national command authorities and US combatant forces. **Contractors:** Lockheed Missiles and Space Co., TRW, Hughes. **Status:** Development.

Navstar GPS Joint Program Office

Navstar Global Positioning System
Program that provides twenty-four-hour, all-weather, worldwide, space-based radio navigation capabilities with extremely accurate three-dimensional position and timing information for military and civilian users. **Contractors:** Rockwell International (Blocks 1 and 2), Martin Marietta (MM) (Block 2R), IBM (Control Segment), numerous user equipment contractors. **Status:** Full operational capability with 24 production satellites on orbit expected in mid-1994.

Spacebased Early Warning Systems Program Office

Defense Support Program
Spacebased integrated tactical warning and attack assessment system for the US. Primary mission is to detect and report any ICBM/SLBM raid against the US and its allies. **Contractors:** TRW, Aerojet Electronic Systems, IBM. **Status:** Operational.

Follow-On Early Warning System (FEWS)
Program to develop a next-generation space surveillance system to replace the Defense Support Program. FEWS is to provide first warning of theater or global ballistic missile attack against US and its allies. **Contractors:** Lockheed/Hughes, TRW/Grumman. **Status:** Demonstration/validation.

Spacelifter Launch System Program Office

Spacelifter Launch System
USAF program, with NASA participation, to develop a new, modular family of launch vehicles for DoD, civilian, and commercial payloads. Seeks to reduce operating costs while improving operability and reliability. **Contractor:** To be determined (TBD). **Status:** Conceptual.

Space Test and Experimentation Program Office

Reentry Systems Launch Program
Program to support acquisition and delivery of booster hardware, integration of boosters and payloads, and services. Current programs include Multiservice Launch System and Thrust Vector Control. **Contractors:** MM, Aerojet. **Status:** Development.

Space Test and Small Launch Vehicle Programs
Program to provide spaceflight for advanced DoD research and development experiments, to prototype operational systems, and to develop, integrate, and launch small and medium-class R&D satellites. Current programs include Pegasus/Taurus, RADCAL, STEP, ARGOS, and APEX. **Contractors:** Orbital Sciences Corp., TRW, Rockwell. **Status:** Development, test, and launch.

Strategic Defense Initiative Program Office[1]

Brilliant Eyes System
Program to produce spacebased sensor as part of the ballistic missile defense architecture, providing acquisition, resolution, and tracking of missiles and space objects. **Contractors:** Rockwell International, TRW (competitive teams). **Status:** Demonstration/validation.

Brilliant Pebbles
Programs to develop weapons to intercept and destroy ballistic missiles, including ICBMs and long-range theater ballistic missiles, before the warheads become active or reenter the atmosphere during nuclear, conventional, or limited theater attacks. **Contractors:** MM, TRW. **Status:** Development.

Directed Energy Weapon System
Program to develop spacebased laser system to intercept and destroy

[1]SDIO's name changed in May to Ballistic Missile Defense Organization.

ballistic missiles during nuclear, conventional, or limited attack. Program at Phillips Lab, Kirtland AFB, N. M. **Contractors:** Many. **Status:** Technology development.

Titan Program Office

Titan II
Modification of Titan II ICBMs into medium-lift expendable launch vehicles. Initial conversion contracts for 14 Titan IIs. Three launched as of May 1993. **Contractor:** MM. **Status:** Production.

Titan IV
Program to provide heavy-lift vehicle for shuttle-class payloads. Launch sites at Cape Canaveral AFS, Fla., and Vandenberg AFB, Calif. Six launched as of April 1993. **Contractor:** MM. **Status:** Production.

Upper Stages Program Office

Inertial Upper Stage
IUS was developed to provide highly reliable two-stage vehicles to boost satellites into geosynchronous orbits. Used for military and NASA payloads, including Magellan, Galileo, and Ulysses interplanetary missions for NASA. **Contractors:** Boeing Aerospace, United Technologies. **Status:** Operational.

Phillips Laboratory Advanced Weapons & Survivability Directorate

Electromagnetic Applications
Program to integrate electromagnetic source technology with effects studies and tests to answer Air Force operational user requirements. Some planned demonstrations will apply high-power microwave technology to two Air Force missions: aircraft self-protection and Suppression of Enemy Air Defense. **Contractors:** In-house R&D; Kaman Sciences, Dikewood Division; Science and Engineering Associates; Ball Systems Engineering Division; BDM, Inc. **Status:** Advanced R&D, technology demonstrations.

Electromagnetic Effects
Development of transient electromagnetic test and prediction techniques, TEM effects database spanning components, modules, subsystems and systems, and a predictive understanding of TEM coupling, scattering, effects, and systems response. **Contractors:** In-house R&D with BDM, UIE, Kaman Dikewood, Fiore Industries. **Status:** Basic to advanced R&D.

Electromagnetic Sources
Development of pulsed power sources, microwave generators, and radiating antenna systems for continuous-wave and fast transient microwave sources. **Contractors:** In-house R&D, many. **Status:** Basic to advanced R&D, including technology demonstrations.

High-Energy Laser Effects
Investigation and measurement of laser effects on theater and strategic components and materials using two carbon-dioxide lasers (15 kw and 45 kw). **Contractors:** Logicon RDA, Kaman Sciences, GIE, in-house. **Status:** Basic to advanced research.

High-Frequency Electromagnetic Hardening
Program to develop electromagnetic hardening methodologies and technologies for aircraft, missiles (strategic and tactical), and satellites. **Contractors:** UIE, Dikewood. **Status:** In-house advanced and applied R&D.

Plasmas
Program of research and development on plasma acceleration, multitrillion-watt radiation sources, and multimegabar pressure sources, with primary effort toward compact toroids and multiple solid liner implosions. Potential applications include microfission and fusion and parallel processing applications. **Contractors:** Maxwell Laboratories, Inc., Mission Research Corp., PSI. **Status:** Basic and advanced R&D.

Satellite Modeling
Research into directed-energy weapons, kinetic-energy weapons, radio frequency satellite lethality and susceptibility, space radiation environments, and classified satellite descriptions. Assessment research analyzes the susceptibility of space satellites to directed-energy and other weapons. **Contractors:** Kaman Sciences, RDA, Ball Systems Engineering, GIE, Lockheed. **Status:** Exploratory and advanced research.

Satellite Signature and Imaging Simulation
Program to support space object identification and mission payload assessment by developing or integrating existing software modules. **Contractors:** Kaman Sciences, RDA, Ball Aerospace, Rockwell Power Systems, Battelle. **Status:** Exploratory and advanced research, technology demonstration.

Satellite Survivability and Vulnerability
Program to provide assessments that help USAF agencies with survivability and vulnerability guidelines. **Contractors:** Kaman Sciences, RDA, Ball Systems Engineering. **Status:** Exploratory and advanced research, technology demonstration.

Space Survivability
Research centering on mission payload assessment for spacecraft, space environments interaction with spacecraft materials, and investigation of hypervelocity impact physics for space debris and kinetic-energy weapons, quantification and mitigation of space debris, and passive hardening and survivability for BMDO assets in multithreat environments. **Contractors:** Many. **Status:** Basic R&D with technology infusion.

Phillips Laboratory Geophysics Directorate

Atmospheric Prediction Technology
Program to develop numerical weather prediction models, diagnostic algorithms, and short-range forecast techniques to provide weather forecast support. **Contractors:** Many. **Status:** Continuing.

Charge Control System
Program to design, develop, fabricate, and test a prototype automatic active control to prevent charging buildup on high-altitude spacecraft. **Contractors:** Hughes, ATAC, Amptek. **Status:** Testing on DSCS satellite planned for 1993 launch.

Flying Infrared Signatures Technology Aircraft
Program to measure and understand the infrared signatures of aircraft, backgrounds, and man-made objects using an NKC-135A aircraft. **Contractors:** Photometrics, Utah State U., Aerodyne Research, Stewart Radiance Lab. **Status:** Continuing.

Geodetic and Gravimetric Instrumentation
Program to develop enabling technology base and techniques for compact, low-cost, high-reliability, autonomous, nonjammable, and virtually drift-free inertial systems for precise navigation, guidance, and pointing. **Contractors:** U. of California at Berkeley, U. of Maryland, Mayflower Communications College, NAVSYS. **Status:** Continuing.

Geophysics for Environmental Quality
Program to develop geophysical technology to address issues associated with global climatic change, as well as local area ground and air pollution. **Contractor:** TBD. **Status:** New program.

Geophysics for Synthetic Environments
Program to develop the capability to simulate the physical environment and its effects in order to mitigate and/or exploit environmental impact on system performance and operations. **Contractors:** Many. **Status:** Continuing.

Global, Real-Time Ionospheric and Neutral Atmospheric Models for Air Weather Service (AWS)
Real-time ionospheric model (PRISM) will provide electron density profiles globally from altitudes of 90–1,000 kilometers for AWS high-priority customers. Neutral atmospheric models (VSH) will specify neutral densities, composition, and winds from altitudes of 90–1,000 kilometers. **Contractors:** Computational Physics, Inc., U. of Michigan. **Status:** PRISM validation in 1993, VSH delivery to AWS in 1993.

High-Frequency Active Auroral Research Program
Program to observe, define, predict, and reduce degradations and outages of C^3I operational systems due to radiowave modification of the atmosphere and ionosphere. **Contractors:** Araco Power Technology, Inc., Stanford U., SRI. **Status:** Continuing.

IR Background Models and Codes
Effort to measure, understand, and simulate the optical environment of the atmosphere. **Contractors:** Many. **Status:** Advanced development.

Nuclear Test-Ban Treaty Verification
Comprehensive seismic research and development program designed to study physical properties and behavior of Earth's interior as they pertain to monitoring underground nuclear tests. **Contractors:** Many. **Status:** Continuing.

Photovoltaic Array Spacepower Plus Diagnostics
Research to determine environmental effects of space on the operation and lifetime of photovoltaic spacepower systems. Joint development program among Phillips Laboratory, Wright Laboratory, and NASA. **Contractor:** Amptek. **Status:** Integration, test.

Smart Weapons Performance Prediction Techniques
Investigation of the weather sensitivities of smart weapon systems to develop techniques (electro-optical tactical decision aids) to measure the required parameters in the battlefield and to use this information to predict the effectiveness of smart weapon systems. **Contractors:** STS, Batelle, Columbus Labs, EOIR Measurements, Inc., Georgia Tech Research Corp. **Status:** Continuing.

Solar/Space Weather
Program to measure and model the transfer of energy from the sun through interplanetary space to Earth for its effect on Air Force satellites. **Contractors:** Many. **Status:** Continuing.

Weather Sensing Technology
Program to develop remote sensing tools to measure atmospheric parameters required to assess system development planning and to provide operational weather support. **Contractors:** STX, Atmospheric Environmental Research Co., U. of Wisconsin, U. of Utah. **Status:** Basic research, exploratory development, advanced development.

Weather Simulation and Applications
Program to develop atmospheric simulation techniques for military systems design and acquisition. **Contractor:** ST Systems Corp. **Status:** Continuing.

Phillips Laboratory Lasers & Imaging Directorate

Advanced Electro-Optical System
Program to develop a four-meter-class telescope that will increase capabilities of the Air Force Maui Optical Station through installation of a large, state-of-the-art, electro-optical system to be operational by 1995. **Contractor:** Contraves (telescope). **Status:** Development.

Advanced Imaging Efforts
Development of methods to remove atmospheric distortions from images of space objects. These methods include such computer post-processing techniques as speckle and hybrid imaging and preprocessing approaches with adaptive optical systems. **Contractors:** In-house, many. **Status:** Research, exploratory development, advanced development.

Advanced Tracking
Investigation of acquisition, pointing, and tracking for laser systems in ground, air, and space experiments. The lab has developed in-house, advanced tracking systems to meet current and future requirements for active laser-illuminated and passive imaging and weapon-class systems. **Contractors:** In-house, many. **Status:** Research, exploratory development, advanced development.

Airborne Laser
Effort to support ABL demonstrator development. Risk-reduction activities focus on investigation of the atmospheric propagation environment, atmospheric compensation, and pointing and tracking technologies. **Contractors:** In-house, many. **Status:** On-going risk-reduction experiments.

Air Force Maui Optical Station
Research and development facility devoted to satellite tracking and imaging and the pointing and tracking problems associated with ground-based lasers. Facility located on Mount Haleakala on Maui, Hawaii. **Contractor:** Rockwell Power Systems (O&M). **Status:** Operational and advanced development.

Argus Program
An airborne optical data collection system based on a modified NC-135E aircraft to support a wide variety of testing, including observations of missile plumes, reentry vehicles, and space-related events. **Contractors:** In-house, many. **Status:** Operational and advanced development.

Chemical Oxygen Iodine Laser
Development of advanced technologies and demonstration of the scaling of chemical lasers to weapon-power levels for strategic and tactical applications. Investigation of methods to enhance laser performance and develop novel pumping mechanisms. **Contractors:** In-house, many. **Status:** Research, exploratory development, advanced development.

Nonlinear Optics Center of Technology
Research into laser beam cleanup of system-induced distortions, correction of aberrations due to optical system imperfections and atmospheric effects for imaging applications, specific frequency generation for high-energy laser systems, laser device scaling through coupling of multiple devices, and novel nonlinear optical processing techniques. **Contractors:** Many. **Status:** Research, exploratory development, advanced development.

Semiconductor Laser Technology
Program to develop new laser technology using semiconductor laser diodes and diode-pumped solid-state lasers for advanced applications. **Contractors:** Many. **Status:** Research, exploratory and advanced development.

Starfire Optical Range
Range located at Kirtland AFB, N. M., that contains a 1.5-meter telescope and auxiliary beam director with associated laboratories and control facilities for conducting night and daytime experiments. Installation in fall 1993 of a new 3.5-meter telescope. **Contractors:** Rockwell Power Systems, RDA, Contraves, U. of Arizona. **Status:** Advanced development.

Phillips Laboratory Propulsion Directorate

Advanced Liquid Axial Stage
Program to develop an advanced liquid axial rocket stage for a spacebased kinetic-energy weapon. This is the second stage of a two-stage vehicle that provides the target intercept velocity for a weight-minimized kinetic-kill vehicle. **Contractor:** Aerojet. **Status:** Advanced development.

Advanced Polymer Components
In-house demonstration of the feasibility of thermotropic liquid crystal polymers as system components for rocket propulsion applications. These materials are characterized by extremely low density, high strength, chemical resistance, insulating properties, and low cost. **Contractors:** Case Western Reserve U., College of William and Mary, Butler U., U. of Mississippi, U. of Lowell, Australian Nuclear Science and Technology Organization, The Deutsches ElektronenSynchrotron. **Status:** Research, exploratory development.

Advanced Solid Divert Propulsion
Program to develop solid propellant divert stage for sea-launched theater defense missile. **Contractor:** Thiokol. **Status:** Advanced development.

Environmentally Acceptable Propellant Development
Program to develop and demonstrate highly reliable low-cost solid propellants that meet current and anticipated environmental regulations for manufacturing, testing, emissions, and disposal. **Contractors:** Various. **Status:** Exploratory development.

High-Energy-Density Materials Development
Program to identify, produce, characterize, and stabilize molecular systems that have potential as high-energy-density materials in propellants. These include research into solid oxygen and hydrogen. **Contractor:** In-house. **Status:** Applied research.

Integrated Powerhead Demonstration
Program to demonstrate advanced turbopumps and their operation in an integral rocket engine environment through the use of existing preburners and gas generators currently under development. **Contractor:** TBD. **Status:** Contract awards late 1994.

Integrated Stage Concept for ICBMs
Program to develop a revolutionary motor configuration that greatly increases the volume available for solid propellant. This program will integrate and demonstrate key stage technologies in subscale hardware. **Contractor:** Aerojet. **Status:** Advanced development.

Liquid Engine Nozzle Advanced Material Application
Program to evaluate advanced composite materials (carbon-carbon and liquid crystal polymers) in a liquid oxygen–liquid hydrogen linear aerospike engine environment. **Contractor:** In-house. **Status:** Exploratory development.

Missile Component Integration
Effort to identify, design, and develop components for the Minuteman III solid rocket motor remanufacturing program. Areas include composite case manufacturing techniques, cleaner propellant, improved nozzles, and improved liner/bonding systems. **Contractor:** In-house. **Status:** Advanced development.

Reclaimed Ammonium Perchlorate Characterization
Effort to determine the extent to which reclaimed ammonium perchlorate can be reused in such solid rocket motors as the shuttle RSRM (redesigned solid rocket motor) and Minuteman III Stage II. **Contractor:** In-house. **Status:** Research and exploratory development.

Scavenged Propellant Test Motor
Project to evaluate and demonstrate a clean propellant candidate in a large-scale test motor. **Contractor:** Thiokol. **Status:** Advanced development.

Solar Thermal Propulsion
Development of technology base for unconventional rocket thrusters using intensely concentrated solar energy. **Contractor:** In-house. **Status:** Exploratory development.

Solid Propellant Environmental Issues
Program to demonstrate environmentally acceptable manufacturing technologies that comply with current and anticipated environmental regulations. **Contractor:** TBD. **Status:** Advanced development.

Turbopump Component Technologies
Project to investigate rotordynamic performance and wear of hydrostatic bearings during turbopump start-up and shutdown transients. **Contractor:** In-house. **Status:** Development and testing.

30-Kilowatt-Class Arcjet Demonstration
Project to develop a spaceflight configuration package consisting of a 26-kw low-impedance ammonia arcjet, power conditioning subsystem, diagnostic package, and control subsystem and to measure its integrated performance on Earth during flight qualification tests. **Contractor:** TRW. **Status:** Advanced development.

Phillips Laboratory Space and Missiles Technology Directorate

Advanced Space Communications 60-GHz Crosslink
Program to demonstrate benchtop 60-GHz crosslink capability, pinpointing technology development required for future systems miniaturization and survivability. **Contractors:** Various, TBD. **Status:** Research and development.

Laser Communications Crosslink
Program to conduct a space demonstration of a heterodyne laser crosslink, providing a high-data-rate (greater than one gigabit/sec) link for satellite-to-satellite and satellite-to-ground communication. **Contractor:** MIT Lincoln Laboratory. **Status:** Ongoing.

Long-Wavelength Infrared Low-Background Uniform Mercury Cadmium Telluride
Program to identify technology, modeling, and cost shortfalls, based on current BMDO requirements, in existing long-wavelength hybrid technology. **Contractors:** Rockwell, Hughes Santa Barbara Research Center, Aerojet. **Status:** Contract awarded February 1993.

Sensor Technology for Applied Research
Program to advance the state of the art for sensors using ultraviolet, visible, near infrared, and infrared spectrum and to study cryogenic semiconductors and superconductor materials to improve speed, sensitivity, size, and radiation hardness. **Contractor:** Maxwell Laboratories, S^3 Division. **Status:** Contract awarded November 1992.

Shuttle Pallet Satellite III
Experiment to perform functional proof-of-principle demonstrations in support of Brilliant Eyes, Brilliant Pebbles, and Theater Missile Defense concepts, as well as sensor technology demonstrations. **Contractor:** Space Dynamics Lab/Utah State U. **Status:** Contract awarded September 1992.

Silicon Hybrid With Infrared Extrinsic Long-Wave Detectors
Program to identify shortfalls in technology, modeling, and cost in existing silicon hybrid technology programs, based on current BMDO requirements. Program to develop a research plan to eliminate shortfalls using new designs and fabrication approaches in an established processing line. **Contractors:** Rockwell, Hughes, Aerojet. **Status:** Contract awarded October 1992.

Space Sensors Integration Effort
Program to push exploratory and advanced development of spacecraft payload integration technologies, including computer and hardware simulations of active and passive sensors, communications, signal and data processors, internal and external environmental effects, target and background phenomenology, orbital scenarios, and system-level engineering models. **Contractor:** TBD. **Status:** Software capability procured.

Strategic Hybrids With Advanced Optimized Medium-Wavelength Infrared
Effort to identify technology, modeling, and cost shortfalls in existing medium- and medium-long-wavelength hybrid technology programs and develop a research plan to eliminate shortfalls with new approaches to processing. **Contractors:** Hughes Santa Barbara Research Center, Rockwell International. **Status:** Contract awarded December 1992.

Phillips Laboratory Space Experiments Directorate

Airborne Laser
Program to develop an airborne demonstrator using a high-energy laser for defense against theater missiles in the boost phase. **Contractors:** In-house, many. **Status:** Risk-reduction experiments ongoing.

Advanced Technology Standard Satellite Bus
Development of a small, modular, multimission satellite bus using advanced technology to provide a high payload mass fraction with standard interfaces to facilitate technology insertion and provide bolt-on payload compatibility. **Contractor:** TBD. **Status:** Potential FY 1994 new start.

High-Altitude Balloon Experiment
Program to conduct balloon-borne, high-accuracy acquisition, tracking, pointing, and fire-control experiments against thrusting boosters. **Contractors:** In-house, many. **Status:** Flight experimentation.

Integrated Product Development
Laboratory to develop and expand efficient concurrent engineering capability for Phillips Laboratory using state-of-the-art CAD/CAE tools. **Contractors:** In-house, Cooperative Research and Development Agreement (CRDA) with Martin Marietta, others. **Status:** Concept development, initial hardware procurement.

Lightweight Exoatmospheric Projectile
Development and integration of kinetic-kill vehicle technologies for BMDO and demonstration of KKV state-of-the-art performance through low-cost ground and flight testing. **Contractors:** In-house, many. **Status:** Flight-testing.

Liquid Metal Test Experiment
Program to test in microgravity environment three liquid metal pipe designs, technology critical to the Air Force Thermionics Program. **Contractors:** Los Alamos National Laboratory, in-house. **Status:** Fabrication and test.

Miniature Sensor Technology Integration
Technology demonstration space platform serving as test-bed for developing and validating LEAP seeker technology and conducting other experiments critical to kinetic-kill vehicle development. MSTI will also serve as a space observation base for actual LEAP engagements. **Contractors:** In-house, many. **Status:** Ongoing.

Payload Operations Center
Data fusion center for Phillips Laboratory balloon and space experiments where information will be sorted, processed, and distributed to investigators. **Contractors:** In-house, many. **Status:** Initial operational capability summer 1993.

Space Power Experiment Aboard Rocket
Sounding rocket mission to investigate spacecraft grounding, surface discharge techniques, effluent effects, test chamber fidelity, and solar cell performance during high-voltage, high-current discharge conditions in space. **Contractors:** Utah State U., Northeastern U., in-house. **Status:** Payload fabrication.

Space Surveillance, Track, and Autonomous Reposition Experiment
Program to demonstrate space control, force enhancement, and space support technologies, combining Electric Insertion Transfer Experiment and Space Surveillance Initiative advanced technology transition demonstrations. **Contractors:** CRDA with TRW, others. **Status:** Preprocurement, requirements definition.

Technology for Autonomous Operational Survivability
Demonstration of autonomous navigation and control spacecraft bus technologies and testing and validation of new operational control concepts. **Contractors:** Many. **Status:** Launch August 1993. ■

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Throughout the world, the toughest jobs always go to Hercules.

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Missiles just sit there, you say? What's to maintain, you ask? Meet AFA's 1993 Team of the Year.

Keeping the Missiles Up

By Peter Grier

A member of the Team of the Year, TSgt. Leo W. Cappelli, examines a missile in its silo. The five honorees earned their award through performance under pressure, keeping the Air Force's on-alert ICBMs—and their guidance systems, computers, and support equipment—in top shape and running twenty-four hours a day.

AIR FORCE intercontinental ballistic missiles (ICBMs) standing on alert never fly, but they still break down. Their guidance systems sometimes fail. Electronics occasionally short out. Silo air-conditioners can stop chilling. Access doors intermittently refuse to lock.

Considering the mission of these strategic nuclear missiles, it is crucial that they stay in top shape. That is why missile maintainers have such important jobs—and why the Air Force and Air Force Association are honoring five of the best as the 1993 Team of the Year.

They work long hours, often in the harsh weather of the northern Great Plains. They hardly ever get posted overseas. Even their Air Force counterparts for other systems sometimes wonder what they do. ICBMs just sit there in the ground. What's to maintain?

The team winners reply that alert ICBMs are up and running twenty-four hours a day, seven days a week. The guidance gyros are spinning, and computers are active.

"I got that question from someone who works at our bomb wing," says SSgt. Kevin L. Williams, Electro-

mechanical Team Chief from the 44th Missile Wing at Ellsworth AFB, S. D. "I told him, 'If you turned on all the engines on a B-1, all the electronics and avionics, and everything else on that aircraft, and you left it on all day, things would start to break.' "

Guidance control systems, for instance, have long been among missile maintainers' biggest headaches. Equipment capable of steering a missile to a target halfway around the world with pinpoint accuracy is, by necessity, complex and somewhat delicate.

When the Gyro Stops

The heart of a guidance system is its constantly spinning gyroscope. If the gyroscope stops turning, the system shuts down. ICBM gyroscopes are sensitive enough for that to happen often. Before the 44th Missile Wing began closing Minuteman II operations as a result of negotiated arms-control reductions, its maintainers sometimes had to fix one guidance control set a day.

"We do more guidance control systems in the winter because of the cold, and it plays havoc with them," said AFA winner TSgt. Leo W. Cappelli, the NCO in charge of the Missile Mechanical Team Training Section for the 44th Maintenance Support Squadron at Ellsworth.

Weather can affect other ICBM systems as well. Missile installations are typically located in isolated areas of the upper Midwest, where winters are long and hard. Heavy snows can knock out the flow of electricity to a missile site, and emergency diesel generators intended for backup power do not always start automatically, as they are supposed to do.

When that happens, the storage batteries at a site can wear down quickly. "Then they will pull them from the site and bring 'em to us," says SrA. Bryan S. Pardue, Minuteman Electromechanical Team Chief from the 90th Organizational Missile Maintenance Squadron, Francis E. Warren AFB, Wyo.

At least that kind of electromechanical work can be done indoors, back at the shop. Work at the missile site can mean a long day in the field. Silos are dispersed over a wide area, not grouped conveniently together on a flight line a short walk from the soft-drink machine.

A typical day can involve loading a semitrailer-sized vehicle with equipment and leaving for the site at 4:00 a.m. After a trip of one to three hours, a team then needs up to an hour and a half to enter the site—or "break into" it, in maintainers' parlance.

That time is spent unlocking and opening the primary and secondary access doors to the facility. With that done, it takes another twenty minutes to get to the bottom of the launcher area.

Opening the ninety-ton launcher closure door for missile or warhead removal takes twenty minutes. After the work is done, the whole process has to be repeated in reverse. "It might be two o'clock in the afternoon before you even get to touch the missile," says Sergeant Cappelli. "It makes for long days—twelve to sixteen hours."

If things go wrong, the days can be even longer. One way this year's winners earned their award was through performance under pressure—by working through tough spots, such as when one of the access doors would not open.

Pulling the B-Plug

The award nomination of Airman Pardue cites his ability to carry out "intricate B-plug troubleshoot and repair actions."

The B-plug is the secondary door—eight feet of steel forming one of the site's main security barriers. The tumblers on B-plug locks sometimes wear out, frustrating site entry. When that happens, maintainers spend much time and effort trying hundreds of different computer-generated combinations and working on the lock tumblers.

If the B-plug will not open, only one way into the site remains. It is not an attractive option, because it involves considerable effort and expense.

"They have to come in and jackhammer it," says Sergeant Williams. This is known as "forced entry," and it is perhaps the most dangerous task in missile maintenance. It involves chipping a hole in the launcher closure door, the massive lid of steel-reinforced concrete intended to seal off the silo from the effects of a nuclear blast.

Once a small opening is created, a missile maintainer is lowered ninety feet to the launcher floor, from where he or she enters the facility maintenance area and opens the B-plug from the inside.

Steel cables that keep the silo door shut add to the difficulty. The cables have to be carefully tied off to prevent their swinging free and banging dangerously against the nuclear warhead.

Forced entry is considered risky "because you've got a nuclear weapon right underneath," points out AFA award winner SSgt. Michael P. Gardner, Missile Maintenance Team Chief from the 351st Organizational Missile Maintenance Squadron, Whiteman AFB, Mo.

Sergeant Gardner's nomination papers refer to him as the premier team chief and technical expert of his squadron. He was handpicked to perform a destructive forced entry, which he carried out flawlessly, according to his commanding officer.

A missile base can expect to perform one forced entry annually, according to the members of the team of the year. Like many maintenance problems, however, forced entries sometimes come in bunches. F. E. Warren AFB once had two in one week.

None of the AFA winners has ever heard of major forced entry problems. If any had occurred, they would know: All bases are briefed if equipment relating to nuclear warheads breaks anywhere.

The 44th MW at Ellsworth recently had trouble with a transporter-erector used to carry the rocket stage of an ICBM, for instance. The vehicle had just brought a rocket back to the site for replacement in a launcher, when its environmental control system caught fire. The operator was knocked unconscious by the smoke and had to be dragged free. The site was evacuated.

A postmortem revealed that designers had run wires far too close to the environmental control system's heater elements. Missile bases are awaiting a retrofit to fix the problem.

"They can still use the transporter-erector, but they have to carry a portable air-conditioner with them," says another AFA winner, SrA. Eric W. Norstrom, a Missile Facilities Specialist with Ellsworth's 44th Field Missile Maintenance Squadron.

Airman Norstrom is a five-level technician responsible for maintaining electrical, power generation, and environmental control systems. His nomination papers cite him for his

important performance in one of Strategic Air Command's Olympic Arena contests, where he helped win "Best Power, Refrigeration, and Electrical Team" honors by troubleshooting problems with an elevator work cage. Out of a possible 300 points, his team received 292.

Stuck in a Silo

A big part of the job is making sure all maintenance support equipment—hoists, support vehicles, lifts—is in good shape. As the transporter-erector fire shows, this task should not be taken for granted. If something goes wrong with a hoist while maintainers are working in the launcher area, says Airman Norstrom, "they'd be stuck there in the middle of the site about twenty or thirty feet down."

Ironically, for many missile maintainers, silo deactivation is now a major part of the work load, as arms-control agreements reduce the number of nuclear weapons the US will keep standing on alert. The 44th MW, for instance, is scheduled to pull its last Minuteman II out of its silo by June 1994. Ellsworth AFB's role in ICBM deterrence will end with the destruction of silos either by implosion with explosives or by excavation.

Dealing well with deactivation—seeing it as an opportunity to stockpile parts and save money—is one way AFA's Team of the Year members won their awards.

Sergeant Cappelli saved the Air Force more than $15 million last year by salvaging 2,300 pieces of equipment from closed launch and launch-control facilities, according to his nomination papers. Sergeant Gardner scrounged a truck and outfitted it as a specialized deactivation vehicle for his missile maintenance team at Whiteman AFB. Airman Norstrom has become an expert in handling sodium chromate, a highly toxic material used in launcher cooling systems. He has now accumulated more than 2,000 pounds of sodium chromate at Ellsworth's waste-accumulation point without a single accident.

The deactivation of missiles will move some missile maintainers to other weapon systems. At least one member of the Team of the Year has already done so. Sergeant Cappelli helped place the first flights of ground-launched cruise missiles on line at Comiso AB, Italy, in 1986. GLCMs were then negotiated away in the Intermediate-Range Nuclear Forces Treaty signed by President Ronald Reagan and Soviet leader Mikhail Gorbachev in 1987.

AFA Team of the Year winners traveled varied paths to become missile maintainers. Some picked their specialty while in basic training because it sounded important and interesting. Others were assigned to missiles and grew to like working on the systems.

One opted for ICBMs because he wanted to work with electronics and felt that alternatives had unappealing aspects. "I don't care much for going up in airplanes," says Sergeant Williams, "and I'm familiar with flight line maintenance. It gets real hot and real cold."

The Team

Representing all missile maintainers in the Air Force, the 1993 AFA Team of the Year:

TSgt. Leo W. Cappelli of the 44th Maintenance Support Squadron, Ellsworth AFB, S. D. Sergeant Cappelli is recognized by his commanders as a superior instructor. They cite his missile maintenance team training classes as so concise, professional, and technically accurate that his first four students won distinguished graduate recognition. He has produced and narrated five training films to make more efficient use of a shrinking instructor force. Sergeant Cappelli helped develop an Exceptional Student Award to honor a former coworker, TSgt. Dick Mayle, who died in 1992 from a brain hemorrhage.

SSgt. Michael P. Gardner of the 351st Organizational Missile Maintenance Squadron, Whiteman AFB, Mo. Sergeant Gardner's nomination papers, prepared by the commander of his unit, cite him as "by far the most productive and versatile team chief we have." He was the first team chief from his unit to be trained in more than forty depot-level tasks needed to remove expensive spares from launch facilities marked for closure. He has helped design and build unique slings for missile maintenance work. After his squadron was ordered to shut down its 150 missiles, Sergeant Gardner quickly took his team through twelve launch facility entries, "helping to complete the massive tasks a full day ahead of schedule," according to his nomination.

SrA. Eric W. Norstrom of the 44th Field Missile Maintenance Squadron, Ellsworth AFB, S. D. Airman Norstrom's superiors cite him as one of the top workers in the Air Force. He tested and gained approval for the use of electrical soldering tongs at ICBM facilities where open-flame soldering is prohibited. This small move saved "countless" man-hours when working on air-conditioning systems at remote sites, according to his nomination papers. Airman Norstrom's work on aging hoists and power systems directly led to safe movement of more than 250 reentry vehicles last year—a command record.

SrA. Bryan S. Pardue of the 90th Organizational Missile Maintenance Squadron, F. E. Warren AFB, Wyo. Airman Pardue's technical skills and leadership ability belie his twenty-one years, according to his commanding officers. Despite having only twelve months of experience, he achieved an outstanding ninety percent work order completion rate for 1992. At one point last year, he was sent to fix an electrical problem in a launch equipment room that had already foiled six teams. Within a few minutes, he had solved the problem—two wires had been wrongly twisted together.

SSgt. Kevin L. Williams of the 44th Organizational Missile Maintenance Squadron, Ellsworth AFB, S. D. According to his nomination papers, Sergeant Williams's remarkable duty performance, combined with extensive community involvement, made him an "obvious choice" for AFA Team of the Year honors. He is cited as a prolific deactivation team chief—saving more than 3,000 pieces of equipment valued at some $20 million. He is also a linchpin of Ellsworth's honor guard, having performed at 138 drill and ceremonial functions, including the nationally televised Mount Rushmore Golden Anniversary Celebration. ■

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, "The Case for the Academies," appeared in the July 1993 issue.*

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The survival plan is to push first-line equipment on the export market and continue to search for foreign business partners.

The Radical Reshaping of Russian Aerospace

By David R. Markov

Staff photos by Guy Aceto

The Russian aerospace industry will not survive without large export orders. The Mikoyan Design Bureau (MiG logo above) is among the companies aggressively pursuing foreign customers at such air shows as Farnborough (opposite).

THE VAST but troubled Russian aerospace industry is in the throes of a profound transformation, one of major significance to the United States. At issue: how the aerospace industry of the future will be organized, which weapons and technologies it will develop, and which nations it will supply.

All signs are that post-Soviet industry is being radically reshaped by broad trends sweeping Russia. These include the collapse of the traditional Soviet industrial organization, disruption of certain critical supplier links, radical change in the economy, and basic shifts in the customer base.

The industry has been thrown into extraordinary turmoil, the outcome of which is unpredictable. Aerospace technologies have broad civilian and military implications. Russia's capabilities are extensive and world-class. Therefore, what happens in this sector can have sharp international repercussions.

The Russians see the export of arms as the single best opportunity to keep their military aviation sector alive. Once, domestic military procurement alone could keep the industry viable,

1,100-lb loads. First order, for 18 Mk 208s with wingtip Sidewinders and flight refueling nose probe, from Malaysia for 1994–95 delivery. *(Data for series 200.)*

Contractor: British Aerospace plc, UK.

Power Plant: one Rolls-Royce Turbomeca Adour 871 turbofan; 5,845 lb thrust.

Dimensions: span over AAMs 32 ft 7½ in, length 37 ft 2 in, height 13 ft 8 in.

Weights: empty 9,810 lb, gross 20,061 lb.

Performance: never-exceed speed at height Mach 1.2, max speed at S/L 632 mph, ceiling 45,000 ft, T-O run 2,070 ft, landing run 1,960 ft, radius of action 120–765 miles.

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

Armament: one or two 25-mm Aden guns, each with 100 rds. Five pylons for bombs of up to 2,000 lb, pods of 18 x 2.75-in air-to-surface rockets, Sea Eagle antiship missile, Sky Flash, Sidewinder, or other AAMs, laser-guided munitions, reconnaissance or EW pods. Wingtip Sidewinders optional.

Hunter

Although the Republic of Singapore Air Force now has F-16s, its No. 141 Squadron continues to operate about 15 veteran Hunters from Paya Lebar, the former Singapore commercial airport. First combat aircraft received by the RSAF in 1971–72, most are **FGA. Mk 74s** and **F. Mk 74Bs,** upgraded to carry AIM-9P Sidewinders and additional bombs and rockets, but a few **FR. Mk 74As** serve in a tactical reconnaissance role. *(Data for Hunter FGA. Mk 74.)*

Contractor: Hawker Aircraft Ltd, UK.

Power Plant: one Rolls-Royce Avon 207 turbojet; 10,000 lb thrust.

Dimensions: span 33 ft 8 in, length 45 ft 10½ in, height 13 ft 2 in.

Weights: empty 13,270 lb, gross 24,000 lb.

Performance: max speed at S/L 710 mph, ceiling 50,000 ft, T-O run 2,100 ft, landing run 3,150 ft, range 1,840 miles.

Accommodation: pilot only, on ejection seat.

Armament: four 30-mm Aden guns, each with 150 rds, in nose. Five pylons under each wing. Two bombs of up to 1,000 lb, two clusters of six 3-in rockets, or two packs each with 24 or 37 x 2-in rockets on inboard pylons. Up to 24 x 3-in rockets, or Sidewinder AAMs, on outboard pylons. Alternatively, four external fuel tanks or napalm containers can be carried.

J-5

Before 1955, the Chinese People's Liberation Army Air Force flew Soviet-built MiG-15s. To launch jet fighter production in China, Moscow provided all necessary design drawings, plus two sample **MiG-17Fs,** 15 knocked-down kits, forgings and raw materials for 10 aircraft, and parts for 15 more. Of the 767 aircraft built at Shenyang in 1956–59 under the designation J-5, up to 600 remain available to the PLA Air Force and Navy. More than 100 continue to serve with the Air Force of North Korea, but the few supplied to Vietnam are believed to be in storage. The basic **J-5** is equivalent to the MiG-17F (NATO "Fresco-C") day fighter. The **J-5jia** is the Chinese-built MiG-17PF ("Fresco-D"), with Izumrud radar. The WP5 afterburning turbojet fitted to all aircraft built at Shenyang is similar to the Soviet Klimov VK-1F, itself developed from the Rolls-Royce Nene. *(Data for MiG-17F.)*

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

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

Dimensions: span 31 ft 7 in, length 36 ft 11¼ in, height 12 ft 5¾ in.

Weights: empty 8,664 lb, gross 13,393 lb.

Performance: max speed at 10,000 ft 711 mph, ceiling 54,450 ft, T-O run 1,935 ft, landing run 2,690–2,790 ft, range 870 miles.

Accommodation: pilot only.

Armament: one 37-mm N-37D and two 23-mm NR-23 guns in nose; underwing pylons for four eight-rocket packs or total of 1,100 lb of bombs.

J-6

More **J-6s** serve with the Chinese People's Liberation Army Air Force (about 2,500) and Navy (300) than any other type of combat aircraft. Most are Chinese counterparts of the MiG-19SF single-seat day fighter (NATO "Farmer-C") and MiG-19PF single-seat limited all-weather fighter ("Farmer-D"). The first few, built at Shenyang during the period of China's disastrous "great leap forward" in 1958–60, were substandard. Responsibility for the J-6 was transferred to Nanchang Aircraft Factory, which eventually exceeded the Soviet production total. In addition to the two basic J-6 variants, it built the tactical reconnaissance **JZ-6** with an IR linescan/camera pack in the front fuselage. Guizhou Aircraft Factory delivered a small number of **J-6As,** with all-weather radar, PL-2 IR-homing AAMs similar to the Soviet AA-2 ("Atoll"), a rocket ejection seat, and other changes. The Air Force of North Korea still operates about 100 J-6s; those in Vietnam are reported to be in storage. *(Data for J-6 day fighter.)*

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

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

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

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

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

Accommodation: pilot only, on ejection seat.

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

JH-7

Very little further information on this important new Chinese warplane has been forthcoming since it was displayed in model form at the 1988 Farnborough International Air Show, although a static test aircraft has been completed and at least one prototype flew for the first time in late 1988 or early 1989. In much the same role class as the Soviet Sukhoi Su-24 "Fencer," the JH-7 is destined for a main all-weather interdictor/strike function in the PLA Air Force (with a secondary role of air defense interceptor) and as a maritime strike aircraft with the PLA Navy.

Design features include shoulder-mounted swept wings and an all-moving tailplane; avionics are said to include terrain-following radar.

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

Power Plant (prototypes): two Xian WS9 (license Rolls-Royce Spey Mk 202) turbofans, each 20,515 lb thrust with afterburning. Intended production engines believed to be Liming turbofans of 31,085 lb afterburning thrust.

Dimensions: span 42 ft 0 in, length (incl nose probe) 68 ft 10¾ in, height 20 ft 4⅞ in.

Weight (estimated): gross 60,627 lb.

Performance: max speed at height Mach 1.7, ceiling 52,500 ft.

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

Armament: 23-mm twin-barrel gun in nose. Four underwing hardpoints for various external weapons (including C-801 sea-skimming antiship missiles in maritime configuration), drop tanks, or other stores; rail for close-range AAM at each wingtip.

MB-339A/C

First flown on December 17, 1985, the MB-339C is an upgraded model of Aermacchi's earlier **MB-339A,** which equips the Italian and several foreign air forces (including Malaysia) as a basic/advanced trainer and ground-attack aircraft. Malaysia's No. 3 Flying Training Center has eleven As for advanced and weapons training, which could provide a light attack capability if required. Further MB-339A details can be found in the "World Gallery of Trainers" in last December's AIR FORCE Magazine. Differences in the C model include a more powerful engine, modified nose contours, larger permanent wingtip fuel tanks, and a fully integrated digital nav/attack system with a HUD in each cockpit, enabling either crew member to instigate air-to-ground weapon delivery. In May 1990, the Royal New Zealand Air Force ordered 18 MB-339Cs (known locally as **MB-339CBs**) to replace its elderly BAe Strikemasters. Deliveries began in March 1991.

Contractor: Aermacchi SpA, Italy.

Power Plant: one Rolls-Royce Viper Mk 680-43 turbojet; 4,400 lb thrust.

Dimensions: span 36 ft 9¾ in over tiptanks, length 36 ft 10½ in, height 13 ft 1¼ in.

Weights: empty 7,297 lb, gross (with external stores) 14,000 lb.

Performance: max speed at S/L 558 mph, at 30,000 ft 508 mph, ceiling 46,700 ft, T-O run 1,608 ft, landing run 1,493 ft, range 1,266 miles with two 86-gal drop tanks and 10 percent reserves.

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

Armament: three hardpoints under each wing for up to 4,000 lb of stores including gun pods, single or cluster bombs, rocket launchers, ASMs or antiship missiles, or (outboard stations only) AAMs.

MiG-23

Export versions of the variable-geometry MiG-23 serve with two air forces in the Far East/Pacific region. North Korea acquired 60 **MiG-23MF** (NATO "Flogger-E") interceptors in the mid-1980s, to match the South's F-16s. Most remain operational, with R-23R ("Apex") AAMs compared with the less effective R-3S ("Atolls") of the earlier MiG-21s alongside which they fly. Their Saphir-23D ("High Lark") radar has a search range of 43 miles and tracking range of 34 miles; an undernose IR sensor pod and RWR are standard, as is a 23-mm twin-barrel GSh-23 gun.

The 50 or so **MiG-23BMs** ("Flogger-F") of the Vietnamese People's Air Force have the same basic airframe as the MiG-23MF, but with the "attack" nose profile of Russian MiG-27s, and an R-29B-300 turbojet instead of the MF's 22,045 lb thrust R-27F2M-300. The nose, sharply tapered in side elevation, contains a PrNK-23 nav/attack system, slaved to a computer; the cockpit sides are armored. Other features include wider, low-pressure tires and active and passive ECM. *(Data for MiG-23BM.)*

Contractor: Mikoyan OKB, Russia.

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

Dimensions: span 45 ft 10 in spread, 25 ft 6¼ in swept, length (incl nose probe) 56 ft 0¼ in, height 16 ft 5 in.

Weight: gross 41,666 lb.

Performance: max speed at height Mach 1.7, at S/L Mach 1.1, ceiling 45,900 ft, T-O run 2,625 ft, combat radius at S/L with six 1,100-lb bombs 248 miles, with four 550-lb bombs 372 miles.

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

Armament: one underbelly 23-mm twin-barrel GSh-23L gun; six external hardpoints for eighteen 110-lb or 220-lb bombs, eight 550-lb bombs, six 1,100-lb bombs, or a mix of bombs and two UPK-23-250 pods, each containing a 23-mm twin-barrel gun and 250 rds, ASMs, or rockets.

OV-10 Bronco

Indonesia operates about 12 of the 16 **OV-10F** Bronco counterinsurgency aircraft that it received from August 1976, to replace F-51D Mustangs. Now equipping No. 3 Squadron of the Air Force, at Baucau, the twin-boom, turboprop OV-10Fs have been used during campaigns to subdue unrest in parts of what is the world's fifth most populous nation, made up of some 13,000 islands. Faced with similar internal problems, the Philippine Air Force took delivery of the last 10 of 24 ex-USAF **OV-10As** in mid-1992, as AT-28D Trojan replacements. They equip its 15th Strike Wing at Sangley Point.

Contractor: Rockwell International Corporation, USA.

Power Plant: two Garrett T76-G-416/417 turboprops; each 715 ehp.

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

Weights: empty 6,893 lb, gross 9,908 lb (normal), 14,444 lb (overload).

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

Accommodation: crew of two, in tandem.

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

Q-5/A-5

This is a much-redesigned attack version of the J-6 (Chinese MiG-19), first flown on June 4, 1965. The original **Q-5** had a 13-ft internal bay for two 551-lb or 1,102-lb bombs, with two more under the fuselage, plus four underwing stations for rockets or other stores. A few were adapted to carry nuclear weapons. In the **Q-5 I** (first flight late 1980), the bomb bay was blanked off, its space being used for additional fuel, and all four bombs were hung under the fuselage. Other features included improved engines and pilot seat and a relocated brake-chute. Production began in late 1981. January 1985 saw production approval for the **Q-5 IA,** with two more underwing stations (increasing external load by 1,102 lb), pressure refueling, improved warning and ECM systems, and other refinements. Current version in Chinese service is the **Q-5 II,** which is similar to the IA but fitted (or retrofitted) with a radar warning receiver. Some 500–600 Q-5s of all versions are thought to be in PLA service, including about 100 with the Naval Air Force. The latter can carry two underfuselage torpedoes or C-801 antiship missiles.

The only Far East/Pacific export customer was North Korea, which received 40 Q-5 IAs in the 1980s. *(Data for Q-5 IA.)*

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

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

Dimensions: span 31 ft 9 in, length (incl nose probe) 51 ft 4¼ in, height 14 ft 2¾ in.

Weights: empty 14,054 lb, gross 20,913–26,080 lb.

Performance (clean): max speed at 36,000 ft 740 mph, at S/L 752 mph, ceiling 52,000 ft, T-O run 2,300–2,460 ft, landing run 3,480 ft, combat radius with max external stores 248–373 miles, range with max internal/external fuel 1,240 miles.

Accommodation: pilot only, on low-speed/zero height ejection seat.

Armament: one 23-mm Norinco 23-2K gun in each wingroot (100 rds/gun); 10 external stations (four

under fuselage, three under each wing) for many different combinations of bombs, rockets, antiship or AAMs, ECM pods, or drop tanks, up to max load of 4,410 lb.

Su-7/20/22

The North Korean People's Army Air Force is thought to have up to 30 veteran Sukhoi **Su-7BMK** (NATO "Fitter-A") fixed-wing attack aircraft. Far more significant are the 70 or so variable-geometry "Fitters" operational in Vietnam. Those supplied originally were reported to be of the basic **Su-20** ("Fitter-C") export version, with Saturn/Lyulka AL-21F-3 afterburning turbojet and eight external stores pylons. They may have been supplemented later with **Su-22**s, offering upgraded avionics and weapon systems, but published information on such deliveries is unreliable. *(Data for Su-20.)*

Contractor: Sukhoi OKB, Russia.
Power Plant: one Saturn/Lyulka AL-21F-3 turbojet; 24,800 lb thrust with afterburning.
Dimensions: span 45 ft 3 in spread, 32 ft 10 in swept, length (incl nose probes) 61 ft 6¼ in, height 16 ft 5 in.
Weight: gross 30,865–39,020 lb.
Performance: max speed at height Mach 2.09, at S/L Mach 1.05, ceiling 59,050 ft, T-O run 2,035 ft, landing run 1,970 ft, combat radius 224–391 miles.
Accommodation: pilot only, on ejection seat.
Armament: two 30-mm NR-30 guns, each with 70 rds, in wingroots. Eight weapon pylons for more than 7,000 lb of bombs, rocket packs, and ASMs, including Kh-23 ("Kerry").

Su-25

North Korea's ground-attack force includes 20 Su-25 (NATO "Frogfoot-A") single-seat, close-support aircraft. As described in detail in the "Gallery of Russian Aerospace Weapons" (March 1993 issue), the Su-25 was designed to battle through to its targets at low level, with a heavy weapon load, against heavy opposition. The pilot sits in an armored cockpit, which, with other survivability features, accounts for 7.5 percent of the aircraft's normal takeoff weight. The engines, based on the MiG-21MF's well-proven R-13 turbojet, will run on any fuel likely to be found in a combat area, including MT gasoline and diesel oil.

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 level speed at S/L 610 mph, max attack speed, airbrakes open, 428 mph, ceiling 22,965 ft, T-O run 3,935 ft, landing run 1,312–1,970 ft, range with combat load at S/L 466 miles, at height 776 miles.
Accommodation: pilot only.
Armament: one twin-barrel 30-mm gun in port side of nose, with 250 rds. 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 370-mm rockets, laser-guided rocket-boosted bombs, and 1,100-lb incendiary, antipersonnel, and other cluster bombs. Two small outboard pylons for R-3S ("Atoll") or R-60 ("Aphid") AAMs.

Bombers and Maritime

E-2 Hawkeye

The latest Far East/Pacific nation to order Hawkeye Airborne Early Warning and Control (AEW&C) aircraft is Taiwan, which received US government approval in 1992 to procure four former US Navy E-2Bs. Before delivery this year, the first of these was to be fitted with AN/APS-138 radar, in place of its original equipment, and various ESM/IFF (electronic surveillance measures/identification, friend or foe) improvements, under the new designation **E-2T**. The remainder will be upgraded by Aero Industry Development Center (AIDC) in Taiwan.

Smaller and far less costly than USAF's E-3 Sentry, the Hawkeye has been the US Navy's standard carrier-based AEW&C type since the mid-1960s. It pioneered the now-standard rotodome form of rotating "saucer" radome, with antennas that provide both radar and IFF data. The General Electric AN/APS-145 radar processing system fitted to the latest E-2Cs detects and assesses targets over a radius of more than 345 miles, from 30,000 ft, and can control more than 40 intercepts simultaneously. Smaller targets, such as cruise missiles, can be detected at well over 100 miles range, the movement of ships and land vehicles can be monitored, and friendly aircraft can be helped to elude enemy defenses by an AN/ALR-73 passive detection system that locates hostile radar emitters over twice the range of the radar.

E-2C Hawkeye, Japan ASDF (Peter Steinemann)

H-6, Chinese PLA Air Force

Il-28/H-5, Chinese PLA Air Force (Kenneth Munson)

Singapore received four **E-2Cs**, with AN/APS-138 radar, in 1987, and has since ordered two more. Japan is receiving 13, in four batches, between 1982 and the end of 1993. The radars of the Japanese aircraft are being upgraded to AN/APS-145 standard for full overland capability. *(Data for E-2C.)*

Contractor: Grumman Aircraft Group, USA.
Power Plant: two Allison T56-A-427 turboprops; each 5,100 ehp.
Dimensions: span 80 ft 7 in (folded 29 ft 4 in), length 57 ft 6¾ in, height (rotodome raised) 18 ft 3¾ in.
Weights: empty 39,373 lb, gross 53,267 lb.
Performance: max speed 389 mph, ceiling 37,000 ft, T-O run 1,850 ft, landing run 1,440 ft, time on station 200 miles from base 4 h 24 min, endurance 6 h 15 min.
Accommodation: crew of five, comprising pilot, co-pilot, combat information center officer, air control officer, and radar operator.
Armament: none.

F27/F50 Maritime and Enforcer

Maritime and surveillance variants of the Fokker F27 Friendship transport aircraft have been available for several years and continue to be offered from the production line of its successor, the Fokker 50. The basic **F27/F50 Maritimes** are unarmed and configured primarily for coastal surveillance or search and rescue (SAR), while the **Maritime Enforcer** versions can be configured for antisubmarine warfare (ASW), anti–surface vessel (ASV), or armed surveillance, weapon installation being done by the operator rather than the manufacturer. No. 27 Squadron of the Philippine Air Force has three F27 Maritimes for unarmed reconnaissance. The Republic of Singapore Air Force has ordered four F50 Maritime Enforcer Mk 2s, with four more on option. *(Data for F50 Maritime Enforcer Mk 2.)*

Contractor: Fokker Aircraft BV, the Netherlands.
Power Plant: two Pratt & Whitney Canada PW125B turboprops; each 2,500 shp.
Dimensions: span 95 ft 1¾ in, length 82 ft 10 in, height 27 ft 3½ in.
Weights: empty 32,620 lb, gross 45,900–47,500 lb.
Performance: normal cruising speed at 20,000 ft 298 mph, ceiling 25,000 ft, T-O distance 5,000 ft, landing distance 2,500 ft, max range (internal fuel) 4,237 miles.
Accommodation: flight crew of two or three, plus two to five systems operators.
Armament: Fokker-installed stores management system only: weapons (selected and fitted by operator) can be carried on two fuselage stations and three under each wing, and can include two or four homing torpedoes and/or depth bombs for ASW, or two ASMs for antiship missions. Two underwing drop tanks can be carried to extend patrol range.

H-6

China obtained license rights from the USSR in September 1957 to build the Tupolev Tu-16 medium bomber. Two completed Tu-16s and a set of major assemblies for one aircraft reached Harbin in May 1959, and the Chinese prototype, designated **H-6**, flew for the first time on September 27. An H-6 assembled that year from a knocked-down component kit was modified to carry China's first atomic bomb, which was dropped successfully in 1965. Difficulties experienced by Chinese industry in the early 1960s delayed a production start, but following transfer of the program to Xian in 1962–64, the **H-6A** production prototype eventually flew there on December 24, 1968.

The H-6A's Xian-built WP8 turbojets are generally similar to the Tu-16's RD-3M engines. When the bomber entered service, their time between overhauls (TBO) was 300 hours; by 1983 it had increased progressively to 800 hours. At that time also, a completely new avionics suite was in production for the bomber, comprising a computer, automatic navigation system, Doppler radar, heading and attitude system, autopilot, and bombing radar. A second version, designated **H-6D**, which first flew on August 29, 1981, was approved for production in 1985. Operated by the PLA Naval Air Force, it is a carrier for China's C-601 first-generation antiship missile. An enlarged cylindrical under-nose fairing houses associated missile guidance radar. Other variants are in service as ECCM aircraft and, in small numbers, as launch aircraft for high-speed, high-altitude drones and as engine test-beds. The number of H-6As and H-6Ds in service is believed to total about 120. Production ended in the late 1980s. *(Data for H-6D.)*

Contractor: Xian Aircraft Manufacturing Company, People's Republic of China.
Power Plant: two Xian WP8 turbojets; each 20,944 lb thrust.
Dimensions: span 112 ft 2 in, length 114 ft 2 in, height 33 ft 11¾ in.
Weights: empty 84,944 lb, gross 158,733–167,110 lb.
Performance: max cruising speed 488 mph, ceiling 39,370 ft, T-O run 6,890 ft, landing run 5,050 ft, max range 2,672 miles.
Accommodation: crew of six.
Armament: six guns, in pairs, in dorsal, ventral, and tail turrets. Two C-601 antiship missiles underwing. Nuclear or conventional bombs in weapons bay. Chute for flares and marine markers to rear of weapons bay.

Il-28/H-5

Of an estimated 3,000 Ilyushin **Il-28s** (NATO "Beagle") manufactured in the Soviet Union from 1948, at least half were exported. Small numbers of those supplied to North Korea and Vietnam may still be nominally available, but China is the only major operator in 1993. After receiving up to 500 Il-28 bombers from the Soviet Union, its leaders decided to use experience gained in repairing and producing spares for these aircraft to create the necessary design drawings and put the aircraft into large-scale production at Harbin as the **H-5** (Hongzhaji-5, "Bomber 5").

About 40 percent of the airframe was redesigned. A one-piece wing superseded the original design, spliced on the centerline, saving 220 lb of structure weight. Many components, including the tailgun turret, were made common with those of the H-6 (Tu-16), already on the assembly line in China under license. The radar, bombsight, and IFF were new. A prototype flew for the first time on September 25, 1966; production began seven months later. Up to 450 H-5s and Il-28s are believed to still be operational in the PLA Air Force, some nuclear-capable, plus up to 150 serving as torpedo-bombers with the Navy. Short/medium-range tactical reconnaissance requirements are handled by **HZ-5s**, with two day/night cameras in the bomb bay, and integral wing fuel tanks that increase combat radius by 50 percent. In addition, 186 **HJ-5s** were manufactured in the 1970s for training bomber pilots. The "Il-28s" of Vietnam might well be H-5s. *(Data for Il-28; H-5 generally similar.)*

Contractors: Ilyushin Design Bureau, former USSR; Harbin Aircraft Manufacturing Corporation, People's Republic of China.
Power Plant: two Klimov VK-1A turbojets; each 5,952 lb thrust. (Chinese WP5 equivalent in H-5.)
Dimensions: span 70 ft 4½ in, length 57 ft 11 in, height 21 ft 11¾ in.
Weights: empty 28,417 lb, gross 46,738 lb.
Performance: max speed at 14,760 ft 560 mph, ceiling 40,350 ft, T-O run 2,870–3,773 ft, landing run 3,838 ft, range 1,490 miles.
Accommodation: crew of three, comprising pilot, navigator/bombardier in nose compartment, and radio operator/gunner in tail turret.

Armament: two 23-mm NR-23 guns, each with 100 rds, in nose; two more, each with 225 rds, in tail turret. Up to 6,614 lb of stores in internal weapons bay, typically four 1,100-lb or eight 550-lb bombs. Naval version carries one large or two smaller torpedoes, mines, or depth charges.

N22 Searchmaster

This twin-turboprop STOL utility aircraft began as the Nomad, a short/medium-range transport for 13 passengers and/or freight in **N22B** form. With a lengthened fuselage, seats for 17 passengers, a commuter interior, and IFR avionics as standard, it became the **N24A.** Military versions are the Missionmaster (see Transports and Tankers section) and the maritime Searchmaster.

The basic coastal patrol **Searchmaster B** has a Bendix/King RDR 1400 search radar, with an 18-in forward-looking flat-plate antenna in a nose radome, and carries a four-man crew. The Papua New Guinea Defence Force received three Bs, and 12 serve with the Indonesian Navy's No. 800 Squadron, as do six more-sophisticated **Searchmaster Ls.** These have a Litton APS-504(V)2 search radar, with a 360° scan, 40-in flat-plate phased-array antenna in an undernose "lozenge" radome; Doppler, Omega, or inertial long-range navigation; and a crew of five. *(Data for Searchmaster L.)*

Contractor: Government Aircraft Factories, Australia.
Power Plant: two Allison 250-B17C turboprops; each 420 shp.
Dimensions: span 54 ft 2 in, length 41 ft 3 in, height 18 ft 2 in.
Weights: empty 5,897 lb, gross 9,100 lb.
Performance: normal cruising speed 193 mph, ceiling 21,000 ft, T-O run 970 ft, landing run 780 ft.
Accommodation: crew of five.
Armament: provision for four underwing hardpoints, each for a 500-lb store, including gun and rocket pods.

P-3 Orion

First Pacific customer for the P-3 was the Royal New Zealand Air Force, to which five **P-3Ks** (equivalent to the USN's P-3B) were delivered in 1966. Since augmented by a sixth (ex-Australian) aircraft, they serve with No. 5 Squadron; upgrade plans are at present in abeyance. Australia's first 10 **P-3Bs**, also joined later by a single (ex-USN) aircraft, were replaced by 10 **P-3C/Update II** Orions (Australian designation **P-3W**) and a further 10 **Update II.5s.** Equipment differences in the P-3Ws, which equip Nos. 10 and 11 Squadrons, include an AQS-901 processing system for Australian Barra sonobuoys. Nineteen are to be upgraded between 1996 and 2001 by Boeing and BAe Australia with new Doppler radar, a digital magnetic tape system, and new magnetic anomaly detector (MAD) and ESM. Three ex-USN P-3Bs are being acquired for training.

Japan acquired three US-built P-3C/Update IIs before local production (starting with four CKD kits) was initiated by Kawasaki for the JMSDF, which plans to have 109 eventually, to Update II or III standard. One hundred and one have so far been ordered, of which about 90 have been delivered; they equip nine JMSDF squadrons of the 1st, 2d, and 4th Fleet Air Wings at Atsugi (two), Hachinohe (two), Kanoya (two), and one each at Shimofusa, Naha, and Iwakuni. Four of those ordered are electronic surveillance **EP-3s** (NEC/Mitsubishi suite with 230-mile capture range; first delivery March 1991); two others are **UP-3D** ECM trainers; one is a **UP-3C** for use as a test-bed. South Korea's Navy has ordered eight P-3C/Update IIIs for 1995 delivery. *(Data for P-3C/Update III.)*

Contractor: Lockheed Aeronautical Systems Group, USA.
Power Plant: four Allison T56-A-14 turboprops; each 4,910 ehp.
Dimensions: span 99 ft 8 in, length 116 ft 10 in, height 33 ft 8½ in.
Weights: empty 61,491 lb, max expendable load 20,000 lb, normal gross 135,000 lb.
Performance: econ cruising speed at 110,000 lb gross weight at 25,000 ft 378 mph, patrol speed at 1,500 ft at same weight 237 mph, ceiling 28,300 ft, T-O run 4,240 ft, landing distance 2,770 ft, mission radius (three hours on station at 1,500 ft) 1,550 miles.
Accommodation: normal crew of 10, including five in tactical compartment in main cabin.
Armament: one 2,000-lb or three 1,000-lb mines, or up to eight depth bombs or torpedoes, or depth bomb/torpedo combinations (including nuclear depth bombs) in internal weapons bay. Ten underwing pylons for torpedoes, mines, rockets, or other stores.

S-2 Tracker and Turbo Tracker

South Korea still has around 20 of the original **S-2A** and **S-2F** piston-engine versions of the Tracker antisubmarine and maritime patrol aircraft, restricted to shorebased operation. Standard equipment includes AN/APS-38 search radar in a retractable radome in the center-fuselage, AN/ASQ-10 MAD in a retractable tailsting, a 70 million candlepower searchlight on the leading-edge of the starboard wing, and sonobuoy stowage in the rear of the engine nacelles. The S-2F differs from the A primarily in having added AQA-3 Jezebel passive acoustic search equipment and Julie explosive echo-sounding equipment. The **S-2G** added AN/AQA-7 DIFAR processing equipment, FLIR, and an ECM pod under each wing.

Under a 1986 contract, Taiwan's Navy is having its 32 S-2As, **S-2Es,** S-2Fs, and S-2Gs converted into **S-2T Turbo Trackers,** with 1,645 shp Garrett TPE331-15AW turboprops driving four-blade advanced technology propellers. An updated avionics/ASW package includes a MAPADS 902F acoustic processor, AN/ASQ-504(V) MAD, AN/APS-509 radar, AN/ARR-84 acoustic receivers, and an AN/ASN-150 tactical navigation system integrated with the INS and Rockwell Collins radios. Max speed is increased to 311 mph at 5,000 ft, with an 1,100-lb increase in payload and generally improved field and climb performance. Engine TBO is also increased. The first two S-2Ts, converted by Grumman, were delivered in 1992; the remainder are being modified in Taiwan by AIDC, with kits supplied by Grumman. *(Data for S-2E.)*

Contractor: Grumman Corporation, USA.
Power Plant: two Wright R-1820-82WA piston engines; each 1,525 hp.
Dimensions: span 72 ft 7 in, length 43 ft 6 in, height 16 ft 7½ in.
Weights: empty 19,033 lb, gross 26,867 lb.
Performance: max speed at 5,000 ft 253 mph, ceiling 22,000 ft, T-O run 1,300 ft, range 1,150 miles.
Accommodation: crew of four, comprising pilot, copilot, and two radar operators.
Armament: one depth bomb or two torpedoes in weapons bay. Depth bombs, torpedoes, or rockets on six underwing hardpoints. Max weapon load is 4,810 lb.

SH-5

Exhibiting design similarities to both the Japanese US-1A and Soviet Be-12, China's SH-5 (Shuishang Hongzhaji 5; "Maritime Bomber 5") has had a lengthy gestation period. Detail design was completed in February 1970, and the first flying prototype came out of final assembly in December 1973 but did not begin water taxi tests until late 1975; it made its first flight on April 3, 1976. The program apparently languished until 1984–85, when six more preseries aircraft were built and flown. Four of these were handed over to the PLA Navy in September 1986. They are in service with a trials unit at Tuandao Naval Air Station, Qingdao.

Primary roles intended for the SH-5 are antisubmarine and antiship warfare and maritime patrol and surveillance. It can also be used for minelaying, SAR, or carriage of bulk cargo, and the prototype has been demonstrated successfully in a water-bomber configuration. The hull is unpressurized but fully amphibious; wingtip stabilizing floats are nonretractable. Doppler search radar is installed in the nose "thimble" and MAD in the tailsting. SAR gear, sonobuoys, and other maritime equipment can be carried internally.

It is not yet certain whether production has been approved, but China has a stated requirement for a future overwater patrol aircraft, and the choice would seem to lie between the SH-5 and the landbased Shaanxi Y-8X.

Contractor: Harbin Aircraft Manufacturing Company, People's Republic of China.
Power Plant: four Dongan WJ5A turboprops; each 3,150 ehp.
Dimensions: span 118 ft 1¼ in, length 127 ft 7½ in, height 32 ft 2 in.
Weights: empty (ASW) 58,422 lb, gross 99,208 lb.
Performance: max cruising speed 280 mph, min patrol speed 143 mph, ceiling 33,630 ft, T-O run (water) 1,582 ft, landing run (water) 2,143 ft, max range 2,951 miles, endurance (on two engines) 12–15 hours.
Accommodation: flight crew of five, plus systems/equipment operators (normally three) according to mission.
Armament: twin-gun remotely controlled dorsal turret. Four underwing hardpoints for C-101 sea-skimming antiship or other missiles (one on each inboard pylon), lightweight torpedoes (up to three on each outer pylon), or other stores. Internal bay in rear of hull for depth charges, mines, or bombs.

Surveiller

Three special **Boeing 737-200s** were ordered by the Indonesian Air Force in the spring of 1981 and delivered during 1982–83. Configured for long-range overwater patrol, they each have a Motorola SLAMMR (side-looking airborne modular multimission radar) installation, which requires a 16-ft antenna fairing on each side of the upper rear fuselage. With this equipment, the Surveiller can spot small ships in heavy seas up to 115 miles away, from a patrol altitude of 30,000 ft. All three can double as government transports, for which they are outfitted with 14 first-class and 88 tourist-class seats. Boeing's Defense & Space Group has a four-year program, with Indonesia's IPTN as subcontractor, to upgrade the Surveillers with a new nose-mounted search radar, Cossor IFF interrogator, long-focal-length camera, improved mission avionics, controls, displays, and data processing (including a real-time SLAMMR display), and updated nav/com equipment. Redelivery of the first upgraded aircraft was imminent as this Gallery went to press; the other two will be upgraded in Indonesia under Boeing supervision.

Contractor: Boeing Commercial Airplane Group, USA.
Power Plant: two Pratt & Whitney JT8D-17A turbofans; each 16,000 lb thrust.
Dimensions: span 93 ft 0 in, length 100 ft 2 in, height 37 ft 0 in.
Weights (standard 737-200): empty 61,630 lb, gross 124,500 lb.
Performance: max cruising speed at 33,000 ft 532 mph, ceiling approx 40,000 ft, T-O field length 5,300 ft, landing field length 4,500 ft, max range approx 2,900 miles.
Accommodation: crew of two; 102 passengers in main cabin.
Armament: none.

US-1A

The last of the Japan Maritime Self-Defense Force's PS-1 antisubmarine flying boats was retired in 1989, but its amphibian descendant, the US-1A, continues in service as a long-range SAR aircraft. The JMSDF has so far received 14 US-1As, and one more is on order. Deliveries began in March 1975, and they are now in service with detachments of No. 71 (Air Rescue) Squadron at the Iwakuni and Atsugi naval bases. They have nose-mounted AN/APS-80N search radar and AN/APN-187C Doppler navigation radar; SAR equipment includes flares, rescue hoist, marine markers, loudspeaker, life rafts, a powered lifeboat, and droppable rescue kits.

Contractor: ShinMaywa Industries Ltd, Japan.
Power Plant: four Ishikawajima-Harima (GE license) T64-IHI-10J turboprops; each 3,493 ehp.
Dimensions: span 108 ft 9 in, length 109 ft 9¼ in, height 32 ft 7¾ in.
Weights: empty 56,218 lb, gross 94,800 lb (water T-O), 99,200 lb (land T-O).
Performance: cruising speed at 10,000 ft 265 mph, ceiling 23,600 ft, T-O distance (water) 1,820 ft, landing distance (water) 2,655 ft, max range 2,372 miles.
Accommodation: crew of three or four; up to 20 seated survivors, or 12 litters and up to three medical attendants or observers, in main cabin.
Armament: none.

Fighters

A-1 Ching-Kuo

The need for a new fighter to eventually replace the Republic of China Air Force's F/TF-104 Starfighters and some F-5E/Fs was apparent in the early 1980s. Although the US government embargoed sale of the Northrop F-20 Tigershark to Taiwan, it permitted US manufacturers to cooperate with that nation's Aero Industry Development Center in designing and building an indigenous defensive fighter (IDF), and the influence of General Dynamics on the IDF airframe is clear. Garrett developed an afterburning version of its TFE731 turbofan jointly with Taiwan's Chung Shan Institute of Science and Technology. The avionics include a 93-mile-range Golden Dragon 53 multimode pulse-Doppler radar, based on the GE Aerospace AN/APG-67(V) but embodying features of the Westinghouse AN/APG-66; Litton INS; and one head-up and three multifunction cockpit displays by Bendix/King. A Lear Astronics fly-by-wire control system is used, with a sidestick controller. The aircraft's missile armament is of Taiwanese origin.

Four prototypes, including one two-seater, were built, the first making its initial flight on May 28, 1989. These were followed by 10 preproduction aircraft, the first four of which were handed over to the RoCAF in March 1992; the remaining six should all be delivered by the end of 1993. Plans to produce up to 256 Ching-Kuos (named after the late President of Taiwan), including some 40–50 tandem two-seaters equipped for training and antiship duties, have been virtually halved following the recent US decision to allow Taiwan to buy 150 F-16s, and the total procurement is now unlikely to exceed 130. This has effectively canceled the proposed "Mk 2" upgraded version intended to be introduced at the midpoint of the production cycle. Sixty production Ching-Kuos have so far been authorized. Deliveries of these should begin in January 1994.

Contractor: Aero Industry Development Center, Taiwan.
Power Plant: two Garrett/AIDC TFE1042-70 turbofans; each 8,340 lb thrust with afterburning.
Dimensions (approx): span over wingtip missiles 29 ft 6 in, length (excl nose probe) 43 ft 6 in.
Weight (estimated): gross approx 20,000 lb.
Performance (estimated): max speed at height Mach 1.7, ceiling 55,000 ft.
Accommodation: pilot only, on zero/zero ejection seat.
Armament: one 20-mm M61A gun in starboard side of fuselage; two medium-range Sky Sword II AAMs under fuselage and four close-range Sky Sword Is on two underwing and two wingtip pylons. For attack

role, bombs, cluster bombs, rockets, or ASMs may be carried, including three Hsiung Feng II antiship missiles, plus wingtip Sky Sword Is.

F-1

First interceptor/close air support fighter designed by the Japanese aerospace industry, the Mitsubishi F-1 emerged in much the same way that Northrop's F-5 was derived from the T-38—by adapting a two-seat supersonic trainer to single-seat configuration. Mitsubishi's T-2 was the first supersonic aircraft designed in Japan. Two examples served as F-1 prototypes, deletion of the second cockpit allowing such additional avionics as an inertial navigation system, radar homing and warning system, and J/ASQ-1 bombing computer, to be installed in its stead. The F-1 first flew in June 1975 and entered service with the JASDF in the fall of 1977. The last of 77 production aircraft was delivered in March 1987. F-1s currently equip the 3d Squadron of the 3d Air Wing at Misawa and two squadrons of the 8th Air Wing at Tsuiki, with which they are expected to remain until replaced by the upcoming FS-X (F-16 derivative) in the mid-1990s. Other F-1 equipment includes nose-mounted Mitsubishi Electric J/AWG-12 fire-control radar, Ferranti INS, and license-built Thomson-CSF HUD.

Contractor: Mitsubishi Heavy Industries, Japan.

Power Plant: two Ishikawajima-Harima TF40-IHI-801A (license Rolls-Royce Turbomeca Adour) turbofans; each 7,305 lb thrust with afterburning.

Dimensions: span 25 ft 10¼ in, length (incl nose probe) 58 ft 7 in, height 14 ft 5 in.

Weights: empty 14,017 lb, gross 30,203 lb.

Performance: max speed Mach 1.6, ceiling 50,000 ft, T-O run 4,200 ft.

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

Armament: one JM61 multibarrel 20-mm gun in port side of front fuselage. Four underwing hardpoints, with multiple carriers, plus one under fuselage. Weapon loads can include two Mitsubishi ASM-1 ASMs; up to twelve 500-lb or eight 750-lb bombs (including IR- or laser-guided); four pods of 70-mm or 125-mm underwing rockets; four AIM-9 Sidewinder AAMs (two underwing and two at wingtips); or up to three drop tanks.

F-4 Phantom II

A detailed career of the long-serving F-4 can be found in the USAF galleries in the May issues of Air Force Magazine for the past several years. In Japan, Mitsubishi built 138 of the E model under license (local designation **F-4EJ**), of which 125 currently remain in service with the Air Self-Defense Force. Under a Service Life Extension Program begun in 1987, 100 of these are being upgraded to **F-4EJKai** (modified) standard. Funding for the first 84 has been approved, and redelivery to the 6th Air Wing at Komatsu began in November 1989. More than 60 have now been delivered to Nos. 301, 302, and 306 Squadrons. In addition to some structural changes, the main ingredients of the upgrade program are the installation of a Mitsubishi (Westinghouse license) AN/APG-66J radar; Japanese license-built versions of the Litton LN-39 INS, Kaiser HUD, and Hazeltine AN/APX-79A IFF; and a locally developed fire-control system and radar warning receiver. Missile capability of the F-4EJKai will include AIM-7E/F Sparrows, AIM-9P/L Sidewinders, and Mitsubishi ASM-1 antiship weapons.

The Republic of Korea Air Force received more than 130 new-build or ex-USAF **F-4Ds** (66) and **F-4Es** (67), of which about 120 remain in service. Of these, at least 32 are equipped with target designation systems (24 Ds with Pave Spike and eight or more Es with Pave Tack). The RoKAF is planning an upgrade, along similar lines to that of the JASDF, involving 38 of its F-4Es. This is intended to include radar/HUD/INS/mission computer modernization, linked through a MIL-STD-1553B data bus. Radars on offer are the Hughes AN/APG-65 and Westinghouse AN/APG-68, the latter perhaps being the more likely to be selected, for commonality with Korea's recently ordered F-16s. *(Data for standard F-4E.)*

Contractor: McDonnell Douglas Corporation, USA.

Power Plant: two General Electric J79-GE-17A turbojets; each 17,900 lb thrust with afterburning.

Dimensions: span 38 ft 7½ in, length 63 ft 0 in, height 16 ft 5½ in.

Weights: empty 30,328 lb, gross 41,487–61,795 lb.

Performance: max speed at 40,000 ft Mach 2 class, ceiling 54,400 ft, T-O run at max gross weight 4,390 ft, landing run with brake-chute 3,040–3,120 ft, combat radius 494 miles (defensive counterair) to 786 miles (area intercept).

Accommodation: pilot and weapon systems operator in tandem on zero/zero ejection seats.

Armament: one M61A1 multibarrel 20-mm gun; provision for up to four AIM-7 Sparrow or AIM-9 Sidewinder AAMs semisubmerged under fuselage; or seven hardpoints (one under fuselage, three under each wing) for up to 16,000 lb of bombs, rocket pods, gun pods, or flares and ECM/camera pods.

F-5E Tiger II

Despite extensive reequipment of Far East/Pacific fighter forces, six countries in the region continue to operate Northrop's "Freedom Fighter" and its developments. Most of these aircraft are now of the later IFA (International Fighter Aircraft) model, the **F-5E** Tiger II and its **F-5F** two-seat combat trainer counterpart. Largest Asian operators are South Korea and Taiwan, both of which manufactured these versions under license. The RoKAF received 159 Es and 64 Fs, of which Korean Air built 48 and 28, respectively, between 1981 and 1986 under the Korean name Chegoong-ho ("Air Master"). In Taiwan, AIDC produced 248 Es and 60 Fs for the Republic of China Air Force, nearly all of which remain in service. In January of this year, it was announced that they are to be upgraded by replacement of their twin turbojets by a single 12,250 lb thrust Garrett F125X or a proposed development of General Electric's F404 turbofan. This will require rebuilding the rear fuselage, making the redesignated **F-5E-SX** externally similar to the long-abandoned Northrop F-20 Tigershark. Other changes will include wing leading-edge extensions, new radar and avionics, and AIM-120 AMRAAM compatibility.

As well as F-5E/Fs, Korea also continues to operate around 50 **F-5A/Bs** from earlier deliveries. Ten similar aircraft form the sole air defense force of the Philippines. Other Asian operators of the F-5E/F are the air forces of Indonesia (11 + 4), Malaysia (14 + 4), and Singapore (28 + 7). The Singapore aircraft have dual air-defense/ground-attack duties, with the ability to carry TV-guided Mavericks and laser-guided bombs. *(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 11⅞ in over wingtip AAMs), length (incl nose probe) 47 ft 4¾ in, height 13 ft 4¼ in.

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

Performance: max speed at 36,000 ft Mach 1.64, ceiling 51,800 ft, T-O run 2,000–5,700 ft, landing run with brake-chute 2,500 ft, typical hi-lo-hi combat radius with max internal fuel, two 530-lb bombs, and two Sidewinder AAMs 553 miles.

Accommodation: pilot only, on ejection seat.

Armament: two 20-mm M39A2 guns in nose; AIM-9 Sidewinder AAM at each wingtip; one underfuselage and four underwing stations for up to 7,000 lb of bombs, cluster bombs, rocket packs, napalm tanks, missiles, or other stores.

F-1, Japan ASDF

F-15J Eagle, Japan ASDF (Peter Steinemann)

FS-X, Japan ASDF (artist's impression)

F-15J Eagle

Only one country outside the US has yet been granted a manufacturing license for the F-15: Japan, which is now well into a program to produce a total of 223 for the country's Air Self-Defense Force.

The program began in 1980, with a first flight in June of the first of two US-built **F-15J** single-seat prototypes, and continued in 1981 when deliveries began of 12 two-seat **F-15DJs**, also US-built. Japanese industry then assembled eight single-seaters from CKD kits before assuming full responsibility for subsequent production. By FY 1993 a total of 200 F-15s had been funded for the JASDF, and deliveries now exceed 170. First Japanese squadron to achieve IOC, in January 1983, was No. 202 (5th Air Wing) at Nyutabaru. All of the remaining six planned squadrons have since been formed: Nos. 201 and 203 (2d Air Wing) at Chitose, No. 303 (6th Air Wing) at Komatsu, Nos. 204 and 305 (7th Air Wing) at Hyakuri, and No. 304 (8th Air Wing) at Tsuiki. Five other F-15Js are assigned to the JASDF 5th Air Wing's "aggressor" squadron, also at Tsuiki. Japanese F-15Js are generally equivalent to the US F-15C but have a degree of domestic avionics, including the J/APR-4A radar warning system, ALE-45(J) chaff/flare dispenser, and J/ALQ-8 ECM. *(Data for F-15C.)*

Contractors: McDonnell Douglas Corporation, USA; Mitsubishi Heavy Industries, Japan.

Power Plant: two Ishikawajima-Harima (Pratt & Whitney license) F100-PW-220E turbofans; each 23,830 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 68,000 lb.

Performance: max speed more than Mach 2.5, ceiling 60,000 ft, T-O run 900 ft, landing run (without brake-chute) 3,500 ft, max range with conformal fuel tanks 3,570 miles.

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

Armament: one JM61A1 six-barrel 20-mm gun in starboard wingroot, with 940 rds. Up to four AIM-9L/M Sidewinders, four AIM-7F/M Sparrows, or eight AIM-120A AMRAAMs; or three (five if configured with conformal tanks) stations for up to 23,600 lb of bombs, rockets, or other stores.

F-16 Fighting Falcon and FS-X

A late switch from the F/A-18 as South Korea's major combat aircraft for the 1990s, and Japan's choice of an advanced derivative of this fighter as its next-generation equipment, have in recent years given a marked boost to F-16 fortunes in this region. They will receive a further one if, as expected, Taiwan decides to buy as many as 150 to offset cutbacks in the program for its domestically produced Ching-Kuo air defense fighter (which see).

The Republic of Korea Air Force received its first 40 Fighting Falcons (30 Block 32 **F-16Cs** and 10 combat-capable two-seat **F-16Ds**) in 1986–89, subsequently equipping 10 of them with Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) pods. A further 120 Block 52 F-16s, with improved weapon delivery systems and AMRAAM capability, will take the form of 12 more US-built aircraft, after which a Korean industry team led by Samsung Aerospace will assemble 36 from knocked-down kits and then build a final 72 locally.

Earlier model F-16s are in service with the air forces of Indonesia and Singapore. The former's No. 3 Squadron received eight **F-16As** and four **F-16Bs**, and No. 140 Squadron of the Republic of Singapore Air Force at Tengah has six As and four Bs. The RSAF also leases, until 1995, nine ex-USAF "Thunderbirds" F-16s, on which it conducts pilot training at Luke AFB, Ariz.

The **FS-X** fighters and **TFS-X** trainers required by Japan's Air Self-Defense Force are advanced developments of the F-16C/D, funded entirely by Japan but undertaken as a joint development program with Lockheed Fort Worth (originally General Dynamics). Powered by a 29,000-lb-thrust class F110-GE-129 engine, the FS-X will have a Japanese-developed radar and other avionics and a Japanese/US jointly developed fly-by-wire flight control system. Other design changes include a bigger (36 ft 6 in span) wing, stretched fuselage (length 50 ft 1 in), and a 48,720-lb gross weight that will include nearly 19,840 lb of external stores. These are expected to include Sparrows as the initial AAM fit, replaced later by the indigenous AAM-3, with Mitsubishi ASM-2s to give an antiship capability. The first of four FS-X prototypes is scheduled to fly in the third quarter of 1995; JASDF requirement is in the region of 70–130 aircraft, including two-seaters. *(Data for Block 30 F-16C.)*

Contractor: Lockheed Fort Worth (formerly General Dynamics), USA.

Power Plant: one General Electric F110-GE-100 turbofan: 27,600 lb thrust with afterburning; or Pratt & Whitney F100-PW-220: 23,450 lb thrust with afterburning. Aircraft of Indonesia, South Korea (first batch), and Singapore all have PW engine.

Dimensions: span 31 ft 0 in, length 49 ft 4 in, height 16 ft 8½ in.

Weights (PW-220 engine): empty 18,238 lb, gross 27,185–42,300 lb.

Performance: max speed at 40,000 ft more than Mach 2.0, ceiling more than 50,000 ft, typical T-O and

landing distance 2,500 ft, combat radius (hi-lo-hi) with six 1,000-lb bombs 340 miles.
Accommodation: pilot only, on zero/zero ejection seat.
Armament: one M61A1 multibarrel 20-mm gun, with 511 rds, in port side wing/body fairing. One underfuselage and six underwing stations, plus AAM rail at each wingtip. External stores (load limit 12,000 lb) can include wide range of single or cluster bombs, ASMs, rockets, laser-guided and electro-optical weapons and sensors, Pave Penny laser tracker pod, FLIR or jammer pods, or drop tanks.

F/A-18 Hornet

Until July of this year, Australia was the only Pacific operator of the Hornet, of which it acquired 57 single-seat **AF-18As** and 18 two-seat **ATF-18As** in 1985–90. The first two ATF-18As were delivered from the US, after which an initial batch of Hornets was assembled from CKD kits by AeroSpace Technologies of Australia (ASTA); the remainder were manufactured in-country by Australian industry. Currently, 71 of these aircraft equip Nos. 3, 75, and 77 fighter ground-attack/air-defense Squadrons, and No. 2 OCU. All are being upgraded with more modern avionics to the standard of the US Navy's F/A-18C/Ds, and with provision for carrying a Loral AN/AAS-38 IR tracking and laser designation pod.

Malaysia has just ordered eight Hornets and will probably take delivery in 1995.

Contractor: McDonnell Douglas Corporation, USA.
Power Plant: two General Electric F404-GE-400 turbofans; each approx 16,000 lb thrust with afterburning.
Dimensions: span 37 ft 6 in (27 ft 6 in folded), length 56 ft 0 in, height 15 ft 3½ in.
Weights: empty 23,050 lb, gross 36,710 lb (fighter), 49,224 lb (attack).
Performance: max speed more than Mach 1.8, combat ceiling approx 50,000 ft, T-O run less than 1,400 ft, combat radius more than 460 miles (fighter), 662 miles (attack).
Accommodation: pilot only, on zero/zero ejection seat.
Armament: one M61 six-barrel 20-mm gun in nose, with 570 rds. Nine external stations (one on centerline, two on nacelles, two under each wing, and one at each wingtip) for up to 17,000 lb of stores including AIM-9L Sidewinder AAMs, AGM-88 HARM and AGM-84 Harpoon ASMs; single, cluster, or 2,000-lb laser-guided bombs; air-launched decoys; laser spot tracker/strike camera, FLIR, or other mission pods; or drop tanks.

F-104G Starfighter

With F-16s, Mirage 2000-5s, and indigenous Ching-Kuos within reach, the Republic of China Air Force in Taiwan can foresee retirement of nearly 100 **F-104G** Starfighters that have served it well for many years. They include a number of reconnaissance-configured **RF-104Gs**. Also in service are about 40 two-seat Starfighter trainers, mostly TF-104Gs but believed still to include about six older **F-104Ds.**
Contractor: Lockheed-California Company, USA.
Power Plant: one General Electric J79-GE-11A turbojet; 15,800 lb thrust with afterburning.
Dimensions: span 21 ft 11 in, length 54 ft 9 in, height 13 ft 6 in.
Weights: empty 14,082 lb, gross 28,779 lb.
Performance: max speed at 36,000 ft 1,450 mph, ceiling 58,000 ft, T-O run 2,960 ft, landing run 2,280 ft, combat radius (max fuel) 745 miles.
Accommodation: pilot only, on ejection seat.
Armament: one M61 Vulcan multibarrel 20-mm gun in forward fuselage. Stations under fuselage (one) and wings (one each side) and at each wingtip for up to four AIM-9 Sidewinder AAMs, or ASMs, bombs, rocket pods, or drop tanks.

J-8

J-8 design began in 1964, and it flew for the first time on July 5, 1969. A clear-weather day fighter, it was a MiG-21/J-7 derivative along similar lines to those that, in the USSR, produced the Mikoyan Ye-152 "Flipper"; it was powered by two Liyang WP7B turbojets and was armed with two 30-mm guns and four wing-mounted PL-2B AAMs. During the "cultural revolution," flight trials (though no other development) were allowed to continue, production being authorized in 1979. This early **J-8** was underpowered and lacked a satisfactory fire-control radar, the latter being quickly remedied in the **J-8 I**, which has a twin-barrel 23-mm gun and entered production in 1985, by fitting a Sichuan SR-4 radar in the single intake shock cone. About 100 J-8 Is were built; the comparatively few earlier J-8s were retrofitted with SR-4 radars.

The **J-8 II**, which first flew on June 12, 1984, is a vastly different aircraft, some 70 percent redesigned. Intended for the dual roles of high-altitude interceptor and ground attack, it features a "solid" avionics-filled nose, twin fuselage-side intakes, more powerful WP13A II engines, and other improvements. Chinese sources claimed "several dozen" (say 40–50) in service by early 1990, with production continuing in small economic batches. *(Data for J-8 II.)*
Contractor: Shenyang Aircraft Corporation, People's Republic of China.
Power Plant: two Liyang WP13A II turbojets; each 14,815 lb thrust with afterburning.
Dimensions: span 30 ft 7⅞ in, length (incl nose probe) 70 ft 10 in, height 17 ft 9 in.
Weights: empty 21,649 lb, gross 31,526–39,242 lb.
Performance: max speed (indicated) 808 mph, ceiling 66,275 ft, T-O run 2,198 ft, landing run 3,280 ft, combat radius 497 miles, range (max) 1,367 miles.
Accommodation: pilot only, on zero/zero ejection seat.
Armament: 23-mm Norinco Type 23-3 twin-barrel gun, with 200 rds, in underfuselage pack aft of nosewheel bay. One station under fuselage and three under each wing for PL-2B infrared or PL-7 semiactive radar homing AAMs, launch pods for 57-mm or 90-mm rockets, bombs, or up to three drop tanks.

MiG-21/J-7

Three Far East/Pacific air forces fly Soviet-built versions of this diminutive fighter, which originated in the 1950s. North Korea has about 150 **MiG-21PF/PFM** interceptors, and 10 MiG-21U two-seat trainers. The two air defense squadrons of the Air Force of the Laotian People's Army, based at the Vientiane airport at Wattay, fly some 30 MiG-21PFMs, eight early **MiG-21Fs**, and two MiG-21Us. Vietnam is believed to have nearly 200, many of them advanced versions, including 150 **MiG-21F/PF/bis** interceptors and 40 **MiG-21MF** ground-attack fighters. The single-seaters all have the NATO reporting name "Fishbed"; the two-seaters are "Mongols."

China's PLA Air Force is estimated to have at least 500 variants of the MiG-21, all manufactured by its national industry. Production was initiated in 1961 by a license agreement for the **MiG-21F-13** and its Tumansky R-11F-300 turbojet. A small series was assembled at Shenyang, under the designation **J-7** (Jianjiji-7; "Fighter 7"). Progressively improved versions, built at Chengdu and Guizhou, are as follows:

J-7 I. First version built at Chengdu for PLA Air Force, from 1967. Second 30-mm gun added. Original Soviet ejection system, with front-hinged canopy that detached with seat to provide blast protection for pilot, was considered unsatisfactory, and few aircraft were accepted.

J-7 II. Initial major production version, first flown December 30, 1978, and still being built in small numbers. WP7B (modified Tumansky R-11) engine. Rear-hinged jettisonable canopy and Chengdu Type II zero-height/155 mph ejection seat. New Lanzhou compass system.

JJ-7. Tandem two-seat, combat-capable trainer version of J-7 II, developed and built at Guizhou.

J-7 III. Advanced development of J-7 II, equivalent to Soviet MiG-21MF, with blown flaps, first flown April 26, 1984; in production and in service with PLA Air Force. All-weather day/night capability. Liyang WP13 engine of greater power, giving 29,530 ft/min initial climb rate. Enlarged nose intake and centerbody for JL-7 J-band interception radar. Side-hinged canopy. HTY-4 improved ejection seat. Twin-barrel 23-mm gun under fuselage; four underwing hardpoints. New fire-control system, IFF, radar warning system, ECM, flight data recorder, and Beijing KJ-11 autopilot. Additional fuel in deeper dorsal spine. Wider-chord fin and rudder. Developed and built in partnership with Guizhou Aviation Industry Corp.

J-7E. Improved version of J-7 II. Enlarged (27 ft 3½ in span) redesigned "cranked arrow" wing, 14,300 lb thrust WP7F engine, PL-8 AAMs, air data computer, and head-up display. *(Data for J-7 III.)*
Contractor: Chengdu Aircraft Industrial Corporation, People's Republic of China.
Power Plant: one Liyang WP13 turbojet; 14,550 lb thrust with afterburning.
Dimensions: span 23 ft 5¾ in, length (incl nose probe) 48 ft 10 in, height 13 ft 5½ in.
Weights: empty 11,629 lb, normal gross 17,968 lb.
Performance: max speed Mach 2.1, ceiling 59,050 ft, T-O run 2,625 ft, landing run 1,805 ft, range (internal fuel only) 596 miles, with three drop tanks 1,034 miles.
Accommodation: pilot only, on low-speed/zero height ejection seat.
Armament: type 23-3A twin-barrel 23-mm gun under fuselage. Four underwing hardpoints for two or four PL-5B AAMs, pods of 12 x 57-mm or 7 x 90-mm rockets, bombs of up to 1,100 lb, or drop tanks.

AF-18A Hornet, Royal Australian Air Force

J-8 II, Chinese PLA Air Force (Paul Jackson)

J-7s, Chinese PLA Air Force

MiG-29

Three years after achieving IOC with the former Soviet air forces, the MiG-29 made its Far East/Pacific debut with the North Korean People's Army Air Force. Thirty were delivered, almost certainly of the initial MiG-29 version known to NATO as "Fulcrum-A," as part of a major equipment modernization program. Unless avionics and armament standards were downgraded for export, in the traditional Soviet manner, each aircraft has an integrated weapon system, based on an RP-29 coherent pulse-Doppler look-down/shoot-down radar 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 9¼ miles. It operates in conjunction with the pilot's helmet-mounted target designator for off-axis aiming of AAMs. During take-off and landing, hinged doors shield the engine air intakes against foreign object ingestion; engine air is then taken in through louvers in the upper surface of the wingroot extensions. "Fences" forward of the dorsal tailfins house flare dispensers. In July 1993, Malaysia ordered 18 MiG-29s, which have not yet been delivered.
Contractor: Mikoyan OKB, Russia.
Power Plant: two Klimov/Sarkisov RD-33 turbofans; each 18,300 lb thrust with afterburning.
Dimensions: span 37 ft 3¼ in, length 56 ft 10 in, height 15 ft 6¼ in.
Weights: empty 24,030 lb, gross 33,600–40,785 lb.
Performance: max speed at height Mach 2.3, at S/L Mach 1.06, ceiling 55,775 ft, T-O run 820 ft, landing run with brake-chute 1,970 ft, range 932–1,800 miles.
Accommodation: pilot only, on zero/zero ejection seat.
Armament: six close-range R-60T ("Aphid"), or four R-60T and two medium-range R-27R ("Alamo-A") AAMs on six underwing pylons; provision for carrying R-73A ("Archer") close-range AAMs; able to carry bombs, submunitions dispensers, and 57-mm, 80-mm, and 240-mm rockets, up to maximum 6,615 lb, in attack role. One 30-mm GSh-301 gun in port wingroot extension, with 150 rds.

Mirage 2000-5

Dassault received a $3.8 billion contract for 60 Mirage 2000-5 multirole fighters for the Republic of China Air Force in November 1992. Deliveries will begin in 1995, with 1,000 Matra Magic 2 and Mica AAMs.

The 2000-5 was developed by Dassault as an update of the basic Mirage 2000. New equipment includes cockpit multifunction displays of the kind fitted in the latest French Rafale fighters, Thomson-CSF RDY radar and VEH 3020 holographic HUD, a new central processing unit, and an ICMS Mk 2 ECM system compatible with Sabre ECM (jammers), Serval RWR, and Spirale chaff/flare pacs. Options include a SNECMA M88-P20 turbofan, uprated four percent to 22,046 lb thrust compared with the standard M53-P2. *(Data for basic Mirage 2000C.)*
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 37,480 lb.

Performance: max speed at height Mach 2.26, ceiling 59,000 ft, range with four 250-kg bombs more than 920 miles.
Accommodation: pilot only, on zero/zero ejection seat.
Armament: two 30-mm DEFA 554 guns in fuselage; five hardpoints under fuselage and two under each wing for max external stores load of 13,890 lb. Two Super 530 and two Magic AAMs for air-defense role. Typical Mirage 2000 ground-attack weapons include eighteen 550-lb retarded bombs or BAP 100 anti-runway bombs, 16 Durandal penetration bombs, two 2,200-lb laser-guided bombs, six Belouga cluster bombs, ASMs, and packs of 18 x 68-mm, or 100-mm rockets.

Su-27

Under the first major arms deal between China and Russia for thirty years, the PLA Air Force began receiving an initial batch of 22 Su-27s in 1991. By far the most competent fighter yet deployed in the air forces of the former Soviet Union, the basic Su-27, known to NATO as "Flanker-B," is a single-seat air-defense interceptor with considerable air-to-ground capability. It has four-channel analog fly-by-wire flight controls and a highly advanced, integrated fire-control system. This enables the track-while-scan coherent pulse-Doppler radar, IRST sensor, and laser rangefinder to be slaved to the pilot's helmet-mounted target designator and displayed on the wide-angle HUD. Search range of the radar is 150 miles and tracking range 115 miles. A flight refueling probe is optional, and a reconnaissance pack can be carried on the centerline pylon.
Contractor: Sukhoi OKB, Russia.
Power Plant: two Saturn/Lyulka AL-31F turbofans; each 27,557 lb thrust with afterburning.
Dimensions: span 48 ft 2¾ in, length (excl nose probe) 71 ft 11½ in, height 19 ft 5½ in.
Weight: gross 48,500–66,135 lb.
Performance: max speed at height Mach 2.35, at S/L Mach 1.1, ceiling 59,055 ft, T-O run 1,640 ft, landing run 1,970 ft, combat radius 930 miles.
Accommodation: pilot only, on zero/zero ejection seat.
Armament: one 30-mm GSh-301 gun with 149 rds, in starboard wingroot extension. Up to 10 AAMs, including pairs of R-27R/T/ER/ET (NATO "Alamo-A/B/C/D") or R-33 ("Amos"), and four R-73A ("Archer") or R-60 ("Aphid"). Underwing rockets in ground-attack role.

Helicopters

AH-1 HueyCobra/SeaCobra

Largest Far East/Pacific customer for TOW-equipped Cobra gunship helicopters is Japan, which acquired two **AH-1Es** (Bell Up-Gun AH-1S) for evaluation by the Ground Self-Defense Force, subsequently obtaining a license for Fuji to build the Modernized AH-1S (US Army **AH-1F**). Eighty-three of a planned total of 88 have so far been funded, of which 70 had been delivered by March 1993. Their cockpits are to be made compatible with use of NVGs. The JGSDF plans five Cobra squadrons, the first four of which are based at Kisarazu, Metabaru, Obihiro, and Hachinohe.

South Korea, which received eight examples of the twin-engined **AH-1J SeaCobra** in the late 1970s, followed these about a decade later by ordering 21 AH-1Ss, later increasing this figure to 70. All are to standards comparable with the US Army's AH-1F full-capability TOW version, with a Hughes laser rangefinder/tracker, Kaiser pilot's HUD, digital fire-control computer, Doppler navigation, hot metal and exhaust plume IR suppressor, IR jammer, IFF, and composite rotor blades. *(Data for AH-1F.)*
Contractors: Bell Helicopter Textron, USA; Fuji Heavy Industries, Japan.
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, ceiling 12,200 ft, range 315 miles.
Accommodation: pilot and copilot/gunner in tandem armored cockpits.
Armament: two weapon stations under each stubwing; outer stations can each carry four TOW antitank missiles, inboard stations each a launch tube for seven to 19 x 2.75-in rockets. GE undernose turret for 20-mm three-barrel gun with 750 rds.

AH-64 Apache

The Apache's outstanding successes from the first minutes of the Persian Gulf War confirmed it as the West's most formidable day/night attack helicopter. With production of 807 for the US Army due to end in December, except for six attrition replacements, export sales are vital to keep the assembly lines alive. First customers were all in Europe and the Middle East. Then, in the summer of 1992, Congress was notified by DoD that South Korea wanted 37 Apaches, plus 775 Hellfire missiles, spares, 70-mm rockets, and 30-mm ammunition, in a deal worth $997 million.

No details of the equipment standard of the Korean helicopters are yet available. The US Army plans to upgrade 254 of its **AH-64As** to **AH-64B** standard in 1994–95, with GPS, SINCGARS radios, target handover capability, new navaids, and improved reliability, including new rotor blades. The next stage will upgrade 308 AH-64As to near AH-64D standard, except for retention of T700-GE-701 turboshafts and omission of Longbow radar. Redesignated **AH-64C**, these helicopters will have provision for later fitment of -701C engines and Longbow. The first of four genuine **AH-64D Longbow Apache** prototypes flew on April 15, 1992, with "production" deliveries of 227 conversions from AH-64A scheduled to begin in mid-1996. Their Westinghouse mast-mounted Longbow millimeter-wave radar, and Hellfire with RF seeker, will enable them to track airborne targets and see through rain, fog, and smoke impenetrable to TV and FLIR. RF Hellfire will improve effectiveness over close range. Plessey AN/ASN-157 Doppler nav will be standard. *(Data for AH-64A.)*
Contractor: McDonnell Douglas Helicopter Company, USA.
Power Plant: two General Electric T700-GE-701C turboshafts (from 604th AH-64A); each 1,800 shp.
Dimensions: rotor diameter 48 ft 0 in, fuselage length, tail rotor turning, 48 ft 2 in, height 14 ft 1¼ in.
Weights: empty 11,387 lb, gross 14,445–21,000 lb.
Performance: max speed at S/L 182 mph, service ceiling 21,000 ft, max range, internal fuel 300 miles, with max external fuel 1,057 miles.
Accommodation: crew of two, in tandem (gunner in front seat).
Armament: turreted 30-mm M230 Chain Gun under front fuselage; four underwing pylons, each for four AGM-114 Hellfire antitank missiles or 2.75-in FFAR rockets in seven-round M200 or 19-round M260 packs.

AS 330L Puma

This workhorse military assault and civilian transport helicopter first flew on April 15, 1965. When Anglo-French production ended in 1989, 697 had been built for delivery to 46 countries, 34 of which have used them for military duties. The Indonesian Air Force received eight from French production and seven of the 11 that were assembled locally from knocked-down component kits by Nurtanio (now IPTN). Thirteen of these 15 still equip Nos. 6 and 17 Squadrons. A single Puma is in the inventory of a "mixed bag" unit of the Philippine Air Force that carries out special and miscellaneous missions. Sole production source of the AS 330 today is the IAR factory in Romania.
Contractors: Aerospatiale SNI, France; IPTN, Indonesia.
Power Plant: two Turbomeca Turmo IVC turboshafts; each 1,575 shp.
Dimensions: rotor diameter 49 ft 2½ in, fuselage length 46 ft 1½ in, height 16 ft 10½ in.
Weights: empty 7,970 lb, gross 16,315 lb.
Performance: max cruising speed at S/L 160 mph, ceiling 15,750 ft, range 341 miles.
Accommodation: crew of two; 16 fully equipped troops, six litter patients and six seated persons, or internal or external freight.
Armament: provisions for side-firing 20-mm gun, two 7.62-mm machine guns, rocket packs, and other weapons.

AS 332 Super Puma/AS 532 Cougar

The **Super Puma** differs from the AS 330 Puma in having a new power plant, uprated transmission, and airframe changes to improve crew survivability, payload, performance, and ease of maintenance. The first prototype AS 332 flew on September 13, 1978, and many versions appeared subsequently. They included the basic 20-passenger military **AS 332B**, and the **AS 332L** and **M**, with cabin lengthened by 2 ft 6 in to accommodate up to 24 persons. When their manufacturer, Aerospatiale, merged its helicopter division with that of MBB of Germany to form Eurocopter SA, military versions of the Super Puma were given the new designation **AS 532 Cougar**. All helicopters of the Super Puma/Cougar series operating currently in the Far East/Pacific region are AS 332s. Customers have been China (six VIP), Japan (three Army 332L VIP), South Korea (three Air Force 332L VIP), and Singapore (five SAR 332B, sixteen 332M transports), assembled in that country by Samco. IPTN (Indonesia) manufactures the helicopter under license as the **NAS-332** Super Puma. It has delivered six transports and one VIP model to that nation's Air Force and four transports to its Navy. The Navy hopes to acquire 22 **NAS-332Fs**, equipped with radar and Exocet antiship missiles. One NAS-332 VIP transport has been exported to the Royal Malaysian Air Force. *(Data for AS 332L.)*
Contractor: Aerospatiale SNI, France.
Power Plant: two Turbomeca Makila 1A turboshafts; each 1,780 shp.
Dimensions: rotor diameter 51 ft 2¼ in, fuselage length, excl tail rotor, 50 ft 11 in (AS 332B 48 ft 5 in), height 16 ft 1¾ in.
Weights: empty 9,535 lb, gross 18,960 lb with internal payload, 20,615 lb with sling load.
Performance: max cruising speed at S/L 173 mph, ceiling 15,090 ft, range at S/L 394–1,068 miles.
Accommodation: one or two pilots; normal seating for 22 passengers; nine or 12 VIP passengers in special interiors with toilet and galley; nine litter patients and three seated persons in ambulance role.
Armament: for army/air force missions, alternatives include one 20-mm gun, two 7.62-mm guns, two packs of 22 x 68-mm rockets or 19 x 2.75-in rockets. Naval options include two Exocet missiles, two torpedoes and sonar, or MAD and sonobuoys.

AS 550 Fennec and AS 350 Ecureuil

The AS 550 Fennec is the current military production version of the familiar AS 350 Ecureuil five/six-seat, single-engine, commercial light helicopter. Standard features include sliding doors, a cockpit compatible with night vision goggles, a taller landing gear, airframe reinforcement for weapon carrying, and provision for armored seats. Available models are the utility **AS 550U2**, gun- and rocket-armed **AS 550A2**, TOW missile-armed **AS 550C2**, unarmed naval **AS 550M2**, and armed naval **AS 550S2**. **AS 350Bs** are used by Australian Army Aviation (18) and **AS 350Ss** by the Royal Australian Navy (six) for training. Singapore has six **AS 350Es** for training and became the first operator of the AS 550 Fennec in the Far East/Pacific region in 1992. Its No. 123 "Sunbird" Squadron has 10 AS 550A2s, armed with a 20-mm GIAT M621 gun and pods of CRV-7 rockets, and 10 AS 550C2s with TOW 2A antitank missiles. *(Data for AS 550 series.)*
Contractor: Eurocopter SA (Aerospatiale, France, and DASA, Germany).
Power Plant: one Turbomeca Arriel 1D1 turboshaft; 732 shp.
Dimensions: rotor diameter 35 ft 0¾ in, fuselage length 35 ft 10½ in, height 10 ft 11½ in.
Weights: empty 2,689 lb, gross 4,960 lb.
Performance: max cruising speed at S/L 153 mph, ceiling 15,750 ft, range 414 miles.
Accommodation: up to six seats standard.
Armament: see above.

Bell 212/412

More than 50 of these twin-turbine helicopters are in military service or on order by nations in the Far East/Pacific region, most of them as general purpose or VIP transports, medevac, or SAR aircraft. The lower-powered, two-blade **Bell 212** is in service with the air forces of Brunei (11 for oil rig patrol, Army support, or staff transport), South Korea (seven for VIP and SAR), and the Philippines (one VIP).

The **Bell 412**, which has a four-blade main rotor and uprated power plant, has been supplied to South Korea (three VIP) and the Philippines (two). In addition, the Indonesian Army is in process of receiving 28 **NBell-412s**, built locally by IPTN. *(Data for Bell 212, with 412 in parentheses.)*
Contractors: Bell Helicopter Textron, USA/Canada; 412 also by IPTN, Indonesia.
Power Plant: one Pratt & Whitney Canada PT6T-3B (PT6T-3B-1) Turbo Twin Pac turboshaft; flat rated at 1,290 shp (1,400 shp).
Dimensions: rotor diameter 48 ft 2¼ in (46 ft 0 in), fuselage length (both) 42 ft 4¾ in, height (both) 12 ft 10 in (10 ft 9½ in).
Weights: empty 5,997 lb (6,495 lb), gross 11,200 lb (11,900 lb).
Performance: max cruising speed at S/L 115 mph (140 mph), ceiling 13,000 ft (16,500 ft), max range 261 miles (408 miles).
Accommodation: pilot and up to 14 passengers or equivalent cargo.
Armament (both): can include a 12.7-mm or 0.50-in machine gun in ventral turret, plus provisions for externally mounted antitank or antiship missiles, gun pods, or rocket pods.

CH-47D International Chinook

Following delivery of two US-built examples and six knocked-down assembly kits, Kawasaki is building the International Military Chinook under license for two of Japan's armed forces, as the **CH-47J.** This version differs from the US Army CH-47D only in power plant, avionics, and rotor brake installation. Deliveries by April of this year totaled 23 to the Ground Self-Defense Force (of 36 ordered) and 12 (of 16 ordered) to the Air Self-Defense Force. In all, Japan is expected to acquire at least 54 CH-47Js. The Republic of Korea received 21 International CH-47Ds between 1989 and early 1992 (Army 18, Air Force three), and three **Boeing 234MLR** Commercial Chinooks are operated, as utility transports, by the Army of Taiwan. These latter aircraft differ in having 4,075 shp AL 5512 engines and a max gross weight of 48,500 lb.

Some older Chinooks also survive in the region. The US Army transferred a number of its early **CH-47As** to South Vietnam in 1972, which were seized by the North two years later. About a year ago, 36 of these were put on the market, but there has been no evidence so far of any being sold.

Australia, which retired its 11 **CH-47Cs** a few years ago, has repented the decision and is now to have four of them upgraded to CH-47D standard. The cost will be met by sale of the other seven to the US Army National Guard. *(Data for International CH-47D.)*

Contractor: Boeing Defense and Space Group, USA.
Power Plant: two Textron Lycoming T55-L-712 turboshafts; each 3,750 shp.
Dimensions: rotor diameter (each) 60 ft 0 in, fuselage length 52 ft 1 in, height 18 ft 11½ in.
Weights: empty 23,321 lb, gross 54,000 lb.
Performance: typical cruising speed at S/L 165 mph, ceiling 8,450 ft, range with max payload 265 miles.
Accommodation: crew of two; 44 troops, 24 litters and two medical attendants, or vehicles/cargo.
Armament: none.

KV107IIA

After being granted exclusive license rights by Boeing (then Vertol) to manufacture and sell its Model 107-II helicopter, Kawasaki flew the first Japanese example in May 1962. Known as the **KV107II,** it was followed in 1968 by the improved **KV107IIA,** with uprated turboshafts and better "hot and high" performance, production of which continued until 1990.

Apart from eight for the Swedish Navy, all military KV107IIs originally were for the Japanese armed services: two in mine countermeasures configuration for the JMSDF, 42 as tactical transports for the JGSDF, and 15 for SAR duties with the JASDF. "Dash" numbers are -3, -4, and -5, respectively. Follow-on orders ensued for seven IIA-3s, 18 IIA-4s, and 35 IIA-5s. The Air Self-Defense Force A-5s are long-range variants, identifiable by their two large external fuel tanks, which increase total capacity to 1,000 US gallons instead of the standard 350 gallons; most are also fitted with an automatic flight-control system. *(Data for KV107IIA-4.)*

Contractor: Kawasaki Heavy Industries, Japan.
Power Plant: two Ishikawajima-Harima (GE license) CT58-IHI-140-1 turboshafts; each 1,400 shp.
Dimensions: rotor diameter (each) 50 ft 0 in, fuselage length 44 ft 7 in, height 16 ft 10 in.
Weights: empty 11,576 lb, gross 19,000–21,400 lb.
Performance: cruising speed 150 mph at 5,000 ft, ceiling 17,000 ft, range 222 miles (standard fuel), 682 miles (max fuel).
Accommodation: flight crew of two; up to 25 troops or equivalent cargo.
Armament: none.

McDonnell Douglas 500MD/530MG Defender

Developed from the US Army's OH-6A Cayuse, this small and agile helicopter can carry a useful weapons load, making it attractive to many air force customers in Africa, the Middle East, and Asia. Basic model is the **MD Scout Defender,** powered by a 375 shp Allison 250-C20B turboshaft, and which can be armed with 14 x 2.75-in rockets and either a 7.62-mm machine gun or a 40-mm grenade launcher. For the antitank role, the **MD/TOW Defender** can carry four TOW missiles, with a nose-mounted sight standard or mast-mounted sight as an option. Third major variant is the **MD/ASW Defender,** with nose-mounted radar, MAD bird, and two homing torpedoes.

The Indonesian Air Force has about a dozen 500MDs for counterinsurgency duties; in Taiwan, the Navy has a similar quantity of the ASW model and the Air Force six elderly OH-6As for training. License production has been undertaken for many years in Japan (by Kawasaki) and South Korea (by Korean Air). More than 150, known as **OH-6Ds,** have been delivered to Japan's GSDF, mainly for observation, liaison, and training; nine others, also for training, were delivered to the Maritime SDF. The Republic of Korea Army has 150 or more Scout and about 50 TOW Defenders, while the country's Navy employs 25 or more ASW Defenders. The Philippine Air Force recently doubled its original late-1980s order for 20 500MDs and operates 22 of the improved **530MG.** North Korea circumvented US export restrictions in 1988 to obtain 86 Scout Defenders, about 70 of which are reported to survive, though maintenance must now be an increasing problem. *(Data for 530MG Defender.)*

Contractor: McDonnell Douglas Helicopter Company, USA.
Power Plant: one Allison 250-C30 turboshaft; derated to 425 shp.
Dimensions: rotor diameter 27 ft 4 in, fuselage length 23 ft 11 in, height 8 ft 7 in.
Weights: empty 1,979 lb, gross 3,100–3,750 lb.
Performance: max cruising speed at 5,000 ft 142 mph, ceiling more than 16,000 ft, range 230 miles at 5,000 ft.
Accommodation: pilot and copilot/gunner.
Armament: pylon on each side of cabin for twin-round packs of TOW 2 missiles, pods containing two 7.62-mm or one 0.50-in machine gun, and launchers for seven or 12 x 2.75-in air-to-surface rockets. Stinger AAMs and 7.62-mm Chain Gun being qualified.

Mi-6

The Vietnamese People's Air Force received about 15 Mi-6 (NATO "Hook") heavy-lift helicopters from the former USSR, all of which are thought to remain operational. A single example delivered to the Laotian Air Force may no longer be serviceable. Until the arrival of the Mi-26, the Mi-6 was the largest helicopter that had been built in series. Its military tasks include transport of guns, armor, vehicles, supplies, freight, and troops in combat areas. When the Mi-6 is used as a flying crane, with slung cargo, the fixed wings that offload the main rotor in cruising flight are usually removed.

Contractor: Mil OKB, Russia.
Power Plant: two Soloviev D-25V turboshafts; each 5,425 shp.
Dimensions: rotor diameter 114 ft 10 in, fuselage length 108 ft 10½ in, height 32 ft 4 in.
Weights: empty 60,055 lb, gross 93,700 lb.
Performance: max speed 186 mph, ceiling 14,750 ft, range with 17,637-lb payload 385 miles.
Accommodation: crew of five; normally, 70 combat-equipped troops, 26,450 lb of internal freight, or 41 litters and two medical attendants. Max slung cargo 17,637 lb.
Armament: some aircraft have a 12.7-mm gun in the nose.

KV107IIA-5, Japan ASDF

McDonnell Douglas 530MG Defender, Philippine Air Force (Peter Steinemann)

Mi-8/17

Well over 10,000 Mil Mi-8 and Mi-17 general-purpose helicopters have been built, of which at least 160 are operated by four air forces in the Far East/Pacific region. All have the same basic airframe and were allocated the same NATO reporting name "Hip." The **Mi-8** is the original production configuration, with TV2 turboshafts and a starboard-side tail rotor, as described below. The **Mi-17** (Hip-H) has more powerful (1,923 shp) TV3-117MT engines in shorter nacelles, and its tail rotor is relocated on the port side.

The basic Mi-8 Hip-C is the standard heavily armed assault transport, able to put down troops, equipment, and supplies behind enemy lines within 15–20 minutes of a nuclear or conventional bombardment/air strike. The Mi-8 Hip-F is even more heavily armed, with a nose machine gun and a triple stores rack on each side of the cabin, able to carry up to 192 rockets in six packs, plus six of the manual command to line of sight antitank missiles known to NATO as "Sagger." These are the versions most used by non-CIS air forces, including those of China (30), Laos (nine), North Korea (40), and Vietnam (60). Twenty-four Mi-17s were purchased by China when the US embargoed supply of six CH-47D Chinooks. *(Data for Mi-8 Hip-C.)*

Contractor: Mil OKB, Russia.
Power Plant: two Klimov (Isotov) TV2-117A turboshafts; each 1,677 shp.
Dimensions: rotor diameter 69 ft 10¼ in, fuselage length 59 ft 7½ in, height 18 ft 6½ in.
Weights: empty 16,007 lb, gross 26,455 lb.
Performance: max speed at 3,250 ft 161 mph, ceiling 14,750 ft, range 311 miles as passenger transport.
Accommodation: crew of two or three; 24 troops on tip-up seats along cabin sidewalls, or 12 litter patients and an attendant, or 8,820 lb of freight or vehicles, loaded via rear clamshell doors and hook-on ramps.
Armament: twin rack on each side of cabin for 128 x 57-mm rockets in four packs, or other weapons.

Mi-24

The North Korean People's Army Air Force acquired about 50 Mi-24 (NATO "Hind-D") helicopters in 1985–86 to equip two of its regiments. Vietnam has at least 30, which saw frequent service during its campaign in Kampuchea. These helicopters are comparable in some respects to the US AH-64A Apache, but have the added capability of carrying a squad of eight combat-equipped troops in their main cabin, which is heavily armored, like the crew accommodation. The Gatling-type nose gun is slaved to an undernose electro-optical sighting pod for air-to-air and air-to-surface use. The Falanga (Phalanx) antitank system comprises four 9M17P Skorpion (NATO "Swatter") missiles and undernose Raduga-F radio command guidance pod. Other stores are carried on pylons under the stub-wings. IFF, RWR, and an IR jamming pod are optional.

Contractor: Mil OKB, Russia.
Power Plant: two Klimov (Isotov) TV3-117 turboshafts; each 2,190 shp.
Dimensions: rotor diameter 56 ft 9¼ in, fuselage length 57 ft 5¼ in, height 21 ft 4 in.
Weights: empty 18,385 lb, gross 24,470–25,350 lb.
Performance: max speed 208 mph, ceiling 16,400 ft, normal range 370 miles, range with max external fuel 700 miles.
Accommodation: crew of two in tandem; flight mechanic, and provisions for eight troops or four litter patients, in main cabin.
Armament: one YakB-12.7 four-barrel 12.7-mm gun in undernose turret, with 1,470 rds; four 9M17P antitank missiles on wingtip launchers. Alternative loads include 32-rd packs of 57-mm rockets, 20-rd packs of 80-mm rockets, UPK-23-250 pods each containing a GSh-23 twin-barrel 23-mm gun, GUV pods each containing either one YakB-12.7 gun and two 9-A-622 four-barrel 7.62-mm guns or a 30-mm grenade launcher, up to 3,300 lb of bombs, mine dispensers, or other stores, on four underwing hardpoints.

OH-58D Kiowa Warrior/Bell 206 JetRanger/Kiowa

The **OH-58D** (Bell 406) is a much-developed version of the US Army's OH-58A Kiowa light observation helicopter. The Army plans to modify all of its 243 upgraded OH-58Ds to **Kiowa Warrior** standard, with uprated turboshaft and transmission, strengthened airframe, increased gross weight, SINCGARS radios, RWR, IR jammer, video recorder, integrated weapons pylons, and other changes. First export customer for the Kiowa Warrior was Taiwan, which ordered 12 in early 1992, with options on 14 more. Deliveries are scheduled to begin this summer. The Indonesian Air Force and South Korean Navy each operate two of the basic commercial **Bell 206B JetRangers,** from which the military OH-58 was developed, for liaison duties. Under a co-production deal, Commonwealth Aircraft Corporation assembled the last 44 of 56 **206B-1s** (similar to the OH-58A) ordered by the Australian government. Known officially as **Kalkadoons,** 43 of them are used by Nos. 161 and 162 Reconnaissance Squadrons of the Australian Army. The Royal Australian Navy has three, of which one is embarked on HMAS *Moresby* for survey and utility operations. *(Data for Kiowa Warrior.)*

Contractor: Bell Helicopter Textron, USA.
Power Plant: one Allison 250-C30R turboshaft; 650 shp.
Dimensions: rotor diameter 35 ft 0 in, fuselage length 33 ft 10 in, height 12 ft 9½ in.
Weights: empty 3,289 lb, gross 5,500 lb.
Performance: max speed at 4,000 ft 147 mph, ceiling 12,000 ft, range 288 miles.
Accommodation: pilot and copilot/observer/gunner side by side.
Armament: four Stinger AAMs or Hellfire ASMs, or two pods of 7 x 2.75-in rockets, or CFD-5000 pods for 7.62-mm and 0.50-in guns, on outriggers on sides of cabin.

S-70A/C and UH-60J/P Black Hawk

Sikorsky designation **S-70A** identifies a military tactical utility export version of the US Army's UH-60A combat transport helicopter. First such customer was the Philippine Air Force (two **S-70A-5s**). The 39 Australian **S-70A-9s** (one built by Sikorsky and 38 assembled in Australia by Hawker de Havilland 1987–91) were intended originally for the RAAF but are now under Australian Army control. They have Dash 701A-1 engines, a modified SH-60B flight-control system, rescue hoist, main rotor brake, folding tail rotor pylon, and external stores support system (ESSS). Japan's Air and Maritime Self-Defense Forces are replacing some of their KV107IIAs with a version designated **UH-60J** (Sikorsky **S-70A-12**), those of the JMSDF becoming operational earlier this year. This service has 10 on order, of 18 required, powered by T700-GE-401C engines and carrying a crew of four; the JASDF version (11 ordered, of 46 required) has an extra crew member and Dash 701A engines. One **S-70A-14** was sold to Brunei as a VIP transport, and South Korea has ordered three **S-70A-18/UH-60Ls** for the Army and seven **S-70A-22s** (including three VIP) for the Air Force. The RoK Army is to get a further 77, designated **UH-60P**, assembled locally by Korean Air.

Brunei's second Black Hawk is an **S-70C**, essentially a commercial utility version of the UH-60A, and this designation has also been used in connection with two pseudo-civil exports to the air forces of the two Chinas: 14 to Taiwan and 24 **S-70C-2s**, with undernose radar, to the People's Republic. *(Data for UH-60A.)*

Contractor: Sikorsky Aircraft, USA.

Power Plant: two General Electric T700-GE-700 turboshafts; each 1,560 shp.

Dimensions: rotor diameter 53 ft 8 in, fuselage length 50 ft 0¾ in, height 16 ft 10 in.

Weights: empty 11,284 lb, gross 16,994–22,000 lb.

Performance: max cruising speed at 4,000 ft 160 mph, ceiling 19,000 ft, range 373 miles (internal fuel), 1,380 miles (max internal/external fuel).

Accommodation: crew of three; 11–14 troops, or 4–6 litters and 1–3 medical attendants, or cargo. Executive configuration for 7–12 passengers. Up to 8,000 lb load on external cargo hook.

Armament: ESSS permits up to 10,000 lb of externally mounted stores, including up to 16 Hellfire laser-guided antiarmor, Stinger air-to-air, or other missiles, gun pods, mine dispensers, rockets, or ECM packs on four cabin-side pylons. Two pintle mounts in cabin, each for a 0.50-in or 7.62-mm machine gun.

S-70B/C and SH-60F/J Seahawk/Thunderhawk

Australia, Japan, and Taiwan have all ordered export versions of the US Navy's SH-60 Seahawk. The Royal Australian Navy, to fill its role-adaptable weapon system requirement, ordered eight in July 1985 and eight more in May 1986. These have the Sikorsky designation **S-70B-2** and comprise eight US-built examples and eight assembled by ASTA (AeroSpace Technologies of Australia). Deliveries were completed in September 1991. Operated by squadron HS-816, whose shore base is at Nowra, New South Wales, they are assigned to the RAN's six FFG-7 (*Adelaide*-class) guided missile frigates, with which the aircraft saw service before and during the 1991 Persian Gulf War. Equipment includes MEL Super Searcher radar and a Collins avionics suite.

Two US-built XSH-60J prototypes were delivered to Mitsubishi in 1986, for outfitting with JMSDF-specified avionics and equipment. To replace that service's Sea Kings, the Japanese company is now producing the **SH-60J** (Sikorsky designation **S-70B-3**), the first Mitsubishi-built example having been delivered in August 1991. At least 75 (48 of them ship-based) are expected to be acquired, and possibly as many as 200. By FY 1993, orders totaled 51, of which about half have now been delivered.

The name **Thunderhawk** identifies 10 other ASW Seahawks, supplied to Taiwan. More closely related to the US Navy's SH-60F variant, they have the pseudo-civil Sikorsky designation **S-70C(M)-1**, and were due to enter service this year in the Republic of China Navy's six *Oliver Hazard Perry*-class guided missile frigates. *(Data for SH-60B.)*

Contractor: Sikorsky Aircraft, USA.

Power Plant: two General Electric T700-GE-401C turboshafts; each 1,900 shp.

Dimensions: rotor diameter 53 ft 8 in, fuselage length 50 ft 0¾ in, height 17 ft 0 in.

Weights: empty 13,648 lb, gross 20,244–21,885 lb.

Performance: max speed at 5,000 ft 145 mph, ceiling 19,000 ft, range with one hour loiter 170 miles.

Accommodation: crew of three.

Armament: two Mk 46 torpedoes or two AGM-119B Penguin antiship missiles.

S-76/H-76 Eagle

The S-76 series is in much the same category as Bell's Model 212/412 and the Eurocopter Dauphin. The Philippine Air Force was the first military export customer for the **S-76 Mk II Utility** version, with an order for 17 in 1983. Two of these were configured for SAR, two as eight-passenger transports, and one as a 12-passenger helicopter. The other 12 are used either for medevac duties or as armed **H-76 Eagles** for counterinsurgency operations. *(Data for S-76 Mk II Utility, except where indicated.)*

Contractor: Sikorsky Aircraft, USA.

Power Plant: two Allison 250-C30S turboshafts; each 650 shp.

Dimensions: rotor diameter 44 ft 0 in, fuselage length 43 ft 4½ in, height 14 ft 9¾ in.

Weights: empty 5,600 lb, gross 10,300 lb (H-76 11,400 lb).

Performance: max cruising speed 178 mph, hovering ceiling IGE 11,200 ft, range with 12 passengers 465 miles.

Accommodation: crew of two; up to 12 passengers in main cabin.

Armament (H-76): one 7.62-mm gun in each doorway; multipurpose pylon system for pods containing one or two 7.62-mm guns, 0.50-in guns, 2.75-in and 5-in rocket pods, 68-mm rockets, mines, Stinger AAMs, Hellfire, TOW, or Sea Skua ASMs, or Mk 46 torpedoes.

S-80M

This mine countermeasures helicopter is an export counterpart to the US Navy's MH-53E Sea Dragon. Twelve are being purchased for the Japan Maritime Self-Defense Force, of which the first was delivered on November 30, 1989. Designated **S-80M-1**, the JMSDF aircraft are replacing KV107IIA-3s. Compared with the CH-53E Iransport, from which they were derived, they have enlarged sponsons for considerably increased fuel capacity, in-flight refueling capability, an automatic flight-control system (with automatic approach to/depart from hover and automatic tow coupling), and mechanical, acoustic, and antimagnetic systems to deal with all types of sea mines likely to be encountered. On-board systems in the USN version include AN/AQS-14 sonar, AN/AQS-17 mine neutralization set, AN/ALQ-141 electronic sweep gear, and an AN/ALQ-166 towed sled. *(Data for MH-53E.)*

Contractor: Sikorsky Aircraft, USA.

Power Plant: three General Electric T64-GE-416 turboshafts; each 4,380 shp.

Dimensions: rotor diameter 79 ft 0 in, fuselage length 73 ft 4 in, height 17 ft 5½ in.

Weights: empty 36,336 lb, gross 69,750 lb.

Performance: cruising speed at S/L 173 mph, ceiling 18,500 ft.

Accommodation: flight crew of three, plus systems operators as required.

Armament: none.

SA 316/319 Alouette III

After many years of service, the Alouette III light helicopter is fast disappearing from the scene in the Far East/Pacific theater. The Royal Malaysian Air Force still operates about 24, side by side with larger S-61A-4 Nuris, in its Nos. 3, 7, and 10 Squadrons, and with No. 2 Flying Training Center at Keluang. Their duties include utility support, SAR, and forward air control, some armed with cabin-mounted guns. The Republic of Korea Navy, which still has about 10 available for operation from the stern platforms of its five *Gearing*-class destroyers, is now replacing them with Super Lynx Mk 99s.

The **SA 316B** Alouette III superseded the original SE 3160 version in 1969. It was followed by the **SA 319B,** with a 600 shp Astazou XIV turboshaft in place of the earlier Artouste, and this remained in production in France until 1985. License manufacture also took place in Romania, Switzerland, and India. *(Data for SA 316B.)*

Contractor: Aerospatiale SNI, France.

Power Plant: one Turbomeca Artouste IIIB turboshaft; derated to 570 shp.

H-76 Eagle, Philippine Air Force (Peter Steinemann)

S-80M-1, Japan MSDF

Super Frelon, Chinese PLA Navy

Dimensions: rotor diameter 36 ft 1¾ in, fuselage length (incl tail rotor) 33 ft 4½ in, height 9 ft 9 in.

Weights: empty 2,315 lb, gross 4,850 lb.

Performance: max cruising speed at S/L 115 mph, ceiling 10,500 ft, range (max) 335 miles.

Accommodation: pilot and up to six passengers or equivalent cargo; normally pilot only, or pilot and gunner, in armed versions.

Armament: range of possible weapons can include a tripod-mounted 7.62-mm gun with 1,000 rds aft of pilot's seat, or a 20-mm gun with 480 rds, turret-mounted on port side of cabin. Instead of guns, can carry two or four wire-guided missiles on external rails, or 68-mm rocket pods. ASW version can carry two torpedoes, or one torpedo and an MAD bird.

SA 321 Super Frelon and Z-8

During 1977–78, the Chinese PLA Navy received 10 **Super Frelons**, similar to the antisubmarine SA 321G developed for the French Navy but less fully equipped. Some reportedly have French-built search radar; all were delivered with an early type dipping sonar, but at least three later received more modern Thomson-Sintra HS-12 for an SSBN escort role. Until the advent of the Z-9 Haitun, they were the only PLA Navy aircraft operated from ships' platforms. To supplement the small number available, China's Helicopter Design and Research Institute developed the virtually identical **Z-8**. A prototype flew on December 11, 1985, and one Z-8 was delivered to the PLA Navy for service trials in August 1989. Initial production has been approved, for various military/naval and civil applications. *(Data for Z-8.)*

Contractor: Changhe Aircraft Factory, People's Republic of China.

Power Plant: three Changzhou WZ6 turboshafts; each 1,550 shp.

Dimensions: rotor diameter 62 ft 0 in, fuselage length 65 ft 10¾ in, height 21 ft 10¼ in.

Weights: empty 16,645 lb, gross 23,351–26,618 lb.

Performance: max cruising speed at S/L 154 mph, ceiling 10,000 ft, range 497 miles.

Accommodation: crew of two or three, 27–39 troops, or 15 litters plus a medical attendant.

Armament (ASW Super Frelon): four homing torpedoes or two Exocet antiship missiles.

SA 342L, Gazelle

The Gazelle was the smaller of the two French members of the three-helicopter collaboration program between Aerospatiale and Westland, which began in the late 1960s. About 1,500 were sold for civil and military use in more than 40 countries worldwide, including China, which acquired eight for antitank duties with its army aviation units. They were used, along with Z-9s, to quell the Tiananmen Square demonstrations in mid-1989.

Contractor: Aerospatiale SNI, France.

Power Plant: one Turbomeca Astazou XIVM turboshaft; 858 shp.

Dimensions: rotor diameter 34 ft 5½ in, fuselage length 31 ft 3¼ in, height 8 ft 11⅞ in.

Weights: empty 2,198 lb, gross 4,410 lb.

Performance: max cruising speed at S/L 161 mph, ceiling 13,450 ft, range 440 miles.

Accommodation: up to five persons including pilot.

Armament: externally mounted weapons can include rocket pods and wire-guided or other antitank missiles. One or more machine guns can be carried, either pod-mounted externally or pintle-mounted in cabin doorway.

Sea King and Nuri

Principal Far East/Pacific operator of Sikorsky's venerable submarine hunter/killer helicopter is the Maritime Self-Defense Force of Japan, which still has just over 100 of the 167 built for it under license by Mitsubishi. These correspond to the basic US Navy **SH-3A,** although Japan quaintly has always identified them by their pre-1962 US designation of **HSS-2**. Few, if any, of the original batch of HSS-2s remain, but about 25 improved **HSS-2As** and 79 **HSS-2Bs** continue in JMSDF service. Some are shore-based, but their primary mission is ASW, singly or in three-aircraft flights from destroyers; this role will progressively be assumed by the SH-60Js now being delivered. The Royal Malaysian Air Force received 38 **S-61A-4 Nuris** from 1968 to 1978, of which 34 remain in service with Nos. 3, 5, 7, and 10 Squadrons and a training unit. These are currently being upgraded by the Malaysian company Airod with Honeywell Primus 500 radar and AN/APN-209(V) radar altimeter, and GEC-Marconi ANV-301 Doppler nav system. About two-thirds of them had been redelivered by February, and the rest are due to be completed by the end of this year. A single S-61A is operated as a VIP transport by the Indonesian Air Force.

Westland-built **Advanced Sea Kings,** with 1,660 shp Rolls-Royce Gnome H.1400-1T turboshafts, more advanced ASW equipment, and other improvements, included ten **Mk 50s** in the mid-1970s and two **Mk 50As** in the early 1980s for the Royal Australian Navy, of which seven remain in service with No. 817 Squadron. *(Data for S-61A.)*

Contractor: Sikorsky Aircraft, USA.

Power Plant: two General Electric T58-GE-8B turboshafts; each 1,250 shp.
Dimensions: rotor diameter 62 ft 0 in, fuselage length 54 ft 9 in, height 16 ft 10 in.
Weights: empty 9,763 lb, gross 21,500 lb.
Performance: cruising speed at S/L 136 mph, ceiling 14,700 ft, range with max fuel 625 miles.
Accommodation: crew of four; up to 22 survivors in SAR role.
Armament (ASW): provisions for up to 840 lb of weapons, including antiship missiles, up to four homing torpedoes, four depth charges, sonobuoys, smoke floats, marine markers, and other weapons and equipment.

Super Lynx

This upgraded export version of the widely used Westland Lynx multirole military helicopter is very like the latest model developed for the Royal Navy. Production was started in 1988, when a batch of 12 **Lynx Mk 99s** was ordered by the Republic of Korea for operation in antiship/ASW roles from its ex-USN *Sumner*- and *Gearing*-class destroyers and future HDF-3500 class. Compared with earlier versions of the Lynx, these helicopters have advanced technology composites main rotor blades, a reversed-direction tail rotor that reduces noise and improves hovering ability for extended periods at high weights, a higher gross weight, all-weather day/night capability, and extended payload/range performance.

Equipment on these Korean helicopters includes Racal Doppler 71/TANS N navigation avionics, 360° GEC-Marconi Seaspray 3000 radar, Bendix/King AN/AQS-18 dunking sonar, Mk 46 torpedoes, Sea Skua antiship missiles, Magnavox AN/SSQ-41 passive sonobuoys, and CAE AN/ASQ-504(V) MAD.
Contractor: Westland Helicopters Ltd, UK.
Power Plant: two Rolls-Royce Gem 42-1 turboshafts; each 1,120 shp.
Dimensions: rotor diameter 42 ft 0 in, length (main rotor blades and tail folded) 35 ft 7¼ in, height (main rotor blades and tail folded) 10 ft 8 in.
Weights: empty 7,255 lb, gross 11,300 lb.
Performance: max cruising speed 159 mph, radius of action (dipping sonar, one torpedo, 2 h 20 min on station) 23 miles.
Accommodation: crew of two; secondary capability for carrying up to nine survivors in SAR role, or three litter patients and an attendant.
Armament: four Sea Skua or two Penguin antiship missiles, or four Stinger AAMs. Provision for wide range of podded gun and rocket installations.

UH-1 Iroquois/Model 205

These single-engine workhorse members of the original "Huey" family still serve with nine countries in the Far East/Pacific region, mostly in transport, utility, or SAR roles. Sole production source is now Fuji in Japan, which has been building the type since 1973. The Japan Ground Self-Defense Force has more than 25 **UH-1Bs** and more than 100 **UH-1Hs**, of 144 so far funded, in service, some for minelaying. Other operators, with approx numbers in service, include Australia (Army 25 UH-1H), Indonesia (Army 13 x 205A-1), South Korea (Army 15 UH-1B and 47 UH-1H, Air Force five UH-1D/H), New Zealand (Air Force 14 UH-1H), Papua New Guinea (Defence Force four UH-1H), the Philippines (Air Force 15 x 205A-1 and 72 UH-1H), Singapore (Air Force four 205A/A-1, 24 UH-1B, and 16 UH-1H), and Taiwan (Air Force 58 UH-1H, Army 60 UH-1H). *(Data for Fuji-built UH-1H.)*
Contractors: Bell Helicopter Textron, USA; Fuji Heavy Industries, Japan.
Power Plant: one Kawasaki-built Textron Lycoming T53-K-13B turboshaft; 1,400 shp.
Dimensions: rotor diameter 48 ft 0 in, fuselage length 41 ft 10¾ in, height 14 ft 5½ in.
Weights: empty 5,270 lb, gross 9,500 lb.
Performance: max cruising speed 127 mph, ceiling 12,600 ft, range 290 miles.
Accommodation: pilot and 11–14 troops, or six litters and a medical attendant, or 3,880 lb of cargo.
Armament: normally none.

Wasp

Of three Far East/Pacific navies that operate Wasp antisubmarine helicopters, only the Royal New Zealand Navy bought some of its aircraft new from Westland. Two acquired in 1966 were augmented later by 10 ex-RN Wasp HAS. Mk 1s. The RNZN fleet had dwindled to seven by 1989 but was brought back to strength with four more ex-RN Wasps in 1990. Their main use now is for SAR and communications. The Royal Malaysian Navy acquired six ex-RN HAS. Mk 1s in 1988, which it operates for a mix of ASW, maritime reconnaissance, and SAR duties; further purchases are believed to have been primarily as sources of spares. The third operator is the Indonesian Navy, whose nine Wasps are also secondhand, 10 having been obtained from the Royal Netherlands Navy in 1981. These perform ASW and SAR duties, operating from three *Tribal*- class frigates.
Contractor: Westland Helicopters, UK.
Power Plant: one Rolls-Royce Bristol Nimbus Mk 503 turboshaft; derated to 710 shp.
Dimensions: rotor diameter 32 ft 3 in, fuselage length 30 ft 4 in, height 11 ft 10 in.
Weights: empty 3,452 lb, gross 5,500 lb.
Performance: max speed 120 mph, ceiling 12,500 ft, range 270 miles.
Accommodation: crew of two; can carry up to three more persons on rear seat.
Armament: two Mk 44 torpedoes or up to 550 lb of depth charges. Some Royal Navy aircraft were equipped to carry two AS.12 wire-guided missiles for antiship missions.

Z-9 Haitun

China acquired an Aerospatiale license in 1980 to build 50 Dauphins (completed 1992) for civil and military use. The Chinese version, built at Harbin, is designated **Z-9** and has the Chinese name **Haitun,** also meaning "dolphin." Initial Harbin Z-9s were equivalent to the French **AS 365N,** later **(Z-9A)** examples to the improved **AS 365N$_1$.** Military Z-9/9As serve with at least two PLA group armies (Beijing and Shenyang military regions), and are thought to include some equipped for an antitank role; others serve on shipboard duties with the PLA Navy. Chinese production, now with much-increased locally made content (more than 70 percent of the airframe and 90 percent of the engine), is continuing as the **Z-9A-100** (first flight January 16, 1992). *(Data for Z-9A.)*
Contractor: Harbin Aircraft Manufacturing Company, People's Republic of China.
Power Plant: two Zhuzhou WZ8A (license Turbomeca Arriel 1C1) turboshafts; each 724 shp.
Dimensions: rotor diameter 39 ft 2 in, fuselage length 38 ft 1⅞ in, height 11 ft 6½ in.
Weights: empty 4,519 lb, gross 9,039 lb.
Performance: max cruising speed at S/L 177 mph, ceiling 19,685 ft, range (standard fuel) at 161 mph 534 miles, (with auxiliary tank) at 161 mph 621 miles.
Accommodation: up to 10 (normal) or 14 (max) persons, including one or two pilots.
Armament: some Chinese Army Z-9/9As equipped with door- or externally-mounted machine guns and/or "Red Arrow 8" antitank missiles.

Reconnaissance and Special Mission Aircraft

RF-4C/EJ Phantom II

Twelve ex-USAF **RF-4C** Phantoms were acquired by the 131st Tactical Reconnaissance Squadron of the Republic of Korea Air Force in early 1989. These aircraft, since augmented by a further nine, have CAI/Fairchild/Itek forward, oblique, and high/low altitude panoramic cameras in the nose, plus a TEREC (tactical electronic reconnaissance) system that includes Loral AN/UPD-8 side-looking airborne radar, Texas Instruments RS-700 infrared linescan (IRLS), and Westinghouse AN/ALQ-131 jammer pods. The Japan Air Self-Defense Force's No. 501 Squadron operates 14 reconnaissance **RF-4EJs,** which it has begun to modernize as **RF-4EJKais** with Texas Instruments AN/APQ-172 forward-looking radar, inertial navigation, an IR reconnaissance system, digital displays, and VHF (replacing UHF) radio. Seven upgraded examples were funded in FYs 1992–93. In addition, the JASDF plans to convert 17 of its existing F-4EJ fighters to RF-4EJKais. Seven of this latter batch will be equipped with a Mitsubishi Electric elint/ESM pod (derived from the French Thomson-CSF Astac) and a Thomson-TRT radar altimeter. *(Data for RF-4EJ similar to those for F-4E; RF-4C has J79-GE-15 engines and length of 65 ft 9 in. Both RF variants are unarmed.)*

RF-5 TigerEye

In addition to its F-5E Tiger II fighters, the Royal Malaysian Air Force has two RF-5E TigerEye day/night reconnaissance aircraft, combining the F-5E airframe with interchangeable nose pallets containing either standard cameras or an IRLS. Six of Singapore's F-5Es are being converted to the same standard, with IRLS and FLIR.
Contractor: Northrop Corporation Aircraft Group, 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 11⅞ in over wingtip AAMs), length (incl nose probe) 48 ft 0¾ in, height 13 ft 4¼ in.
Weights and Performance: essentially as F-5E, except combat radius 282–685 miles.
Accommodation: pilot only, on ejection seat.
Armament: one 20-mm M39 gun, with 280 rds; two AIM-9 Sidewinder AAMs and up to three drop tanks.

YS-11E/E(EL)

As noted in the Transports and Tankers section, two of the JASDF's YS-11C cargo transports were converted in the late 1970s and early 1980s as **YS-11E** trainers for ECM operators. A third YS-11 was modified by Nippi in 1991 as a **YS-11E(EL)** elint aircraft. Differences include exchanging the original Rolls-Royce Dart turboprops for 3,493 ehp Japanese-built General Electric T64-10Js with Hamilton Standard propellers, and fitting a Nippon Electric J/ALQ-7 electronic jamming set. *(Data generally as for YS-11.)*

Transports and Tankers

An-2/Y-5

The Antonov An-2's biplane configuration was regarded as an anachronism by many aeronautical engineers when the prototype flew for the first time on August 31, 1947. Forty-six years later, after more than 5,000 were built initially in Russia, Poland has continued to manufacture An-2s and had delivered more than 11,950 at the last count. China began producing An-2s under license in the mid-1950s. Nanchang factory delivered 727 in 1957–68. Shijiazhuang Aircraft Plant had built 221 by early 1987 and continues small-scale production. Most An-2s are used for agricultural and other civilian tasks, but the Chinese PLA Air Force has about 300 and the Navy at least 40. Others serve with the air forces of Laos (10), North Korea (200), and Vietnam (20). The specification data below apply to the basic **An-2P** general-purpose transport. Other versions in military use include the **An-2S** ambulance, **An-2TD** paratroop transport and training version with six tip-up seats along each side of the cabin, and **An-2V/An-2M** floatplanes. All Chinese versions have the basic designation **Y-5** (Yunshuji-5; "Transport 5"). NATO reporting name for An-2s and Y-5s is "Colt."
Contractors: WSK-PZL Mielec, Poland, and Shijiazhuang Aircraft Plant, People's Republic of China.
Power Plant: one PZL Kalisz ASz-62IR piston engine (Zhuzhou HS5 in Y-5); 1,000 hp.
Dimensions: span 59 ft 7¾ in, length 40 ft 8¼ in, height 13 ft 2 in.
Weights: empty 7,605 lb, gross 12,125 lb.
Performance: max speed at 5,750 ft 160 mph, ceiling 14,425 ft, T-O run 492–558 ft, landing run 558–607 ft, range 560 miles.
Accommodation: crew of two and 12 passengers, 2,735 lb of freight, or six litters plus attendants.
Armament: none.

An-24/26/30 and Y-7

When Oleg Antonov flew the prototype 50-passenger **An-24** twin-turboprop airliner (NATO "Coke") in 1960, he could not have imagined that it would be the starting point for a family of transport, photographic, and general-purpose aircraft that would still be in production in Ukraine and China 33 years later. Except for its redesigned "beaver-tail" rear fuselage, the addition of an auxiliary turbojet in the rear of the starboard engine nacelle, fewer cabin windows, and more powerful turboprops, the **An-26** ("Curl") differs little from the An-24. It was the first type to use Antonov's unique rear-loading ramp. This forms the underside of the rear fuselage when retracted, in the conventional way, but can be slid forward under the rear of the cabin to facilitate direct loading onto the floor of the hold, or when the cargo is to be airdropped. An extensively glazed nose, to give the navigator a wide field of view, and raised flight deck identify the **An-30** ("Clank"), which carries cameras and equipment in its cabin for aerial survey and other photographic duties.

In China, Xian Aircraft Company produces a number of "reverse engineered" developments of the An-24/26 series under the basic designation **Y-7.** The PLA Naval Air Force has a few of the passenger transports, but the major military version is the **Y7H-500** cargo transport, first flown in 1988 and now in production. Features include a rear-loading ramp of the kind fitted to the An-26, rough-field landing gear, modern avionics, and military versions of the 2,790 shp Dongan WJ5A I turboprops fitted to the latest commercial Y-7s. Other data are generally as for the An-26.

Military operators of these transports in the Far East/Pacific region include China (20 An-24/Y-7, 12 An-26/Y7H-500, eight An-30), Laos (seven An-24, three An-26, operated also as national airline), North Korea (12 An-24), and Vietnam (nine An-24, at least 20 An-26). *(Data for An-26.)*
Contractor: Antonov OKB, Ukraine.
Power Plant: two Ivchenko AI-24VT turboprops, each 2,820 ehp; plus 1,765 lb thrust RU-19A-300 auxiliary turbojet for turboprop starting and to provide additional power for takeoff, climb, and cruising flight, as required.
Dimensions: span 95 ft 9½ in, length 78 ft 1 in, height 28 ft 1½ in.
Weights: empty 32,518 lb, gross 50,706–52,911 lb.

Performance: cruising speed at 20,000 ft 270 mph, ceiling 24,600 ft, T-O run 2,855 ft, landing run 2,135 ft, range with max payload 770 miles, with max fuel 1,652 miles.
Accommodation: crew of five plus station for load supervisor or dispatcher; 12,125 lb payload. Electrically powered mobile hoist, capacity 4,409 lb, and conveyor to facilitate loading and airdropping. Provision for carrying 40 paratroops or 24 litters and an attendant.
Armament: provision for pylons on the sides of the fuselage for carrying up to 4,409 lb of weapons or supply containers.

Boeing 707

The Royal Australian Air Force's No. 33 Squadron operates two ex-airline Boeing 707-320Cs as VIP and staff transports; another provides similar capability for the Indonesian Air Force. In addition, Hawker de Havilland received a contract in 1988 to convert the RAAF's four ex-Qantas 707-338Cs into tanker combis, using kits from Israel Aircraft Industries. The upgrade involved structural strengthening and interior refit, and installation of new avionics, a centerline boom-type refueling system, plus a Flight Refuelling Mk 32B hose-and-drogue pod at each winglip. The converted aircraft can each carry a maximum transferable fuel load of 190,000 lb, equivalent to approx 28,350 US gallons. The flight deck upgrade includes Litton LN-92 ring-laser INS, Bendix/King multifunction displays, IFF, and Tacan. One of the tankers was lost in October 1992.
Contractors: Boeing Commercial Airplane Group, USA: HDH Victoria, Australia.
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 version): empty 145,000 lb, gross 335,000 lb.
Performance: max cruising speed at 25,000 ft 605 mph, ceiling 39,000 ft, T-O to 35 ft 10,020 ft, landing from 50 ft 6,250 ft, max range 3,625 miles.
Accommodation: crew of two or three; main cabin can accommodate up to 219 passengers or combinations of passengers/cargo (max payload approx 89,000 lb) when transferable fuel not carried.
Armament: none.

Boeing 747

On April 1, 1992, the Japan Air Self-Defense Force took delivery of two Boeing 747-47Cs for VIP transportation. Like all series 400 aircraft, they have winglets. General Electric engines were specified, rather than the alternative Pratt & Whitney PW4056 or Rolls-Royce RB211 turbofans. *(Data for standard 747-400.)*
Contractor: Boeing Commercial Airplane Group, USA.
Power Plant: four General Electric CF6-80C2B1F turbofans; each 57,900 lb thrust.
Dimensions: span, fully fueled 213 ft 0 in, length 231 ft 10 in, height 63 ft 8 in.
Weights: empty 399,000 lb, gross 800,000–870,000 lb.
Performance: max cruising speed at 35,000 ft 583 mph; T-O field length 10,900 ft, landing field length 6,800 ft, range with max payload 8,310 miles.
Accommodation: crew of two, plus seats for two observers; typical seating for 421 passengers on two decks; max seating for 660 passengers. Max payload 140,800 lb.
Armament: none.

C-1

This portly Japanese medium transport was designed in the mid-1960s to replace the JASDF's elderly Curtiss C-46s. The first of two NAMC-built prototypes flew in November 1970, the program then being turned over to Kawasaki, which completed two preproduction and 27 production C-1s. Deliveries began in December 1974 and ended in October 1981. The last five aircraft are longer-range models, with an additional fuel tank in the wing center-section. Current operators are Nos. 402 and 403 Squadrons. One C-1 was converted as the Asuka quiet STOL research aircraft; others have been test-beds for Japanese turbofans and for air-launch of Japanese air-to-surface missiles. One aircraft was delivered in 1986, in **EC-1** configuration, to the JASDF's electronic warfare training unit. Equipped with TRDI/Mitsubishi Electric XJ/ALQ-5 ECM, it is recognizable by its bulbous nose and tail radomes, large blister fairings each side of the forward and rear fuselage, and underfuselage antennas.
Contractor: Kawasaki Heavy Industries, Japan.
Power Plant: two Mitsubishi-built (Pratt & Whitney license) JT8D-M-9 turbofans; each 14,500 lb thrust.
Dimensions: span 100 ft 4¾ in, length 95 ft 1¾ in, height 32 ft 9¾ in.
Weights: empty 53,572 lb, gross 85,320–99,210 lb.
Performance: econ cruising speed at 35,000 ft 408 mph, ceiling 38,000 ft, T-O run 2,100 ft, landing run 1,500 ft, max range 2,084 miles.
Accommodation: crew of five, including loadmaster; main cabin accommodates up to 60 troops or 45 paratroops; 36 litters with medical attendants; artillery pieces or small vehicles; or equivalent palletized or other cargo (payload 17,416 lb normal, 26,235 lb max overload).
Armament: none.

EC-47D Skytrain, Republic of China Air Force (Peter Steinemann)

C-119G Flying Boxcars, Republic of China Air Force (Peter Steinemann)

C-130H Hercules, Republic of Singapore Air Force (Peter Steinemann)

C-47 Skytrain/Li-2

First flown as the commercial DC-3 prototype in 1935, the military **C-47** version and its Soviet license-built counterpart, the **Lisunov Li-2** (NATO "Cab"), have outlived many of their modern successors on day-to-day operations in the Far East/Pacific area. Numbers diminish each year, but the total still appears to exceed 130. China has the largest fleet, with more than 50 Li-2s still flying with the PLA Air Force and at least 20 with Aviation of the People's Navy. More than 20 flying in Vietnam are thought to be a mix of Li-2s and C-47s. Other C-47 operators are Indonesia's Army and Air Force with a total of nine, the Air Force of the Laotian People's Liberation Army (seven, including at least three **AC-47** gunships), the Papua New Guinea Defence Force (five), and Taiwan's Republic of China Air Force (19), which also uses an **EC-47D** for navaids calibration. *(Data for C-47B except where indicated.)*
Contractor: Douglas Aircraft Company, USA.
Power Plant: two Pratt & Whitney R-1830-90C radial piston engines; each 1,200 hp.
Dimensions: span 95 ft 6 in, length 63 ft 9 in, height 17 ft 0 in.
Weights: empty 18,135 lb, gross 26,000 lb (normal), 31,000 lb (max overload).
Performance: max speed at 10,000 ft 224 mph, ceiling 26,400 ft, T-O field length 4,000 ft, range 1,600 miles.
Accommodation: crew of two; up to 27 troops, 18–24 litters, or 10,000 lb of cargo in main cabin.
Armament (AC-47): up to three General Electric 7.62-mm Miniguns in main cabin.

C-119 Flying Boxcar

Taiwan appears to be the last remaining operator of Fairchild's rear-loading (twin-boom/podded fuselage) transport. The most-produced version was the **C-119G**, of which 396 were delivered by Fairchild and 88 by Kaiser at Willow Run, Pa., with others upgraded from **C-119Fs**. They saw war service in Korea and, notably as gunships, in Vietnam. About 40 C-119Gs are operated by the Republic of China Air Force 20th Tactical Transport Wing from Pingtung, Taiwan. *(Data for C-119G.)*
Contractor: Fairchild Engine and Airplane Corporation, USA.
Power Plant: two Wright R-3350-89A piston engines; each 3,500 hp.
Dimensions: span 109 ft 3 in, length 86 ft 6 in, height 26 ft 6 in.
Weights: empty 40,785 lb, gross 72,700 lb.
Performance: max speed at 18,000 ft 281 mph, ceiling 21,580 ft, range 1,630 miles.
Accommodation: crew of six, including loadmaster; up to 62 troops, or 35 litters and four attendants, or freight, including vehicles.
Armament: none.

C-123 Provider

One of the first postwar transports to feature a rear-loading ramp/door, the Fairchild (originally Chase) Provider had a fairly undistinguished early career that improved when its twin-piston-engine power plant was later augmented by a pair of small underwing turbojets. Payload capability and short-field performance benefited from this addition, and the C-123 came into prominence during the years of the Vietnam War. Three Far East air forces are known still to fly the type: South Korea (14), Laos (about three), and Taiwan (10); South Korea's are soon to be replaced by recently ordered CN-235s. *(Data for C-123K.)*
Contractor: Fairchild Hiller Corporation, USA.
Power Plant: two Pratt & Whitney R-2800-99W radial piston engines, each 2,300 hp; and two General Electric J85-GE-17 turbojets, each 2,850 lb thrust.
Dimensions: span 110 ft 0 in, length 76 ft 3 in, height 34 ft 1 in.
Weights: empty 35,366 lb, gross 60,000 lb.
Performance: max cruising speed at 10,000 ft 173 mph, ceiling approx 25,000 ft, range with max payload 1,035 miles.
Accommodation: crew of two; up to 60 troops, 50 litters with six sitting casualties and six medical attendants, or 15,000 lb of cargo, in main cabin.
Armament: none.

C-130 Hercules

More than 2,000 C-130s have been delivered, in 40 years of continuous production. Most of those operating today in the Far East/Pacific region are from the C-130H series, introduced in 1964 with uprated engines and more modern avionics, but late-1950s **C-130As** and **Bs** continue to give robust service, as well as **C-130Es**. Operators of the early variants include the air forces of Australia (12 C-130Es), Indonesia (eight Bs and two KC-130B tankers), and Singapore (four KC-130Bs). The standard **C-130H** is operated by, or on order for, Australia (12), Indonesia (two), Japan (15, with more planned), South Korea (six), Malaysia (six), New Zealand (five), the Philippines (three), Singapore (four), and Taiwan (12). Examples of the maritime patrol **C-130H-MP** serve with Indonesia (one) and Malaysia (three), but the latter are being replaced by four Beech King Air 200Ts modified for maritime reconnaissance. Also in service in this theater is the stretched "Super Hercules," the **C-130H-30**, and its commercial counterpart, the **L-100-30**, which are 15 ft longer than the standard C-130H. They serve with the air forces of Indonesia (seven), Singapore (two), and South Korea (four). The Philippine Air Force has two intermediate-length (106 ft 1 in) **L-100-20s**. *(Data for C-130H.)*
Contractor: Lockheed Aeronautical Systems Group, USA.
Power Plant: four Allison T56-A-15 turboprops; each 4,508 shp.
Dimensions: span 132 ft 7 in, length 97 ft 9 in, height 38 ft 3 in.
Weights: empty 76,469 lb, max payload 42,673 lb, gross 155,000 lb (normal), 175,000 lb (max overload).
Performance: max cruising speed 374 mph, ceiling 33,000 ft, T-O run 3,580 ft, landing run 1,700 ft, range with max payload 2,356 miles.
Accommodation: crew of four plus loadmaster; up to 92 troops, 64 paratroops, 74 litters and two medical attendants, or equivalent weight of vehicles, artillery pieces, or cargo in main cabin.
Armament: none.

CN-235 M/MPA

CASA and IPTN set up Aircraft Technology Industries (Airtech) to handle the joint design and production of this twin-turboprop commuter and utility transport. Each company assembled one prototype, with simultaneous rollouts in Spain and Indonesia on September 10, 1983. The CASA prototype flew on November 11 that year, followed by the IPTN aircraft on December 30. The first production CN-235 was flown for the first time on August 19, 1986. Deliveries began four months later, with an IPTN aircraft for Merpati Nusantara Airlines. The first two Spanish production aircraft were military **CN-235 Ms**.

By the beginning of 1993, orders had been received for 157 military examples, of which more than 40 had entered service. The first 15 aircraft delivered by each manufac-

turer are to **Series 10** standard, with 1,700 shp CT7-7A engines; subsequent **Series 100 and 200** aircraft have more powerful CT7-9Cs, as detailed below. Main military customers in the Far East are the Indonesian Air Force and Navy, for which a total of 24 have been ordered. The Naval **CN-235 MPA** is being developed by IPTN for ASW missions, with search radar in a large nose fairing. Three CN-235 Ms have been ordered by the Royal Air Wing of Brunei, two by the Papua New Guinea Defence Force, and 12 by the Republic of Korea Air Force. *(Data for CN-235 M Series 100.)*

Contractor: Aircraft Technology Industries (Airtech: CASA, Spain, and IPTN, Indonesia).

Power Plant: two General Electric CT7-9C turboprops; each 1,870 shp, flat rated to 1,750 shp for takeoff.

Dimensions: span 84 ft 8 in, length 70 ft 2½ in, height 26 ft 10 in.

Weights: empty 19,400 lb, gross 36,376 lb.

Performance: max cruising speed at 15,000 ft 286 mph, ceiling 26,600 ft, T-O distance 4,235 ft, landing run with propeller reversal 1,306 ft, range 932 miles with max payload, 2,706 miles with 7,826 lb payload.

Accommodation: crew of three; up to 48 troops, 46 paratroops, 24 litters and four attendants, or 13,227 lb of freight, loaded via rear ramp. Cabin can be equipped for ASW/maritime patrol, EW, or photographic duties.

Armament: three hardpoints for stores under each wing; max weapon load 7,716 lb. Indonesian CN-235 MPA can carry two Exocet antiship missiles.

F27 Friendship/Troopship

Although known chiefly as a highly successful twin-turboprop, short-haul civil transport, this familiar Dutch aircraft also proved popular with a number of world air forces as a VIP or troop/cargo transport. Most of such sales were either **Mk 200s**, similar to the basic commercial airline model, or of the **Mk 400M** dedicated military transport version. Pacific/Far East operators are Indonesia and the Philippines. The Indonesian Air Force received 12 Mk 400Ms, seven or eight of which remain in service with No. 2 Squadron. Of 10 Mk 200s that originally equipped the Philippine Air Force's No. 208 Air Transport Squadron, seven remained at the beginning of this year. Until recently, the Royal New Zealand Air Force operated three early **Mk 100s** for aircrew nav/com training, but these were placed in short-term storage last year. *(Data for Mk 400M.)*

Contractor: Royal Netherlands Aircraft Factories NV Fokker.

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

Dimensions: span 95 ft 1¾ in, length 77 ft 3½ in, height 27 ft 11 in.

Weights: empty (according to mission) 25,307–26,240 lb, gross 45,900 lb.

Performance: normal cruising speed at 20,000 ft 298 mph, ceiling 30,000 ft, T-O distance 2,310 ft, landing distance 1,900 ft, max range 2,727 miles.

Accommodation: crew of two or three; up to 46 paratroops, 24 litters with nine sitting casualties/medical attendants, or 13,283 lb of cargo.

Armament: none.

HS 748 and Andover

The Royal Australian Air Force continues to operate all 10 of its **HS 748 Series 2s**. Based on the standard transport, with 2,105 ehp Dart RDa.7 Mk 531 turboprops, eight serve as aircrew trainers at the School of Air Navigation and two as VIP transports with No. 32 Squadron. Two **Series 2As**, with RDa.8 Dart engines, are used for EW training by the Royal Australian Navy. The Republic of Korea Air Force uses two standard Series 2As, purchased in 1974, as VIP transports.

The oldest aircraft of the 748 family in the Pacific area are 10 **Andover C. Mk 1** transports of No. 42 Squadron, Royal New Zealand Air Force, based at Auckland. Built for the Royal Air Force, with which they served from 1966 until 1975, they differ from other 748s in having 3,245 ehp Dart RDa.12 Mk 201C engines, a rear-loading ramp in a lengthened fuselage, and a "kneeling" landing gear to facilitate loading of such vehicles as armored cars and Land Rovers. Some are kept in storage for use at peak periods. Their duties include parachute training, logistic support, and crew training. Two have VIP interiors. *(Data for Series 2A.)*

Contractor: Hawker Siddeley Aviation, UK (now British Aerospace).

Power Plant: two Rolls-Royce Dart Mk 532-2L/S turboprops; each 2,280 ehp.

Dimensions: span 98 ft 6 in, length 67 ft 0 in, height 24 ft 10 in.

Weights: empty 26,700 lb, gross 44,495 lb.

Performance: max cruising speed 278 mph, ceiling 25,000 ft, T-O run 2,750 ft, landing run 1,255 ft, max range 1,987 miles.

Accommodation: crew of two; up to 58 passengers in main cabin.

Armament: none.

Islander

The Islander was designed as a simple and easy to manufacture, maintain, and service STOL transport for 10 persons. Some 1,160 had been built by early 1993, including military **Defenders** sold to more than 20 export customers. The 22 Islanders used by the Philippine Air Force for utility missions, and the four flown by the Philippine Navy on transport and SAR duties, were built on a PADC license assembly line at Pasay in Metro Manila. One Islander also flies with an Indonesian Army communications squadron.

Contractors: Pilatus Britten-Norman Ltd, UK; Philippine Aerospace Development Corporation (PADC), the Philippines.

Power Plant: two 260 hp Textron Lycoming O-540-E4C5 or 300 hp IO-540-K1B5 piston engines.

Dimensions: span 49 ft 0 in, length 35 ft 7¾ in, height 13 ft 8¾ in.

Weights (300 hp engines): empty 4,244 lb, gross 6,600 lb.

Performance (300 hp engines): max cruising speed at 7,000 ft 164 mph, ceiling 17,200 ft, T-O run 866 ft, landing run 460 ft, range 1,220 miles with underwing tanks.

Accommodation: pilot, and up to nine passengers, eight parachutists and a dispatcher, three litter patients and two attendants, or freight.

Armament: none.

N22/24 Missionmaster

The Missionmaster is a military version of the short-fuselage **N22B** Nomad, for personnel and equipment transport, forward area support, surveillance, and maritime patrol. One remains of four received for coastal surveillance and transport by the Papua New Guinea Defence Force's Air Transport Squadron, and the Philippine Air Force's 220th Airlift Wing has about 14 for utility or tactical transport and weather reconnaissance. Largest user is Australia: the RAAF with four for training and support, the Army now increasing its fleet to 23 (including five longer-fuselage **N24s**) as its Turbo-Porters are phased out. *(Data generally as for Searchmaster: see Bombers and Maritime section.)*

NC-212 Aviocar

The C-212 twin-turboprop STOL utility light transport was designed and developed by CASA, and since 1976 has been manufactured in Indonesia as the NC-212. IPTN in Jakarta built 29 **Series 100s** before switching to the **Series 200** a few years later, and this company produces the Aviocars for all military operators in South Asia and the Far East/Pacific areas. The major one is Indonesia itself, whose Air Force has about 14, Navy four, and Army four. The IAF aircraft equip Nos. 2 and 4 Squadrons; those of the Navy form a part of No. 600 Squadron. Features include a rear ramp/door that can be opened in flight for LAPES (low-altitude parachute extraction system) and other types of airdrop. The Series 200, which first flew in April 1978, has more powerful TPE331 engines and higher max T-O weight than the original Series 100. *(Data for Series 200.)*

Contractor: Industri Pesawat Terbang Nusantara (IPTN), Indonesia, under license from CASA, Spain.

Power Plant: two Garrett TPE331-10R-511C turboprops; each flat rated at 900 shp.

Dimensions: span 62 ft 4 in, length 49 ft 8½ in, height 20 ft 8 in.

Weights: empty 9,700 lb, gross 16,975 lb.

Performance: max cruising speed at 10,000 ft 227 mph, ceiling 28,000 ft, T-O run 1,445 ft, landing run 656 ft, max range 1,094 miles.

Accommodation: crew of two; up to 24 troops (or 23 paratroops and a jumpmaster), or 12 litters and four medical attendants, light vehicles, or 5,952 lb of containerized or other cargo, in main cabin.

Armament: none.

CN-235 M, Republic of Korea Air Force (Kenneth Munson)

Y-8, Chinese PLA Air Force

YS-11M, Japan MSDF (Katsumi Hinata)

Y-8

Except for its more pointed nose transparencies, the Chinese **Y-8** is outwardly indistinguishable from the Antonov An-12BP. It is manufactured without a license, and its redesigned Chinese turboprops have a higher rating than the An-12's AI-20K. It also introduced a rear-loading ramp/door. The first Y-8 flew at Xian on December 25, 1974. Production was allocated to Shaanxi, which had delivered about two dozen to the PLA Air Force by early 1989. Basic military version is the **Y-8A**, which has been adapted to carry such helicopters as China's S-70C Black Hawks. Standard civil versions are the **Y-8B** for passengers and freight and the **Y-8F** livestock carrier. Only the forward cabin of the basic Y-8 is pressurized, but a fully pressurized 100-passenger **Y-8C**, developed with Lockheed assistance and with 4,550 ehp WJ6A engines, flew on December 17, 1990. Export versions are designated **Y-8D**.

The prototype of a maritime patrol version, designated **Y-8X**, with a large, drum-shaped undernose radome, made its first flight on September 4, 1985. Its equipment includes Western avionics, infrared camera, infrared submarine detection gear, and sonobuoys. A **Y-8E** drone carrier has been developed specifically for Chang Hong 1 high-altitude reconnaissance UAVs, as well as an AEW&C version, with GEC-Marconi assistance. *(Data for standard Y-8A.)*

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

Power Plant: four Zhuzhou WJ6 turboprops; each 4,250 ehp.

Dimensions: span 124 ft 8 in, length 111 ft 7½ in, height 36 ft 7½ in.

Weights: empty 78,264 lb, gross 134,480 lb.

Performance: max speed at 22,965 ft 411 mph, ceiling 34,120 ft, T-O run 4,035 ft, landing run 3,609 ft, range 791 miles with max payload, 3,490 miles with max fuel.

Accommodation: crew of five and 14 passengers in pressurized forward section of fuselage; unpressurized main cabin for 96 troops, 58 paratroops, or 60 litter patients and 20 seated casualties plus three attendants, or two army trucks.

Armament: two 23-mm guns in manned tail turret.

YS-11

This indigenously designed Japanese twin-turboprop transport first flew in August 1962, the first of 180 production aircraft following in October 1964. Aircraft of the first batch were designated **YS-11-100**, those of subsequent batches being **YS-11A** followed by dash numbers starting at -200. Most production went to commercial customers, but 23 were delivered to the Japanese armed forces. The JASDF received four 60-seat **YS-11Ps** (YS-11A-100), one **YS-11FC** (-200), one passenger/cargo **YS-11PC** (-300), and seven all-cargo **YS-11Cs** (-400). Today, nine of these aircraft remain. Two of the YS-11Cs have been converted as **YS-11E** ECM trainers, and another YS-11 has been modified as a **YS-11E(EL)** elint aircraft. Principal transport operators are Nos. 402 and 403 Squadrons.

Deliveries to the JMSDF, which ended in February 1974, comprised one -100, four -200s, two -400s, and three -600s. Four are currently allocated to the 61st Squadron at Atsugi for transport duties and have the service designation **YS-11M**. The other six, which serve with the 205th Air Training Wing at Shimofusa and are called **YS-11Ts** by the MSDF, are employed as ASW trainers. *(Data for YS-11A-200.)*

Contractor: Nihon Aeroplane Manufacturing Company, Japan.

Power Plant: two Rolls-Royce Dart Mk 542-10K turboprops; each 3,060 ehp.

Dimensions: span 104 ft 11¾ in, length 86 ft 3½ in, height 29 ft 5½ in.

Weights: empty 33,993 lb, gross 54,010 lb.

Performance: max cruising speed at 15,000 ft 291 mph, ceiling 22,900 ft, T-O field length 3,650 ft, landing field length 2,170 ft, max range 2,000 miles.

Accommodation: crew of two; up to 60 passengers.

Armament: none. ■

AFA Nominees for 1993–94

By Toni Kuzma

At a meeting May 29 in Colorado Springs, Colo., the Air Force Association Nominating Committee selected a slate of candidates for the four national officer positions and the six elective positions on the Board of Directors. This slate will be presented to the delegates at the AFA National Convention in Washington, D. C., on September 13.

The Nominating Committee consists of the five most recent past National Presidents and one representative from each of twelve regions.

Nominated for his second term as National President was **James M. McCoy** of Omaha, Neb. Mr. McCoy, a retired Chief Master Sergeant of the Air Force (1979–81), joined Mutual of Omaha as vice president and director of Military Sales and stayed with the insurance company until his retirement in 1991. Active in many business and civic organizations, he has served as a member of the Subcommittee on Military Matters, American Council of Life Insurance; Corporate Contributions Coordinating Council, Omaha Chamber of Commerce; Board of Directors, Omaha Zoological Society; Airman Memorial Foundation; Met Life Military Advisory Board; and with many national, regional, and local boards of the Boy Scouts of America, including the National Eagle Scouts Scholarship Selection Committee.

Mr. McCoy was born in Creston, Iowa. After graduating from Maur Hill High School in Atchison, Kan., he enlisted in the Air Force in January 1951, serving as a basic training instructor, NCO PME instructor, and sergeant major at Strategic Air Command's 2d Air Force NCO Academy. He graduated from that academy and the first class of the USAF Senior NCO Academy. In addition to serving in personnel, training, and operations posts, Mr. McCoy was the first Senior Enlisted Advisor in SAC and the sixth Chief Master Sergeant of the Air Force. He earned a degree in business administration from Centenary College of Louisiana in 1966.

He joined AFA in 1974 and has served on the Resolutions, Executive, and Membership Committees; as president, executive vice president, and membership chairman of the Ak-Sar-Ben Chapter; as Chairman of AFA's Long-Range Planning Committee and Ad Hoc, Active-Duty Voting Privileges Committee; and as a member of the Aerospace Education Foundation

(AEF) Board of Trustees. He has served as National Vice President (Midwest Region) and is a Chairman of the Membership Committee and a permanent member of the National Board of Directors. He has received AFA's Presidential and Special Citations and is a Life Member of both AFA and AEF.

O. R. Crawford of Austin, Tex., was nominated for his second term as Chairman of the Board. Mr. Crawford is a business consultant and private investor. Active in many business and civic organizations, he has served as chairman, Bergstrom Austin Community Council; member, Bergstrom Support Group; trustee, Texas A&M University Research Foundation; member, Texas A&M University Century Council; vice chairman, American Airpower Heritage Foundation; and trustee, Southwest Research Institute. He also participates in the Austin Council on Foreign Affairs.

Mr. Crawford was born in Amarillo, Tex., where he attended public schools. He entered the US Army Air Forces in 1943 and served as a fighter pilot during World War II. He was a member of the Air Force Reserve until 1959. After attending Washington State University and South Texas University School of Law, he began work with Time-Life, Inc., a New York publishing company with extensive holdings in Texas, where he served as an officer and director of several subsidiaries from 1956 to 1974. He served on the Board of Directors of the First State Bank, Jasper, Tex., from 1959 to 1975.

Mr. Crawford has received numerous honors, including the rank of brevet major general from the Air National Guard (ANG) and the Commander's Cross of the Order of Merit from the President of West Germany. The award was that country's highest civilian honor and the peacetime equivalent of the Blue Max. Mr. Crawford is listed in several volumes of *Who's Who* and in *Leading Men in the United States of America*.

He has flown nearly 100 different types of civilian and military aircraft, logging more than 13,000 hours in jet and propeller-driven planes. He currently flies his personal Aerostar, as well as a Curtiss P-40 Warhawk as a colonel in the Confederate Air Force.

Mr. Crawford, who joined AFA in 1946, has served on the Finance Committee and as Texas state president, member of the Texas executive committee, National Vice President (Southwest Region), Austin Chapter president, member of the Austin Chapter executive committee, AEF Trustee, and National President. He currently serves on the Executive and Resolutions Committees and is an AEF Trustee. He has received AFA's Presidential Citation, Exceptional Service Award, Special Citation, and Medal of Merit. He was AFA's Man of the Year in 1989 and is a Life Member of AFA and a Charter Life Member of AEF.

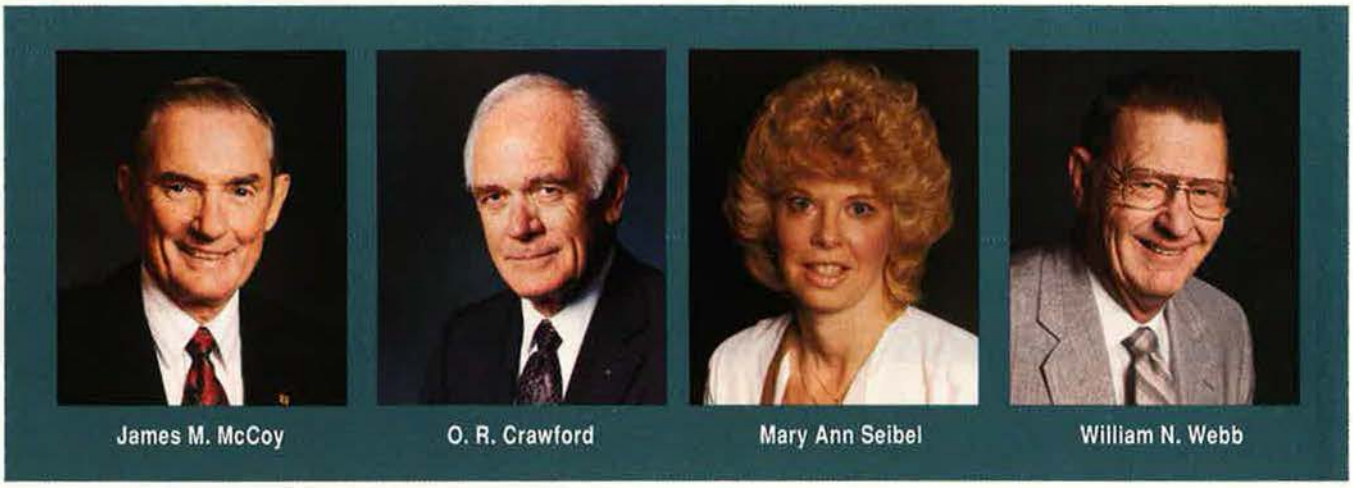
Mary Ann Seibel of St. Louis, Mo., was nominated for her third elected term as National Secretary. Ms. Seibel is director of Personnel for ANG's 131st Fighter Wing in St. Louis.

She directs the base Family Support Program and has the collateral duty of Federal Women's Program Manager. Ms. Seibel's previous assignments included Commander, Communications-Computer Staff Officer, Executive Officer, and Base Services Officer. She completed the Air War College Seminar program in 1989. Ms. Seibel has twenty-nine years of federal civil service and seventeen years of military service. She was commissioned as a first lieutenant in 1976. Ms. Seibel was a 1986–87 participant in the Leadership St. Louis program and is now a member of its alumni association. She is a member of the St. Louis Federal Executive Quality Council and the Military Affairs Committee of the St. Louis Regional Commerce and Growth Association.

Ms. Seibel is also a past president of the Junior Women's Chamber of Commerce and a member of the St. Louis World Affairs Council, the Missouri National Guard Association and National Guard Association of the United States, the Missouri Committee for Employer Support of Guard and Reserve, and the Airlifters Association.

Ms. Seibel was born in St. Louis and attended Webster University. She received her bachelor's degree in business administration from Columbia College in Columbia, Mo.

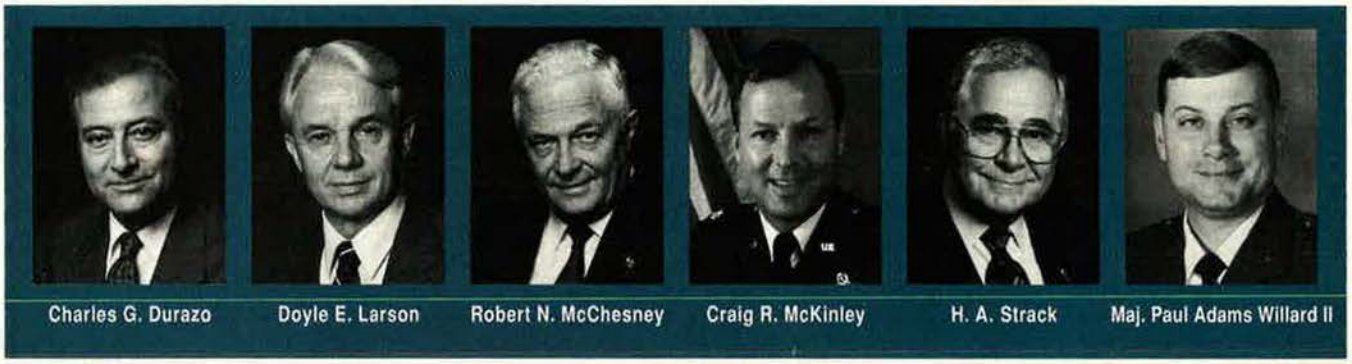
Ms. Seibel served previously on the Executive, Long-Range Planning, and Resolutions Committees of AFA. She has also served as National Director, Under-40 Director, Resolutions Committee Chairman, and Missouri state vice president. She has been a member of the Junior Officer Advisory Council and AEF Board of



Directors and president, vice president, and executive committee member of the Spirit of St. Louis Chapter. Currently, she serves as National Secretary and member of the Executive Committee and Chairman of the Resolutions Committee. She has received AFA's Exceptional Service Award and Medal of Merit twice. She is an AFA Life Member and Charter Life Member of AEF.

bership Award. He is a Life Member of AFA.

The following additional individuals are permanent members of the AFA Board of Directors under the provisions of Article IX of AFA's National Constitution: John R. Alison, Joseph E. Assaf, David L. Blankenship, John G. Brosky, Dan F. Callahan, Robert L. Carr, George H. Chabbott, Charles H. Church, Jr., Earl D. Clark, Jr., M. Lee Cordell, R. L. Devoucoux, Jon R. Donnelly, James H. Doolittle, Russell E. Dougherty, George M. Douglas, Joseph R. Falcone, E. F. Faust, Joe Foss, Barry Goldwater, Jack B. Gross, George D. Hardy, Alexander E. Harris, Martin H. Harris, Gerald V. Hasler, H. B. Henderson, John P. Henebry, Robert S. Johnson, David C. Jones, Arthur F. Kelly, Victor R. Kregel, Jan M. Laitos, Frank M. Lugo, Nathan H. Mazer, William V. McBride, Edward J. Monaghan, J. B. Montgomery, J. Gilbert Nettleton, Jr., Ellis Nottingham, Jack C. Price, William C. Rapp, Julian B. Rosenthal, Peter J. Schenk, Joe L. Shosid, William W. Spruance, Thos. F. Stack, Edward A. Stearn, James M. Stewart, Harold C. Stuart, James M. Trail, A. A. West, and Sherman W. Wilkins.



William N. Webb of Midwest City, Okla., was nominated for his seventh term as National Treasurer.

Born in western Oklahoma, Mr. Webb attended local schools at Burns Flat, Okla., and attended Southwestern State Teachers College, Weatherford, Okla., in 1945. He moved to Midwest City in August 1950 and obtained employment at Oklahoma City Air Materiel Command (now Oklahoma City ALC) at Tinker AFB. He started at Tinker as a warehouseman and completed his career in April 1981 as chief of the Management Organization for Distribution. His responsibilities included accounting, manpower, funding, data systems, and engineering.

Mr. Webb joined AFA in 1960. He has held the office of National Vice President (Southwest Region) and has served on the Finance Committee for fifteen years, been Chairman of the Building Acquisitions Committee, and served as an AEF Trustee. Currently, he is Chairman of the Finance Committee, a member of the Executive Committee, an AEF Trustee, and a member of the Central Oklahoma (Gerrity) Chapter and the Oklahoma executive committee. He has received AFA's Special Award, twice received the Exceptional Service Award, and was honored with the first Storz Mem-

The six people whose photographs appear above are nominees for the six elected Directorships for the coming year.

Charles G. Durazo, Virginia. Executive Vice President, Electronics and Engineering Services. Former chapter secretary, vice president, and president; state president; National Vice President (Central East Region); and National Director. Current state vice president. Life Member of both AFA and AEF.

Doyle E. Larson, Minnesota. Retired Air Force major general. Chief executive officer. Former chapter and state president, National Vice President (North Central Region), and AEF Trustee. Current National Vice President (North Central Region). Life Member of both AFA and AEF.

Robert N. McChesney, New Hampshire. Retired financial programmer. Former National Vice President (New England Region), chapter president, state secretary, treasurer, and president. Current National Vice President (New England Region). AFA Member.

Craig R. McKinley, Florida. Commander of the 125th Fighter Group (ANG) in Jacksonville, Fla. Former Under-40 Director, National Director; Membership Committee Chairman; Executive Committee, Audit Committee, and Long-Range Planning Committee member; and state president. Current National Director. AFA Life Member.

H. A. Strack, Nevada. Retired Air Force brigadier general. Former chapter president, state president, state vice president, chairman of the board, National Vice President (Far West Region), AEF Presidential Advisory Council member, Communications Committee Chairman and member, Finance Committee member, and Long-Range Planning Committee member. Current National Vice President (Far West Region). Life Member of both AFA and AEF.

Maj. Paul Adams Willard II, USAF, Ohio. Air Force Chief of Process Analysis. Former executive board member of the Paul Revere Chapter, member and chairman of the Junior Officer Advisory Council. Current Presidential Advisor for Civil Air Patrol and Vice President for Awards of the Wright Memorial (Ohio) Chapter. AFA Life Member. ■

Books

Compiled by Frank Oliveri, Associate Editor

Armstrong, Roger W. *The Hard Way: An Autobiography of a B-17 Crew Member.* Roger W. Armstrong, 9641 Skylark Blvd., Garden Grove, CA 92641-2631. 1991. Including photos and bibliography, 304 pages. $25.00.

Avery, N. L. *B-25 Mitchell: The Magnificent Medium.* Phalanx Publishing Co., Ltd., 1051 Marie Ave., St. Paul, MN 55118. 1992. Including photos and appendix, 200 pages. $29.95.

Berry, F. Clifton, Jr. *Inventing the Future: How Science and Technology Transform Our World.* Brassey's (US), Inc., 8000 Westpark Dr., First Floor, McLean, VA 22102. 1993. Including photos, bibliography, and index, 180 pages. $19.95.

Blake, Thomas G. *The Shield and the Storm.* The Commemorative Group, P. O. Box 1304, Point Pleasant Beach, NJ 08742-1304. 1992. Including photos, 500 pages. $59.95.

Brackeen, Donna, and Garner, Dean. *Topgun: Miramar.* Motorbooks International, P. O. Box 1, 729 Prospect Ave., Osceola, WI 54020. 1992. Including photos, 160 pages. $29.95.

Chapin, William. *Milk Run. Prisoner of War, 1944: An American Flier in Stalag 17-B.* Windgate Press, P. O. Box 1715, Sausalito, CA 94966. 1993. Including photos and index, 230 pages. $12.95.

Cline, Lydia Sloan. *Today's Military Wife: Meeting the Challenges of Service Life.* Stackpole Books, Cameron and Kelker Sts., Harrisburg, PA 17105. 1992. Including photos, charts, glossary, and index, 258 pages. $14.95.

Coonts, Stephen. *The Cannibal Queen: An Aerial Odyssey Across America.* Pocket Books, 1230 Avenue of the Americas, New York, NY 10020. 1992. Including photos, 344 pages. $22.00.

Crane, Conrad C. *Cities & Civilians: American Airpower Strategy in World War II.* University Press of Kansas, 2501 W. 15th, Lawrence, KS 66049-3904. 1993. Including notes, photos, index, and bibliography, 208 pages. $29.95.

Crosby, Harry H. *A Wing and a Prayer: The "Bloody 100th" Bomb Group of the US Eighth Air Force in Action Over Europe in World War II.* HarperCollins Publishers, 10 E. 53d St., New York, NY 10022-5299. 1993. Including photos and index, 336 pages. $27.50.

Crowe, Adm. William J., Jr. *The Line of Fire: From Washington to the Gulf, the Politics and Battles of the New Military.* Simon & Schuster, 1230 Avenue of the Americas, New York, NY 10020. 1993. Including index, 367 pages. $25.00.

Cubbison, Bruce. *Flyboys Don't Just Fly.* Bruce Cubbison, 5051 W. Portland Dr., Littleton, CO 80123. 1992. 157 pages. $7.95.

Davis, Kenneth S. *FDR: Into the Storm, 1937–1940.* Random House, 201 E. 50th St., New York, NY 10022. 1993. Including notes and index, 691 pages. $35.00.

Dunnigan, James F. *The Complete Wargames Handbook: How to Design & Find Them.* William Morrow and Co., Inc., 1350 Avenue of the Americas, New York, NY 10019. 1992. Including index, 333 pages. $12.00.

Foss, Joe, with Donna Wild Foss. *A Proud American: The Autobiography of Joe Foss.* Pocket Books, 1230 Avenue of the Americas, New York, NY 10020. 1992. Including photos and index, 359 pages. $22.00.

Goodman, Allan E., and Berkowitz, Bruce D. *The Need to Know: The Report of the Twentieth Century Fund Task Force on Covert Action and American Democracy.* The Twentieth Century Fund Press, 41 E. 70th St., New York, NY 10021. 1992. Including appendix, notes, bibliography, and index, 148 pages. $9.95.

Howarth, Stephen. *Men of War: Great Naval Captains of World War II.* St. Martin's Press, 175 Fifth Ave., New York, NY 10010. 1993. Including photos and index, 602 pages. $27.95.

Ion, A. Hamish, and Errington, E. J., eds. *Great Powers and Little Wars.* Greenwood Publishing Group, 88 Post Road W., Box 5007, Westport, CT 06881. 1993. Including index, 246 pages. $49.95.

Jackson, Robert. *Mustang: The Operational Record.* Smithsonian Institution Press, 470 L'Enfant Plaza, Suite 7100, Washington, DC 20560. 1993. Including photos and index, 156 pages. $35.00.

Kautzmann, F. N. *MIA: World War II.* The Austin Press, 95 Elizabeth St., Delaware, OH 43015. 1992. Including photos, 172 pages. $14.95.

Kelly, Michael. *Martyr's Day: Chronicles of a Small War.* Random House, 201 E. 50th St., New York, NY 10022. 1993. 354 pages. $23.00.

Kuttner, Paul. *History's Trickiest Questions.* Henry Holt and Co., Inc.,115 W. 18th St., New York, NY 10011. 1992. Including index, 291 pages. $10.95.

Loomis, David. *Combat Zoning: Military Land-Use Planning in Nevada.* University of Nevada Press, Reno, NV 89557-0076. 1993. Including notes, bibliography, and index, 144 pages. $24.95.

Menos, Dennis. *Arms Over Diplomacy: Reflections on the Persian Gulf War.* Greenwood Publishing Group, 88 Post Road W., Box 5007, Westport, CT 06881. 1992. Including appendix and index, 174 pages. $42.95.

Napier, Lt. Col. John Hawkins III, USAF (Ret.). *Air Force Officer's Guide.* Stackpole Books, Cameron and Kelker Sts., Harrisburg, PA 17105. 1992. Including photos and index, 406 pages. $19.95.

Neilson, Keith, and McKercher, B. J. C., eds. *Go Spy the Land: Military Intelligence in History.* Greenwood Publishing Group, 88 Post Road W., Box 5007, Westport, CT 06881. 1992. Including bibliography and index, 205 pages. $45.00.

Noah, Joe, and Sox, Samuel L., Jr. *George Preddy: Top Mustang Ace.* Motorbooks International, P. O. Box 2, 729 Prospect Ave., Osceola, WI 54020. 1991. Including photos and appendix, 192 pages. $12.95.

Packard, Jerrold M. *Neither Friend Nor Foe: The European Neutrals in World War II.* Charles Scribners Sons, 866 Third Ave., New York, NY 10022. Including appendix, notes, bibliography, and index, 432 pages. $30.00.

Papadin, Valentin. *Teach Yourself to Be a Madman: Memories of a Young Russian Soldier.* Burning Bush Publishing, 283 Sherwood Rd., Willits, CA 95490. 1993. Including illustrations, 97 pages. $12.95.

Pearcy, Arthur. *Flying the Frontiers: NACA and NASA Experimental Aircraft.* Naval Institute Press, Annapolis, MD 21402. 1993. Including photos and appendix, 200 pages. $34.95.

Perret, Geoffrey. *There's a War to Be Won: The United States Army in World War II.* Random House, 201 E. 50th St., New York, NY 10022. 1992. Including photos, notes, and index, 597 pages. $5.99.

Sears, Stephen W., ed. *Eyewitness to World War II: The Best of American Heritage.* American Heritage, 60 Fifth Ave., New York, NY 10011. 1991. 308 pages. $9.95.

Sears, Stephen W., ed. *World War II: The Best of American Heritage.* American Heritage, 60 Fifth Ave., New York, NY 10011. 1991. 280 pages. $9.95.

Stinnett, Robert B. *George Bush: His World War II Years.* Brassey's (US), Inc., 8000 Westpark Dr., First Floor, McLean, VA 22102. 1992. Including photos, notes, and index, 208 pages. $20.00.

Tritten, James J., and Stockton, Paul N., eds. *Reconstituting America's Defense: The New US National Security Strategy.* Greenwood Publishing Group, 88 Post Road W., Box 5007, Westport, CT 06881. 1992. Including bibliography and index, 178 pages. $42.95.

Wagner, William, and Sloan, William P. *Fireflies and Other UAVs (Unmanned Aerial Vehicles).* Jay Miller, Publisher, P. O. Box 200006, Arlington, TX 76006. 1992. Including photos and index, 205 pages. $17.95.

Ward, Cmdr. Nigel David. *Sea Harrier Over the Falklands: A Maverick at War.* Naval Institute Press, Annapolis, MD 21402. 1993. Including photos, index, and appendix, 299 pages. $25.95.

Zuckerman, Lord. *Six Men Out of the Ordinary.* Paul & Company, Publishers Consortium, Inc., P. O. Box 442, Concord, MA 01742. 1992. Including photos and index, 200 pages. $34.95. ■

Valor

By **John L. Frisbee,** Contributing Editor

Gung Ho Fighter Pilot

In every fighter outfit there were—and are—a few pilots whose spirit and determination set them apart.

Long after World War II, a friend of retired Lt. Col. Edwin L. Heller mentioned a former fighter pilot who had flown with Colonel Heller in Europe. Ed Heller grunted. He didn't like the man. Why not? After searching his memory for specifics, Heller replied, "He wasn't gung ho."

Few are better qualified to pass judgment on that score than Ed Heller, who flew two European theater combat tours and two extensions as a member of the 352d Fighter Group, totaling 520 combat hours, who is credited with 19.5 enemy aircraft destroyed, and who then served an interrupted Korea tour in F-86s that led to many months behind bars in China.

In the spring of 1944, VIII Fighter Command began organized strafing of German airfields, the most dangerous of fighter tactics. On April 24, Heller and his flight leader attacked a heavily defended field. Heller destroyed three aircraft, but his flight leader was shot down. On his solo return to the UK, Ed Heller strafed two other airfields, burning four more enemy planes and damaging five. For that courageous achievement, he was awarded the Distinguished Service Cross. He later added seven more, making him a leader in ground kills.

Ed Heller's most memorable air-to-air combat came May 8, 1944, on an escort mission over Germany. Early on, his wingman had to abort, and Heller became tail-end Charlie in a three-ship flight. In an engagement with some thirty German fighters, he shot a Bf-109 off his flight leader's tail, then damaged another that dove for the ground 20,000 feet below. Heller gradually closed on him. The German pulled out on the deck and led Heller a wild chase around steeples, buildings, trees, and haystacks, preventing his pursuer from drawing enough lead to fire. Running out of obstacles, the -109 pilot made a tight left turn, and the two fighters ended up in a Lufbery circle with Heller slowly gaining on the German.

In desperation, the German pilot broke out of the circle. As he pulled up over a bridge, Heller hit him again, and the Luftwaffe pilot crash-landed in a river. At that point, Heller's coolant blew up, covering his windscreen, but enough was trapped to form steam that kept the engine turning for the two-hour flight to Bodney, where he landed in marginal weather. A day to remember.

In 1952, Ed Heller was in Korea commanding the 16th Fighter-Interceptor Squadron of the 51st Fighter-Interceptor Wing. By January 22 of the next year, he had flown forty-six missions, shot down 3.5 MiGs, and been promoted to lieutenant colonel.

The next day, his fortune changed over North Korea. Cannon fire from a MiG broke his right arm, severed the F-86's control stick, and disabled the ejection system. The Sabre went into an uncontrollable vertical dive from 40,000 feet, and there was no way to get out. When it reached denser air, the F-86's nose came up and it slowed to perhaps 650 miles an hour. Looking up, Heller saw an eight-inch shell hole in his canopy. As the plane rolled into another dive, he stood up in the seat and was sucked through the shattered canopy. His left leg struck the horizontal stabilizer with what seemed a minor impact.

Heller was able to hook his left thumb into the parachute's D-ring. Still tumbling at high speed, he blacked out when the chute opened. His left leg, with a compound fracture, dangled uselessly. When he had recovered his senses from an agonizing landing at a high rate of drift, he was confronted by a peasant armed with a large bolo knife.

Once the peasant was convinced Heller had no gun, he and his companions loaded the suffering man into an ancient truck for an excruciating ride over hub-deep potholes to a village. Heller discovered that, though his air battle had begun over North Korea, he had landed across the Yalu in Manchuria. That border crossing at the will of the winds was to be a key issue during his next twenty-eight

Edwin L. Heller, shown here in 1944, stayed gung ho through two World War II combat tours and a tour in Korea.

months as a prisoner of the Chinese, who informed him he would never be released unless he signed a confession that the border crossing was on orders from his commanders.

Though Colonel Heller was not tortured physically, he spent his imprisonment in solitary confinement, lying painfully on a plank bed in rudimentary conditions for more than two years. Eventually a third operation gave him the use of his left leg, now somewhat shortened as a result of inept surgery. Until the eve of his "deportation" to Hong Kong on May 31, 1955—almost two years after the war ended—he was interrogated and pressured constantly to sign a confession.

What was the top item on Ed Heller's agenda after a reunion with his family? To get a waiver on his left leg and return to flight status. During the Cuban Missile Crisis of October 1962, Lt. Col. Ed Heller sat at Homestead AFB, Fla., in the cockpit of an F-100 armed with iron bombs, ready to hit a missile site in Cuba.

Ed Heller retired from the Air Force in 1967 and now lives at Grass Valley, Calif., with his wife Johanna, still—and always—a gung ho fighter pilot. ■

Thanks to retired Col. Dennis O'Connor for nominating Colonel Heller and to Ed Heller for making his records available.

AFA/AEF Report

By Daniel M. Sheehan, Assistant Managing Editor

Chanute History Completed

First opened in 1917, Chanute AFB, Ill., will close its doors October 1, 1993. Its illustrious history as a training base will not go unrecorded, thanks in part to the efforts of AFA member and former **Illini Chapter** President Donald O. Weckhorst, the chief historian at Chanute. In response to a 1983 request by Maj. Gen. Joseph D. Moore, commander of the Chanute Technical Training Center, Mr. Weckhorst began the process that last year resulted in an illustrated history of the base, containing more than 1,800 photographs, historical accounts, statistics, and anecdotes.

Mr. Weckhorst, who sifted through more than 200,000 photographs to put the book together, will be temporarily displaced by the base's imminent closure but plans to return to the Chanute area when he retires. Though the base's closing will upset many, Mr. Weckhorst has hope for the future. "As hard as Mayor [Katy] Podagrosi and all the others have worked, . . . they deserve something good to happen at the base," he says, "and I think it will." Whatever happens, Chanute's seventy-six years of service have been preserved.

National President James M. McCoy (left) and Alamo (Tex.) Chapter President Buster Horlen (right) present an AFA plaque to former AMC Commander Gen. H. T. Johnson in honor of his thirty-three years of service. Lackland Training Center Commander Maj. Gen. Billy G. McCoy was also honored at the event.

Chapter News

Gen. Alfred Gray, retired Commandant of the US Marine Corps, was the featured speaker at the annual dinner meeting of the **Burlington (Vt.) Chapter.** General Gray's speech, which former Chapter President Andrew D. Clark termed "inspiring," focused on the dangers that persist after the breakup of the Soviet Union. General Gray expressed his belief that the status of the US as a world power was in jeopardy and that long-range planning and continued technological improvement were necessary to preserve that status.

Chapter President Eugene Meiler welcomed representatives of the American Legion, VFW, National Guard, Civil Air Patrol, and ROTC units from Norwich University, St. Michael's College, and the University of Vermont. National Vice President (New England Region) Robert N. McChesney, National Director Jack B. Gross, and Chapter Treasurer Eugene Eardensohn also attended the meeting.

Col. Frederick D. Gregory, a veteran of five flights on space shuttles *Challenger, Discovery,* and *Atlantis,* delighted an audience of 300 participants in the Young Astronauts Program with tales of space exploration and a video of one of his flights. The **Carl Vinson Memorial (Ga.) Chapter** cosponsored the event with Georgia AFA at the Robins AFB Museum of Education. The young students enjoyed the talk and the many hands-on workshops that were part of Young Astronauts Day at the museum. They took advantage of the opportunity to learn about technology by building model airplanes and rockets, using a powerful telescope, and operating flight simulators.

Chapter Vice President (Communications) Zack Osborne praised Colonel Gregory for his speech and thanked Vicki Hunnicutt, director of curriculum for Robins AFB schools, for coordinating the project. Warner Robins Air Logistics Center Vice Commander Brig. Gen. Fredric N. Buckingham and Brig. Gen. Robert L. Scott, USAF (Ret.), were on hand to encourage and challenge the Young Astronauts to learn all they can.

Gen. Ronald R. Fogleman, commander of Air Mobility Command and commander in chief of US Transportation Command, delivered remarks to a joint dining-out held by the **General E. W. Rawlings (Minn.) Chapter** and AFROTC Det. 410 of the University of St. Thomas in St. Paul, Minn. An audience of 180 heard General Fogleman's discourse on the US military drawdown, the future of the officer corps, and the sacrifices and responsibilities of members of the military. He paid special attention to the role of the Air National Guard and Air Force Reserve in the airlift mission, noting their contributions to recent operations in Bosnia and Somalia. He had particular praise for AFA, its support of military families, and its importance as a voice for the service during times of cutbacks.

Chapter President Vic Seavers, Minnesota State President Robin Wohn-

In a demonstration of Rockwell International's continued support of aerospace education, Rockwell Vice President Joe Garrett donates a $1,250 check to AFA/AEF Executive Director Monroe W. Hatch, Jr. The money will be used to help fund Aerospace Education Foundation scholarship programs.

sigl, and National Vice President (North Central Region) Doyle Larson worked closely with Lt. Col. Charles St. Sauver, professor of aerospace studies at the University of St. Thomas, and Cadet Lt. Col. Greg McCarty, cadet liaison to AFA, to ensure the success of the dining-out.

The Rawlings Chapter and AFROTC Det. 410 have another reason for celebration: For the third straight year, the detachment boasts 100 percent membership in AFA. Colonel St. Sauver and Cadet McCarty presented a $412.50 check to Mr. Larson and Mr. Seavers, representing this year's participation.

A "Tribute to World War II Veterans" air show was staged by the **Mobile (Ala.) Chapter** at Brookley Air Field last spring, complete with wing-walkers, parachute jumps, and flights by vintage aircraft. Chapter member and National Director Frank M. Lugo cited "outstanding" support by city officials, local media, and civic organizations and saw the "V for Victory" formation flight of B-17, P-51, P-38, and TBM Avenger aircraft as the highlight of the show. A crowd of more than 20,000 attended the show, which also featured a flight by an Air Force F-15. Chapter President William Divin said the work by three chairmen of the air show committee, Jed Steber, Steve Hester, and Scott Hunter, was the key to the show's success.

Former B-29 radio operator and current member of Congress Rep. Ben Gilman (R–N. Y.) paid a visit to a meeting of the **Westchester Falcon (N. Y.) Chapter,** vowing to do his best to help the US maintain a strong military posture. Chapter President Herbert S. Leopold said the congressman's talk was "warmly received." Also at the meeting, chapter members John F. Flanagan, Jr., and Karl Miller led a discussion about conversion of military technology to civilian uses and chapter member Jim Cleary screened a video honoring the fifty-year history of the jet engine.

Every year, the **Lake Superior Northland (Mich.) Chapter** pays tribute to one of the Upper Peninsula's most famous native sons with a scholarship award named for Aviation Hall of Fame member Clarence L. "Kelly" Johnson, aircraft designer at Lockheed's famed "Skunk Works." This year, AFROTC cadet Susan Sample, a student at Michigan Technological University, received the scholarship, presented by Chapter Vice President (Aerospace Education) Jim Anderson.

The chapter further demonstrated its support for education by awarding an Aerospace Education Foundation Eagle Grant to SSgt. Daniel Marcum. The $250 scholarship was presented at Community College of the Air Force graduation ceremonies at K. I. Sawyer AFB, Mich.

The **David D. Terry, Jr. (Ark.), Chapter,** in conjunction with Arkansas AFA, honored AFJROTC cadets at Cabot High School. State President William A. Kehler presented the AFA Award to Cadet Eric Poss, who was also chosen to be the next cadet group commander. The Reserve Officers Association, VFW, American Legion, and Daedalians participated in the awards ceremony.

The **General Nathan F. Twining (Fla.) Chapter** also focused on the achievements of cadets and their instructors, donating a $1,000 scholarship to CAP Cadet Maj. Curtis L. Frewin. Also at the meeting, Cadet SSgt. Richard P. Mandella was named Cadet of the Year and Jeri James Antozzi received an award as the county's Science/Math Teacher of the Year.

National Director and former National Vice President (Northwest Region) Alwyn T. Lloyd reports that the **Greater Seattle (Wash.) Chapter** has had a fine series of guest speakers. First, Woodruff T. Sullivan III, astronomy professor at the University of Washington, delivered an interesting presentation on the dangers of nuclear waste and the necessity of making sure its disposal sites will be undisturbed for the 10,000-year lifetime of the radioactivity. Second, Capt. Keven Leek of the 49th Fighter Wing, Holloman AFB, N. M., described life in today's active-duty force, accompanied by slides and a video presentation.

Coming Events

August 5–7, **California State Convention,** Sacramento, Calif.; August 6–7, **Montana State Convention,** Three Forks, Mont.; August 13–14, **Air Force Ball of Mid-America,** St. Louis, Mo.; August 13–14, **Colorado State Convention,** Colorado Springs, Colo.; August 20–22, **Oregon State Convention,** Bend, Ore.; August 27–29, **Mississippi State Convention,** Jackson, Miss.; August 28, **Indiana State Convention,** Indianapolis, Ind.; September 13–15, **AFA National Convention and aerospace exhibition,** Washington, D. C.

AFA in Moscow

Charles Mack, a member of the **Gold Coast (Fla.) Chapter,** recently completed a record-breaking flight from Washington, D. C., to Moscow in an A-36 Bonanza single-engine plane with AFA logos displayed prominently on the aircraft. The thirty-two-hour flight covered 4,230 nautical miles and included an unplanned stop in

Reykjavik, Iceland. Chapter Vice President (Communications) Frank Morris was instrumental in the success of the flight, coordinating logistics and lending valuable moral support.

California AFA Tags

Supporters of California AFA will soon be able to display their dedication. In an innovative program, the state has authorized use of license plates with a full-color AFA logo. With more than 20,000 members, California AFA should be able to increase the visibility of the association tremendously. More information will be made available as the program progresses.

Have AFA/AEF News?

Contributions to "AFA/AEF Report" should be sent to Dave Noerr, AFA National Headquarters, 1501 Lee Highway, Arlington, VA 22209-1198. ■

Unit Reunions

AAF/USAF Crash Rescue Boat Ass'n
AAF and USAF Crash Rescue Boat personnel will hold a reunion October 8–10, 1993, in Fort Walton Beach, Fla. **Contact:** AAF/USAF Crash Rescue Boat Association, P. O. Box 6004, MacDill AFB, FL 33608. Phone: (813) 837-6658 or (407) 588-5504.

AFOG Alumni Ass'n
The Air Force Orientation Group will hold a reunion August 14, 1993, at Bass Lake Lodge, Wright-Patterson AFB, Ohio. **Contacts:** William M. Butler, 378 Bent Twig Dr., Vandalia, OH 45377-2702. Phone: (513) 878-2203 (Ken Fosberg).

Air Force Postal and Courier Ass'n
The Air Force Postal and Courier Association will hold a reunion October 8–10, 1993, in San Antonio, Tex. **Contact:** Maj. James K. Foshee, USAF (Ret.), 3509 Deer Trail, Temple, TX 76504. Phone: (817) 774-7303.

Readers wishing to submit reunion notices to "Unit Reunions" should mail their 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.

Air Transport Command
Veterans of the Air Transport Command (European Division) who served in World War II will hold a reunion September 17–19, 1993, in Canton, Ohio. **Contact:** Dale Wearstler, 1018 Sunset Blvd., S. W., North Canton, OH 44720. Phone: (216) 499-6602.

Ardmore AAB
Personnel assigned to Ardmore Army Air Base during World War II will hold a reunion September 24–25, 1993, in Ardmore, Okla. B-17 combat crews who trained there are invited. **Contact:** Gabriel F. Aruffo, 106 Countryside Dr., Hackettstown, NJ 07840. Phone: (908) 852-0862.

Berlin Airlift
Veterans of all services who served in the Berlin Airlift will hold a reunion September 26–30, 1993, in San Diego, Calif. **Contact:** Bruce Kates, 7 Cloverbrook Ct., Austin, TX 78738. Phone: (800) 523-7287 (Galaxy Tours).

National EOD Ass'n
The National Explosive Ordnance Disposal Association will hold a reunion September 16–18, 1993, in Fort Walton Beach, Fla. **Contact:** James P. Dwyer, P. O. Box 53688, Albuquerque, NM 87153. Phone: (505) 884-8431.

4th Fighter-Interceptor Wing Ass'n
Veterans of the 4th Fighter-Interceptor Wing and all assigned squadrons will hold a reunion October 15–17, 1993, in Quitman, Tex. **Contact:** John David, Rte. 2, Box 2543, Quitman, TX 75783. Phone: (903) 967-2569.

5th Air Force Memorial Foundation
The 5th Air Force Memorial Foundation will hold a reunion dedication October 8, 1993, at the Air Force Academy in Colorado Springs, Colo. **Contact:** Jules Teck, 1601 Cabana Dr., Lake Havasu City, AZ 86403-1033.

7th Ferrying Group
Veterans of the 7th Ferrying Group will hold a reunion September 16–19, 1993, at the Seapoint Hotel in San Diego, Calif. **Contact:** Robert H. Milligan, P. O. Box 377, Centuria, WI 54824. Phone: (715) 646-2043.

7th Photorecon Group Ass'n
The 7th Photoreconnaissance Group will hold a fiftieth-anniversary reunion October 28–30, 1993, in St. Louis, Mo. **Contact:** George Lawson, 4390 14th St., N. E., St. Petersburg, FL 33703. Phone: (813) 526-8480.

12th Tactical Recon Squadron
The 12th Tactical Reconnaissance Squadron will hold a reunion September 30–October 3, 1993, in Dayton, Ohio. **Contact:** Wayne Pittman, 498 Carthage Dr., Beavercreek, OH 45434-5865. Phone: (513) 426-1289.

21st Air Depot Group
Veterans of the 21st Air Depot Group will hold a reunion September 4, 1993, at the American Legion Hall in Van Wert, Ohio. **Contact:** James Campbell, 20 Chelsea St., Staten Island, NY 10307.

30th Bomb Group
Veterans of the 30th Bomb Group will hold a reunion October 28–30, 1993, at the Sheraton Hotel in Riverside, Calif. **Contact:** Ed Hattrup, 24306 Del Amo Rd., Ramona, CA 92065-4073. Phone: (619) 788-0749.

36th Fighter Group
Veterans of the 36th Fighter Group and 23d Fighter Squadron will hold a reunion October 6–10, 1993, at the Ramada Inn Airport East in Phoenix, Ariz. **Contact:** E. G. Reyman, 4420 E. Osborn, Phoenix, AZ 85018. Phone: (602) 840-2620 (work) or (602) 840-1661 (home).

Class 40-E
Members of Class 40-E will hold a reunion September 23–25, 1993, at the Menger Hotel in San Antonio, Tex. **Contact:** Col. David Gaston Alford, USAF (Ret.), P. O. Box 276513, San Antonio, TX 78227-6513.

Class 41-H
Members of Pilot Class 41-H will hold a reunion October 28–30, 1993, at the Menger Hotel in San Antonio, Tex. **Contact:** Bob Sheeks, 145A Treasure Way, San Antonio, TX 78209. Phone: (210) 826-8842.

Class 42-K
Members of Pilot Class 42-K are planning to hold a reunion in November 1993 in Jacksonville, Fla. **Contact:** Jules Horowitz, 3507 Oaks Way, Apt. 911, Pompano Beach, FL 33069-5356. Phone: (704) 256-6274.

Class 43-H
Members of Class 43-H (Eagle Pass, Tex.) will hold a fiftieth-anniversary reunion August 26–29, 1993, in San Antonio, Tex. **Contact:** Brig. Gen. Frank Gailer, USAF (Ret.), 7 Dartford Ln., San Antonio, TX 78257. Phone: (800) 929-5667.

Class 43-H
Members of Class 43-H (George Field, Ill.) will hold a fiftieth-anniversary reunion in conjunction with George Field personnel September 10–12, 1993, in Vincennes, Ind. **Contact:** Robert E. Hiemstra, 4760 Terrasanta, Pensacola, FL 32504. Phone: (904) 478-9392.

51st Fighter Squadron
Veterans of the 51st Fighter Squadron, 6th Air Force (World War II), are planning to hold a reunion in conjunction with the Confederate Air Force air show October 8–10, 1993, in Midland, Tex. **Contacts:** L. Derick, 19 Mermaid Rd., Toms River, NJ 08753. Phone: (908) 270-0889. John Rodenhaus, 11323 Manchester Rd., Kirkwood, MO 63122. Phone: (314) 821-7129.

Class 55-K
Members of Pilot Class 55-K will hold a reunion October 8–10, 1993, in San Antonio, Tex. **Contact:** R. Thomas Roe, P. O. Box 911, Palm Beach, FL 33480-0911. Phone: (407) 881-8180.

57th Bomb Wing
Veterans of the 57th Bomb Wing and assigned units (World War II) will hold a reunion September 6–12, 1993, at the Embassy Suites Hotel in Portland, Ore. **Contact:** Robert E. Evans, 1950 Cunningham Rd., Indianapolis, IN 46224-5341. Phone: (317) 247-7507.

75th Troop Carrier Squadron
The 75th Troop Carrier Squadron will hold a reunion October 6–10, 1993, in Burlington, Vt. **Contact:** Robert C. Richards, 266 Woodlawn Dr., Tipp City, OH 45371. Phone: (513) 339-7508.

79th Fighter Group Ass'n
Veterans of the 79th Fighter Group and assigned squadrons will hold a reunion August 19–21, 1993, at the Marriott Hotel in Newton, Mass. **Contact:** Frank Sanders, 126 E. Norman Pl., Broken Arrow, OK 94012. Phone: (918) 251-9936.

94th Fighter Squadron
The 94th Fighter Squadron ("Hat-in-the-Ring") will hold a reunion September 17–18, 1993, at Langley AFB, Va. **Contact:** Capt. William C. Paszkiewicz, USAF, 94th Fighter Squadron, Langley AFB, VA 23665. Phone: (804) 764-4040 or DSN: 574-4040.

96th TCS/FBS/TAS
Veterans of the 96th Troop Carrier/Fighter-Bomber/Tactical Airlift Squadron will hold a fiftieth-anniversary reunion September 10–12, 1993, in Minneapolis, Minn. **Contact:** Capt. Michael W. Huttner, AFRES, 2100 W. 86th St., Bloomington, MN 55431. Phone: (612) 884-7728.

333d Bomb Group
Veterans of the 333d Bomb Group are planning to hold a reunion October 7–10, 1993, in Fort Mitchell, Ky. **Contact:** Don Brzezinski, 11 Baldwin Pl., Massapequa, NY 11758. Phone: (704) 256-6274.

363d Mustang Fighter Group
Veterans of the 363d Mustang Fighter Group and assigned units, 9th Air Force (World War II), will hold a reunion November 4–7, 1993, in Orlando, Fla. **Contact:** Dave Holbrook, 7844 Clubhouse Dr. Estates, Orlando, FL 32819. Phone: (407) 352-1662.

366th Fighter Group Ass'n
Veterans of the 366th Fighter Group/Tactical Fighter Wing will hold a fiftieth-anniversary reunion September 16–18, 1993, at the Holiday Inn–Airport in Richmond, Va. **Contact:** John F. Peterson, P. O. Box 392, Harrodsburg, KY 40330. Phone: (606) 734-7912.

385th Bomb Group Ass'n
Veterans of the 385th Bomb Group will hold a reunion August 25, 1993, in Spokane, Wash. **Contact:** George S. Hruska, 7442 Ontario St., Omaha, NE 68124. Phone: (402) 397-1934.

390th Bomb Squadron
Veterans of the 390th Bomb Squadron, 42d Bomb Group, 13th Air Force, will hold a reunion October 7–10, 1993, in Asheville, N. C. **Contact:** Adrian J. Good, P. O. Box 1844, Elizabethton, TN 37644. Phone: (615) 542-8681.

436th Fighter Squadron
Veterans of the 436th Fighter Squadron, 479th Fighter Group (World War II), will hold a reunion October 11–14, 1993, in Galveston, Tex. **Contact:** Travis Greenwood, 4506 Navajo Path, Austin, TX 78745. Phone: (512) 442-7134.

452d Bomb Group Ass'n
Veterans of the 452d Bomb Group will hold a reunion September 23–25, 1993, at the Omni Hotel in Norfolk, Va. **Contact:** John Witte, 40 S. 16th St., Richmond, IN 47374. Phone: (800) 944-3570.

457th Bomb Group
The 457th Bomb Group and attached units (World War II) will hold a reunion October 15–19, 1993, in San Antonio, Tex. **Contact:** Homer L. Briggs, 811 N. W. B St., Bentonville, AR 72712.

462d Aircraft Weapons
Members of the 462d Aircraft Weapons Unit will hold a reunion October 2, 1993, at Lowry AFB, Colo. **Contacts:** George Cooper, P. O. Box 281176, Lakewood, CO 80228. Billy R. Williams, 3460th Technical Training Squadron, 7985 E. Irvington Pl., Lowry AFB, CO 80230-3205. Phone: (303) 644-3369.

507th Air Materiel Squadron
Members of the 507th Air Materiel Squadron will hold a reunion September 9–10, 1993, at Wright-Patterson AFB, Ohio. **Contact:** Richard H. Giffin, Rte. 6, Box 6444, Clarkesville, GA 30523.

565th/574th SAW Battalions
Veterans of the 565th and 574th Signal Aircraft Warning Battalions will hold a reunion September 10–13, 1993, in Colorado Springs, Colo. **Contact:** Angel M. Zaragoza, 1581 W. 9th St., San Bernardino, CA 92411. Phone: (909) 889-7853.

585th Bomb Squadron
The 585th Bomb Squadron will hold a reunion September 16–18, 1993, at the Westpark Hotel in Arlington, Va. **Contact:** Tom O'Brien, 1907 Rio Vista Dr., Fort Pierce, FL 34949. Phone: (407) 465-7974.

596th SAW Battalion
Veterans of the 596th Signal Aircraft Warning Battalion (Company C) will hold a fiftieth-anniversary reunion October 6–9, 1993, in Memphis, Tenn. **Contact:** Liz Bartley, 255 Crescent Dr., Decatur, IL 62526. Phone: (217) 877-1417.

702d Airlift Squadron
Members of the 702d Airlift Squadron and the 702d Bomb Squadron (World War II) will hold a fiftieth-anniversary celebration October 2, 1993, in Cherry Hill, N. J. **Contact:** Lt. Col. Zachary Prescott, 702d Airlift Squadron, 22-16 W. Arnold Ave., McGuire AFB, NJ 08641-5218. Phone: (609) 724-2707.

1129th Special Activities Squadron
Members of the 1129th Special Activities Squadron, Det. 1, will hold a reunion September 23–26, 1993, in Las Vegas, Nev. **Contact:** Paul H. Zobrist, 1405 N. Mojave, Las Vegas, NV 89101.

3520th Flying Training Wing
Members of the 3520th Flying Training Wing will hold a memorial dedication reunion October 6–10, 1993, at McConnell AFB, Kan. **Contacts:** George Ureke, 7266-1 Glen Hollow Ct., Annandale, VA 22003. Phone: (703) 256-6266. Gena Dillard, 240 Penrose, Wichita, KS 27206. Phone: (316) 683-9675.

7330th Flying Training Wing
Members of the 7330th Flying Training Wing will hold a fortieth-anniversary reunion October 7–10, 1993, in Fürstenfeldbruck, Germany. **Contact:** Father William L. Travers, American Embassy Bonn, Box 270, APO AE 09080. Phone: 0228 37 47 92.

Pyote Army Airfield
Seeking contact with personnel who were stationed at Pyote AAF, Tex., for a reunion in October 1993. **Contact:** Dr. Ken Pierce, 2381 Keech Rd., Branchport, NY 14418. Phone: (704) 256-6274.

Skoshi Tigers
Members of Skoshi Tigers are planning to hold a reunion in September or October 1993 in Colorado Springs, Colo. **Contact:** Brig. Gen. Robert F. Titus, USAF (Ret.), 1110 Garlock Ln., Colorado Springs, CO 80918.

19th Tactical Airlift Squadron
For the purpose of organizing a reunion in October 1993, I am seeking contact with members assigned to C-123Ks who served with the 19th TAS, based at Tan Son Nhut AB, Vietnam. **Contact:** Col. Charles Zemple, 4213 High Ridge Rd., Haymarket, VA 22069. Phone: (703) 754-8244.

Class 43-B-2
Seeking contact with members of Pilot Class 43-B-2 (Mather Field, Calif.) who are interested in a fiftieth-anniversary reunion. **Contact:** Harold E. Scott, 102 Lancelot Ln., Camillus, NY 13031. Phone: (315) 488-5954.

100th Air Refueling Squadron
Seeking personnel of the 100th Air Refueling Squadron who are interested in a reunion. **Contact:** Charles R. Wagner, P. O. Box 150, St. Peter, MN 56082-0150. Phone: (507) 931-6973.

822d Bomb Squadron
For the purpose of planning a reunion, I am seeking contact with members of the 822d Bomb Squadron, 126th Bomb Wing, who served in Laon, France, between 1951 and 1955. **Contact:** Ed Nelson, 401 Beverly Ave., Hendersonville, NC 28792. Phone: (704) 693-0971. ■

Bulletin Board

Seeking contact with **pilots of four F-86Ds** in formation that I have in a framed photograph. The tail numbers on two of the aircraft are 23764 and 23826. **Contact:** Oscar D. Teel, 4214 Don Felipe Dr., Los Angeles, CA 90008.

Seeking information on aircrews who flew with the **3d** and **9th Military Airlift Squadrons**, Dover AFB, Del., during the airlift of Cobra Dane equipment from Hanscom Field, Mass., to Shemya AFB, Alaska. Also seeking information on **Col. Charles G. Johnson**, Hanscom AFB, Mass., 1972, and old black-and-white or color photos of **Thunderbirds** (F-100D, F-4E). **Contact:** Andrew Biscoe, 1504 Coeur d'Alene Ave., Coeur d'Alene, ID 83814-9513.

Seeking contact with **eight survivors** of a **B-24E** that crashed in the mountains behind Santa Barbara, Calif., July 4, 1943. The pilot was **Lt. T. T. Johnson.** The aircraft was with the 7th Bomb Squadron, 34th Bomb Group, stationed at Blythe, Calif. At the time of the accident, the organization was operating out of Salinas AAB, Calif. **Contact:** Robert A. Burtness, Air Heritage Museum, 601 Firestone Rd., Goleta, CA 93117.

Seeking information on **Lee Massengale** who served at Harvard AAB, Neb., from 1944 to 1945. He was married to Bess Talich of Giltner, Neb. **Contact:** Clarence M. Juett, 3057 Page St., Redwood City, CA 94063.

Seeking a color copy of ***Mission Vietnam,*** an unofficial publication of 7th Air Force. The publication depicts various elements of 7th Air Force,

including the "Infantry of the United States Air Force"—the security police involved in a combat defense role. **Contact:** John J. Lockwood, 987 South St., Tewksbury, MA 01876.

For a book, I am seeking contact with civilians employed by US corporations as foreign **military advisors, instructors**, or **operators**—combat or noncombat, World War II to Operation Desert Storm. **Contact:** David S. Gauntlett, 9825 Lakepointe Dr., Burke, VA 22015.

Seeking information on the **Douglas A-20,** especially books and other publications on the aircraft. Also interested in collecting Consolidated, Convair, and General Dynamics artifacts. **Contact:** Marvin Wood, Jr., P. O. Box 150903, Fort Worth, TX 76126.

Seeking information, anecdotes, and copies of photos of **Florence H. Harrington Grantham** for a memorabilia project. She served in Victoria Station, Tex., and Germany during the 1950s. **Contact:** Capt. Robin F. Grantham, 6ATAF, PSC 88 Box 2557, APO AE 09821.

Seeking contact with **8th Air Force** personnel who served in air depot repair or mobile repair and reclamation outfits in England, France, Belgium, Holland, or Germany during World War II. **Contact:** Roland P. Harper, 21995 Rodeo Ct., Colfax, CA 95713.

Seeking information on families with three or more brothers who were **military pilots** (past or present). **Contact:** Maj. Jefferson K. Warren, USAF (Ret.), 13618 E. 2d Ave., Aurora, CO 80011.

Seeking contact with runners, sponsors, and support personnel who participated in the **Marathon Orphans Run** from the Black Sea to Ankara, Turkey, sponsored by the US logistics group and the base chapel, between 1989 and 1992. **Contact:** Lt. Col. Steve McCormack, USAF (Ret.), 11521 Davis St., Moreno Valley, CA 92557.

Historian seeking contact with anyone who flew in, administered, or maintained **F-4 Phantoms** with the 35th and 479th TFWs at George AFB, Calif., from 1965 to 1976. **Contact:** Alan Howarth, 16 Brook St., Woodbridge, Suffolk IP12 1BE, UK.

Seeking information on **Lt. Thomas Francis Delaney**, a B-17 pilot with the 743d Bomb Squadron, 455th BG, 15th Air Force, stationed at Bari, Italy. He was killed August 4, 1945, near Ypsilanti, Mich. Also seeking information on **Lt. Darwin M. Kelter** of the 95th Fighter Squadron, 820th FG, who died in the same crash. Delaney was from New York, N. Y., and Kelter from Bryant, Ind. **Contact:** Rosemary Clarke, RR 1, Box 120-1C, Blue Hill, ME 04614.

Seeking information for county history on **1st Lt. Charles M. Lee,** who was shot down over France August 8, 1944. He was in the 355th or 357th Fighter Group, flying P-51s. **Contact:** Capt. A. E. Weiland, USAF (Ret.), 1113 N. Main St., Richland Center, WI 53581.

For a future publication, seeking photos of **USAF Air** and **Security Police** on duty. All types, especially Korean War, Vietnam and Thailand, and Operations Desert Shield and Desert Storm, are needed. **Contact:** SrA. Patrick B. Roche, 6009 Altamont Pl., Baltimore, MD 21210.

Collector seeking **aircraft desktop display models,** flight test patches, and X-15 and X-plane memorabilia. **Contact:** John E. Kregel, P. O. Box 506, Toronto, SD 57268.

Seeking photographs of the following former **20th Air Force commanders:** Maj. Gen. Francis H. Griswold, Brig. Gen. Frederick Hopkins, Jr., Maj. Gen. Alvar C. Kincaid, Maj. Gen. Ralph F. Stearly, and Maj. Gen. Fay R. Upthegrove. **Contact:** Dr. Martin Hagopian, 20th Air Force, 747 Nebraska Ave., Suite 17, Vandenberg AFB, CA 93437-6277.

Seeking **copies of anatomical** or **cutaway drawings** from factory presentation plaques, technical orders, and manuals of the following aircraft: Douglas C-133A, C-124C, and C-54A and Fairchild C-119A/G. I need eighteen by twenty inch or eleven by seventeen inch photocopies. Will copy and return any originals sent. **Contact:** Juan Flores, 5316 Jonah St., Bakersfield, CA 93307-6326.

Seeking the following **patches**: 460th Tactical Reconnaissance Wing from Tan Son Nhut AB, Vietnam (1966–67); 415th Bomb Squadron, 98th BW, from Lincoln AFB, Neb. (1959–63); 321st Strategic Reconnaissance Squadron, 90th SRW, from Forbes AFB, Kan. (1957–58); 61st, 62d, and 63d Fighter Squadrons from MacDill AFB, Fla.; and 17th, 19th, 21st, and 33d Fighter Squadrons, 363d FW, from Shaw AFB, S. C. **Contact:** Jimmy Fallon, 3025 S. E. Burton St., Topeka, KS 66605-2100.

Seeking information on **Lt. William T. Surgeson,** who was stationed at Pocatello, Idaho, in August 1943 with the 382d Bomb Group. In January 1944 he was at the 29th Combat Crew Training School in Boise. **Contact:** Joan Dinwoodie, 25 Doman Rd., Lakenham, Norwich, Norfolk NR1 3AW, UK.

Seeking information for a biography of **2d Lt. Harold Joseph Mann,** who served with the 329th Bombardment Squadron, 93d BG, at RAF Alconbury, UK, and North Africa during World War II. I am seeking contact with crew members of an 8th Air Force B-29 piloted by **Maj. Ramsay D. Potts, Jr. Contact:** John J. Chapman III, 116 Penny Pack Cir., Hatboro, PA 19040-3559.

If you need information on an individual, unit, or aircraft, or if you want to collect, donate, or trade USAF-related items, write to "Bulletin Board," AIR FORCE Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Letters should be brief and typewritten; we reserve the right to condense them as necessary. We cannot acknowledge receipt of letters. Unsigned letters, items or services for sale or otherwise intended to bring in money, and photographs will not be used or returned.—THE EDITORS

Seeking contact with family members of **Jerry Wildblood** of Texas. He was stationed at RAF Burtonwood, UK, in the 1950s. **Contact:** Marie Louise Maier, 5094 Ivywild Ave., Hilliard, OH 43026.

Seeking contact with **Francis H. Dawson,** from Belmont, Mass., who graduated from Class 43-D, George Field, Ind. He is believed to have stayed in the service after World War II. **Contact:** Dennis J. Donnelly, 637 Ravenswood Rd., Hampstead, NC 28443.

Seeking donations of **short-snorters** for display in a museum. **Contact:** L. A. Vanderboegh, 5100 John D. Ryan Blvd., #1904, San Antonio, TX 78245.

Seeking information on any **B-50 crew member** from Eglin AFB, Fla., on TDY to Kirtland AFB, N. M., in the spring of 1955 for **Operation Teapot. Contact:** MSgt. Ed Graham, AFRES (Ret.), P. O. Box 76, Mackinaw, IL 61755.

Seeking information on **Robert Wigg**, an instructor pilot at Enid AAF, Okla., in 1944, and **Robert Moxley**, of Titusville, Pa., of the 9th Fighter Squadron, 49th FG, in 1952. **Contact:** Jack Borland, 4105 S. W. Hocken, #8, Beaverton, OR 97005.

Seeking contact with former members of the **304th Service Group** and 845th/888th Aviation Engineers Battallion Company for information on the construction of Sardinian airfields from 1943 to 1944. **Contact:** Alessandro Ragatzu, Via Sulcitana 134, 09034 Elmas, Ca, Sardegna, Italy.

Seeking contact with **Lt. Alfred Gates**, stationed at Westover Field, Mass. He may have been with Troop Carrier Command from 1944 to 1945. **Contact:** Charlotte Tenczar, 281 Chauncey Walker St., Lot 47, Belchertown, MA 01007.

Seeking contact with **Paul D. Morriss,** stationed at RAF Huntington, UK, who possibly hailed from Hartman, Ark. **Contact:** K. Baker, 88 Marston House, S. M. E., Leicester LE1 2PX, England.

Seeking contact with **Lt. Raymond F. Lienhart**, a pilot cadet in Class 44-B in San Antonio, Tex. Primary at Hicks Field, Fort Worth, Tex. **Contact:** Harry W. Lewis, 7291 Raccoon Hill Dr., Kirtland, OH 44094-970191.

Seeking contact with **Robert L. Goldston** and **Morris A. Sutton**, who were in the 91st Maintenance Control section, stationed at Barksdale AFB, La., and Lockbourne AFB, Ohio, during the 1950s. **Contact:** William C. Sinclair, 9457 Garfield Dr., Shreveport, LA 71118.

Author seeks information on A-20s of the **59th Bomb Squadron,** 6th Air Force. **Contact:** Dan Hagedorn, Smithsonian Institution, Archives Division, Mail Code 322, Washington, DC 20560.

Historian seeks information on **USAAF planes** forced to land in Spain during World War II. **Contact:** Jose Miguel Sales Lluch, c/o Sagrado Corazon, 13-1, 46100 Burjasot (Valencia), Spain.

Seeking contact with individuals from the **719th Bombardment Squadron** in Italy who flew with **Myron J. Sullwold** and **Marcelino J. Huerta** during World War II. **Contact:** Marcelino J. Huerta III, 620 E. Twiggs St., Tampa, FL 33602.

Seeking information on **Lesley Cresser** (or **Creaser),** who served on bombers stationed near Shropshire, England, during World War II. **Contact:** Louise S. Morgan, 27 Cherington, Stirchley, Telford, Shropshire TF3 1UJ, England.

Seeking information on an **Air Force Scuba School,** if one existed. I also want information on the Special Forces team it was a part of. **Contact:** Greg Boschert, 7 Florence Ave., Newport, RI 02840.

Seeking contact with **Atlas D and E missileers** and maintenance workers stationed at F. E. Warren AFB, Wyo. **Contact:** Rich Nolan, 832 Silver Sage Ave., Cheyenne, WY 82009-1027.

Air Force medical student seeks USAF metal satin finish **flight surgeon wings**, large and small sizes. Also interested in USAF medical memorabilia. **Contact:** 2d Lt. Arunas Banionis, AFRES, 135 Montana Ave., #16, Santa Monica, CA 90403-1059.

Seeking contact with anyone who served on **Iwo Jima** with the 6415th Air Base Squadron, Central AB, from 1950 to 1956. **Contact:** George J. Fuller, 1219 E. Newport Pike, Wilmington, DE 19804-1940.

Seeking information on B-17s from crew members of the ***Miami Clipper.*** I need photos, de-

scriptions of markings, color scheme, and history of the aircraft to be used in preparing an oil painting. Also seeking information on pilot **James E. Burry,** from Greenville, S. C., who was killed in April 1944 while crash-landing a bomber in Greifensee, Switzerland. I need the plane's serial number, unit, squadron, and dates for an oil painting. **Contact:** Mark Meriwether, 67 Briggs Rd., Asheville, NC 28805.

Seeking information on an apparition of a priest reported flying over the **Italian peninsula** in 1944 or 1945. **Contact:** Robert B. Coble, 5504 N. Mountain View Ave., San Bernardino, CA 92407.

Seeking an authentic **World War II WAF dress uniform**, size 14 or 16, as well as pictures, articles, or information that will assist in making accurate presentations with hairstyles, makeup, pins, or medals. **Contact:** Lee Ann Richardson, 616 Oak Dr., Greenwood, IN 46142.

Seeking **World War II uniforms** to be displayed in clubrooms in Hamilton, New Zealand. **Contact:** L. Kerr, 8 Dowding St., Hamilton, New Zealand.

Seeking information on USAAF involvement with Natal AB, Brazil, during World War II. The project may have been labeled the **"Green Project"** or **"Ferrying Command." Contact:** Lt. Col. Carol Stegall, AFRES, 4828 N. Kenmore, Apt. 1N, Chicago, IL 60640.

Seeking information on **Dale O. Wilcox**, from Muncie, Ind., a waist gunner on a B-24 who served in USAAF in North Africa, Italy, and ETO. He also served with the 3d Infantry in Korea. **Contact:** MSgt. Ralph C. Wilcox, USAF (Ret.), 7811 15th Ave., Kenosha, WI 53143-5913.

Seeking contact with **Donald R. Biehn,** a U-10 pilot with the 5th ACS at Pleiku, Vietnam, in 1967–68. **Contact:** Ralph Baber, Rte. 1, Box 237, Tow, TX 78672.

Seeking information on **1st Lt. Howard G. Theobald,** who served with the 416th Bomb Squadron, 99th BW, 15th Air Force, Foggia, Italy. He was killed in a midair collision on a mission to Graz, Austria. **Contact:** Bruce Pike, 970 Lantern St., E. Liverpool, OH 43920.

Collector and historian seeking **Air Corps** and **AAF memorabilia** from World War I through World War II: flight jackets, uniforms, flight equipment, and photo albums. **Contact:** Jon Cerar, 425 John St., Carlinville, IL 62626.

Seeking contact with the following individuals who served in World War II: **Frank Magnetti, Lt. Ronnie McCullock, Lt. Selma L. McDougle, Mary McNally, Walter A. Renze,** and **Capt. Marvin Wilson. Contact:** R. C. Harris, Jr., 4813 Burton S. E., Albuquerque, NM 87108-3419.

Seeking contact with **Navigators Protective Association** members (374th Troop Carrier Wing, Tachikawa, Japan, 1953), including **Bill Jones, Al Pillar, Dave Tracy,** and **Bill Ware.** Also seeking World War II **flight jackets** to be donated to the Aerospace Historical Foundation. **Contact:** Lt. Col. Tim Dunn, USAF (Ret.), 448 Wild Oak Cir., Longwood, FL 32779.

Seeking information on **Rémy Chuinard** of Granville, France, who may have served in the French Underground. Members of the Air Force Escape and Evasion Society might be of assistance. **Contact:** Don Goodenow, 3128 Sunnybrook Dr., Charlotte, NC 28210.

Collector seeks World War II USAAF **patches** to complete a collection. Need patches from the Philippine, Cuban, and 18th Air Forces. **Contact:** John Anderson, 1700 Grand Ave., Leavenworth, KS 66048.

Seeking contact with the **Canadian aviation enthusiast** whose letter and drawing of an FB-111 were published in Pease AFB's ***Seacoast Flyer.*** This person had an interest in SAC FB-111As. **Contact:** Curtis J. Lenz, 32 June St., Nashua, NH 03060-5345.

Seeking contact with pilots who flew both **SAC fighters** and **SAC bombers. Contact:** Maj. Richard R. Gundry, USAF (Ret.), Box 486, Yellville, AR 72687.

Seeking contact with members of the **44th, 93d, 389th,** and **392d Bomb Groups,** 8th Air Force, who participated in the 1943 Oslo-Kjeller, Norway, mission. A memorial to that mission is planned. **Contact:** Forrest S. Clark, 703 Duffer Ln., Kissimmee, FL 34759.

Collector seeks **flight scarves, stickers,** and **patches** from any USAF units. **Contact:** Spc. Wylie A. Mathis, 3314 E. Orlando Rd., Panama City, FL 32405.

Seeking **patches** from the following units: 307th Bombardment Wing/Group and 371st Bombardment Squadron (B-29s, Korean War), and 3537th Electronic Warfare Squadron (T-29s, Mather AFB, Calif., 1962). **Contact:** Steven E. Michaud, 2137 Louella Ave., Venice, CA 90291.

Seeking correspondence with anyone interested in **aviation** in general and USAF in particular. **Contact:** Hans Mickael Jankowski, 24 rue du Chasse Marée, 56000 Vannes, France.

Seeking information on **Allen Bennett,** who was stationed in Anchorage, Alaska, in the 1950s. After his discharge from the Air Force, he managed a tavern in Anchorage. **Contact:** Leanne Moore, P. O. Box 2075, Jackson, WY 83001.

Seeking contact with members of the **67th Fighter Squadron,** 18th Fighter Group, 13th Air Force, who served at Clark Field, the Philippines, from 1947 to 1950. **Contact:** Steven T. Seele, Sr., 4587 Griffin Creek Rd., Medford, OR 97501.

Seeking contact with alumni of the **Major Rudolf Anderson, Jr., Squadron,** Arnold Air Society, Clemson University. **Contact:** Cadet 1st Lt. Lisa N. McMahan, 300 Tillman Hall, Box 340705, Clemson University, Clemson, SC 29634-0705.

Seeking contact with persons who knew or served with **Daniel D. Dean,** who was killed in action in Europe in 1945. At the time he belonged to the 773d Bomb Squadron, 463d Bomb Group, 15th Air Force. **Contact:** Denise Luddeke, 7020 Fallbrook Ct. E., Fort Worth, TX 76120.

Seeking engineering-quality plans and drawings of an obsolete US Army **tactical missile known as "Little John."** The rocket was developed in the 1950s and deployed in Europe and CONUS. Specifically interested in detailed drawings of the airframe, both fin patterns, and launch lug details. **Contact:** Paul Gennrich, 1109 Hickory St., Hinesville, GA 31313.

Seeking contact with members of the **8th Tactical Fighter Wing,** Ubon RTAFB, Thailand, for a unit history. Request pictures, stories, or other information from those who served there. **Contact:** Richard M. Heid, 530 S. 7th St., Vandalia, IL 62471.

Seeking contact with **Sgt. Michael Ford,** who was stationed at RAF Alconbury, England. He may have lived briefly in Panama. **Contact:** Julie Windle, 84 Darwin Dr., Cambridge CB4 3HH, UK.

Seeking information and photos from anyone who served on **air rescue** aircraft, from World War II through the Gulf War, from the OA-10 Catalina to the OA-10A "Warthog," including the Sandy A-1 in Vietnam. **Contact:** Larry Davis, Squadron/Signal Publications, 4713 Cleveland Ave, N. W., Canton, OH 44709.

Seeking information on the following members of the 9th and 513th Bomb Squadrons, World War II: **Capt. Harry Shilling, 1st Lts. Stephen J. Jerbic** and **Lloyd A. Severson,** and **MSgts. Michael Herbert, Jr.,** and **Carl F. Lewis, Jr. Contact:** Hal Raiklen, 4300 Cerritos Ave., Long Beach, CA 90807.

Seeking copies of ***World Electronic Aircraft*** by Streetly and ***Aerial Espionage*** by Van Der Aart. **Contact:** Michael E. Mayer, 2025 Waycross Rd., Fremont, CA 94539.

Seeking contact with anyone who knew **Charles F. "Rudolph" Hess,** of the 631st Bomb Squadron, 401st Bomb Group (World War II). Seeking contact with other members of the squadron, including **Robert Raine** and Messrs. **Bryant, Buchanan,** and **Irwin. Contact:** Capt. Richard P. MacKeen, PSC 560, Box 77, APO AP 96376-0077.

Seeking information on **Lt. Eugene Jochens,** a pilot with the 732d Bomb Squadron, 453d Bomb Group, stationed near Old Buckingham, England. **Contact:** Robert Yudelson, 621 S. Barrington Ave., Los Angeles, CA 90049.

Author seeks contact with **Capts. Dwight Evans** and **Michael Heck.** Also seeking contact with anyone else who participated in **Operation Linebacker II. Contact:** Grace Sevy, 2440 Larkin St., San Francisco, CA 94109.

Seeking contact with **Charles DeBellevue** and **William W. Wilkinson III.** DeBellevue was commander at Misawa AB, Japan, in 1989. Wilkinson served at Williams AFB, Ariz., from 1970 to 1972, and Randolph AFB, Tex., from 1972 to 1975. **Contact:** Maj. Patrick B. O'Callaghan, AFRES, 602 Gigi Ct., Richland, WA 99352-9795.

Seeking information about the crew of the ***Devil May Care.*** Its pilot, **James Shanks,** is believed to have died in Georgia two years ago. Its bombardier was **David Wirshborn.** Also seeking photos of the aircraft. **Contact:** James F. Wirshborn, 820 S. Summit View Dr., Fort Collins, CO 80524.

Requesting the donation of an **A-26 bomber** for an air museum. Other aircraft would also be appreciated. **Contact:** Ed Nelson, 401 Beverly Ave., Hendersonville, NC 28792.

Seeking information on **Sgt. Fred R. Palmer,** from San Francisco, Calif., who was stationed with the 11th Infantry Brigade in Vietnam in 1968 and the 601st Tactical Control Squadron in West Germany from 1969 to 1971. **Contact:** S. M. Frith, 13 Kerry Close, Chandlersford, Eastleigh, Hants. SO5 2PQ, UK.

Researcher seeks information, photos, and patches of the Lockheed **SR-71, YF-12,** and **A-12** aircraft. **Contact:** Kenneth Buck, 14900 Nacogdoches, Apt. 2201, San Antonio, TX 78247-1659.

Editor and photographer seeking to trade **35-mm slides** of modern military aircraft (1980 to present). Also interested in trading **military patches** and **decals. Contact:** Renato E. F. Jones, P. O. Box 73403, Puyallup, WA 98373.

Seeking the whereabouts of **Henry P. King,** former commander of the 10th Troop Carrier Group and 27th Troop Carrier Squadron. **Contact:** Harry A. Blair, 27th Troop Carrier Squad-

ron Foundation, P. O. Box 582, La Crosse, WI 54602-0582.

Seeking contact with **William Elsdon,** copilot on Luis Coppola's B-17 crew with the 379th Bomb Group, 8th Air Force (World War II). His last known address was in southern California. **Contact:** M. H. Abbott, P. O. Box 229, New Berlin, IL 62670.

Seeking contact with anyone who flew on **Bristol Beaufighters** in the night-fighting role during World War II. The applicable squadrons were the 414th Fighter Squadron, 310th Bomb Group; 415th FS, 64th Fighter Wing; and 417th FS, 337 Wing (RAF). **Contact:** Michael O'Hagan, 309-11 Cooperage Pl., Victoria, B. C. V9A 7J9, Canada.

Author seeks information and photos from crew members or support personnel with the **113th Tactical Fighter Wing,** based at Andrews AFB, Md. **Contact:** Ibrahima Gaye, 10212 Arizona Cir., Bethesda, MD 20817.

Seeking contact with instructors of the 1943–46 **Single Engine Advanced Central Instructors School. Contact:** Lt. Col. Phillip Coady, USAF (Ret.), 12935 Rio Oso Rd., Auburn, CA 95602.

Collector seeks patch from the **9th Strategic Reconnaissance Squadron. Contact:** P. B. Rascasse, P. O. Box 114, Laguna Beach, CA 92652.

Seeking contact with anyone involved in **T-28A operations** in Munich or Salzburg from 1950 to 1952. **Contact:** MSgt. David W. Menard, USAF (Ret.), 5224 Longford Rd., Dayton, OH 45424.

Seeking contact with **Salvatori Angelo Spagnowalla,** now in his sixties, from Brooklyn, N. Y. He was a military policeman stationed in England at Hunstanton or Kingslyn in the 1950s. He knew Breda Patricia Lenihan of Limerick, Ireland. **Contact:** S. A. Johnson, 32 Buckingham Gate, Eaglestone, Milton Keynes, Buckinghamshire, UK.

Seeking contact with the following members of the **1932–4 Army Airways Communications System Detachment** (Crystal III), who served on Padloping Island, Canada, in 1950, for possible reunion: **James E. Glass,** and Messrs. **Austin, Cantrell, Hranac,** and **Payne. Contact:** Walt Ziemke, 110 Courtney Ct., Neenah, WI 54956.

Historian seeks contact with former **AAF radio technicians** familiar with the radio equipment used in UC-64 Noorduyn Norseman aircraft in Europe in 1944–45. **Contact:** Dale M. Titler, P. O. Box 7361, Courthouse Rd. Station, Gulfport, MS 39506.

Seeking information on **Lt. Floyd E. Lund,** who was killed when his B-29 crashed over Japan in June 1944. **Contact:** Col. William L. Evans, USAF (Ret.), 4390 N. 125th W., Ogden, UT 84414.

Historian seeks contact with anyone who flew or maintained **Republic F-84D, F-84E,** or **F-84G Thunderjets** in Korea from 1950 to 1953. **Contact:** Robert F. Dorr, 3411 Valewood Dr., Oakton, VA 22124.

Seeking photos of **Douglas A-1 Skyraiders** for a book on aircraft used in southeast Asian combat service. **Contact:** Richard S. Drury, 7303 Foxridge Cir., #2, Anchorage, AK 99518-2710.

Historian seeks information on the following special-purpose aircraft: **C-130A/B-II, J/NC-130A/B, DC-130E/H, EC-130E Volant Solo,** and **C-130H Eagle Claw.** Also seeking information from unit historians on past and present unit affiliations. **Contact:** Frank H. McCurdy, 6312 Rumford Ln., Houston, TX 77084-2052.

Seeking aerial views of the **Catalina, Ariz., Titan Site #390,** Davis-Monthan AFB, Ariz. **Contact:** Eugene C. Ensing, 15770 N. Oracle Rd., C-5, Tucson, AZ 85737. ■

Bob Stevens'

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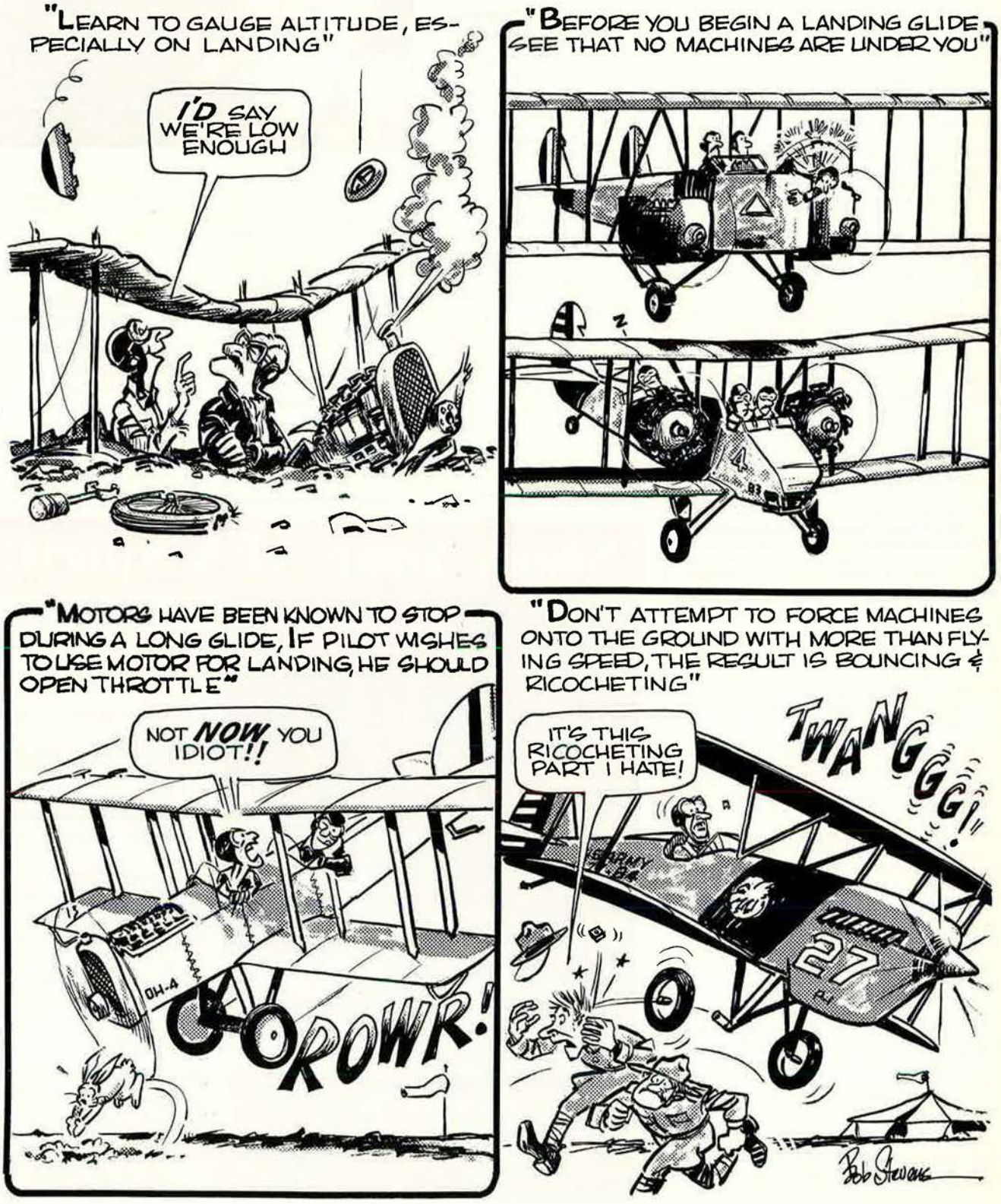

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