


AUGUST 1992/\$3

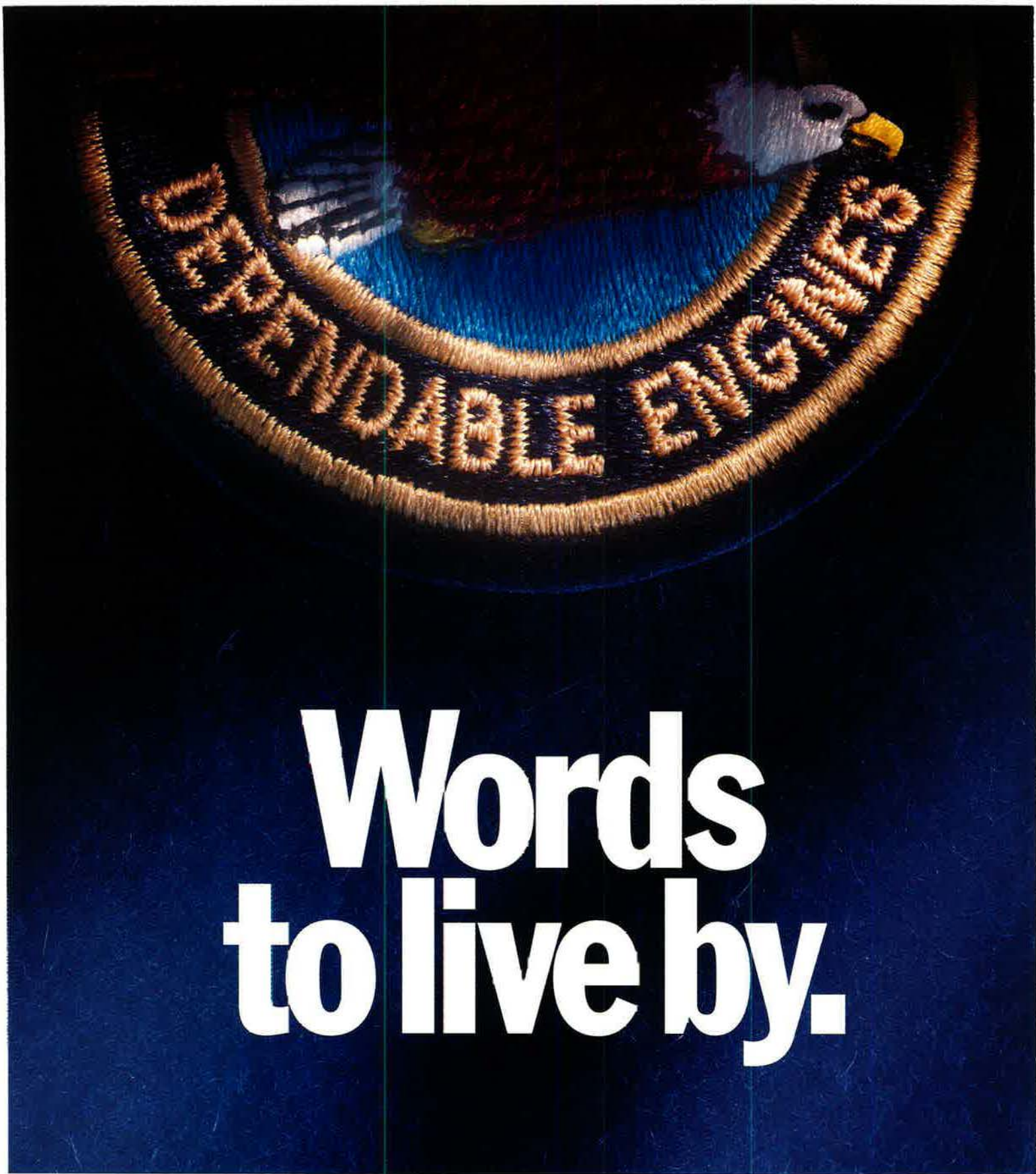
AIR FORCE

PUBLISHED BY THE AIR FORCE

MAGAZINE

The Enlisted Airman





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AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE

August 1992, Vol. 75, No. 8

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About the cover: SSgt. Craig Dock, an instructor with the 20th Special Operations Squadron, 1st SOW, Hurlburt Field, Fla., demonstrates the professional caliber of today's enlisted force. For an overview of ninety-four years of enlisted contributions to US airpower, see p. 46. Cover photo © Randy Jolly/Arms Communications.

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By John T. Correll, Editor in Chief

Russia and the Eleven Dwarfs

A REMNANT of the Communist Party met in Moscow June 13 and expelled former Soviet leader Mikhail Gorbachev for "the ruination of the party and the state." Hardly anyone noticed. Virtually no one cared.

A vast amount of history has happened since the three-day coup a year ago this month. The plotters botched the job, but they set the Soviet Union toppling. Mr. Gorbachev, the party, and the Soviet Union itself were gone by Christmas. A Union of Sovereign States was proclaimed in September. It lasted ninety-seven days, then gave way to the Commonwealth of Independent States. By spring, the former Soviet republics had loosened ties with the Commonwealth and formed their own armed forces.

There was never any doubt that the dominant power among them would be Russia, which had the most people, industry, and military assets. It also demonstrates the clearest sense of identity and direction.

Ukraine, potentially a major nation, is still defined in the shadow of Russia. The Ukrainians have never liked the Russians, and the feeling has deepened with disputes about the Crimea and the Black Sea fleet. Some Ukrainians are reluctant to give up their nuclear weapons without guaranteed protection by the United States.

The other republics are pretty much in a condition of primordial soup. Their evolution is unpredictable. Georgia (which just put down a coup staged by the faction ousted in the previous coup in January) held back from joining Russia and the ten other republics in the Commonwealth but wants some sort of collective security arrangement. The president of Moldova was not completely exaggerating in June when he declared that "we are at war with Russia." There is no telling how the Islamic republics of central Asia might eventually align.

It seems a reasonable bet that Russia will be around for a while, but President Boris Yeltsin's personal future is less certain. Former US President Richard Nixon rates Mr.

Yeltsin "the most pro-Western Russian leader in history," but he has big problems at home. The worst is an economic disaster that he may not be able to fix.

Mr. Yeltsin's reform program is opposed by a parliament of former Com-



**One year after the
coup, the Soviet Union
is gone and the
Commonwealth is
fading fast.**

munist Party elites who want to keep state subsidies and prop up the old industrial infrastructure. Mr. Yeltsin's authority as president is likewise carried forward from the Soviet era. He is operating largely on emergency powers granted by the badly parlia-

ment. He must also deal with the army, the only other power group in a position to bring him down quickly. Before pushing Mr. Gorbachev out, he checked with the military leaders and agreed to a number of concessions they wanted. He continues to give the armed forces a remarkable degree of slack.

The other republics have conceded, somewhat nervously, a nuclear weapons monopoly to Russia. President Bush and Mr. Yeltsin agreed June 17 to eliminate about two-thirds of the strategic nuclear warheads on both sides.

The Russians have not become pacifists. The Commonwealth joint military command, headed by Marshal Yevgeni Shaposhnikov, becomes increasingly irrelevant by the week as control shifts to the Russian defense ministry under Gen. Col. Pavel Grachev, who demonstrates real ability for the consolidation of power.

General Grachev disclosed in May that force reductions have been delayed and that Russian military strength will not be down to 2.1 million before the end of 1995. (The US projects a force of 1.6 million in 1995.) General Grachev does not expect to complete his reductions until the turn of the century. Leaders from Mr. Yeltsin on down have said consistently that they intend to field a Russian military force of top caliber. Modernization has been curtailed but not stopped. Upgrades to the MiG-29, for example, are extensive enough that the new version will be designated the MiG-33.

"While restoring the Russian Army, we are restoring Great Russia," declares Vice President Alexander Rutskoy, whose fiery nationalism reflects a popular sentiment. The trouble in Moldova, for example, stemmed from aggressive support for Russian minorities in other republics.

The prevailing assumption is that except for nuclear weapons—whose numbers are falling fast—there is no military threat left in what used to be the Soviet Union.

Russia and its neighbors may not be dangerous at present, but it is rash to write them off as harmless. By far, the largest military force between the Atlantic and the Urals today belongs to Russia. The second largest is Ukraine's. These states may not know exactly what lies ahead, but they show no inclination to accept it lying down. ■



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Watch for this world-class aircraft as it continues its flight tours throughout the Americas and Europe.



Aerospace and Defense
Aircraft Division

Letters

May Issue Miscues

The Air Force Almanac in the May issue neglected to mention many of the Air Force's operational satellites. It failed to include such operational programs as the Defense Meteorological Satellite Program (DMSP), the Global Positioning System (GPS), the Defense Support Program (DSP), and the Defense Satellite Communications System (DSCS). All of these programs made valuable contributions during Operations Desert Shield and Desert Storm. In addition, the Air Force operates the Navy's FLTSATCOM satellites and the NATO communications satellites. Lastly, space systems cannot operate without a ground segment to support their operations. Each of the satellites mentioned above has its own ground station and is supported by the Air Force Satellite Control Network (AFSCN).

The Basic *Aerospace* (emphasis added) Doctrine of the USAF (AFM 1-1, March 1992) clearly states the requirement to have space assets and their role in accomplishing the war-fighting mission. We do not understand how our satellite systems and ground support activities were not discussed in your fine magazine.

Capt. Tom Doyne, USAF
Capt. Jeff Bachman, USAF
Space Test and Pegasus Launch
Vehicle Program Office
Long Beach, Calif.

While not wanting to spoil a very comprehensive and informative Almanac issue, I need to point out that the 347th Fighter Wing, based at Moody AFB, Ga., flies the F-16C/D Fighting Falcon, and not the F-15, as indicated in the 9th Air Force chain of command chart on p. 74.

Capt. R. Steven Murray,
USAF
Moody AFB, Ga.

Please adjust your information regarding Torrejon AB, Spain, and what happened to it on May 4, 1992.

First, you must understand that the Spanish Air Force never relinquished control of the installation to the United States. The Spanish Air Force has,

for as long as I can remember, controlled entry and access to the installation; provided installation security; and, through the Permanent Committee, allocated facilities (IDAs) on the installation for our use. The only thing under US "control that reverts" to the Spanish is the "use of facilities" (IDAs) associated with departing elements of US activities.

What happened at Torrejon AB on May 4, 1992, was dictated in the most current Agreement on Defense Cooperation (ADC) between our two countries. In the ADC, the Spanish only required the 401st Tactical Fighter Wing to be out of Spain. Essentially, the Spanish wanted all airframes with Torrejon markings removed from Spanish soil. Other US activities at Torrejon AB were supposed to leave "as a consequence" of the 401st TFW's departure. (One could argue that unless we negotiated a continued presence in the next ADC, the other units had until 1997, when the current agreement expires, to depart.)

I hope this sets the record straight.

Maj. Richard A. Zyvolski, Jr.,
USAF
Sheppard AFB, Tex.

I read the Almanac edition with my usual fervor, that fervor saved for publications involved with my vocation and avocation—the Air Force and flying. I was, however, appalled at the inaccuracy with which you list my installation. I can handle the fact that you list us as a minor installation (p. 128) even though we encompass 106,110 acres, or 165.8 square miles.

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

We are, in fact, only one squadron of less than 200 personnel (military and civilian). I cannot, however, condone your listing us as Avon Park AFS! The term "Air Force Station" usually refers to an installation with no runway. We happen to have a very nice 8,000-foot runway used many times by F-16s in emergencies, C-130s, and other aircraft.

Over the years, we have been called many things: Avon Park Army Air Field (1943), Avon Park Air Force Base (1948), Avon Park Bombing Range (never), but in 1956 the base and the bombing range were combined and renamed Avon Park Air Force Range. We have had that name since.

Lt. Col. William P. Moline,
USAF

Avon Park Air Force Range, Fla.

I congratulate you and the staff on another outstanding and informative Almanac issue.

I noticed that you have again shown the first commander in chief of US Air Forces in Europe (USAFE) to be Brig. Gen. John F. McBlain. Unless I am mistaken, his name should read "McBain." I am sure his family would appreciate a correction in your records.

Lt. Col. Gordon D. McBain, Jr.,
USAF (Ret.)
Carmel, Calif.

In the Almanac issue—p. 41—Awards and Decorations Ribbon Bars, isn't there supposed to be a RVN Presidential Unit Citation? If so, where does it come in—behind the ROK Presidential Unit Citation or behind the RVN Gallantry Cross with Palm? Samuel K. Brown
Dallas, Tex.

Generally, I find that the Almanac issue is accurate and up-to-date, but I must take issue with two errors in the 1992 issue.

The first error is in the footnote that accompanies the enlisted grade and insignia chart on p. 40. Note (a) should read, "After May 1, 1992, all promotions are to E-4 Senior Airman." I believe this was done to shift the balance of the enlisted force back toward

Publisher
Monroe W. Hatch, Jr.

Editorial

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Advertising

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

Manager of Marketing Services
Elizabeth B. Smith—703/247-5800

Manager, East Coast and Canada
By Nicholas—203/357-7781

Manager, Midwest
William Farrell—708/295-2305

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Gary Gelt—213/295-3050

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Piazzo Fontane Marose 3
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Letters

the airman side. Currently a majority of the enlisted personnel are in the NCO ranks.

The second error is on p. 108, where the caption to the bottom photograph refers to the aircraft depicted as a C-5. The aircraft is definitely not a C-5. Being a flight engineer on a C-141, I would know that view anywhere!

The issue as a whole was most enjoyable, and I enjoy reading both the features and the "Letters" column. It is refreshing to see the diversity of the opinions expressed by the authors and the respondents.

SSgt. Patrick J. Tweed,
USAF
Tacoma, Wash.

Your Almanac was excellent. However, I feel compelled to correct an error in the listing of previous winners of the Airlift Rodeo Moore Trophy (p. 133).

In 1986, it was the men and women of the 145th Tactical Airlift Group, North Carolina ANG, Charlotte, N. C., not the 136th TAW, Dallas, Tex., that won Airlift Rodeo.

At that time, the 136th was our parent wing headquarters and we received a great deal of moral support from them. However, I believe that the record should clearly show that it was the "First in Flight," 145th TAG that won the Air Guard flyoff and represented the wing. This victory was especially meaningful to our unit since it was the first time, and so far the only time, that an ANG airlift unit has won the prestigious airlift competition.

Col. Charles D. Burnfield,
N. C. ANG
Charlotte, N. C.

In your May 1992 issue, on p. 34, you indicate the total number of F-117A aircraft in the USAF active-duty fleet to be fifty-eight. I do not agree with your number.

According to the numbers I have seen, there were five full-scale development aircraft, with production numbers YF-117A-LO 79-10780 through 79-10784. Then fifty-nine production aircraft were delivered to USAF with serial numbers F-117A-LO 80-0785 running consecutively to F-117A-LO 88-0843. Three aircraft have been admitted lost by crashing, and these are serial numbers 785, 792, and 815. This would leave only fifty-six aircraft in inventory, assuming the above data are correct. If there are fifty-eight in current inventory, then two aircraft would have to be full-scale development models included in your total number.

I am collecting data, photographs, and anecdotes concerning this aircraft with the intention of publishing a record of the F-117A individually by tail number indicating any differences or similarities.

Patrick Cullumber
Portland, Ore.

In your Almanac's "Guide to Air Force Installations Worldwide" on p. 123, the write-up on Iraklion AB incorrectly states that Iraklion is the capital of Crete.

The capital is Khania, located on the western end of the island. I was stationed at Iraklion AB back in 1959-61. Even then, one had the feeling that Iraklion was the capital because it is the largest city, but Khania has that distinction.

Lt. Col. Robert Dubowsky,
USAF (Ret.)
Satellite Beach, Fla.

Please accept my compliments for an interesting, informative, and enjoyable May issue.

The following comments are offered in the spirit of accuracy presented throughout that edition.

Perhaps it is because certification was granted a bit late that Charles R. D'Olive's name does not appear among the World War I fighter aces listed on p. 48. 1st Lieutenant D'Olive was credited with destroying one enemy aircraft on September 12, 1918, three enemy aircraft downed in a frantic but flawless twelve-minute episode on September 13, 1918, and a fifth on October 18, 1918. All were Fokker D.VIIs.

Since hostilities ended shortly afterwards, Lieutenant D'Olive's designation as an ace became one of the war's many unattended loose ends, but history finally caught up with the last ace of World War I. As the enclosed documents show, 1st Lt. Charles R. D'Olive was finally and officially certified an ace on June 8, 1965.

Col. Don Solwold,
USAF (Ret.)
Esko, Minn.

Though I enjoyed your May 1992 issue, I must ask, why were no enlisted gunners noted as aces on pp. 48 and 49?

Ronald S. Macklin
Winston-Salem, N. C.

■ *With regard to Captain Doyne's and Captain Bachman's comments, expanded coverage of space missions and assets is under consideration for*



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MCDONNELL DOUGLAS

1993. Readers Murray, Zvoloski, McBain, Tweed, Burnfield, and Dubowsky are correct. Mr. Cullumber is also correct: Fifty-nine production F-117As were built, and three crashed, leaving a total of fifty-six. With regard to Avon Park, it does not qualify as a major installation under the latest USAF definition because it is not operated by a unit of wing size or larger, and "Air Force Station" is the appropriate title under those circumstances. The RVN Presidential Unit Citation to which Mr. Brown refers is an Army ribbon.

The Almanac issue would not be complete without a controversy about aces. Faced with several conflicting sources, AIR FORCE Magazine relies on Air Force Aerial Victory Credits, published by the Air Force Historical Research Center. This source does not list gunners as aces because of the difficulty in apportioning individual credit when so many gunners were involved in the vast majority of individual victories. This source, published in 1988, supersedes the records cited by reader Solwold and credits Lieutenant D'Olive with a total of four victories.

In addition to the errors spotted by our readers, there were several errors of omission and commission in the "USAF Tail Markings" section of the Almanac (p. 39), and the name of 14th Air Force Commander Maj. Gen. Dale R. Baumler was misspelled. We strive for accuracy in the Almanac issues, and we appreciate the comments of readers that help us achieve that goal.—THE EDITORS

Don't Forget Vietnam

I thoroughly enjoyed "The BUFF at War" [June 1992, p. 44], by Capt. Doug Fries, because it gave a clear description of the conventional B-52 operation in the Gulf War. However, I did take exception to the caption describing the B-52 on p. 45.

The caption reads, in part, "The Persian Gulf War was an opportunity for B-52s to prove their value as conventional bombers, after thirty-eight years in a strategic nuclear mission." My question to the caption-writer is, "Have you forgotten Vietnam and the role the B-52 had in that conflict—especially in Linebacker II?" The article never mentions Vietnam and the tons of bombs dropped by B-52s on Hanoi that contributed to ending that conflict.

With nearly 4,000 hours as a radar navigator and ninety-six Arc Light missions to Vietnam from Guam, Okinawa, and Thailand, I feel moderately

qualified to say that, when employed properly, the B-52 had proven its value as a conventional bomber long before the Persian Gulf War.

Col. Gordon M. Rounds,
USAF (Ret.)
Yorktown, Va.

The Full Flight Lab

Since I am interested in history, I enjoyed "Beginnings" [June 1992, p. 82] very much. However, Mr. Callander made one small error, which should be brought to the attention of your readers.

He states that the Air Corps set up the Full Flight Laboratory at Mitchel Field on Long Island. Although one would think that the military of that time would have been very much interested in any research that would help the airplane become more useful to them, military funds for such research were limited.

More than a few military and congressional leaders remained unconvinced that military aviation had more

than a minor support role on the battlefield.

The Full Flight Laboratory was created through a grant by the directors of the Daniel Guggenheim Fund for the Promotion of Aeronautics at the suggestion of its president, former Naval aviator Harry Guggenheim, the son of the founder. The Air Corps's contribution came when Capt. (later Vice Adm.) Emory S. "Jerry" Land, USN, vice president of the fund, was asked who should head the "blind flying" program. Although it caused much criticism from his Navy contemporaries, Jerry Land suggested that Lt. James Doolittle, chief of the Flight Test Section at McCook Field, Ohio, would be a good choice. One of the most experienced test pilots in the Air Corps and holder of a doctorate in Aeronautics, he was an obvious choice for the job, and Harry Guggenheim asked the Air Corps if he could "borrow" Lieutenant Doolittle for the project.

The Air Corps loaned Lieutenant

**Air Force Association
Comparative Statement of Revenues and Expenses**

	Year ended	
	Dec. 31, 1991	Dec. 31, 1990
General Fund Revenue		
Aerospace development briefings	\$ 1,289,360	\$ 1,221,270
Building operations	747,722	749,024
Convention	382,064	352,361
Data processing services	29,236	47,716
Industrial Associates	164,816	178,100
Insurance programs	3,511,250	2,789,811
Investment	419,095	505,335
Magazine	2,074,355	2,497,241
Membership	2,991,875	3,090,915
Patrons	222,665	241,988
Other	651,446	619,229
Total revenue	12,483,884	12,292,990
Expenses¹		
Aerospace development briefings	551,223	588,458
Building operations	811,959	855,896
Convention	932,271	829,766
Data processing services	121,459	140,137
Industrial Associates	123,813	120,719
Insurance programs	3,931,437	3,712,065
Magazine	2,067,611	2,363,584
Membership	3,490,616	3,640,129
Patrons	262,116	253,118
Total expenses	12,292,505	12,503,872
Excess (deficit) of revenue over expenses	\$ 191,379	\$ (210,882)
Life Membership Fund		
Revenue from investments	579,076	598,988
Less: transfer to General Fund for annual dues and other costs	629,048	605,747
Net income (loss), Life Membership Fund	\$ (49,972)	\$ (6,759)

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.

¹Expenses include chapter commissions, state commissions, and other direct support for field units totaling \$583,314 in 1991 and \$582,722 in 1990.

Doolittle to the Guggenheim Fund for one year, and he moved to the New York area to head the Full Flight Laboratory. He kept his first lieutenant's pay scale, so he accepted the job because he believed it to be a worthwhile endeavor, not because it was financially rewarding to him. . . .

Robert S. Hartmaier, Jr.
Jamesburg, N. J.

The Ash Warriors

After I read "Last Days at Clark," [February 1992, p. 56], I was filled with anger. There were many errors. The worst stated that "all flight operations at Clark had ceased in June 1991 due to the eruption of Mount Pinatubo." I flew with a unit that has since been named "the Volcano Watchers." We flew our UH-1N Hueys on many diverse missions.

On April 4, 1991, our missions changed. We were tasked to provide support to the USGS (US Geological Survey) team throughout the following eight months. We flew around, on, and eventually inside the steaming, erupting volcano, placing sensitive monitoring equipment everywhere in order to provide timely and accurate information on Mount Pinatubo. We even evacuated a village that was near the mountain.

All of the beautiful, close-up photos of the exploding mountain (which your magazine used but failed to credit to our unit) were taken from our helicopters. The pictures look so impressive because we flew very close to the mountain in order to get the informative shots. The USGS commander nominated our unit for the Air Medal

on four separate occasions for our flying in the dangerous environment, and four times it was refused because we were doing dangerous things which we should not have done; yet we were asked to do them. . . .

Please give the people that stayed behind to the bitter end (and it got bitter), November 26, 1991, at Clark AB some acknowledgement. We left our families during a cruel evacuation, fought the elements and local entrepreneurs, and now we are forced to fight our government for what was promised our families (housing at our next base, payment for the volcano damages, etc.). I know because I am one of the "Last Ash Warriors!"

Lt. P. J. Putnam,
USAF
Yokota AB, Japan

Going It Alone

Can anyone tell me what has happened to the aircraft industry in the US? After reading "A Trainer Built for Two" [June 1992, p. 38], I noticed that the box listing the joint primary aircraft training system contenders showed that each entrant was a joint venture with some foreign company.

Isn't there any company left in this country that can work by itself? I can remember some pretty good aircraft that came out of US factories, with no help from foreigners. Of course, that was nearly fifty years ago, and the baby-boomers who manage these places today apparently do not have the stomach to go it alone.

CMSgt. James K. Maultsby,
USAF (Ret.)
Phoenix, Ariz.

Coping With Weather

Having spent the last several years of a rather mundane Air Force career setting up and instructing Air Weather Service personnel how to provide operational support to combat units through the Volant Lightning program, I read "When Weather Is an Enemy" [April 1992, p. 68] with more than a passing interest. One of the major problems in military operations is convincing the "operators" to use the weather to their advantage whenever possible and that the staff weather personnel are on their side. If the author was correct, maybe the operators he interviewed will survive to continue to fight in the next test and remember their lesson learned the hard way.

Maj. Wilbur G. Hugli,
USAF (Ret.)
Fort Walton Beach, Fla.

Unworkable Composites

The proposed Air Force reorganization involves composite wings. The Air Force had composite wings in the 1950s, and, as I remember from the many critical articles and official papers put out after their demise, they did not work. World events were not the cause. Rather, the composite wings represented the poorest kind of organization from management, operational, and maintenance standpoints and they were loaded with constant and unresolved personnel conflicts.

I do not see anything today to even vaguely suggest that they will work any better now.

Lt. Col. William G. Meyer,
USAF (Ret.)
Las Vegas, Nev.

Air Force Association Balance Sheet

	December 31, 1991			December 31, 1990		
	General Fund	Life Membership Fund	Total	General Fund	Life Membership Fund	Total
Assets						
Current assets						
Cash plus marketable securities at lower of cost or market	\$ 3,330,872	\$ 8,753,443	\$ 12,084,315	\$ 4,251,429	\$ 8,274,308	\$ 12,525,737
Receivables, prepaid expenses, etc.	1,672,834	433,175	2,106,009	1,311,335	485,332	1,796,667
Fixed assets (land, building, etc.)	12,383,740		12,383,740	12,825,106		12,825,106
Funds on deposit and other assets	4,907,874		4,907,874	4,580,724		4,580,724
Total assets	\$22,295,320	\$9,186,618	\$31,481,938	\$22,968,594	\$8,759,640	\$31,728,234
Liabilities and fund balances						
Current liabilities (including payables, accrued expenses, etc.)	\$ 2,461,426		\$ 2,461,426	\$ 3,050,060		\$ 3,050,060
Deferred revenue (including advance membership dues and magazine subscriptions)	1,374,446		1,374,446	1,363,315		1,363,315
Long-term debt	5,925,000		5,925,000	6,242,500		6,242,500
Fund balance						
Unrestricted	10,903,834		10,903,834	10,854,204		10,854,204
Designated	1,630,614		1,630,614	1,458,515		1,458,515
Restricted		9,186,618	9,186,618		8,759,640	8,759,640
Total liabilities and fund balances	\$22,295,320	\$9,186,618	\$31,481,938	\$22,968,594	\$8,759,640	\$31,728,234



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GENERAL DYNAMICS
A Strong Company For A Strong Country

By Brian Green, Congressional Editor

The Specter of Hollow Forces

Proposed O&M cuts have the Air Force worried about a rapid decline in readiness.

IN ITS rewrite of the Fiscal 1993 defense authorization bill, the House whacked ten percent from the Pentagon's operations and maintenance request, dropping the proposed \$86.3 billion account to \$77.8 billion. The Air Force maintains that the House action, if adopted in the final congressional bill, could seriously harm combat readiness.

Rep. Earl Hutto, a Florida Democrat who chairs the House Armed Services Committee's Subcommittee on Readiness, contended in an interview with AIR FORCE Magazine that "we cannot allow our forces to become hollow," and he took strong issue with claims that the cuts will hurt readiness. "We were going to provide a good state of readiness by keeping up the flying hours, steaming hours, tank hours, . . . [and] we funded what DoD wanted to maintain [in] flying hours, steaming hours, and so on," he said.

The lawmaker views the reduction as an effort to reduce duplication, overhead, and waste in the Department of Defense and to "spend the taxpayers' money extremely wisely."

One staff aide to the committee explained that the cuts reflected five needs: to protect funding most directly related to readiness, to keep readiness spending in balance with other accounts, to stay within overall budget constraints, to recognize reduced requirements caused by the force drawdown, and to eliminate waste, duplication, and unnecessary spending.

This House committee staffer argued that "a very small portion of the O&M account [involves] rubber-meets-the-road, nuts-and-bolts readiness" funding, adding that such O&M comes to only about \$21 billion. That part of O&M was "sacrosanct," he claimed, and was not cut at all. "Troops want to train, they need to train, and we didn't want to do anything to upset

their effectiveness or safety on the battlefield," he said. The rest of the account, he contended, was fair game.

Procurement, research and development, military personnel, and military construction funding are declining, but the Pentagon O&M funding requests continued to increase. Lawmakers expected there to be no letup in that trend through the rest of the six-year defense plan.

The House committee's defense authorization bill came in at \$274 billion, about \$7 billion less than the amount contained in the President's request. Action by the full House lopped off another \$4 billion. "In this budget environment, people need to start thinking tradeoffs," the House staff member observed. "You can't have it all."

Many lawmakers believe that, with the force structure shrinking, O&M funds should shrink. By 1995, the force structure will have declined by about twenty-five percent from its peak in 1987. In addition, there is waste in the O&M account. The House committee's Fiscal 1993 authorization report claims, "The system is rife with duplication and obsolete and inefficient functions." This led to reductions in inventory, overhead, and infrastructure funding; civilian personnel cuts; a reduction in funding for outside contractors and consultants; and reductions based on anticipated savings and efficiencies.

The Air Force does not accept many of these arguments. Its O&M account would also be pared by about ten percent in the House bill. Areas of special concern include the following:

"Excess inventory." Across the four services, the House bill would chop \$2 billion from certain accounts to reduce what it sees as "excess inventory." The Air Force does not believe its inventories are grossly overstocked. Air Force units would lose funding to buy parts for repairs, and cuts of this nature, USAF argues, would almost immediately reduce readiness. Further, such cuts would *slow* the reduction of inventories, since the units using the parts could

no longer afford to buy them through the Defense Business Operations Fund, a fund from which spares and other O&M elements are purchased.

Real property maintenance. With its vers on of the defense budget, the House would trim \$332 million from proposed Air Force funding of \$1.4 billion. The House report criticized a \$250 million "growth" in this account. Air Force figures show an increase in O&M funding for real property maintenance of only \$10 million. When all sources of real property maintenance are tallied, including military construction, the Fiscal 1993 request is \$440 million above last year's level—which only partly recovers last year's billion dollar cut. Congress doesn't see it that way. "The reduction they took in 1992 doesn't play," said the staff member. "We're not in the business of funding backlogs in this kind of budget environment."

Recruiting. The House bill would chop \$5 million from the proposed Air Force recruiting budget, dropping it to \$28 million. Despite the decline of the force structure, recruiting goals are going up, and new recruits are needed to maintain a force balanced in age and rank. The Air Force missed its goals for the third quarter of Fiscal 1992 by a substantial margin, and the available pool of high-quality prospects is shrinking.

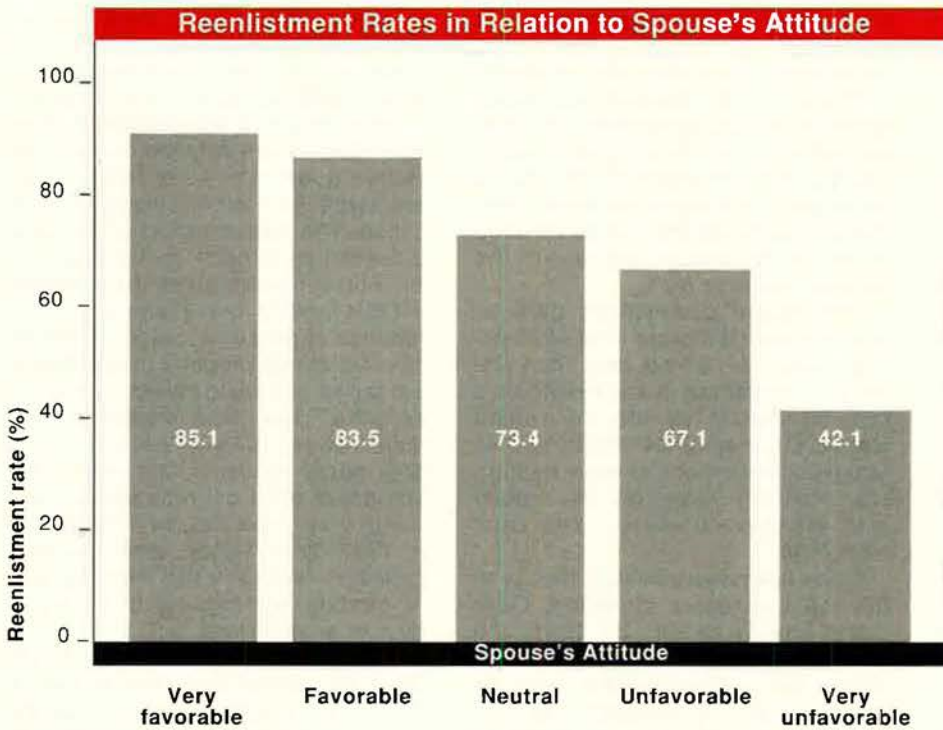
Anticipated savings. The House bill would make cuts based on projected savings that may or may not result from improvements in automatic data processing, maintenance, and host nation support arrangements for foreign national employees of the US military. The Air Force is skeptical that these economies will materialize and is concerned that the reductions will have to be absorbed in other O&M areas.

The Air Force disputes the claim that only a modest portion of O&M funding contributes directly to readiness. If House actions hold, it claims, the Air Force would be forced to release civilian workers handling stock fund operations and depot maintenance, trim flying hours, and permit mission capable rates to fall. ■

The Chart Page

By Tamar A. Mehuron, Associate Editor

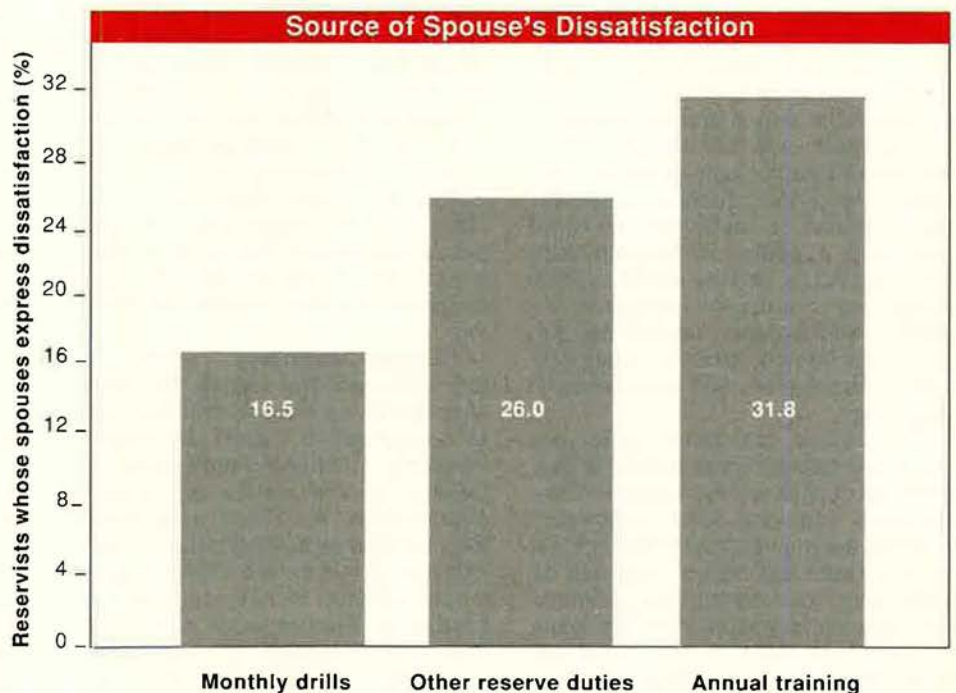
Reserve Reenlistment: The Spouse Factor



The US armed forces will rely increasingly on its reserve forces, comprising large numbers of reservists with ten to twenty years of service. As these reservists retire, the military faces the challenge of maintaining experience levels. The military must keep reenlistments high among those with four to twelve years of service.

A recent RAND Corp. study examined why reservists with four to six years of service often chose not to reenlist. They cited a spouse's negative attitude toward reserve duty as the primary non-economic reason for not reenlisting (left).

Specific complaints centered on the requirements of annual training, monthly drills, and other duties. Annual training requires a two-week absence from family. In addition, annual training's net reserve pay is much less than that for drills.



Source: RAND Corp., "Factors Affecting Reenlistment of Reservists," 1992.

Washington Watch

By James W. Canan, Senior Editor

The Mission in Thirteen Words

The Chief of Staff says USAF's job is "to defend the United States through control and exploitation of air and space."



A few months ago, Gen. Merrill A. McPeak, the Air Force Chief of Staff, called a moratorium on new moves to reorganize the service. The historic restructuring had come a long way in

less than a year. USAF headquarters, major commands, numbered air forces, air wings, you name it, were taking on new looks and new jobs right and left. The time had come for a breather.

"We need a respite from reorganization," General McPeak told an interviewer. "I do have some other ideas, but we've changed as much as we're going to change for a while."

One of those ideas, it turns out, had to do with the mission of the Air Force, no less. General McPeak found it troubling. In his view, it badly needed defining. He had come to doubt that anyone knew exactly what the mission was, and he saw this uncertainty as a major impediment to remodeling the Air Force.

"How can we restructure and build a quality Air Force if we cannot say, in clear, simple language, what the purposes of our organization are—in brief, what our mission is?" he asked.

Now he has defined it in thirteen words. "Our mission—the job of the forces we bring to the fight—is to defend the United States through control and exploitation of air and space," he declared.

The Chief of Staff made that statement in his commencement address, "Does the Air Force Have a Mission?," delivered at the Air University late last June. His definition is open to question in some circles because it implies a combatant role for the Air Force in contradiction of laws ruling out such a role for the military departments. Sticklers for the law reject any suggestion that the institutional Air Force—as

distinct from its combat elements—is a warfighting organization.

Toward the "Objective Air Force"

Lines are blurring, however, as the Air Force evolves. General McPeak's mission statement lays the groundwork for changes that will reinforce it and make it ring true. Some will come about as a result of the service-wide reorganization aimed at producing, as he put it, "an objective Air Force"—one with a mission objective—and "a more combat-oriented Air Force." In this vein, one highly placed Air Force official speculates that "we may end up drawing new kinds of distinctions between major commands that execute [Air Force] departmental functions, such as training, and major commands that execute operational functions under the combatant command of the CINCs."

Other changes affecting the Air Force will result from the current review of the US military command structure by the Joint Staff under the direction of Chairman of the Joint Chiefs of Staff Gen. Colin Powell. Big things are said to be in store for USAF's recently formed Air Combat Command, which merges the former Tactical Air Command with most of the former Strategic Air Command.

Odds are that ACC will be designated as a specified (single-service, mission-oriented) combat command or as a major element of a new unified combat command. For the Air Force, such a move would mark a major departure from the SAC/TAC era of the past forty-five years.

SAC was a specified combat command, owner and operator of all Air Force bombers and ICBMs and charged with the strategic nuclear mission. TAC, in contrast, was never a combat command. Its fighter forces were folded into such commands during wars and crises.

ACC is a much different animal. The new command, heir of SAC and TAC, can muster as much raw combat power for the whole range of air warfare as can any air force in the world. It may wield that power, or much of it, as a combat command or as part of

one. It could come to symbolize the Air Force at large to a degree that no other command ever has.

SAC was USAF's star player from the beginning. General McPeak recalled that SAC was established "as the centerpiece of our new [Air Force] organization" to do strategic bombing, a mission then—and still—seen by many as "the only convincing justification for a separate Air Force." SAC's disestablishment last June 1 "is proof," he said, "that we have moved beyond the phase when strategic bombing, standing alone, is in any way adequate to describe our purposes. . . . The establishment of Air Combat Command is both a sign of our maturity and a signal that the new gospel is airpower integration.

"Now, more than ever, we need to understand our mission [and to] use it to help bind us together and guide us during this turbulent time," the Chief of Staff asserted.

Reaffirming the Air Force's identity and purpose as a separate service becomes increasingly important at a time of mounting uncertainty over the future size, makeup, and missions of the budget-beleaguered US armed forces. Sentiment for streamlining the military runs high in some circles. Sen. Sam Nunn (D-Ga.), chairman of the Senate Armed Services Committee, is questioning the nation's need for "four air forces"—those of the Air Force, Navy, Army, and Marine Corps. The question is an old one, but this time, with money tight and the cold war over, it may not go away.

"A Little Nervous"

Thus a lot was riding on General McPeak's Air University address. Acknowledging the controversial nature of his topic, he told his audience that he was "a little nervous about . . . offering a mission statement for the Air Force," even though he saw it as a legitimate part of his job. "If I get it wrong, a room full of ghosts from Mitchell to LeMay will make the rest of my days miserable," he said.

The long-smoldering mission-definition issue flares up from time to time, as it did a few years ago in the

context of USAF's role in space. In promulgating new space policy and plans, Air Force military and civilian leaders began referring to space as an Air Force operational "mission." They were taken to task by critics who contended that space is the operational province and mission of Air Force Space Command, a major command, and US Space Command, a unified command—not of the Air Force itself.

The roles of the military services were first defined by the Defense Reorganization Act of 1958 and were reaffirmed by the Goldwater-Nichols Defense Reorganization Act of 1986. The 1958 law stripped the service chiefs of operational authority over their forces and transferred it to the commanders in chief (CINCs) of unified and specified commands, the so-called warfighting commands. Defense Department Directive 5100.1 of December 31, 1958, in detailing the provisions of the new law, decreed that the purpose of the military services was to "organize, train, and equip forces" and to provide those forces to the warfighting commands.

The law relegated the services and their chiefs to residual roles in operational matters and left the chiefs with the trappings, but not the real stuff, of operational command. Through the years, the service chiefs got around the law and the CINCs, when so inclined, by influencing and manipulating combat forces who put their service loyalties first.

Gen. Russell E. Dougherty, USAF (Ret.), former commander in chief of Strategic Air Command, referred to this ambiguous state of affairs in a speech at the Tactical Air Command Commanders Conference late last year. He declared that "a lot of things did not work very well" for the US military in the years following the first Defense Reorganization Act "because, in part, we had a law that said, 'This is the way the command arrangements are supposed to be' and, on the other hand, we had practices that, to a degree, ignored [those] arrangements."

This paradox gave rise to uncertainty about the purpose of the Air Force. A Pentagon incident during the Vietnam War was illustrative.

"Don't Forget It"

Gen. John P. McConnell, Air Force Chief of Staff from 1965 to 1969, posted a sign on his office door that proclaimed, "The mission of the Air Force is to fly and fight—don't you forget it." General Dougherty took exception to it, declaring, as he recalled, "I don't think that is the mission of the Air

Force. I think that used to be the mission of the Air Force, but it was changed in 1958, and we ought to recognize that it has changed."

The former CINCSAC told his audience, "The 'fly and fight' imperative was included in the combatant mission of CINCPAC [commander in chief, Pacific] and CINCPACAF [commander in chief, Pacific Air Forces], but it was not our Air Force mission. As I saw it, our Air Force mission was to organize, procure, train, equip, and support those forces to go out there and fly and fight."

He said his observation "started a big brouhaha, but it also caused some people to start thinking about the things that had changed." Not long afterward, he said, "we changed the name of the Air Force 'Command Post' [in the Pentagon basement] to the Air Force 'Operations Center.' We were beginning to see the light." The 1986 Goldwater-Nichols Act made that light brighter. General Dougherty said it "put the command relationships in context and demanded that we 'get with it' " in adhering to them.

Goldwater-Nichols gives the CINCs of combat commands unprecedented authority and responsibility over the multiservice or single-service forces under their operational jurisdictions. Among other things, it gives the CINCs—not the service chiefs—the authority to hire and fire service-component commanders, requires the component commanders to go through the CINCs in reporting to their service chiefs, and authorizes the CINCs to demand "info" copies of all correspondence between service chiefs and service component commanders.

As a result of Goldwater-Nichols, "the CINCS now are able to direct and influence some of the unit training, inspection, and disposition of forces put under their operational command," General Dougherty explained. Thus the act erodes one of the principal historical prerogatives of the services themselves.

"Goldwater-Nichols goes far toward combining combatant command authority with mission responsibility," the former CINCSAC declared. Air Force leadership "must learn to live with those legislative dictates," he said, or be out of sync.

General Dougherty related his remarks to the Air Force reorganization just then under way. "We must organize like we . . . fight," he asserted. "We are going to have to develop a first-rate, responsible organization that supports the combatant commanders of the United States at every turn with

the best we've got. In my judgment, we are going to have to do our thing in the framework of the unified or specified commands and train our top people to be the CINCS and senior staff officers of such commands."

General McPeak takes a different approach. He himself was CINCPACAF under a Navy CINCPAC prior to becoming Air Force Chief of Staff. He naturally values the role of the CINCs and seems to have no quarrel with their legal and practical preeminence as combatant commanders.

Don't Go Overboard

It's just that he doesn't want to go overboard with all that. He makes it clear that he sees the Air Force as much more than a support organization that exists only to provide CINCs with well-trained, well-equipped forces. His mission statement portrays the Air Force as a spear-thrower, not as a spear-carrier.

At Air University, the Chief of Staff noted that "many knowledgeable people would say that our mission is to organize, train, and equip forces for prompt and sustained air combat." He disagreed with this, calling it "a summary of functions," not a statement of mission. To illustrate the "important difference" between functions and missions, he noted that "the function of suspenders is to hold up trousers; the mission of suspenders is to prevent embarrassment."

"Organizing, training, and equipping aerial combat forces are functions we must do and that we understand and do well," he declared, "but we do not exist as an institution for the purpose of organizing, equipping, and training ourselves. We have a much broader, more compelling—even inspiring—purpose."

He said that the Air Force has no monopoly on air and space and that the other services also operate in those arenas. "A dominant concern" for the Air Force "ought to be our wholehearted participation as part of the combined arms team. . . . For me," he said, "a great day [in combat] is one that features a 100 percent allocation [of Air Force resources] to close air support" of ground forces. General McPeak called it "a central truth" that USAF's "most valued contribution" to combined arms combat often lies in "helping our brothers on the ground or at sea achieve *their* operational objectives."

"I realize that our theater combat doctrine must be built around the flexible application of airpower to prosecute the CINC's priority objectives," he said.

On the other hand, the Air Force and the airpower that it applies are distinctive, he claimed. He quoted the 1990 Air Force white paper "Global Reach, Global Power" as having noted that "air, naval, and land forces are fundamentally and necessarily different."

The Chief of Staff said, "Make no mistake, our approach to the mission genuinely separates us from our colleagues in the other services. For them, air operations are seen as an extension of surface activity. . . . We, on the other hand, seek to control and exploit air and space, not to facilitate operations somewhere else but to achieve national objectives in and through this dimension.

"Thus the way we perceive the mission is different from the other services. In this sense, we are, in fact, unique."

General McPeak said that USAF must be reorganized as "a comprehensive Air Force" with a clear purpose reflecting its nature as "the only service, not just in the US but in the world, that even attempts to provide a full range of air and space capabilities, from helicopters to satellites and across the entire spectrum of equipment, roles, and tasks in between."

The US Air Force, he claimed, is "the air force of last resort for the other services and for our allies as well" in providing airlift and "big-time air refueling" for those services and in "filling some critical shortfall when allied air forces get in trouble."

"So, in this sense, we do have a monopoly," he said. "Our attitude about the whole mission, our approach to [the] control and exploitation of air and space as a primary responsibility, and, springing from this, our requirement for comprehensive air and space capabilities—these things set us apart, make us unique, provide the essential rationale for a separate Air Force."

General McPeak contended that General McConnell's office-door sign of many years ago understated, rather than overstated, the mission of the Air Force. "It contained a familiar dictum: 'The mission of the Air Force is to fly and fight.' That's not bad. Pretty close. [But] in the end, I think it falls short."

He noted that "air superiority, close air support, interdiction, long-range attack, and airlift," for example, come under the fly-and-fight heading. These, he said, are "critical roles or tasks, but none of them so broad, so all-encompassing, as to constitute a mission for the institution and all its people. . . . Absent a clear understanding of overarching purposes, some people give their loyalty to the next best thing, to their particular job or equipment . . . to flying, or even to a particular airframe.

We all recognize this problem as occupationalism. It's what can happen when an institution does not convey a sense of mission to its people."

General McPeak asserted that "our mission must be to reach into the air and into space, to control this dimension, to exploit it, to use it to keep Americans alive and free. That is a mission that calls for . . . the world's greatest air force."

Big things are clearly in store for the Air Force and its combat commands in the National Military Strategy promulgated by the White House and the Pentagon late last year. It is predicated on a US military establishment to be spread over the following operational spheres:

- Strategic forces consisting of Air Force and Navy nuclear-capable assets under the wartime control of US Strategic Command, a new unified command initially headed by Air Force Gen. George Lee Butler, former CINC-SAC.

- Atlantic-region and Pacific-region forces belonging to unified regional commands and consisting of maritime units and forward-deployed air and ground units of all the services.

- CONUS-based, crisis-responsive, multiservice "contingency forces" combined in a unified command that may be called US Contingency Command.

USAF's Air Combat Command and Air Mobility Command are in position to provide operational forces for all those mission areas and to all those unified commands.

Get Tucked In

General Dougherty, addressing a SAC Commanders Conference at Offutt AFB, Neb., earlier this year, recommended "organizing the Air Force so that we can fit handily into the forthcoming unified command organizations" and "making sure we get all of our operational forces tucked in under the proper unified command structure and train together as we plan to fight together."

The former CINCSAC said he hoped Gen. John Michael Loh, commander of Air Combat Command, "will become a CINC in the unified command structure at the earliest possible time—hopefully as CINC of a unified US combat command, if not as the CINC of the air component of such a unified command."

ACC's place in the scheme of things is the big question before the house. It shapes up as an extraordinarily potent outfit, as the epitome of modern airpower, endowed with the war-fighting attributes that General McPeak, in his mission statement, imputes to the Air Force at large.

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ACC is a blend of TAC and SAC forces, but it clearly cannot be a blend of their markedly different missions. The question is, what will it be?

TAC's combatant role as an Air Force major command was largely indirect. Many of TAC's principal functions mirrored those of the Air Force itself: organizing, training, and equipping fighter forces and putting them at the disposal of unified combat commands in times of crisis and conflict, as it did for US Central Command in the Persian Gulf War. Apart from its management of numbered air forces that served as air components of US Atlantic Command and US Southern Command, TAC never was a combat command.

SAC, on the other hand, had a war-fighting mission as a USAF specified command, the steward of strategic nuclear missile forces and all bomber forces. Now ACC has those forces under its wing, though its ICBMs and nuclear-capable bombers would chop to STRATCOM in a nuclear crisis.

In the end, ACC may be designated a specified combat command somewhat analogous to the Army's Forces Command (FORSCOM), a specified command in control of all CONUS-based ground forces, or as a partner with FORSCOM in a new unified command. ■

Aerospace World

By Frank Oliveri, Associate Editor



The 36th Fighter Squadron, 51st Wing, celebrated its seventy-fifth anniversary on June 12. The 36th's F-16Cs now sport the Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system. The squadron became the first unit in the Air Force to incorporate the LANTIRN system's targeting pod.

Strategic Arms Slashed Again

The US and Russia agreed to slash their nuclear arsenals even further, dropping them far below levels set in the Strategic Arms Reduction Talks Treaty. The new accord could chop the official post-START warhead inventories by about one-half.

At a June summit in Washington, D. C., President Bush and Russian President Boris Yeltsin agreed to eliminate all landbased weapons equipped with multiple independently targetable reentry vehicles (MIRVs). By 2003, this could leave the US and Russia with between 3,000 and 3,500 warheads each. START left each side free to deploy 6,000 "countable warheads"—a diplomatic term of art that, exploited fully, would have left each side with more than 8,000 actual weapons. Today each nation deploys 11,000 to 12,000 warheads.

Each nation accepted major new reductions in areas where it enjoyed a clear numerical advantage.

The Russians will be forced to scrap their heavy multiwarhead SS-18 ICBM (ten MIRVs) while either downloading

or scrapping some of their remaining MIRVed missiles. Russia would keep a total of 500 ICBM warheads. The US will give up its fifty ten-warhead Peacekeepers ICBMs and will convert its 500 Minuteman IIIs from three warheads to one.

In seabased assets, the Russians would be reduced to 1,750 warheads. The US would have a total of 1,728 warheads deployed on eighteen Trident submarines. However, the US has not decided how the warheads would be distributed among its C4 and D5 missiles.

Both nations would have to reorient up to 100 bombers to conventional missions, with the remaining US bombers carrying 1,272 warheads and the Russians carrying 800.

ANG to Get Wild Weasels

The Air Force says it plans to retain two squadrons of F-4G Wild Weasel defense-suppression aircraft in the Air National Guard at Boise, Idaho.

The F-4G is the only aircraft in the Air Force inventory capable of fully exploiting the capabilities of the AGM-

88 high-speed antiradiation missile (HARM). Though specially equipped F-16s can fire the HARM, the plane cannot independently detect and identify the position of the emitting radar. Only the F-4G, with its specialized radar-homing system, can do that, and HARM-carrying F-16s operate in tandem with F-4Gs.

The Air Force plans to give the F-15E full HARM-shooting capability. Until it achieves that goal, say officials, the service will keep the two F-4G squadrons ready.

House Funds Unsought F-16s

The House authorized procurement of twenty-four F-16s in Fiscal 1993, as the Air Force wanted, and contemplates buying yet another twenty-four in Fiscal 1994, as USAF does not.

Lawmakers said the House took the action to hedge against potential problems in development of a next-generation Multirole Fighter to replace the F-16 and to preserve a fighter that could provide a basis for a new derivative MRF.

The House defense authorization bill, passed in June, sets aside \$648.7 million to procure twenty-four aircraft in 1993 and \$68.4 million for advanced procurement of materials for another twenty-four F-16s the next year.

The Air Force, claiming it already has plenty of F-16s, had planned to halt the program in 1993 to save money for other, more pressing needs. The House Armed Services Committee called the decision to terminate the F-16 buy premature.

Friendly Fire Case Fizzles

The British public prosecutor in the highly controversial "friendly fire" case doubts she will take any further legal action against US Air Force personnel. The Pentagon said that, as far as it was concerned, the case is closed.

In May, a British coroner's jury issue stunned many and stirred an international furor by its ruling that the inadvertent killing of nine British soldiers by two US A-10 aircraft during the Persian Gulf War constituted a criminal act. The inquest was sought



Engineers from Northrop Corp. check the exterior design of the "Bat" prototype. The Bat is a "brilliant" self-guided submunition that autonomously seeks, identifies, and destroys armored moving targets. The Bat is deployed from the triservice standoff attack missile to be used by Air Force and Navy aircraft.

by the families of the victims, not the British government.

The Air Force has never identified the pilots of the two aircraft. Both gave sworn, written statements to the inquest but did not appear in person. They claimed that British liaison officers had cleared them to make the attack. The British officers disputed this claim.

Following the verdict, Pentagon spokesman Pete Williams issued this statement: "It is obvious that a terrible accident occurred that day that is deeply regretted by all concerned. There are different interpretations about what was said in the communications between the British liaison officers and the US pilots . . . but there is no final answer as to why it happened, and there never will be."

The inquest found that the two pilots were fourteen miles from their assigned position when they fired missiles at two armored personnel carriers. The pilots said they thought the carriers were part of an advancing column of Iraqi vehicles.

Mr. Williams said the US went to extraordinary lengths to cooperate with the British investigation, but "we don't believe that every question that arises on the battlefield can be answered in a courtroom, and we don't believe that further legal wrangling will shed any more light on this tragic incident."

New USAF Acquisition Executive

G. Kim Wincup was sworn in as the new Assistant Secretary of the Air Force for Acquisition.

Mr. Wincup replaces John J. Welch in the post, which he assumed in May. He will be responsible for USAF research, development, and acquisition and is the Air Force Acquisition Executive. Mr. Wincup formerly served as the Assistant Secretary of the Army for Manpower and Reserve Affairs. Before that, he was staff director for the House Armed Services Committee.

House Acts on C-17, F-117, B-2

The House approved \$1.9 billion for six C-17s and \$155 million in ad-

vanced procurement for eight aircraft in 1994. The bill also requires the Defense Secretary to certify that any defects in the fuel system have been fixed at no cost to the government. If this cannot be done, the fixes must take place at Air Logistics Centers so that no funds go to the contractor, McDonnell Douglas.

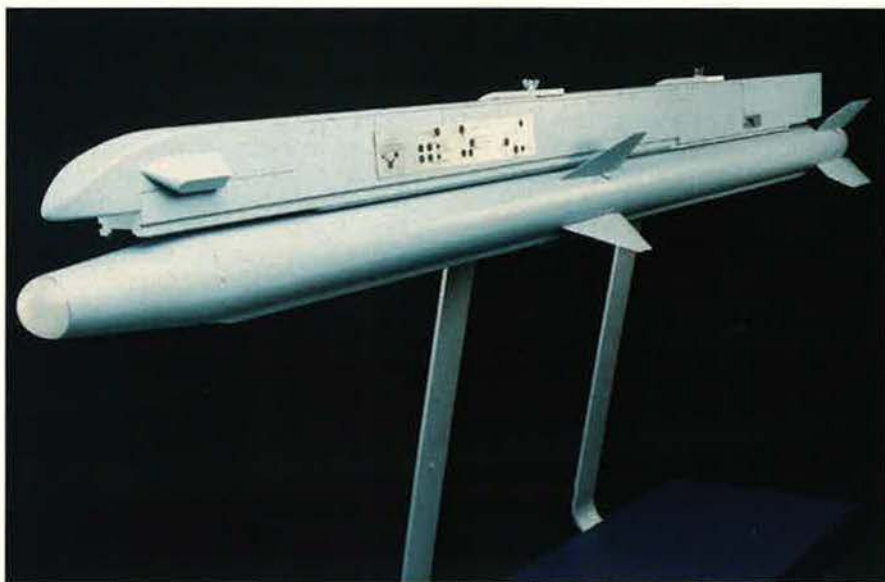
The House authorized \$32.3 million—\$31 million more than requested—to redesign the F-117's exhaust system to eliminate fuel leaks, complete the consolidation of automatic test equipment, enhance the mission planning system, and improve communications.

While the House approved the President's request of \$2.68 billion for the final four B-2s, it expressed concern about stealthiness, survivability, and total program cost of the bomber. As a result, the House prohibited the obligation of 1993 funds until the Secretary of Defense submits reports on B-2 stealth capabilities and survivability in the conventional role, GAO favorably reviews them, and Congress votes again to release the funds.

Long Rifle VII

Aircrews representing 12th Air Force defeated those of 9th Air Force in Long Rifle VII, a major gunnery meet hosted by 9th Air Force at Shaw AFB, S. C.

The one-day June event, sponsored by Air Combat Command, pitted aircrews from fifteen Air Force bases against each other. Competing squadrons were given short-notice deployment orders. Each provided flight commanders, three other pilots, and two



Hughes is studying an air-to-air missile with an imaging infrared seeker using a focal plane array (FPA) detector as a potential configuration for the AIM-9X. The missile would be 115 inches long and 5.6 inches in diameter. The FPA detector was recently tested and demonstrated considerable performance improvement.



The first production Learjet 60 made its initial flight in June, with systems performing as planned. The aircraft is currently undergoing FAA testing, and two more Learjet 60s will join the flight test certification program. Certification is expected later this year. Initial deliveries will start shortly thereafter.

alternates. Four-ship teams flew over the target area, dropped bombs, and participated in strafing runs.

The squadrons flew F-16s, F-15Es, F-111s, and OA-10s. The target area was Townsend Gunnery Range, near Savannah, Ga.

Capt. Joe Ford from the 31st Fighter Wing at Homestead AFB, Fla., won the Top Gun award for the competition for his overall performance.

Team awards: top F-15E team, 366th Wing/391st Fighter Squadron, Mountain Home AFB, Idaho; top F-111 team, 27th Fighter Wing/524th Fighter Squadron, Cannon AFB, N. M.; top OA-10 team, 23d Fighter Wing/75th Fighter Squadron, Pope AFB, N. C.; top F-16 team, 347th Fighter Wing/68th Fighter Squadron, Moody AFB, Ga.

Individual winners: top low-angle strafe, Capt. Stephan Otto (A-10) of the 354th Fighter Wing, Myrtle Beach AFB, S. C.; best low-angle bombing, Capt. Don Mencl (F-16C) of the 58th Fighter Wing, Luke AFB, Ariz.; best low-angle drag, Capt. Roger Matteson (F-16C) of the 56th Fighter Wing, MacDill AFB, Fla.; best dive bomber, Capt. Michael Updike (F-16C) of the 347th Fighter Wing, Moody AFB; best high-altitude dive bomb, Captain Mencl (F-16C) of the 58th FW.

House Seeks to Ease Drawdown Pain

As part of its 1993 defense authorization bill, the House set aside \$1 billion in defense funds to spur economic growth, help manage the de-

fense drawdown, and preserve critical parts of the defense industrial and technology base.

One major element of the bill is designed to encourage displaced military personnel and defense industrial workers to enter the education field. The program would provide a departing service member or employee a \$5,000 stipend to be used while securing a state teacher certification and would subsidize the individual's salary as a teacher for two years, not to exceed a total of \$50,000. Participants would be required to teach in areas with a demonstrated need. The House set aside \$180 million for this program.

The House also seeks to create a new government-private sector consortium to develop critical technologies with military and civilian applications. The bill specifically cites microelectronics, special materials, and robotics. In addition, funds would be authorized for an existing law that permits DoD investment in firms that might not otherwise be able to pursue critical technologies. The House authorized \$200 million for this project.

Another \$200 million would be set aside to provide job training for separated military and civilian personnel. The bill includes \$100 million for assistance to state and local governments; \$122 million for extended medical help, separation pay, hiring preference for former service and defense workers, and retirement benefits; and \$125 million for removing

business barriers between DoD and contractors.

Services Meet Recruiting Goals

All US military services met their recruiting goals for the first half of Fiscal 1992, the Pentagon announced in May.

Despite concerns about the future of the military as a career, recruit quality increased. Ninety-nine percent of those recruited between October 1, 1991, and March 31, 1992, had earned high school diplomas—a prime Pentagon measurement of quality. During the same period in 1990-91, ninety-seven percent of recruits were high school graduates.

The Air Force gained 15,700 new recruits through March 1992. The figure for all services was 81,000.

GAO Hits Night Attack Plans

The General Accounting Office says that the Air Force should not procure a close air support night attack capability for F-16 and A-10 aircraft until it clarifies its plans for that capability within the force structure and establishes that it can afford to do so. The Air Force and DoD generally agreed with the information in the report but did not comment on GAO's recommendations.

In 1982, the Air Force established the need for 700 night-attack-capable aircraft to counter the Soviet/Warsaw Pact threat. The Air Force plans to spend about \$1 billion over the next few years on night attack capability.

GAO noted that, under current plans, hundreds of aircraft with only eight years remaining of a twenty-two-year life cycle will be outfitted with new night attack capability. In addition, the Air Force is buying certain equipment even though less expensive alternatives exist, according to GAO.

The GAO report declared, "Even though that threat has . . . significantly diminished and the Air Force budget has declined, the Air Force could, if allowed to proceed with its modernization plan, have nearly 1,000 night capable aircraft by the year 2000."

Airlift Questions Raised

The Pentagon's Office of the Inspector General claims that the Air Force's planned procurement of 120 new C-17 transports is not sufficient to meet the nation's airlift needs. Nor, said the IG's office, does the answer lie in expanding the C-17 program.

The IG maintained that the Air Force had not adequately considered the possibility of a C-141 service life extension program (SLEP) as a comple-

ment to the C-17. The Air Force has long maintained that such a program is not a cost-effective way to increase long-term airlift capabilities.

The IG recommended that a new cost and operational effectiveness study be performed and that a special Defense Acquisition Board review be conducted before the Lot V production decision on the C-17. In addition, the report called for a new assessment of a C-141 SLEP as part of a plan for fulfilling airlift needs outlined in a recent Mobility Requirements Study.

George R. Schneiter, the Defense Department's director of Strategic and Space Systems, took issue with the call for another DAB review, saying that enough reviews had already been conducted on the program.

Mr. Schneiter also said the Joint Staff, the Pentagon's Office of Program Analysis and Evaluation, and the Air Force's Air Mobility Command are already conducting an analysis to certify the C-17's cost-effectiveness and utility. Mr. Schneiter said that the Mobility Requirements Study found that a decision to increase the current airlift capability is not required until 1996.

GE Suspended, Reinstated

The Defense Logistics Agency in

June suspended General Electric's Aircraft Engine Group as a supplier as a result of a Justice Department charge that the firm filed false statements and claims to Israel and the US. However, the suspension was lifted days later after intensive meetings between GE and DLA.

The suspension, which took GE by surprise, could have seriously affected several future programs, including the F414 engine for the Navy F/A-18E/F. GE suggested that DLA had been unaware of all the facts of the case when it issued the suspension.

The Justice Department's charge was based on allegations that a former GE employee paid Israeli Gen. Rami Dotan an \$11 million bribe to help GE win a \$40 million engine contract. GE fired the employee in 1991. General Dotan pleaded guilty and is serving a prison sentence in Israel.

GE claimed that, upon learning of the Dotan affair in December 1990, it immediately and voluntarily disclosed details to the Defense Department and pledged full cooperation. GE conducted an internal probe, disciplined its employees, improved systems relating to the foreign military financing program, and cooperated with the Justice Department.

Martin Marietta Top RDT&E Contractor

Martin Marietta Corp. was the top recipient of DoD research, development, test, and evaluation (RDT&E) contracts in 1991, the Department said in a May report.

Martin Marietta received contracts totaling \$1.75 billion. It was followed by General Electric with \$973 million, Grumman Aerospace with \$846 million, McDonnell Douglas with \$751 million, and LTV Aerospace and Defense with \$596 million.

Westinghouse Electric was awarded \$547 million in contracts, followed by TRW with \$530 million, General Dynamics with \$465 million, United Technologies with \$463 million, and Unisys with \$460 million.

McDonnell Douglas Seeks C-17 Claims

McDonnell Douglas is seeking \$237 million in claims against the Air Force to cover its losses on the C-17 transport.

The Pentagon expects additional claims relating to schedule slippage and cost overruns. The contractor attributes these problems to program turmoil caused by the government, the General Accounting Office said in a May report.

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McDonnell Douglas sought about \$108 million in claims in 1990 and 1991. The Air Force has denied most of these.

House Bill Draws DoD Gripes

Though it was generally pleased with the Fiscal 1993 House defense authorization bill, the Pentagon found flaws in House plans for the F/A-18E/F and the A-X, spokesman Williams said.

The House called for the Navy to prototype the F/A-18E/F. According to Mr. Williams, this would delay development of a replacement for the A-6. He said there is plenty of experience already on the F/A-18 and, although the new aircraft would be "slightly modified," the basic "characteristics of the F/A-18 are pretty well known."

Current program cost for the F/A-18E/F is set at \$4.5 billion. McDonnell Douglas said in June that this cost could jump by as much as \$1.6 billion if the House plan were approved.

"The other problem is that while they [the House] want to slow down the F/A-18 program, they want to speed up the A-X program," Mr. Williams said. "We think that would make it more expensive." He said it would be unwise to rush the A-X program because it is a totally new aircraft.

Mr. Williams said it would cost more to speed up the A-X program than to go slow on A-X and fill force gaps with the F/A-18E/F. "We learned a lesson from the A-12," he said. "We don't want to try to rush things."

DMR Doubles Savings

The Pentagon will actually save nearly twice as much as it originally planned as a result of reforms stemming from the 1989 Defense Management Report. That, at least, was the claim in an annual Pentagon DMR report issued last May.

The Pentagon expects to save \$13 billion a year by eliminating 58,000 civilian and 50,000 military jobs.

Last year the Pentagon proposed cutting 50,000 civilian and 48,000 military jobs. Three years ago DMR called for the elimination of 42,000 civilian and military positions combined, yielding \$7.8 billion in yearly savings.

Russian Weapons For Sale

Russian military personnel are apparently selling military equipment—including fighters, tanks, high-caliber machine guns, and rocket launchers—at bargain basement prices to underground forces of the world, according to a report in June in the Russian newspaper *Izvestia*.

The newspaper said that five jet aircraft used to teach cadets how to fly (types not disclosed) were sold for about \$18 each. The article also said new army trucks could be bought for \$200, plus a \$200 bribe.

The sales are being made by capitalism-minded officers and enlisted men worried about their futures outside the shrinking Russian Army. Marshal Yevgeni Shaposhnikov, Commander in Chief of the forces of the Commonwealth of Independent States, ordered

all military personnel to stop their commercial activity, but the newspaper report claims that the order may have come too late.

The article blames the massive military buildup in the Caucasus on sales of Russian equipment. *Izvestia* reported that, during a fire at a military depot, 200 individuals were arrested as they tried to steal arms and ammunition.

Stealth Revealed

The F-117 Stealth fighter can almost fly itself, using a combination of mission planning computers and an electronic data transfer module that integrates the aircraft's navigation and flight controls into a fully automated flight management system, according to a recently released Lockheed report on the exotic fighter.

According to the report, which was released in June, a combination of the mission program, autothrottle, and autopilot permits hands-off flying through several turning points, altitude changes, and airspeed adjustments.

The system maneuvers through threats to within visual range of the target area. It allows the pilot to focus on the F-117's primary function: weapons delivery. Once within sensor range of the target, the pilot may resume control of the aircraft, guided by infrared video imagery.

IG Faults Navy on F/A-18E/F

The Pentagon's Inspector General said that alternatives to the F/A-18E/F were not properly considered before the Navy committed to the program.

The June IG report said that the Navy insisted that the F/A-18E/F be measured in effectiveness against the C/D model only. The E/F will replace the C/D aircraft. The alternatives are the F-14D Quickstrike, the A-X, and the French Rafale. The IG called for a new cost and operational effectiveness analysis (COEA).

The report found that, because the E/F and the A-X missions would overlap, it was essential that the two be compared. The E/F and the A-X will both have air-to-air and air-to-ground capability, but the A-X's air-to-air capability will be secondary.

The IG also reported that the Navy never performed a COEA of the F/A-18E/F vs. the F-14D Quickstrike and Rafale as requested by Assistant Secretary of Defense for Program Analysis and Evaluation David Chu.

The Navy also failed to provide total cost of the aircraft, omitting avionics upgrades and other items. The



Northrop and Embraer signed an agreement in principle in May to team and compete for the JPATS program. The firms will use a derivative of Embraer's EMB-312 Tucano turboprop trainer as their candidate. This proof-of-concept aircraft will be demonstrated in the US later this year.

E/F program is expected to cost nearly \$55 billion.

The Navy argued that the E/F was only an upgrade, not a new program, and should only be compared to the C/D aircraft. In addition, the Navy said it received a waiver from the Under Secretary of Defense for Acquisition for the COEA.

News Notes


■ Rep. Charles Bennett (D-Fla.), longtime chairman of the House Armed Services Committee's Seapower and Strategic and Critical Materials Subcommittee, announced he will retire at the end of the year. Eight members of the House Armed Services Committee will not be returning next year. Representative Bennett, who was first elected to Congress in 1948, is second only to Rep. Jamie Whitten, a Mississippi Democrat, in seniority in the House.

■ Fatigue-related cracks were found in 171 of 265 C-141 aircraft, the Air Force said in June. Maintenance personnel at Robins AFB, Ga., found cracks in the frames adjacent to the side windows of the C-141 windshield. Aircraft found with cracks are restricted to altitudes no higher than 26,000 feet until repairs can be made.

■ McDonnell Douglas unveiled a wind tunnel model of a new rotor wing canard aircraft that could allow convertible helicopters to fly at speeds that exceed 350 knots. As speed is increased, the main rotor is locked into wing form, with the large H-tail and canards taking the lift off the rotors. McDonnell Douglas is studying two versions. One is a full-size, two-seat helicopter; the other is an unmanned aerial vehicle. The two-seat version could carry up to 3,000 pounds of ordnance internally. The unmanned vehicle would be about one-fifth the size of the manned helicopter.

■ A Navy T-45 ran off the runway at Edwards AFB, Calif., during a landing rollout in June. The aircraft was en route from NAS Patuxent River, Md. The pilot ejected and was taken to Air Force Systems Command Hospital with minor injuries. A Navy investigation is under way. The cause of the accident is unknown.

■ The first of sixteen US Navy ES-3A electronic warfare, reconnaissance aircraft completed operational evaluation and was deployed, Lockheed said in May. The ES-3A, a modified S-3A Viking, will eventually serve in two-plane detachments with aircraft carrier battle groups performing a mission that includes intelligence gathering, targeting, and battle management.



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■ Loral Corp. has joined LTV Aerospace and FMA Argentina to pursue the USAF-Navy Joint Primary Aircraft Training System (JPATS) program, LTV announced in May. Loral will provide the ground-based training partner to the Pampa 2000, a high-winged, single-engine, jet aircraft with a stepped tandem cockpit.

■ Northrop and Embraer signed an agreement in principle to team and compete for the JPATS program, Northrop said in May. The two contractors

plan to offer a derivative of Embraer's EMB-312 Tucano turboprop trainer, known as the Super Tucano. Northrop will be the prime contractor.

■ Fairchild Aircraft and General Dynamics will jointly produce and market a multimission surveillance aircraft, Fairchild said in May. The aircraft integrates the Metro 23 aircraft, whose military counterpart is the C-26, with such off-the-shelf, low-intensity conflict aircraft systems as surveillance sensors, C³ systems, and

pilot and systems operator situational awareness displays. The configurations will be tailored to special military, law enforcement, and commercial tasks.

■ Air Force Space Command took over operation of the Air Force Satellite Communications System in June, the service said. The change results from the disestablishment of Strategic Air Command. AFSCS will continue to operate at Offutt AFB, Neb., with its primary function being to support the National Mili-

tary Command System, Joint Chiefs, and commanders in chief requirements for worldwide command of nuclear forces.

■ The Air Force is closing down its operations at the 10th Missile Warning Squadron at Cavalier AFS, N. D., returning the site to Army control in September. The action was taken to save funding for higher priorities, according to Air Force Space Command.

■ Embraer delivered the first two-seat AMX aircraft to the Brazilian Air

Force in May. This is the first of four-teen aircraft ordered by Brazil. Embraer also makes a single-seat fighter.

■ Texas Instruments said in June that the third terminal guidance, free flight demonstration of an autonomous imaging infrared guided weapon resulted in another successful hit at Eglin AFB, Fla. The test is a part of the Autonomous Guidance for Conventional Weapons program. The system was launched from an F-4E and detonated within lethal range of the target.

Senior Staff Changes

RETIREMENTS: B/G James S. **Allen**; M/G George W. **Larson, Jr.**; M/G James J. **LeClair**; M/G Fred R. **Nelson**; L/G Clifford H. **Rees, Jr.**; B/G Stephen R. **Shapiro**; B/G Lester J. **Weber**; B/G Frederick A. **Zehrer III**.

PROMOTIONS: To be **AFRES Major General:** Gary L. **Eichhorn**; Jacques P. **Klein**; Thomas L. **Neubert**; James E. **Sherrard III**; David R. **Smith**; Jerry E. **White**.

To be **AFRES Brigadier General:** John A. **Bradley**; Donald W. **Bryan**; William A. **Cohen**; James J. **Kennedy III**; Michael R. **Lee**; Robert A. **Nester**; Reese R. **Nielsen**; Ralph H. **Oates**; Herbert P. **Riessen**; James E. **Sehorn**; Virgil J. **Toney, Jr.**; Donald K. **Woodman**.

To be **ANG Major General:** Hugh L. **Cox III**; William P. **Bland, Jr.**; Charles M. **Butler**; Nelson E. **Durgin**.

To be **ANG Brigadier General:** Allen W. **Boone**; Bruce G. **Bramlette**; Rendell F. **Clark, Jr.**; James R. **Hendrickson**; Jack D. **Koch**; Allen M. **Mizumoto**; Gary P. **Morgan**; C. D. **Payne**; Robert L. **Privett**; Xel **Sant'anna**; Loran C. **Schnaidt**; Fred R. **Sloan**; John H. **Smith**; Albert H. **Wilkening**; Richard B. **Yules**.

CHANGES: B/G George T. **Babbitt, Jr.**, from DCS/Log., Hq. ATC, Randolph AFB, Tex., to DCS/Log. and Dep. Dir., Log., EACOS, Hq. USAFE, Ramstein AB, Germany, replacing M/G Philip L. Metzler, Jr. . . . B/G (M/G selectee) Jay D. **Blume, Jr.**, from Cmdr., E-3A Comp. Cmd., NATO, Geilenkirchen, Germany, to Cmdr., Lowry Training Ctr., ATC, Lowry AFB, Colo., replacing retired M/G Fred R. Nelson . . . M/G Phillip E. **Bracher**, from Dir., C⁴ Sys., J-6, USEUCOM, Stuttgart-Vaihingen, Germany, to Dir., C² Sys. and Logistics, J-4/6, Hq. USSPACECOM; and DCS/Sys. Integration, Logistics, and Support, Hq. AFSPACECOM, Peterson AFB, Colo., replacing M/G Carl G. O'Berry . . . B/G Patrick K. **Gamble**, from Capstone student and former Exec. Officer to C/S, Hq. USAF, Washington, D. C., to Cmdr., 58th Fighter Wg., ACC, Luke AFB, Ariz., replacing retiring B/G Ralph T. Browning . . . M/G James F. **Hinkel**, from DCS/Airlift Forces, Hq. PACAF, Hickam AFB, Hawaii, to Dir., Transportation, DCS/Log., Hq. USAF, Washington, D. C., replacing retiring B/G Charles C. Barnhill.

Col. (B/G selectee) Clinton V. **Horn**, from Cmdr., 343d Wg., PACAF, Eielson AFB, Alaska, to Cmdr., 325th Fighter Wg., ACC, Tyndall AFB, Fla., replacing Col. David L. Yates . . . B/G Jerome A. **Landry**, from Dir., C⁴ Sys., J-6, Hq. USTRANSCOM, Scott AFB, Ill., to Dir., C⁴ Sys., J-6, USEUCOM, Stuttgart-Vaihingen, Germany, replacing M/G Phillip E. Bracher . . . M/G John M. **Nowak**, from DCS/Log., Hq. MAC, Scott AFB, Ill., to Dir., Supply, DCS/Log., Hq. USAF, Washington, D. C., replacing retiring M/G James W. Hopp . . . B/G Tad J. **Oelstrom**, from IG, Hq. USAFE, Ramstein AB, Germany, to Cmdr., 86th Fighter

Wg., and Cmdr., Kaiserslautern Mil. Community, USAFE, Ramstein AB, Germany, replacing B/G Richard T. Swope.

M/G James F. **Record**, from C/S, UN Cmd. Korea; C/S, CFC; and C/S, Ground Component Cmd., USA Garrison, Yongsan Compound, Korea, to Vice Cmdr., 12th AF, ACC; and Vice Cmdr., USSOUTHAF, Bergstrom AFB, Tex., replacing M/G Walter T. Worthington . . . M/G Ralph R. **Rohatsch, Jr.**, from Cmdr., TUSLOG, USAFE, Ankara, Turkey, to Cmdr., 16th AF, USAFE, Aviano AB, Italy, replacing retiring M/G Gerald A. Daniel . . . B/G (M/G selectee) Ronald N. **Running**, from Dir., Plans, Policy, and Doctrine, J-5, USSOCOM, MacDill AFB, Fla., to C/S, UN Cmd. Korea; C/S, CFC; and C/S, Ground Component Cmd., USA Garrison, Yongsan Compound, Korea, replacing M/G James F. Record . . . B/G Rondal H. **Smith**, from Exec. Dir., Quality Assurance, DLA, Cameron Station, Va., to DCS/Log., Hq. AMC, Scott AFB, Ill.

B/G Richard T. **Swope**, from Cmdr., 86th Fighter Wg., and Cmdr., Kaiserslautern Mil. Community, USAFE, Ramstein AB, Germany, to ACS/Ops., AFCENT, Brunsum, the Netherlands, replacing retired B/G James S. Allen . . . Col. (B/G selectee) Thomas A. **Twomey**, from Ass't DCS/Log., Hq. SAC, Offutt AFB, Neb., to Dep. Dir., Ops., NMCC, J-3. Jt. Staff, Washington, D. C. . . . M/G Walter T. **Worthington**, from Vice Cmdr., 12th AF, ACC; and Vice Cmdr., USSOUTHAF, Bergstrom AFB, Tex., to Dep. Cmdr., USSOUTHCOM, Quarry Heights, Panama . . . B/G William L. **Worthington, Jr.**, from Vice Cmdr., San Antonio ALC, AFLC, Kelly AFB, Tex., to DCS/Log., Hq. ATC, Randolph AFB, Tex., replacing B/G George T. Babbitt, Jr.

SENIOR ENLISTED ADVISOR (SEA) CHANGES: CMSgt. David J. **Campanale**, to SEA, Hq. AMC, Scott AFB, Ill. . . . CMSgt. Tommy A. **Roberts**, to SEA, Hq. ACC, Langley AFB, Va.

SENIOR EXECUTIVE SERVICE (SES) CHANGES: James F. **Bair**, from Dep. Dir., Wright Lab, AFSC, Wright-Patterson AFB, Ohio, to DCS/Integrated Engineering and Technical Mgmt., ASC, Hq. AFMC, Wright-Patterson AFB, Ohio . . . John M. **Griffin**, from Chief Systems Engineer, ASD, AFSC, Wright-Patterson AFB, Ohio, to DCS/Development Planning, ASC, Hq. AFMC, Wright-Patterson AFB, Ohio, replacing James J. Mattice . . . John M. **Halpin**, from Engineering Advisor, Product Assurance Engineering, ASD, AFSC, Wright-Patterson AFB, Ohio, to Chief Systems Engineer, ASC, Hq. AFMC, Wright-Patterson AFB, Ohio, replacing John M. Griffin . . . Maurice **Himmelberg**, from Dir. of Engineering, Reconnaissance and EW Systems, ASD, AFSC, Wright-Patterson AFB, Ohio, to Director of Engineering, F-16, ASC, Hq. AFMC, Wright-Patterson AFB, Ohio, replacing John P. Braile. ■

■ Raytheon began laying off 700 workers in late May in an attempt to stay competitive in a time of declining defense spending, the firm said. The firm's work force will drop to 69,700 personnel.

■ USAF and its Commonwealth of Independent States counterparts began a joint search-and-rescue exchange program in June. The move was initiated to establish ties in light of the overlapping rescue interests in the Bering Sea and Arctic Ocean.

■ Pratt & Whitney tested a one-eighth-scale model of an engine at Mach 5 for the National Aerospace Plane, the firm said in May. The test took place at Aerojet's Hypersonic Test Facility in Sacramento, Calif.

■ The Armament Directorate's Electromagnetic Launcher Technology Branch at Eglin AFB, Fla., fired two separate five-shot bursts with twenty-five-gram projectiles achieving muzzle velocities of 4,921 feet per second in May. The test is significant because, for the first time, electromagnetic muzzle velocities were consistent in each burst.

■ Students at Mississippi State University unveiled a fifty-foot, one-third-scale mockup of the National Aerospace Plane at Starkville, Miss., in June, after ten months of designing and building the model. The school won a nationwide competition to build the \$125,000 mockup in November 1991.

■ Rockwell's Command and Control Systems Division achieved the first communication link test message via satellite with the Milstar terminal at Wright-Patterson AFB, Ohio. Rockwell has been working to design and build the Milstar Terminal Test Facility since it was awarded a low-rate initial production contract in December 1989.

Purchases

The Air Force awarded Lockheed a \$37.4 million cost plus award fee contract for the F-22 airframe program. Expected completion: January 2000.

The Air Force awarded General Dynamics a \$332 million face-value increase to a fixed-price incentive contract for Fiscal Year 1990 and 1991 production for the AGM-129A Advanced Cruise Missile, consisting of twenty-five ACMs (FY 1990) and thirty-five ACMs (FY 1991). Expected completion: August 1993.

The Air Force awarded Lockheed an \$18 million firm fixed-price contract for one basic C-130H aircraft for later modification to an AC-130U gunship. Expected completion: December 1992.



Students at Mississippi State University completed a one-third-scale model of the National Aerospace Plane in June. The \$125,000 mockup, which took forty-three students about nine months to design and build, is fifty feet long and weighs 5,000 pounds. It was displayed at the US Air and Trade Show in Dayton, Ohio, in June.

Awards

Lt. Gen. Thomas R. Ferguson, Jr., commander of Air Force Systems Command's Aeronautical Systems Division (now Air Force Materiel Command's Aeronautical Systems Center), accepted the Federal Quality Institute's 1992 Quality Improvement Prototype Award in May on behalf of ASD. The division was named one of five winners last December. The award is given annually to federal agencies that achieve high standards in quality in the delivery of products and services and serve as models for the rest of the government.

The president and board of directors of the Air National Guard Non-commissioned Officers Association

awarded the Maj. Gen. I. G. Brown Command Excellence Trophy for 1992 to Lt. Col. Wayne Green, commander of the 244th Combat Communications Squadron, Portland, Oregon; Lt. Col. Brian Bade, commander of the 114th Fighter Group, Sioux Falls, S. D.; Col. Shelby Bryant, commander of the 189th Training Group, Little Rock, Ark.; and Col. Ralph Fugini, deputy commander of the 102d Interceptor Wing, Otis ANGB, Mass.

The Reserve Officer Association inducted Air Force Chief of Staff Gen. Merrill A. McPeak into the association's Minute Man Hall of Fame in late June. General McPeak was honored for his contributions to national defense. ■

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The systems and the satellites work superbly. The big need is teaching combat commands how to make best use of them.

Squeezing More From Space

By James W. Canan, Senior Editor

THE Air Force is troubleshooting space. Its satellites on orbit are not the problem. They work fine. The trouble is that they are in danger of going to waste in wartime. Too many Air Force combat units do not yet know how to take advantage of space systems, and they could come out losers unless they learn.

Air Force Space Command, USAF's warfighting command for space, is "working intensely" to make sure that they do, says its vice commander, Lt. Gen. Thomas S. Moorman, Jr.

All sorts of space systems proved their worth in the Persian Gulf War, but their contributions to combat, at times stunning, only served to underscore the problem. Their success was a near thing, an accident of timing. It could have gone the other way.

General Moorman asserts that the Gulf War's "overwhelming lesson for space was the lack of preplanning" on how and when to acquire and use the data from various satellites. He expresses pride in the impressive—even decisive—contributions of space systems to the coalition cause, but he also notes that this was possible "only because we had five months to get ready during [Operation] Desert Shield."

Had the Iraqi invasion force continued to advance from Kuwait into Saudi Arabia, "we would have employed our space capabilities *ad hoc*, and we would not have been able to do all the good things we did," General Moorman declares.

After the war, AFSPACECOM moved to set things right. First stop: Korea, always a potential hot spot. From its space applications directorate, AFSPACECOM dispatched a team of space operations specialists, including some members experienced in air warfare, to 7th Air Force headquarters at Osan AB. The team's assignment: show the resident air warriors how to tap into the flow of communications, navigation, surveillance, weather, reconnaissance, and early warning data from space and work it into their combat plans, training, and operations.

The result, says General Moorman,



was "a comprehensive operational document" in the form of "a space annex to the Pacific Air Forces operations plan for a potential Korean theater conflict." Among other things, it "tells how to obtain and coordinate space support, identifies the requisite ground terminals and interfaces, and describes the command relationships," he explains.

Bombs, Fuel, . . . Receivers

Coached by comparable AFSPACE-COM teams, all USAF warfighting commands and air components of US unified commands will have woven space into their operations plans by the end of this year. The idea is "to make sure that those units pack their satellite receivers right along with their bombs and JP-4 when they go to war," General Moorman declares.

"We're directing much of our effort to making space services more readily available to warfighters," he says. "We hope to have the entire [US] military thinking and understanding space capabilities in just a few more years."

The Air Force space program has more of a here-and-now, operational slant than ever before. For the first time in the thirty-plus years of that program, USAF seems at least as intent on getting the most out of existing space systems as it is on forging next-generation advanced systems for future use.

New programs to develop such systems are few and, by historical standards, not all that fancy. The Air Force takes a "show me" approach in determining whether they are needed and for what.

"There is more scrubbing of operational requirements for space programs than we've ever seen before," declares Maj. Gen. Donald G. Hard, director of space programs in the office of the Assistant Secretary of the Air Force for Acquisition. "We do not opt for additional capability in space systems if we think it won't be absolutely necessary."

The number of major new space modernization programs is down to two—the Follow-On Early Warning System (FEWS) for a new generation of sentinel satellites and the National Launch System (NLS), a USAF-NASA undertaking to develop a new family of space-launch vehicles.

The Milstar program to develop new communications satellites certainly



qualifies as a major modernization program, but it has been around a while and is less ambitious than before. Milstar's orientation has become more tactical than strategic, and its focus is increasingly down-to-earth—acquiring additional receiver terminals in order to disseminate Milstar signals more widely among tactical forces.

The Air Force is pushing hard for all these programs. Martin C. Faga, Assistant Secretary of the Air Force for Space, calls them "our core modernization programs" and sees them as "the keys to our future capability in space." General Moorman concurs. He predicts "gradual growth of investment in new technologies and new ideas for performing our space missions." He says, however, that "the future [for space] is not about new [program] starts, it's about applications—using data from space, becoming comfortable with using it, integrating space into the warfighting Air Force."

Unforeseen Applications

An eye-catching case in point is the Global Positioning System (GPS). As more and more fighter pilots become accustomed to using GPS navigational and positional data, "they will develop GPS applications that the [Air Force] space community might never even think about," General Moorman says.

This is already happening in the F-16 community as a result of Gulf War pioneering on the part of the 59th Tactical Fighter Squadron from Moody AFB, Ga. That squadron's twenty-

four F-16Cs were the only Air Force fighters in the war equipped with GPS terminals. They also carried Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) pods. On strike missions at night, their pilots relied on GPS to navigate to initial points and then on LANTIRN to take them directly to their targets.

The pilots credited GPS in large measure for the precision of their nighttime bombing. By providing pilots with a sure sense of direction and position, GPS was also "a big factor in our not losing a single aircraft" to enemy fire, one pilot later said.

Mr. Faga claims that such contributions "cut right to the core of what modern airpower is all about: highly precise strikes." This is why GPS is "one of the biggest contributors to making space a part of the operational Air Force," he says.

"GPS is pervasive," Mr. Faga asserts. "I call it 'the next utility.' Every pilot will be using it."

Shortly after the Gulf War ended, the Air Force made room in its shrinking budget to beef up GPS funding. It added \$400 million to accelerate the integration of GPS receivers in front-line combat aircraft. General Moorman calls this "a considerable investment and one of the smartest the Air Force has ever made."

He expects combat forces to do imaginative things with data from other satellites as well—"weather data, warning data, what have you. Once we get space integrated into their operations, they'll make demands on the systems and we'll have an explosion of applications from space. That's where the real growth industry will be."

The Air Force is hustling to fill out its orbiting constellations of satellites to give operational units all possible support from space. In Fiscal 1993, beginning on October 1, USAF expects to launch five more GPS satellites, thus completing the twenty-four-satellite GPS constellation. It plans to launch two more DSCS (Defense Satellite Communications System) III satellites, a Defense Meteorological Satellite Program (DMSP) satellite, and a Defense Support Program (DSP) early warning satellite. It will also buy seven more launch vehicles—two Delta rockets, two Atlas rockets, and three Titan IV rockets.

Space is expected to hold its own—and then some—in the Air Force scheme of things. Gen. Merrill A.

McPeak, Air Force Chief of Staff, declared not long ago that "space is a growth business" and that USAF's investment in space "will grow even during this time of decline in many other dimensions of our activity."

Space programs and activities will account for roughly nine percent of all Air Force spending in Fiscal 1993 and are expected to account for nearly eleven percent by Fiscal 1997.

No Turning Back

This is not surprising. Space has come of age. General McPeak called Operation Desert Storm "the first space war" and said there will be no turning back from space. No one doubts that space is fundamental to the Defense Department's new National Military Strategy—with its emphasis on a smaller base force, fewer forces overseas, quick response to regional crises, and reconstitution of forces if necessary—and to USAF's theme of "global reach, global power."

"The threats we face may be individually smaller [than the former Soviet threat], but there are many more of them spread throughout the world," Mr. Faga says. He notes that the US "could be drawn into any number of conflicts—not on a scale of World War II or of the Gulf War, but involving hundreds or thousands [of troops] who would be called upon to move quickly and without advance preparation."

He claims that space could save the day for those troops when—or even before—they arrive in combat zones, by providing "the complete and instant information that every military situation requires." Space systems are the keys to "global situational awareness," to divining "who are the enemy, where are they, what do they have, what are they doing, what are they capable of doing, and what are they likely to do that they haven't already done," Mr. Faga says.

In the Gulf War, satellites handled most of the communications that originated both outside and inside the theater of operations; provided unprecedented navigational accuracy in support of air, land, and sea operations; enabled air planners to work around and compensate for unusually bad weather in the region; and did an unexpectedly good job of detecting the launches of strategic and tactical Scud missiles.

Air Force space officials credit the

Illustration by Randy Lyhus



Gulf War with having convinced the senior leadership of all military services that, as General Moorman puts it, "space systems are essential elements of strategy and force structure."

The war was an eye-opener for all concerned. "We learned more about supporting theater commanders and warfighters in Desert Shield and Desert Storm than we'd learned in the prior eight years of Air Force Space Command's existence," General Moorman asserts. He calls the performance of space systems in the Gulf War "a clear preview of what the future could hold" if US forces stand ready to see to it.

"Come-As-You-Are" War

There are no guarantees. Things may be much different the next time around. "We must think about the next conflict being a 'come-as-you-are' war," General Moorman says. "Every war-planner in the world now knows better than to give the United States five months to get ready. Space can't be something our forces start thinking about only when they get into combat. If they haven't become familiar with it and trained with it, they won't use it. That's just a fact."

This, he says, is why AFSPACECOM is teaming with other warfighting commands to incorporate space "through the whole spectrum of our space systems" in their operations plans, training, and exercises.

With space ops plans in hand, combat commanders will be able to figure out "what kinds of command, control, and communications are available; what sorts of communications lashups

they need in order to make the C³ work; how and when they should go about requesting support from space, such as communications, surveillance or whatever; and what they can reasonably expect space resources to do for them," General Moorman explains.

The space ops plans are also aimed at "making sure that weather satellite vans and communications satellite terminals won't be left in warehouses or off the [deployment] transportation plans because no one knew what they were or why they were needed," the AFSPACECOM vice commander declares.

AFSPACECOM's blueprints for space operations are now seen as the best means of making space an integral part of the Air Force, a goal that remained out of reach, despite the best efforts of space advocates, until the Gulf War.

Since that war, "we've had more operational 'pull' on space from the warfighters than we know what to do with," General Moorman says. "We in the space business went around for years pushing space on senior leaders, trying to convince them of all the great things space could do for the Air Force. We made a lot of progress, but Desert Storm was what finally did it."

He sees this decade as "a time for consolidating our gains and for learning how to make the systems we have more useful to the warfighters." He also sees it as a time for selective modernization "to apply our space technology . . . to take on new responsibilities and missions when called on to do so."

FEWS is synonymous with such modernization. "Missile warning will continue to be our number one priority," General Moorman says, "because there are still thousands of missiles out there that threaten this country, the downfall of communism notwithstanding."

DSP early warning satellites have served as sentries in space for more than twenty years and will continue to do so into the next century. Designed to detect launches of intercontinental ballistic missiles, the DSP satellites were pressed into service during the Gulf War to detect launches of Iraqi Scuds. They did a surprisingly good job, thanks in large measure to AFSPACECOM's operational innovations, but the Air Force cannot count on them to cope with the much more capable and sophisticated ballistic

missiles that the US and its allies are likely to face in the future.

In the Beginning, BSTS

The Defense Department moved to develop new early warning satellites ten years ago, first as an Air Force program and then as part of the Strategic Defense Initiative. Its highly ambitious goal was the Boost Surveillance and Tracking System (BSTS), to be composed of supersophisticated early warning satellites to detect, track, and target thousands of ballistic missiles in the boost phase of their launching.

The program was transferred back to the Air Force from the Pentagon's Strategic Defense Initiative Organization in late 1990. The Air Force scaled down BSTS and renamed it "AWS" (Advanced Warning System), then scaled it down again, renamed it "FEWS," and began funding its development this year.

General Hard cites FEWS as a prime example of the hard-nosed approach that USAF now takes in evaluating the affordability and operational requirements of new space systems. He explains that there are "two kinds of operational requirements: threshold requirements—capabilities that the system must have—and objective requirements—capabilities that would help do the mission but that we can't afford right now." In these tight-budget times, "We fund threshold requirements, not objective requirements," he declares.

Such is the case with FEWS. "We scrubbed it down to a bare bones kind of program and took a lot of dollars out of it," General Hard says.

FEWS is far less sophisticated and costly than BSTS. It will embody fewer, lighter, and smaller satellites designed only for attack warning and attack assessment—not for targeting as well—and for much longer life expectancy on orbit. FEWS is expected to cost about \$7 billion less than BSTS to build and operate.

Operational requirements are huge considerations in the case of NLS. It is almost impossible to exaggerate the need for new launch vehicles and infrastructure, Air Force space officials contend.

"The problems with our current launch systems are operability and cost, in that order," General Moorman declares. "If the President requested an immediate satellite launch today, the earliest we could make it happen

Illustration by Randy Lyhus



would be thirty to 180 days, depending on the specific system and assuming that both the satellite and the launchpad were available and ready to go."

"That just does not qualify as an operational launch capability. We have to do better," he says.

The Price Is High

Launch costs rank high among the US space program's political and public relations problems. Costs are to blame for much of the criticism leveled at the space program by US military and political leaders. Space officials have no comeback. For example, one launch of a Titan IV/Centaur rocket or a space shuttle costs a quarter of a billion dollars.

Launch timetables are laggard and troublesome. Last February, AFSPACECOM launched a DSCS III satellite into orbit aboard an Atlas II rocket. This was a major milestone in the defense establishment's transition from old DSCS II satellites to new DSCS III satellites to provide high-volume, super-high frequency communications for all military forces, and from the space shuttle to an expendable rocket for launching the newer satellites.

The bad news was that it took seven months to prepare for the launch with the rocket on the pad.

"One of these days, we'll have to start to hold our space transportation system to the same standards of readiness and availability that we do for other military systems like airplanes, ships, and tanks," General Moorman

says. "We're flying the space equivalents of the old F-4 [fighter]."

The solution may lie in the NLS program. USAF and NASA conceived it to develop a family of new rockets, using advanced but proven technology, to launch payloads of assorted sizes and weights. NLS launch vehicles are expected to provide routine access to space at lower cost for civil, commercial, and military satellites.

NLS is no sure thing. Its cost and some of its requirements remain under scrutiny. Congress was balky about funding it this year. Its final form and pace have yet to be decided, assuming it survives the budget-cutters.

If not NLS, some other launch system will have to come along. There seems to be a consensus in defense and space circles that something must be done about the launch situation. Declares General Hard, "If we don't move on to the next generation of launch vehicles, we'll close the door on America as a spacefaring nation. We'll eventually have to turn to other nations to launch our satellites, and we'll no longer control our own destiny."

Early next year, AFSPACECOM will launch the first satellite of a long-planned Milstar constellation that is expected to be fully operational early in the next century. Comprising cross-linked satellites in various orbits and inclinations, the Milstar constellation will provide US tactical and strategic forces with secure, jam-resistant, extremely high frequency communications.

The final configuration of the constellation remains to be seen. The end of the cold war allowed the Air Force to relax some Milstar requirements, notably self-protection features designed to make the satellites hold up under nuclear attack. Indeed, the Air Force has been reviewing all space communications requirements, not just Milstar's, for a year or so from the standpoint of those who use the satellites—USAF's combat forces.

"We ask the operational users for their communications connectivity requirements, not for their Milstar or their DSCS III requirements," General Hard explains. In the process, "We've learned more about Milsatcom [military satellite communications] requirements than we've ever known before," he declares. "We've been able to make tradeoffs, not only in systems requirements but in operations concepts as well." ■



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If defense outlays were zero, there would still be a federal deficit of \$142.4 billion.

The Long, Dark Night of the Deficit

LESS than two years ago, the Bush Administration predicted a near-balanced federal budget by 1995. The Congressional Budget Office, whose forecasts are usually gloomier but often more accurate, saw signs that the deficit was falling toward tolerable levels.

Things didn't work out that way. The deficit will hit a record \$425 billion this year. It is expected to taper off to \$282 billion in 1996, then begin rising again, and keep rising into the next century.

Wishful thinking no doubt played some part in the forecasts two years ago, but predicting the deficit is a tricky art. It depends on how accurately the economists divine what will happen with the Gross Domestic Product, inflation, and dozens of other factors.

"In 1991, revenues deteriorated while spending on many benefit programs climbed sharply," CBO said in its updated analysis in January.

There is no basic mystery about why a deficit exists. The federal government currently spends 24.9 percent of the Gross Domestic Product while collecting only 18.5 percent of GDP in revenues.

By John T. Correll, Editor in Chief

Voters say they are outraged by the deficit. At the same time, however, they are against higher taxes or cuts in the entitlement programs that dominate federal spending.

The traditional dodge for politicians facing that impasse in years gone by was to blame the deficit on the Pentagon and call for defense cuts to solve the problem. That idea has become a mathematical impossibility.

Today's entire defense appropriation is smaller than the deficit total. If 1992 Pentagon outlays—budgeted at

\$282.6 billion—were reduced to zero, a deficit of \$142.4 billion would remain.

The Persian Gulf War did not cause the deficit to surge. In fact, CBO calculates that allied contributions for Operation Desert Storm actually lowered the deficit by \$43 billion in 1991 and by \$5 billion in 1992.

The core of the deficit lies in the entitlement and benefit programs that account for \$709 billion of this year's outlays and, according to the Congressional Budget Office forecast, will reach \$970 billion by 1997.

The government's term "total deficit" is somewhat misleading. It uses the surplus from the Social Security trust fund—excluded by law from the budget process—to offset the deficit total. Most references to the deficit use the "on-budget" figure, which is regarded as more valid.

Source: Congressional Budget Office.

amendment to the states for ratification.

This term, balanced budget amendment bills were introduced by Sen. Paul Simon (D-Ill.) and Rep. Charles Stenholm (D-Tex.). President Bush supported the movement, declaring that "forty-four states have their own constitutional balanced budget requirements, and the federal government must now do the same."

Rep. Thomas S. Foley (D-Wash.), Speaker of the House, disagreed. He warned that "there is not, as some people believe, enough money in

Senator Simon, appearing on a broadcast with Mr. Panetta, acknowledged that "what we need is clearly something to force us to do what we ought to do without a Constitutional amendment."

Mr. Panetta replied that "there are, frankly, a lot of members who will vote for a Constitutional amendment, but when you call on them to make the tough choices on the issues I just discussed, they're the first ones out the back door."

He forced the issue further May 26 with a package of three "illustrative"

The Economy and the Deficit

	1992	1993	1996	1997
GDP	\$5.8 trillion	\$6.2 trillion	\$7.4 trillion	\$7.8 trillion
Federal revenues	18.5% GDP	18.8% GDP	18.9% GDP	18.8% GDP
Federal outlays	24.9% GDP	24.1% GDP	22.0% GDP	21.5% GDP
"Total" deficit	\$372 billion (6.4% GDP)	\$332 billion (5.3% GDP)	\$184 billion (2.5% GDP)	\$216 billion (2.8% GDP)
"On-budget" deficit	\$425 billion (7.3% GDP)	\$396 billion (6.3% GDP)	\$282 billion (3.8% GDP)	\$326 billion (4.2% GDP)

"The growth in the deficit is propelled by the growth in mandatory spending, especially for health-care services," CBO said in a report published in March. By 2002, the report estimated, it will take 5.0 percent of the GDP just to pay for Medicare and Medicaid.

An attempt to curb entitlement spending failed in the Senate, 54-35, in April. It would have held increases to the rate of inflation plus two percent, plus allowance for caseload growth. Among those voting against the cap were five of the six sponsors of a bill then pending to amend the Constitution and require a balanced budget.

The Balanced Budget Campaign

The balanced budget amendment is not a new idea. Such proposals passed before by simple majorities in both the Senate (in 1982 and 1986) and the House of Representatives (in 1982 and 1990), but fell short of the two-thirds vote needed to refer an

Washington in terms of government revenues to meet all the expenses of current government, reduce the deficit, and reduce taxes. That is a mythology."

Background papers distributed by Senator Simon and Representative Stenholm addressed the general merits of a balanced budget but said little about the specific steps to produce one.

Mr. Stenholm, in an interview with Fox Morning News, alluded generally to "cuts in defense and in other programs, including entitlements," but added candidly that "we won't get into that until next year because, obviously, in an election year you don't touch that."

Rep. Leon E. Panetta (D-Calif.), chairman of the House Budget Committee, said a balanced budget amendment would leave Congress still facing "very tough choices on entitlements, on defense, and on taxes" that the "leadership in this country has been avoiding."

options for reducing outlays and raising revenues. "If balancing the budget is so important, and I believe it is, then let's do it," Mr. Panetta said, reminding Congress and the Administration that "we have all of the Constitutional power we need to do the job" without amending the Constitution.

The three Panetta options were geared to generate \$550 billion to \$600 billion by 1997 with some combination of spending cuts and new revenues.

Depending on how much of that goal the government chooses to achieve by increased revenue, Mr. Panetta envisions cutting as much as \$114 billion from Medicare and \$112 billion from Social Security. He noted that Congress and the President were already laboring to make \$239 billion in defense cuts they had agreed previously to make between 1993 and 1997. His option package prescribed additional savings of \$58 billion to \$128 billion from defense over five years.

Three Ways to \$600 Billion			
Alternatives in the Panetta Package			
Source of deficit relief	Option 1: all savings	Option 2: 2/3 savings, 1/3 revenue	Option 3: 1/2 savings, 1/2 revenue
From reduced spending on entitlements	50%	34%	23%
From reduced spending on defense	31%	19%	18%
From reduced spending on nondefense discretionary	19%	13%	10%
From increased revenues	—	33%	50%

The balanced budget amendment founded in Congress June 12, but the deficit problem remains. Rep. Leon E. Panetta's "illustrative options" for resolving it demonstrate the severity of spending cuts or tax increases that would be needed.

Percentages are rounded. Source: House Budget Committee.

Two days later, Rep. Richard A. Gephardt (D-Mo.), the House Majority Leader, introduced his own balanced budget amendment bill, which would have exempted Social Security benefits from reduction.

As decision day approached, however, concern about the possibility of entitlement cuts eroded support for the amendment. The campaign died—for this session of Congress, anyway—June 12, when the House vote fell nine short of the supermajority required. The Gephardt variant was rejected outright in a preliminary vote.

That left the President and Congress with the same problems and the same options they had before.

The "Firewall" Question

Hardly anyone still pretends that defense is driving the deficit. Those who have looked at the numbers recognize that defense has borne the brunt of budget reductions in recent years. Nevertheless, the belief persists that a much larger "peace dividend" is available and could be used to alleviate the deficit.

It is by no means certain that any gains from cutting defense would be applied to the deficit. Most of the savings from defense reductions in years past were simply redirected and spent in other areas.

That practice is presently blocked by the "firewall" provision of the 1990 budget summit agreement. It stipulates that savings from defense cannot be spent on domestic programs.

Some in Congress now regret that bargain. A substantial number of legislators from both parties proposed last year to take money out of defense to underwrite tax cuts or domestic spending initiatives. In October, for example, Mr. Panetta called for defense cuts of up to forty percent to finance "investments" of some \$370 billion over the next decade in education, health care, and economic growth.

A bid to rescind the "firewall" provision failed, 238-187, in the House this March, but the Congressional Democrats who sponsored it have not given up. Rep. Ronald V. Dellums (D-Calif.), for example, continues to urge that Congress "take down the artificial wall," cut defense by fifty percent, and use the money on social programs.

After the House Armed Services Committee voted in May to chop \$7 billion out of the defense authorization

bill, Rep. Les Aspin (D-Wis.), the committee's chairman, proposed that the savings be diverted to urban aid.

Meanwhile, the national debt continues to grow and, according to Senator Simon, will exceed \$4 trillion by the end of the year. He calculates that the government is paying close to \$800 million a day in interest.

The Gramm-Rudman Experience

The federal budget has not been balanced since 1969, when outlays were 19.8 percent of GDP and revenues 20.2 percent. The most notable attempt to resolve the deficit was the Gramm-Rudman-Hollings Act, originally passed in 1985 and modified in 1987.

Like a balanced budget amendment, Gramm-Rudman was designed to force the President and Congress to do what they apparently could not do by the normal process.

Shifting Shares of the Nation's Wealth					
Outlays as Percentage of GDP					
	1962	1970	1980	1992	1997
Defense	9.5%	8.3%	5.1%	5.3%	3.7%
Entitlements and mandatory programs	5.8%	7.0%	11.0%	12.1%	12.4%

Source: Congressional Budget Office.

It set a series of annual caps for the deficit, leading by gradual stages to a balanced budget in 1993. In any year when the government had not met the deficit target by fall, federal outlays were to be "sequestered" and reductions made automatically.

Mandatory spending and entitlement programs were exempt from sequestration, although they accounted for almost two-thirds of the outlays. Half of the savings had to come from defense and the other half from domestic discretionary programs.

The loophole was enormous. The categories of spending that drove the outlays had been excused from scrutiny.

Entitlement programs were—and are—essentially self-adjusting. Once eligibility and benefit rules are set, the payments are recomputed regularly by formula. Increases occur without further congressional discussion or authorization.

There was no choice about paying interest due on debts, and outlays for mandatory and entitlement programs were nearly automatic. By 1988, that combination accounted for 58.3 percent of federal outlays. Less than half of the total spending was under direct control.

(The trend did not end there. Today 62.9 percent of federal outlays are for entitlements, mandatory programs, and interest. The annual budget fight is limited to 37.1 percent of the money.)

The Tax Pattern Changes

A parallel shift has also taken place in the tax structure. In 1962, social insurance taxes (mostly for Social Security) were only seventeen percent of federal revenues, but the share began rising and stood at thirty percent in 1980.

Even so, the Social Security program was on the ropes in the early 1980s. The trust funds were almost depleted, and there was genuine concern that benefits might not be paid on time.

The rescue included an infusion of money from the general fund and bigger payroll deductions for workers and employers. Between 1980 and 1988, the share of GNP collected as federal revenues remained about the same, but Social Security taxes increased by twenty-three percent as a portion of the take. The result was a rising surplus in the Social Security trust fund. The money was a restricted

reserve off limits to the budgeteers grappling with the deficit.

The situation worsened with an epidemic of failures of federally insured savings and loan institutions. The Treasury was suddenly confronted with yet another set of large expenditures.

The government took imaginative steps to obscure the fact that it was flunking the Gramm-Rudman tests. Reports consistently understated the deficit. Accountants kept score with estimates rather than the actual numbers. In 1989, the Administration "reduced" the deficit by shifting a monthly military payroll by two days, which threw it into a different fiscal year. To make the deficit look smaller, government reports lumped the Social Security trust fund surplus in with general revenues, which deflated the appearance of the problem considerably.

By 1990, the accounting tricks had played out. The government was looking at a sequester so punishing that, as one budget official said, "it would blow the doors off everybody."

Congress and the Administration agreed to shelve the hard provisions of Gramm-Rudman-Hollings and adopted the Budget Enforcement Act, which set separate caps for discretionary spending on defense, domestic, and international programs. That measure is still in effect.

Opinions differ on what lessons should be drawn from the experience.

According to Senator Simon, "the reason Gramm-Rudman-Hollings—legislation designed to hold down the deficit—had only limited effect in reducing the deficit was that it was statutory and its constraints could be changed at any time."

Pork and Other Priorities

Senator Simon complains that interest on the national debt "comes from the pockets of taxpayers and goes to those who are wealthy enough to invest in Treasury bills."

It may be some consolation to Senator Simon that the T-bill profiteers were getting only a 3.7 percent return this spring—a twenty-year low and less than some passbook savings accounts were paying.

One of the few bright spots in the deficit picture is that interest rates, which were close to fifteen percent in the early 1980s, have fallen steadily. Higher rates would have made a crush-

ing difference in the cost to service today's enormous national debt.

Current projections of the deficit are based on the assumption that inflation and interest rates will remain low and that there will be moderate growth in GDP. Even if these relatively favorable assumptions hold, the Administration and Congress have a real problem with voters whose demands are often inconsistent.

"One group came to see me about the deficit and then asked for tax breaks totaling \$67 billion," Rep. David R. Obey (D-Wis.) told the *Washington Post* in June.

Many citizens agree with Presidential candidate H. Ross Perot, who has suggested that a considerable part of the deficit could be offset by eliminating \$180 billion of waste in federal spending.

The Reagan Administration came to Washington with a similar conviction and mounted a relentless campaign against waste, fraud, and abuse. The search went on for years, but never struck real paydirt.

Few government officials or informed analysts believe it possible to make any appreciable dent in the deficit by eliminating waste, but the popular perception continues.

The belief is reinforced by periodic revelations of expenditures that sound goofy. Some of these are pork barrel appropriations that members of Congress engineer to spend federal money or fund projects in their constituencies back home.

One such project is an elevated, moving sidewalk to span a railroad track in Altoona, Pa., and connect the depressed downtown area with a shopping plaza several blocks away.

"Basically, we're looking to create something for people to see and react to," the local development director explained. Rep. Bud Shuster (R-Pa.) promoted \$3.5 million in the federal transportation plan to pay for it.

Congressmen are notoriously tolerant of each other's pork barrel projects as they may want support later for pork projects of their own. When there is need to make a show of being tough, it is safer to pick more vulnerable targets.

In May, for example, Congress cut \$183,000 for a project to find out why people are afraid to go to the dentist. It did, however, approve \$120,000 for a study on the disposal of animal manure. ■

A Checklist of Space Systems

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 DMSP and National Oceanic and Atmospheric Administration satellites. Launches of four remaining refurbished Atlas E boosters will be 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 and other payloads. **Contractor:** GD. **Status:** Production.

Brilliant Eyes System Program Office

Brilliant Eyes System

Space-based sensor for use in conjunction with the SDI Global Protection Against Limited Strike (GPALS) architecture. Provides acquisition, resolution, tracking, and discrimination of space objects. **Contractor:** To be determined (TBD). **Status:** Development.

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.

Defense Support Program Office

Defense Support Program

Space segment of US Integrated Tactical Warning and Assessment System. Primary mission is to detect and report any ICBM/SLBM raid against the US and its allies. Secondary missions include space-launch detection and nuclear detonation. **Contractors:** TRW, Aerospace Electro Systems, IBM. **Status:** Operational.

Delta Launch Vehicles Program Office

Delta II

Program that provides medium launch vehicle currently used for launching Navstar GPS, space test payloads, SDIO experimental payloads, NASA scientific payloads, and commercial payloads. **Contractor:** McDonnell Douglas. **Status:** Operational.

Follow-On Early Warning System Program Office

Follow-On Early Warning System

Program to develop a next-generation space surveillance system to replace the Defense Support Program. FEWS is to provide first warning of ballistic missile attack against US and its allies. **Contractor:** None. **Status:** Demonstration/validation.

Milstar Joint Program Office

Milstar

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

National Launch System Joint Program Office

National Launch System

Joint USAF-NASA program to develop a new family of launch vehicles for medium to heavy payloads. Seeks significant gains in performance,

reliability, responsiveness, flexibility, and cost-effectiveness. **Contractors:** Many. **Status:** Conceptual.

Navstar GPS Joint Program Office

Navstar Global Positioning System

Program that provides twenty-four-hour, all-weather, worldwide, space-based radio navigation capabilities for military and civilian users with extremely accurate three-dimensional position information. **Contractors:** Rockwell International (Blocks 1 and 2), GE (Block 2R), IBM. **Status:** Full operational capability (FOC) in mid-1993.

Satellite Communications 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 voice, high-data-rate communications for DoD, State Department, and other US government users. DSCS III satellites provide increased capability and longer on-orbit life spans. **Contractors:** GE, TRW, Aerospace Corp. **Status:** Operational.

NATO III

System that provides military and diplomatic communications for ground, airborne, and shipborne NATO European and North Atlantic forces through satellites that are interoperable with DSCS. **Contractors:** Loral, Aerospace Corp. **Status:** Operational.

Space Weapons System Program Office

Brilliant Pebbles/Space-Based Interceptor Systems

Interceptor programs for interception and destruction of ICBMs before the warheads become active or reenter the atmosphere during a nuclear attack. **Contractors:** Many. **Status:** Development.

Directed Energy Weapon System

Program to develop space-based laser system to intercept and destroy ICBMs before the warheads become active or reenter the atmosphere during a nuclear attack. **Contractors:** Many. **Status:** Technology development.

Titan Program Office

Centaur

Modification of Centaur G-prime with high-energy cryogenic propellants and multiple restart capability. It will be the most powerful upper stage in the US inventory. **Contractors:** Martin Marietta (MM), GD. **Status:** Development.

Titan II

Modification of Titan II ICBMs into expendable launch vehicles. Initial conversion contracts for fourteen Titan IIs. **Contractor:** MM. **Status:** Production.

Titan IV

Program to produce heavy-lift vehicle for shuttle-class payloads. Launch sites at Cape Canaveral AFS, Fla., and Vandenberg AFB, Calif., will provide eight launches per year. **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 Chemical Systems Division. **Status:** Operational.

Phillips Laboratory: Geophysics Directorate

Atmospheric Prediction Technology

Program to develop numerical weather prediction (NWP) models, diagnostic algorithms, and short-range forecast techniques to provide weather forecast support. **Contractors:** Many. **Status:** Development.

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:** Development.

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 Univ., Aerodyne Research, Stewart Radiance Lab. **Status:** Development.

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:** Univ. of California at Berkeley, Univ. of Maryland, Mayflower Communications College, NAVSYS. **Status:** Development.

Global, Real-Time Ionospheric and Neutral Atmospheric Models for Air Weather Service

Real-time ionospheric model will provide electron density profiles globally from altitudes of 90–1,000 kilometers for AWS high-priority customers. Neutral atmospheric models will specify neutral densities and winds from altitudes of 90–500 kilometers. **Contractors:** Computational Physics, Inc., Univ. of Michigan. **Status:** Development.

High-Frequency Active Auroral Research Program

Program to observe, define, predict, and reduce degradations and outages of C³ operational systems due to chemical and radiowave modification of the atmosphere and ionosphere. **Contractors:** Raytheon, Arco Power Technologies, Inc., Univ. of Alaska, Penn State Univ. **Status:** Advanced development.

IR Background Models and Codes

Effort to define and understand the atmospheric environment, including optical and infrared airglow and auroral emissions, high-spectral resolution, molecular formation, and quenching. **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:** Development.

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:** Development.

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:** Development.

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., Univ. of Wisconsin, Univ. of Utah. **Status:** Basic research, exploratory development, advanced development.

Phillips Laboratory: Rocket Propulsion Directorate

Advanced Cryogenic Engine

Exploratory projects to develop a low-cost, lightweight cryogenic engine with high reliability. **Contractor:** TBD. **Status:** Advanced development.

Advanced ICBM Technologies

Effort to identify, design, and develop advanced solid rocket motor technologies for a next-generation ICBM. These technologies include an advanced composite conical case, a forced-deflection nozzle, integrated stage, laser ignition system, GAP/boron propellant, and noneroding nozzle. **Contractor:** In-house. **Status:** Exploratory development.

Advanced Liquid Axial Stage

Program to develop an advanced liquid axial rocket stage for a space-based 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 Materials for Turbomachinery

Investigation of diamond film coatings for turbopump bearings and seals, advanced polymers for turbopump housings, and advanced ceramic and metal matrix components. **Contractor:** In-house. **Status:** Development, test.

Advanced Polymer Components

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 Univ., College of William and Mary, Butler Univ., Univ. of Mississippi, Univ. of Lowell. **Status:** Research, exploratory development.

Ammonium Perchlorate Specification

Effort to correlate the chemical and physical properties of ammonium perchlorate and the final solid propellant properties. It will establish new specifications and develop standardized testing techniques. **Contractor:** In-house. **Status:** Research, exploratory development.

Clean Propellant Development

Program to develop and demonstrate a high-reliability, low-cost solid propellant with acid-free exhaust. **Contractor:** Aerojet Solid Propulsion. **Status:** Advanced development.

High-Energy-Density Materials Development

Program to identify, produce, characterize, and stabilize molecular systems that have potential for use as high-energy-density materials in propellants. **Contractor:** In-house. **Status:** Applied research.

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.

Minuteman Remanufacture

Program to provide environmental alternatives to the current Minuteman III propulsion system baseline. Major thrust is to demonstrate an environmentally acceptable propellant replacement that has minimum impact on the Minuteman III system. **Contractors:** Aerojet Solid Propulsion, Thiokol Corp., Chemical Systems Division, Hercules Aerospace Co., Atlantic Research Corp. **Status:** Advanced 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.

Solar Thermal Propulsion

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

30-Kilowatt Class Arcjet Demonstration

Project to develop a flight suit 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 a flight qualification test. **Contractor:** TRW. **Status:** Advanced development.

Phillips Laboratory: Space and Missile Technology Directorate

Advanced Composites With Embedded Sensors and Actuators

Project to design, fabricate, test, and evaluate composite components

with embedded sensors, actuators, and microprocessors for dynamic sensing and control of precision space structures. A secondary goal is to determine the applicability of sensors for health monitoring of space structures. **Contractor:** TRW. **Status:** Fabrication.

Advanced Spaceborne Computer Module

Development and production of standardized electronic data-processing modules for space applications. The program will produce processor, memory, and input/output modules that can be combined to produce a fully fault-tolerant space computer. **Contractors:** IBM, Honeywell. **Status:** Advanced development.

Advanced Space Communications Technologies

Program to develop and demonstrate advanced components, subsystems, and systems for integration into present and future A-J/EHF satellites. **Contractors:** Hughes, EMS, Research and Development Laboratory, MIT/Lincoln Labs. **Status:** Development, demonstration.

Ballistic Missile Technology

Program to develop and integrate a spectrum of system-level technologies for upgrades to current ballistic missiles and for future missile systems. Missile avionics, penetration, and survivability and endurance are the key technology thrusts. **Contractors:** In-house, other Air Force laboratories, many contractors. **Status:** Basic research to advanced development.

Carbon-Carbon Radiator

Application of advanced carbon fibers to spacecraft radiator subsystems. Potential for 50 percent weight savings. **Contractor:** In-house. **Status:** Development.

EHF TT&C Payload

Development of telemetry, tracking, and control (TT&C) subsystem for addition to EHF Milsatcom payloads. This subsystem will provide survivable TT&C function for a satellite bus to replace or augment space ground link system subsystems. **Contractor:** Research and Development Laboratory. **Status:** Study contract.

Nondestructive Evaluation of Solid Rocket Motors

Program to investigate automation of labor-intensive procedures and data archival requirements for inspecting solid rocket motors. **Contractor:** MM. **Status:** Development.

Radiation-Hardened Microelectronics for Space

Program to research and develop advanced hardening technology for space electronics, develop prototype hardened parts and packaging technology for space applications, and investigate new qualification methods for advanced electronics used in space. **Contractors:** Mission Research Corp., TI, GE, Physitron, Vanderbilt Univ. **Status:** Research, exploratory development, advanced development.

Silicon Hybrid With Infrared Extrinsic Long-Wave Detectors

SDIO-funded program to enhance the state of the art and producibility of long-wave silicon staring and scanning infrared focal plane arrays for space surveillance applications. **Contractor:** TBD. **Status:** Conceptual.

Silicon on Insulator Material Development

Program to develop the material fabrication and qualification techniques required to make thin film silicon on insulator substrates available for the manufacture of radiation-hardened, large-scale integrated circuits. Various techniques such as SIMOX and bonded wafers are studied. **Contractors:** DSRC, IBIS, Spire, Allied Signal, Univ. of Fla., N. C. State Univ. **Status:** Development.

Single-Stage, Reverse-Turbo, Brayton Cycle Cryogenic Cooler

Preliminary design and critical component demonstration of a reverse turbo Brayton cycle cooler for space. **Contractor:** Creare, Inc. **Status:** Critical component demonstration.

Small Reactor For Air Force Applications

Program to reduce satellite life-cycle costs, increase mean mission duration, and improve performance through the development of a small space nuclear reactor power system in the 2-20-kw range. **Contractor:** TBD. **Status:** Development.

Sorption Cooler

Effort to support potential SDI surveillance systems by demonstrating long-life, highly reliable sorption cooler technology. **Contractor:** Jet Propulsion Lab. **Status:** Proof-of-principle testing.

Space Integrated Controls Experiment

Applied research program to investigate and demonstrate attenuation of disturbance effects, using active isolation, passive damping, advanced materials, active control, adaptive control, and active optics. **Contractors:** Lockheed, Honeywell. **Status:** Research, test-article fabrication.

Space Subsystems Technology

Exploration and technologies development for next-generation, space-based radar. Goal is to develop advanced transmit/receive modules, lightweight antennas, photonics, power management, thermal control, and signal/data-processing subsystems. **Contractor:** Research and Development Laboratory. **Status:** Flight-test planning, advanced ground testing.

Space Nuclear Thermal Propulsion

Program to develop advanced nuclear rocket engine with twice the specific impulse of best available current liquid engines. **Contractors:** Sandia National Laboratories, Brookhaven National Laboratory, Grumman, Babcock and Wilcox. **Status:** Advanced development.

Thermionic System Evaluation Test

Test of the un fueled Soviet Topaz II space-based power system. Program seeks to provide experience operating a space nuclear power ground test, provide insight into power system design, and provide benchmarks for US system and component models. **Contractors:** SPI, New Mexico Engineering and Research Institute. **Status:** Test.

30° Kelvin Cryocooler Development

Development and test of first-generation components to achieve continuous cooling at 30° Kelvin. Components under investigation include high-reliability compressors and pulse tubes. **Contractor:** MTI. **Status:** Development.

60-GHz Standard Space Systems Division Crosslink

Program to develop hardware for space cross-link applications. The link will be capable of handling low to high data rates. **Contractors:** Sandia National Laboratories, GE, Avoca Labs. **Status:** Development, demonstration.

65° Kelvin Cryocooler Space Experiment

Program to fabricate, integrate and fly a 65° Kelvin cryocooler on the FY 1996 Navy Research Laboratory superconductivity space experiment. **Contractor:** TBD. **Status:** RFP released June 1992.

65° Kelvin Standard Spacecraft Cooler

Conceptual design, performance prediction, analysis, detailed design, critical component fabrication, and demonstration of a cryogenic cooler capable of providing two watts of cooling at 65° Kelvin for ten years of continuous unattended service in space applications. **Contractors:** Creare, Inc., Hughes Aircraft Co. **Status:** Fabrication, performance testing.

Phillips Laboratory: Lasers & Imaging Directorate

Advanced Electro-Optical System

Program to develop a four-meter-class telescope that will increase capabilities of the AMOS (Air Force Maui Optical Station) facility 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 postprocessing 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.

Aircraft Based Laser

SDIO program to develop an airborne demonstrator that uses a high-energy laser for defense against theater missiles. **Contractors:** In-house, many. **Status:** Risk-reduction, concept exploration.

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. The facility is located on Mount Haleakala on the island of Maui, Hawaii. **Contractor:** Rockwell Power Systems (O&M). **Status:** Operational.

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:** Many. **Status:** Operational, 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, RDA/Logicon. **Status:** Research, exploratory development, advanced development.

Malabar Test Facility

Optical surveillance tracking facility to collect data for a broad range of DoD and other missions. **Contractor:** Harris. **Status:** Operational.

Multipurpose Multiple Telescope Test-Bed

Wide-field-of-view imaging array to collect the power and distinguish the details of an equivalent single telescope equal to the area of all four smaller telescopes. **Contractors:** Many. **Status:** Establishing technology database.

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.

Phased Integrated Laser Optics Technology

Program to develop new laser technology using semiconductor laser diodes and diode-pumped, solid-state lasers for advanced applications. Research is conducted to develop semiconductor laser diodes and diode arrays, integrated optical elements, and control technologies and components. **Contractors:** Many. **Status:** Research, exploratory development, advanced development.

Starfire Optical Range

Range located at Kirtland AFB, N. M., that contains a 1.5-meter telescope and auxiliary beam director with associate laboratories and control facilities for conducting night/daytime experiments. **Contractors:** Rockwell Power Systems, RDA, Contraves, Univ. of Arizona. **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. **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/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, others. **Status:** Basic to advanced research.

Electromagnetic Pulse

Development of EMP hardening methodologies and technologies for aircraft, missiles (strategic and tactical), and satellites. Research in wideband coupling and effects on systems, electronics, and advanced materials. **Contractors:** In-house, UIE, Dikewood, MRC. **Status:** Advanced and applied research.

Electromagnetic Sources

Development of pulsed power sources, microwave generators, and radiating antenna systems for continuous-wave and fast transient microwave sources. **Contractors:** Many. **Status:** Basic to advanced research.

High-Energy Laser Effects

Research into target damage assessments for directed-energy weapon effects and other experiments. **Contractors:** Logicon and RDA. **Status:** In-house basic and exploratory research.

Materials Damage

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 and RDA. **Status:** In-house basic and exploratory research.

Plasmas

Program of research into compact toroids, solid liner implosion applications, microfusion and fusion, and parallel processing applications. **Contractors:** Maxwell Laboratories, Inc., Mission Research Corp., RDA. **Status:** Basic and advanced research.

Satellite Modeling

Research into space nuclear environments, classified satellite descriptions, and DEW satellite lethality. Assessment research centers on analyzing the susceptibility of space satellites to directed-energy and other weapons. **Contractors:** RDA, Boeing, GIE. **Status:** Exploratory and advanced research.

Satellite Signature and Imaging Simulation

Program to develop means of supporting space object identification and mission payload assessment by developing or integrating existing software modules. **Contractors:** RDA, Ball Aerospace, Rockwell Power Systems. **Status:** Exploratory and advanced research.

Satellite Survivability and Vulnerability

Program to provide assessments that help Air Force agencies with survivability and vulnerability guidelines. **Contractors:** RDA, Ball Systems Engineering. **Status:** Exploratory and advanced research.

Shock Physics

Research into techniques in explosives blast and shock effects, explosives hazard reduction (EHR) programs, and survivability and vulnerability of Air Force ground-based systems to explosive weapons effects. **Contractor:** New Mexico Engineering Research Institute. **Status:** Advanced research.

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 SDIO assets in multithreat environments. **Contractors:** Many. **Status:** Basic research.

Phillips Laboratory: Space Experiments Directorate

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:** Source selection.

Brilliant Eyes Cryocooler Technology Experiment

SDIO-sponsored shuttle flight demonstration of a 120° Kelvin cryocooler for Brilliant Eyes intended to validate technology for operational system. **Contractors:** Many. **Status:** Engineering development.

Eagle Dancer

Advanced technology demonstration of sensor capable of detecting, tracking, and identifying/classifying selective airborne and ground targets in near real time. **Contractors:** TBD, in-house. **Status:** Preliminary design.

Electric Insertion Transfer Experiment

Demonstration of a fully integrated electric transfer vehicle in a realistic mission scenario. **Contractor:** TRW. **Status:** Preliminary design.

Lightweight Exoatmospheric Projectile

Development and integration of kinetic-kill vehicle technologies for SDIO and demonstration of KKV state-of-the-art performance through low-cost ground and flight testing. **Contractors:** Boeing, Rocketdyne, Thiokol, in-house. **Status:** Flight testing.

Miniature Seeker 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:** First launch second half of 1992.

Payload Operations Center

Data fusion center for Phillips Laboratory balloon and space experiments where information will be sorted, processed, and distributed to investigators. **Contractors:** Many. **Status:** IOC in 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 Univ., Northeastern Univ., in-house. **Status:** Fabrication.

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 1993. ■

The fabled Aggressor squadrons are history. Only a small cadre remains at Nellis to teach the tactics of potential adversaries.

Demise of the Aggressors

By James Kitfield

Photo by Randy Jolly / Arms Communications

IN EARLY August 1990, sharp-eyed yachtsmen in the Gulf of Mexico were treated to an air show of rare intensity in the skies overhead. A few days earlier, Iraq had invaded Kuwait, and F-15 pilots of the 33d Fighter Wing, Eglin AFB, Fla., were working out in a round of mock aerial combat before heading to Saudi Arabia for the real thing.

Their opponents, drawn from the 64th Aggressor Squadron, were deemed the Air Force's toughest sparring partners, acknowledged experts in Soviet-style tactics and fighter equipment.

Pilots of the 33d would go on in Operation Desert Storm to become the coalition's most prolific killers of Soviet fighters, downing fourteen MiGs and Sukhois (and two French-built Mirages). For the pilots of the 64th Aggressors, however, the training deployment to Eglin was a curtain call. It was the last official road trip for the Aggressors, who were dissolved soon afterward.

Now, two years later, some believe the pilot training that helped produce such stunning success in the Gulf War has suffered as a result. "We've already started to see that the proficiency level of many pilots has started

to drop a little bit," reports Col. Jim Wisdom, director of operations for the Air Force's Red Flag training exercises at Nellis AFB, Nev. "They don't have the same edge."

Formerly, the Aggressor squadrons would visit each fighter wing between two and three times a year on average, says Colonel Wisdom. Now the remnant of Aggressor training resides with a small cadre of "Adversary Tactics" pilots permanently stationed at Nellis, where they support USAF's Red and Green Flag exercises. The operation comprises only thirteen pilots and eight F-16 fighters, which log about 2,400 flying hours per year at a cost of \$540,000.

Increasingly, young Air Force pilots who come to Red Flag have never flown against Aggressor-type opponents. Nor have they heard the detailed debriefings and academic presentations on enemy capabilities that were once a signature operation of the Aggressors.

"A lot of the things we used to take for granted that they understood is brand-new to them, and that has an impact," says Colonel Wisdom. "In two or three years, when the vast majority of young pilots have never re-

ceived dedicated Aggressor training, our ability to exploit enemy weaknesses will suffer.

"It's a shame, because there has never been an Air Force as good as the one we saw in Desert Storm, and there may never be again. If we had to go to war tomorrow, I don't think we'd be as ready."

Emulating the Soviet Style

The first Aggressor squadron was formed in the early 1970s to allow Air Force pilots to train against a dissimilar aircraft and a pilot who would base

his tactics on Soviet doctrine and "style." At that time, nearly all fighter aircraft in the Air Force were F-4 Phantoms. The Aggressors began operations flying T-38 trainers.

Through the 1970s, the program grew until the Air Force had established four Aggressor squadrons—two at Nellis, one at Clark AB in the Philippines to train Pacific Air Forces, and one at RAF Bentwaters, UK, to support US Air Forces in Europe.

Starting in the late 1970s, however, the Air Force began introducing large numbers of different types of fighter aircraft into the inventory. By the late 1980s, the services were flying a variety of fighter aircraft and increasingly training together in joint exercises, and Air Force leadership decided the need for the Aggressors had diminished substantially. The decision to dissolve the Aggressors came in the late 1980s, when the Air Force realized it faced severe budget pressures and a need to cut force structure.

Also contributing to the demise of the Aggressors: The special squadrons antagonized an impressive number of enemies. A number of Air Force officers say that, accurately or not, the Aggressors of the late 1970s and early 1980s had a reputation for hot-dogging in the air and smoke-blowing in the bar.

Observes Col. Edward Clements, currently Nellis's deputy commanding officer and one of the original Aggressor pilots, "Some of the guys that took over the Aggressor squadrons at that time never did catch on to the concept of, 'Be humble, you're just a training aid.' There was a feeling that, on the road, these guys would walk into the bar wearing gold lamé gloves and silver flying suits, striking sparks. Once that kind of reputation starts, it just snowballs."

While purges of Aggressor squadron leadership in the late 1970s and again in the mid-1980s were said to have dramatically improved relations with field units, the snowball gained momentum from time to time through occasional transgressions. Col. Bobby D. Buffkin, commanding officer of Red Flag, recalls one Aggressor pilot maneuvering a brand-new F-5 fighter into an unrecoverable stall and crashing.

On other occasions, says the Colonel, he had to discipline Aggressors who broke ironclad training safety rules at Nellis.



Photo by Randy Jolly / Arms Communications

The roving Aggressor squadrons of the past have been replaced by a small cadre of Adversary Tactics pilots permanently stationed at Nellis AFB, Nev. Above and on the preceding page, an F-16C from the Adversary Tactics unit sports the camouflage paint scheme typical of MiG-29s.

"Unfortunately," says Colonel Buffkin, "the buffoonery of a relative few, coupled with the perception from the old days that they were a bunch of free-lancers who raised too much hell in the bar, cost the entire Aggressors as a group dearly. That's why we dropped the name 'Aggressors' and started saying 'Adversary Tactics'—to give them a new identity."

Like many Nellis observers who see a broad spectrum of Air Force units rotate through on an annual basis, Colonel Buffkin believes the demise of the Aggressors has had a negative impact on training. "As a whole, the Aggressors were some of the best fighter jocks and best instructors I've ever flown with," says he. "Fighter pilots need to confront different airplanes, different tactics, and different problems to keep their minds working and inquisitive about their own tactics."

He worries, for example, that the F-15 drivers from Eglin who fought in Desert Storm won't be "quite as sharp" in the next conflict as they were for that war.

The Red Baron Study

To understand why Air Force leaders believe the Aggressor squadrons were expendable and why others feel their contribution to training is sorely missed, one must examine why they were formed in the first place.

In action during the Vietnam War, Air Force pilots registered a relatively poor two to one kill ratio against en-

emy fighters, compared to a ratio of about fifteen to one in the Korean War, a conflict in which many of the pilots still had World War II combat experience. In an effort to explain the poor showing, the Air Force conducted its famous Red Baron study, interviewing all of its pilots who fought air-to-air engagements in the war. When an interim report was released in 1972, it called attention to the Air Force's relative lack of air-to-air combat training, especially the ban on training between "dissimilar" aircraft.

"Not one pilot we talked to who was shot down ever saw the aircraft that hit him," says Lt. Col. Lloyd "Boots" Boothsby, USAF (Ret.), who headed the Red Baron effort and later commanded the first Aggressor squadron. "We also believed that not only were our pilots subconsciously looking for the same type of aircraft that they trained against, but they also expected the enemy to fight the same way. So our answer was that Air Force pilots needed to scrimmage against someone with aircraft and tactics similar to the Russians'."

From the beginning, the Aggressors' charter was to become the undisputed experts on Soviet tactics and capabilities. They would use that expertise to brief fighter pilots on the threats they faced and to fashion themselves into a hard, Soviet-style sparring partner. The problem was that the intelligence organs holding data on Soviet capabilities jealously guarded that informa-



The Aggressor squadrons were formed to fill the Air Force's need for dissimilar air combat training. This scene, captured at Nellis during Red Flag in the Aggressors' heyday, of an A-10 Thunderbolt II and an Aggressor F-5 underlines the starkness of the dissimilarity.

tion. They were also particularly reluctant to share it with fighter pilots who might very well be shot down behind enemy lines in a war.

"Breaking down those 'green doors' and getting that information was like pulling teeth," says Colonel Clements. "I wish I had a nickel for every trip I took around the country, demanding information about enemy communications exploitation or hardware capabilities."

To gain access to that information, all Aggressors had to get higher security clearances than pilots were normally allowed. Those clearances probably ended any chance that the original Aggressors would fly in combat in any future conflict—no small sacrifice for aviators who were nearly all combat veterans from the Vietnam War.

Shocking Information

With backing from the highest Air Force levels and a proven "need to know," the Aggressors became familiar with most of the known threat information available at the time. They were shocked by what they learned.

"We discovered there was a lot of information about MiG capabilities and engagements in Vietnam that was known during the war but wasn't shared with the guys in the cockpits, out of security concerns," reports Colonel Clements. "We probably lost some pilots because of that."

Thus the Aggressors came to believe that one key reason for their

existence was to break down barriers to the US intelligence "take," sanitize it to the extent necessary, and get it into the training program.

Over the years, the Aggressors' role as academic experts on the threat grew. Each Aggressor pilot was assigned an area of expertise. During a visit to a fighter wing, he would brief this aspect in depth to operational pilots. Some became authorities on the background and training of the Soviet pilot. Others talked about threats in specific theaters of particular relevance

to a certain wing. One Aggressor would lecture on the Soviet ground-controlled intercept system, and others would lecture on formations, tactics, and weapons capabilities.

During the 1980s, when the Soviets fielded a number of new fighter aircraft, those lectures helped convince Air Force pilots that their opponents weren't exactly ten feet tall.

Previously, says Colonel Wisdom, "Our guys would read articles . . . saying the MiG-25 has got this incredible combat radius, that it can fly Mach 3 and shoot down ten guys in one pass, and all these inflated capabilities that were taken from Soviet political statements meant to justify their defense budget."

The Aggressors would set pilots straight. "They'd sit our pilots down and say, 'OK, the MiG-25 really does not have this combat radius, it can only fly this fast for any length of time, and, by the way, it's a real lead sled when it comes to maneuvering.' And in today's dynamic and unstable environment, getting behind those [intelligence restrictions] to learn about the real capabilities of potential threats out there is more important than ever, because the door could very well shut again."

The Last Toehold

With the Aggressors gone, the Adversary Tactics cadre at Nellis is the operational Air Force units' last toehold in the intelligence community.



The specialized training provided by the Aggressors gave US pilots an edge that helped them clear the skies over Iraq, but future generations of Air Force pilots won't have that advantage, and the lack is already evident.



Colorful paint schemes have always been the mark of the Aggressors. Unfortunately, their colorful reputation extended beyond their aircraft, contributing to their demise. Their replacements in Adversary Tactics (above) have kept the paint schemes but are working to tone down the attitude.

After Iraq invaded Kuwait, for example, Aggressor officers flew to France to receive classified briefings on the capabilities of the French-built Mirage F1, a mainstay of Iraq's arsenal, and its weapons load. They emulated the F1 in special Desert Flag exercises held in the fall of 1990 for pilots deploying to Saudi Arabia.

In terms of future threats, the Adversary Tactics shop at Nellis is still the final bridge between the intelligence and fighter pilot communities.

According to some Adversary Tactics pilots, the waning exposure of pilots to detailed threat briefings already is beginning to show. "When pilots saw the Aggressors two or three times a year and were told, 'Here is your potential adversary, and here's what he can do to you,' they understood the threat," says one Adversary. "Now we see pilots coming through Red Flag, and they react with surprise when we tell them about the threat. And I'm thinking, 'Holy cow! That's basic stuff that we used to take for granted that they understood.' But they're not exposed to it anymore."

Many pilots in the operational wings concede that such exposure is one of the things they miss most, now that there are no more Aggressor "road shows." "Perhaps the biggest contribution the Aggressors made was that they always stayed current on the threat and could emulate what a flight of four Fulcrums or Floggers might do," says Lt. Col. Bill Thiel, commander

of the 58th Fighter Squadron at Eglin. Otherwise, he says, it's easy for an operational squadron to stagnate in its training. "The tendency is to gravitate to the things that worked yesterday, and by bringing you the latest thinking, the Aggressors made you think about what you might try tomorrow."

The more obvious Aggressor role of providing "dissimilar aircraft" training probably peaked in importance around 1980. At that time the Aggressors were mostly flying F-5E Tiger IIs to emulate small, agile MiG-17s and

MiG-21s, and the operational Air Force was still primarily flying F-4 Phantoms, with a smattering of new F-15s.

Those who were there say that it was around this time that institutional resentment of the Aggressors reached its zenith. While operational units were scrambling for money to get into the air for training, Aggressor pilots were routinely flying thirty to forty sorties each month, most involving intense air-to-air training. Secondly, in close-in combat, the F-4 was no match for the F-5 in terms of maneuverability, a fact that caused quite a bit of tension.

Hurt Feelings

"It wasn't that the F-4 pilots did anything wrong," says a former Aggressor, "but you had to fly that airplane perfectly, or you were in real trouble against an experienced Aggressor in an F-5. So, at one time or another, most of our pilots had their heads handed to them by an Aggressor, and there were a lot of hurt feelings out there. By the late 1980s, a lot of those pilots had become senior commanders."

By the mid-1980s, with the Air Force fighter inventory expanding and gaining significant numbers of F-15s and F-16s, the need for a dedicated group of trainers flying dissimilar aircraft was evaporating. Because of the requirement to emulate the more sophisticated, beyond-visual-range radars and missile capabilities of a new generation of Soviet aircraft, the Aggressors gave up their F-5s for new F-16s.



The Aggressors were the designated experts in enemy tactics. To gain access to intelligence data, they got much higher security clearances than other pilots did, which meant forfeiting their chance to see combat in any future conflict.

"When we got all these different kinds of airplanes," explains Colonel Clements, "one of the key reasons for having the Aggressors kind of went away."

The idea that pilots needed to train against different kinds of aircraft had been thoroughly ingrained into Air Force thinking by that time, and dissimilar aircraft training continued to be a staple. "Still," says Colonel Clements, "when you came rolling into a base with eight Aggressor F-16s painted funny colors, it was always easy to focus the pilots' attention on the problem at hand. I do worry that we've now lost that."

With the Aggressors gone, day-to-day training responsibilities largely fall to a squadron's weapons officer. Usually an elite graduate of the Air Force's Fighter Weapons School, this individual probably trained against the Aggressors while undergoing the stringent course at Nellis. In trying to duplicate that kind of training environment back at home base, however, he faces problems.

First is the amount of time needed to bring a new pilot up to a level of proficiency that qualifies him for advanced training. With the trend toward more complex, multirole fighters, say experts at Nellis, much of a young pilot's time and a squadron's training curriculum is taken up just emphasizing the fundamentals and teaching the capabilities of Air Force aircraft and weapon systems.

Visits by experienced Aggressor units a few times a year were a useful way to measure a squadron's overall level of training. They also served as a reminder that the capability of enemy aircraft and weapons must be considered an integral part of the air-superiority equation.

"It's one thing to read intel reports about what the threat can do to you at thirty miles or twenty miles, and it's another to be flying and see it in blips on your radar scope," says Colonel Thiel. "That expertise on the threat, combined with the ability to replicate it in the air, was something we lost with the Aggressors. Whether we can afford it, or even need it as much, given the world situation, is for someone way above my pay grade to decide."

Little Dissimilarity

A second constraint is money. Trainers may recognize the need to practice



The Aggressors had to hang up their helmets, casualties of a high-handed reputation and a changing world that made them seem more expendable. Though the training provided by the Aggressors is missed, their successors are working hard to keep the idea and capability of dissimilar training alive.

against other squadrons with dissimilar aircraft, but they may find that most of their money is consumed going through the basics at the base. "We've been getting a lot of feedback from units that pass through Red Flag that they just aren't getting a lot of dissimilar training anymore," says Colonel Wisdom. "In many cases, the last time they flew against dissimilar aircraft was when they were out here for a Red Flag exercise."

Experts at Nellis argue that even when the units conduct dissimilar training, it is a different experience from an Aggressor rotation. When F-15 and F-16 squadrons fly against each other, for instance, both will be trying to maximize their own training and neither will emulate Soviet tactics and weapons capabilities.

"Because we're not there for our own training, but rather to provide training, we'll present the pilots with a tactical problem, and if we see they can't handle it we'll back off a little," says Lt. Col. Mark Dulaney, head of Adversary Tactics at Red Flag. "If they start doing better, then we'll step it up a notch in difficulty. So we pride ourselves on how well we present a picture of the enemy, never on how many of them we go out and kill."

Privately, Adversary Tactics pilots say that the lack of dissimilar training at the squadron or wing level is evident in a certain tentativeness that they have not seen before. "It's clear to me that some wings are backing off on home base training, because their pilots are flying more conservatively," says one Adversary. "You can see it in how they react to situations at low altitude or how they employ their ordnance. They're not as aggressive as they were before."

No one believes that the Aggressors will be back in force anytime soon. Behind the door of the Adversary Tactics room, with its distinctive Soviet lettering, officers hope they are keeping alive an important idea and capability. In the meantime, they have adopted a new motto: "Think humble. Be humble." It applies equally to the airspace around Nellis and to the environs of the Officers Club.

"My hope," says Colonel Buffkin, "is that one day a four-star general will walk through here and see the role our Adversary Tactics guys play, and say, 'Damn! We lost the bubble. We need more of this capability.' Because it's true. For all their ups and downs, the Aggressors were dearly needed." ■

James Kitfield is a defense correspondent in Washington, D. C., and winner of the 1991 Gerald Ford Prize for Defense Journalism. His most recent article for AIR FORCE Magazine was "3-D Sound and Other Innovations" in the December 1991 issue.

The Air Force's top enlisted man wants a fair deal for the troops—those who stay and those who go in the drawdown.

The Airman's Advocate

By Peter Grier

FOR all the Air Force enlisted men and women worried about their future as the force shrinks in the post-cold war era, Chief Master Sergeant of the Air Force Gary R. Pfingston offers this pledge: He will push as hard as he can to make sure they won't have to leave the service against their will.

That's only fair, he says, considering that this is the first time the US has had to reduce a military force composed entirely of people who volunteered to join in the first place. "We've been an all-volunteer *in* force, and we need to do everything we possibly can to be an all-volunteer *out* force as well," Chief Pfingston declared recently in an interview in his Pentagon office.

It's no accident if that sounds like somebody who's an advocate for the airman. Looking out for the welfare of the ranks is Chief Pfingston's job. As the Air Force's top enlisted man, he travels constantly, hearing the daily concerns of the men and women in the field. Back in Washington, he communicates those concerns to the Air Force's senior leaders.

He's the tenth Chief Master Sergeant of the Air Force, and his tenure has been an eventful one. The tour

began in August 1990, just in time for the first rumblings of the big crackup in the Soviet Union, and proceeded through the Persian Gulf War, the eventual demise of the Soviet Union, and the massive Air Force restructuring these events had a hand in bringing about.

When Chief Pfingston first began traveling around to listen to enlisted personnel, the primary question was

already "What is the future of the Air Force?" That's still the number one category. "I don't see where the concerns have really changed that much in the past couple of years," says Chief Pfingston.

It's a basic question, but one that has four or five different parts. What is the future as it relates to career opportunities? Promotion? Retirement? "The questions are still pretty much all the same," says Chief Pfingston.

The context has changed, of course. In the dramatically changed world of today, the Air Force faces different requirements and must change accordingly.

Great Uncertainty

That's a point that Chief Pfingston says he communicates to enlisted personnel suddenly faced with a career path more uncertain than they had planned. The political structure determines the degree of security the US needs. After that, says the Chief, it's the Air Force's job to take the money obligated and give the US the most dynamic air arm money can buy.

He says that, yes, people who several years ago may have been looking at an Air Force career are now being required to rethink their options.

"It's now paramount that the Air Force do everything possible to ensure that we are absolutely up front and fair with all those dedicated professionals—and I am very comfortable that we are," he says.

He says that, so far as he knows, this is the first large military draw-down that hasn't principally involved demobilization of conscripts. The key issue for the enlisted ranks, according to Chief Pfingston, is to keep the whole concept of the force in balance. In making reductions, he says, planners should look at grades, year groups, and specialties and make sure they have the right mix of these things. Otherwise, cuts could hit one category harder than another, leading to an overload of high-ranking NCOs, say, and fewer promotion opportunities for those further down the ladder.

"How do you come about? Who do you focus on retraining, and who do you focus on allowing to leave? That obviously is a humongous process to keep your arms around," says Chief Pfingston.

The Air Force cannot reduce its numbers and remain effective with a business-as-usual organization, ac-

ording to the Chief. That's why the big command reorganization of this year was important, as is the shift to a new composite wing structure.

Chief Pfingston says he's hearing that the young people of the Air Force are beginning to understand what's being done, and why, despite the uncertainty it holds for them.

"I'm very excited, though not with the fact that people are having to rethink their careers," says the Chief. "I'm excited that we are in the process of building a new Air Force. We're going to get better because we're going to be organized, streamlined, focused on really what our no-kidding combat responsibilities are."

A Scary Schedule

There may be a silver lining for any Chief Master Sergeant of the Air Force in a reorganization that's causing some service bases to close. With fewer installations out there, the job's travel might be cut back a bit.

Chief Pfingston admits his travel schedule is "scary." He says he's on the road probably three-quarters of the time. This weekend, it's the New Hampshire Air National Guard; early next week, Reserve units in New York; after that, who knows?

At latest count, the current Chief has traveled to more than 100 major Air Force locations, many more than once. He's made at least half a dozen major overseas trips. He spends twenty-four to thirty-six hours on a base at any one time, speaking to and meeting with groups as small as two airmen and as large as 6,000 people, depending on the size of the base.

He tries to balance his time among skills, ranks, and organizations—visiting with airmen as long as he visits with senior NCOs, for instance, and going to the security police as well as the flight line. He tells people what's going on with their Air Force and gives them an opportunity to talk with him about whatever they want.

"I'm not an inspector. I'm not the IG [Inspector General]. I'm not the complaints NCO," he says. "I just try to devote as much time as I can to be available to the majority of the folks on the installation."

As the airman's advocate, he gets

an earful. What he's heard over the years puts two things at the top of his priority list, after concerns about downsizing: quality of life and compensation.

With the force shrinking and good people becoming worried about their opportunities, quality of life will be even more important in retaining the personnel the Air Force wants to keep. In that regard, Chief Pfingston says he's particularly focused on providing adequate housing for enlisted men and women—single and married alike.

He thinks it's important that the service try to provide a single dormitory room for every unmarried member of the enlisted ranks, though it's still a ways from doing so. Renovation of often-creaky military family housing needs to continue.

"I think it's time that we stepped up to providing as much dormitory privacy for our enlisted airmen and NCOs as we can. We need to step up to providing military family housing that is adequate to the needs of the enlisted force," says Chief Pfingston.

The Chief says he particularly worries about housing allowances. "We have some areas of the US where our enlisted personnel are stationed that are very-high-cost-of-living areas. Are we doing everything we possibly can for them?" he asks.

Chief Pfingston has been in the service for more than thirty years. Among his postings have been Thailand, Plattsburgh AFB, N. Y., Lackland AFB, Tex. (his years as a training sergeant were capped when he became commandant of the Military Training Instructor School in 1979), and Guam.

He says he found something good about every place he's gone with the Air Force. Even Guam? "I enjoyed Guam because I like warm sunny weather where you can get out and do yard work and play golf," he says.

Wherever he's been, he's made friends and has become increasingly impressed by the work of the young people under him, he says. "I see an awful lot of very young people doing incredible things. We need to do everything within the realm of possibility to provide for them: quality of life, equipment, working conditions, and compensation." ■

Peter Grier is the Washington defense correspondent for the Christian Science Monitor and a regular contributor to AIR FORCE Magazine. His most recent article, "The Other Industrial Base," appeared in the July 1992 issue.

The heritage began at San Juan Hill with Sergeant Ivy and his observation balloon.

Photo by Randy Jolly / Arms Communications

The Enlisted Airman

By Bruce D. Callander

FOR US troops, the taking of San Juan Hill would have been far tougher without the help of simple aerial reconnaissance—and the resourceful enlisted man who made it possible. Apart from some largely unsuccessful experiments with balloons during the Civil War, Sgt. William Ivy was the US Army's first real aerial technician, an enlisted jack-of-all-trades of the type that for decades has served as the backbone of US air operations.

Sergeant Ivy was working as a commercial stunt balloonist when the Signal Corps recruited him to take charge of its single observation balloon. When that one was wrecked, Sergeant Ivy and his wife made another. It was the only one in the inventory when the Spanish-American War broke out in 1898.

When Sergeant Ivy's balloon arrived in Spanish-occupied Cuba, it had been damaged by the heat and its gas-generating equipment had been left aboard ship. Sergeant Ivy patched the air bag, filled it with gas from portable cylinders, and trained his inexperienced crew members to handle it. He then went aloft with one of his officers and located the Spanish fleet, which US warships promptly sent to the bottom.

The next day, the crew moved the fully inflated balloon to the vicinity of San Juan Hill, where the soon-to-be-famous battle was already under way. Observers went aloft within range of enemy guns, found a new trail for attacking US forces, and directed US artillery fire. By day's end, Sergeant Ivy's balloon had been shot up beyond repair, but it had done its work.

So had Sergeant Ivy. In doing so, he had opened up an entirely new military career. Though the Army had used balloons in the Civil War, they were made and manned by civilian contractors. The few soldiers detailed to help did little more than follow orders, hold ropes, and worry about getting their pay and rations. Sergeant Ivy was different. He could personally keep his craft flying and, in a pinch, rebuild it.

With aeronaut William Ivy—and the largely self-taught mechanics who followed him—the enlisted force began a long, painful process that has made it clearly indispensable to today's Air Force.

Sergeant Ivy left service after the Spanish-American War, but the Army trained others to handle and repair its balloons. When the Signal Corps cre-

From the Army's first enlisted balloonist to the more than 400,000 men and women in the Air Force's enlisted rolls today, the enlisted airman has been an essential part of US airpower. Here, SSgt. Craig Dock, an instructor gunner with the 20th Special Operations Squadron, Hurlburt Field, Fla., preflights his MH-53 Pave Low helicopter. Sergeant Dock's crew won this year's Mackay Trophy for a daring rescue during the Persian Gulf War.



ated an Aeronautical Division, two ground crews became its enlisted corps. Pfc. Joseph Barrett, not much of a role model for future airmen, deserted. Cpl. Edward Ward stayed on and later headed the ground crew of the Army's first dirigible. When officers were not available, he flew it.

Enter the Flying Machine

By 1910, the Army had acquired a heavier-than-air flying machine, which it sent to San Antonio with one officer pilot, one civilian mechanic, and several enlisted former balloon handlers. On March 2, 1910, Sgt. Stephen Idzorek and Cpl. Vernon Burge cranked the props and Cpls. Herbert Marcus and Glen Madole balanced the wings as the flyer moved down the starting rail for its first operational flight. Later that day, the crew patched up the machine after the first of many crash landings.

Like future mechanics, these enlisted men became innovators and scroungers. They recruited the local post blacksmith to forge replacement aircraft parts, the post tailor to mend the plane's fabric, and the plumber to supply fittings for fuel lines. They equipped the plane with a safety strap and wheels from an old farm cultivator. In this way they kept the plane flying for more than a year.

Flying then shifted to College Park, Md., and most of the mechanics went along. Sergeant Idzorek helped the Army test a new bombsight. On one

flight, he scored better than the sight's inventor. Marcus, now a sergeant, headed ground crews of planes used to direct artillery fire. Corporal Madole helped train new mechanics.

Among the newcomers was a former artilleryman, Cpl. Frank Scott, who became chief mechanic on a Wright machine. Eager to make a flight, he talked a newly rated pilot into taking him up. Ten minutes into the flight, the plane crashed, and Scott (for whom Scott AFB, Ill., is named) became aviation's first enlisted fatality. He would not be the last.

By then, other soldiers were flying, not just as passengers but also as pilots. Corporal Burge had left Texas to become a mechanic on a training plane sent to the Philippines. When the Army faced a lack of officer volunteers, Corporal Burge became the Army's first enlisted pilot. Later, Sergeant Marcus and other mechanics qualified. Sgt. William Ocker bartered his off-duty work at a civilian flying school for flying lessons. He later became a pioneer in instrument flying.

Sergeant Idzorek also took some flight training. He did not become a pilot but, along with Burge, Marcus, and Madole, was rated an "aviation mechanic." That status allowed mechanics to fly and draw fifty percent more pay, as pilots did. Enlisted men with either rating still found it hard to log flight time, however, and some paid the government for remaining service and left for civilian jobs. Cpl.

William Lamkey bought his discharge to fly in Mexico for Pancho Villa.

Corporal Lamkey picked the wrong side. When Villa raided US border towns in 1916, Washington launched a "punitive" action, and the 1st Aero Squadron joined it with eight planes, ten pilots, and eighty-two enlisted men. Pilots and ground crews had their hands full. Props delaminated in the heat, and planes were tattered by storms and rifle fire. Enlisted mechanics scavenged the wrecks to keep the survivors flying.

A Growing Enlisted Force

One year later, the United States entered World War I. The Aviation Section still had barely 1,000 enlisted men, but it was growing. It recruited lumbermen to cut spruce for airframes and construction workers to build new airfields. It enlisted civilian mechanics and trained more at overseas bases and in US factories. By war's end, it had graduated some 14,000 mechanics and countless other enlisted specialists.

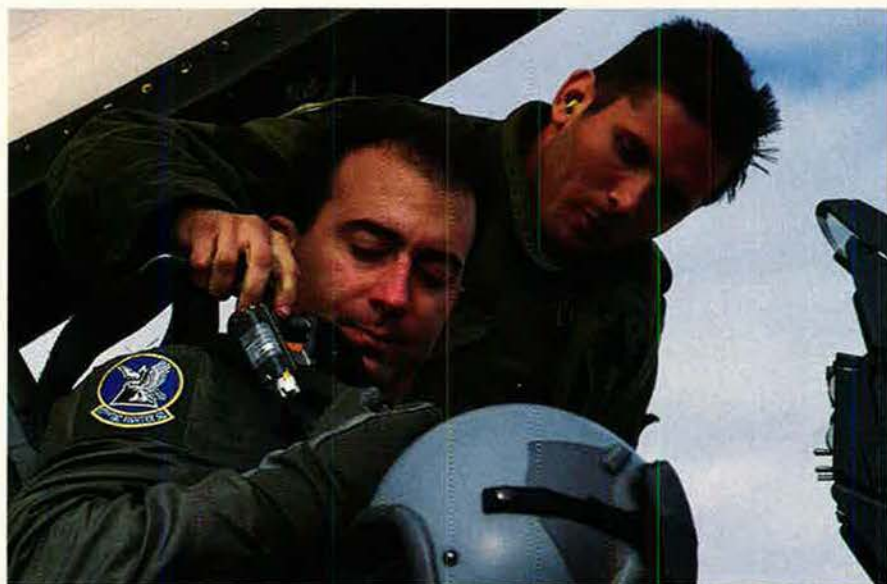
With no American combat planes available, ground crews had to learn the workings of British, French, and Italian types. When US-built de Havillands finally arrived, most had to be overhauled extensively. Guns, bomb racks, radios, and gunsights all had to be reworked to fit the planes.

Enlisted mechanics escaped the rigors of trench warfare but faced other hazards, including strafing attacks. Because there were not enough officers, a few enlisted men flew combat missions as observers and gunners. Sgts. Fred Graveline, Albert Ocock, and Philip Smith each claimed at least one aerial victory, and Sgt. Frank Neal died in an air battle.

After the 1918 Armistice, the Air Service joined the free-for-all of what later would be called the Golden Age of Flight. Parachute jumping became a fad, particularly in the enlisted ranks. SSgt. Gilbert Shoemaker, a jump instructor, demonstrated the art for a Pathé newsreel. Sgt. Encil Chambers topped him by opening one chute at 4,000 feet, cutting it loose, and landing with another. When Pvt. Earl W. Moon parachuted into the Chesapeake Bay and drowned, however, the Army began to tighten up.

For a time, dirigibles looked promising. The Army bought a 410-foot Italian airship. MSgt. Harry Chapman was among the forty-five men aboard

Photo by Randy Jolly / Arms Communications



Going back to 1909, when the US Army acquired its first heavier-than-air flying machine, the relationship between technician and pilot has been characterized by respect and interdependence, despite the vagaries of rank and pay structures.

when it crashed and exploded. He survived and rescued several others, but sixteen enlisted men died, and the days of the big Army airships became numbered.

Winged aircraft had their own problems but kept breaking records. On a formation flight from New York to Alaska and back, Sgt. Edmund Henriques served as mechanic on the lead de Havilland and flew it while the pilot handled on-board emergencies. On the same flight, SSgt. James Long straddled the tail of his nose-heavy plane on landings and was thrown off at least once.

When four big Douglas biplanes began a flight around the world in 1924, SSgt. Alva Harvey was mechanic on the lead ship. The plane crashed in Alaska, and Harvey and his pilot hiked to safety. Later, a second plane ditched in the North Atlantic, but SSgt. Henry Ogden and his pilot were rescued and finished the flight in a reserve ship.

The Flight of *Question Mark*

In early 1929, SSgt. Roy Hooe joined four pilots aboard the three-engine *Question Mark* for a week-long test of aerial refueling. He helped transfer fuel and serviced the engines in flight from catwalks along the fuselage and wings. Later, the Air Corps used midair refueling during maneuvers, and Sgts. Robert Brewer and Wilbur Simmons flew in the tanker and became forerunners of today's boom operators.



Photo by Hans Halberstadt / Arms Communications

Most flight line and technical specialties were closed to the Air Force's first enlisted women. Gradually, more fields were opened to them, and their career opportunities improved. SrA. Elizabeth VerSteeg is an Air Traffic Controller with the 27th Fighter Wing at Cannon AFB, N. M.

Within months of *Question Mark's* flight, however, the stock market crashed and the Air Corps's budget plunged. Service pay was frozen, then reduced. Enlisted men assigned to run camps for the new Civilian Conservation Corps bristled when they learned CCC workers were getting \$30 per month. Army privates were drawing only \$18, noncoms not much more.

To make things worse, the Army gave many of its newly graduated pilots reserve commissions but called them to duty as NCOs. MSgt. Maurice

Beach flew transports and eventually regained his commission and commanded a troop carrier wing. Others quit in disgust. Sgt. William McDonald and SSgt. John Williamson stayed long enough to fly with an aerobatic team, then bought their discharges to become flight instructors in China. The team's leader joined them there later to form the Flying Tigers.

Other peacetime flyers and ground crews were on hand when the Japanese attacked Pearl Harbor. Some were aboard the B-25s of the famous Doolittle Raid that struck back at Japan four months later. After hitting his target, the lead plane's bombardier, Sgt. Fred Braemer, bailed out over China. Sgt. David Thatcher, injured when his plane ditched, swam back for the medical kit, then helped other crewmen escape. Others didn't make it. Cpl. Leland Faktor died bailing out, Sgt. Donald Fitzmaurice was killed in a crash landing, and Sgt. Harold Spatz was captured, given a mock trial, and executed.

The mission helped spur enlistments. To handle the flood, the Army Air Forces opened thirty new training centers, leased sixty-eight civilian mechanics schools, and turned factory shops and civilian hotels into classrooms. In 1943 alone, it graduated some 91,500 new gunners and more than half a million technicians.

This time, enlisted men not only serviced planes but also flew aboard them by the thousands. Four of them



Photo by Randy Jolly / Arms Communications

Enlisted airmen have become essential partners in an increasingly technical force. Sgt. Larry M. Matson is a combat control operator with the 23d Special Tactics Squadron, 1st Special Operations Wing, at Hurlburt Field.

earned the Medal of Honor, a decoration only officers had received in World War I. Sgt. Maynard Smith earned his on his first mission. When his plane was hit and caught fire, he alternately fought the flames, fired his guns, and nursed the wounded crewmen until the ship made it home [see "Valor," April 1984, p. 120]. TSgt. Forrest Vosler, wounded and almost blind, fixed his damaged radio to send out a Mayday before his plane ditched and then helped his wounded tailgunner into the dinghy ["Valor," March 1983, p. 128]. SSgt. Archibald Mathies helped fly his crippled plane back to England with a dead copilot and unconscious pilot but was killed trying to land it ["Valor," August 1985, p. 106]. All three men flew with Eighth Air Force in Europe. Later, in the Pacific, SSgt. Henry Erwin earned his medal for throwing a burning phosphorus bomb from his B-29 with his bare hands ["Valor," October 1989, p. 91].

Other enlisted flyers received lesser medals, earned fast promotions, and went home after short but hairy combat tours. Soldiers in other branches resented the teenaged "flyboys," but the resentment was not shared by the ground crews who sweated their return from missions, patched the battle damage, and lifted the dead and wounded from their planes.

This army of mechanics, armorers, munitions handlers, and other technicians of all sorts nursed not only bombers but also fighters, transports, cargo



USAF photo by SSgt. Vern McQueen

SSgt. Mike Brant and SrA. Rod Bush, fire fighters at Wurtsmith AFB, Mich. (a former SAC bomber base), debrief after a training exercise. The Air Force boasts nearly 6,000 members in Fire Protection, one of fifty-some USAF enlisted specialties spanning integral services from C³ Operations to Sanitation.

planes, and troop carriers. Freezing on Arctic flight lines and sweating in jungle clearings, they changed thousands of engines, patched millions of flak holes, and turned scrap heaps into flyable machines. Like the crew of the Army's first flyer, they begged, borrowed, and, when the occasion demanded, stole to keep their planes flying.

New Service, New Ranks

When it was over, most of those who served in the Army Air Forces went home. Those left became charter

members of the United States Air Force.

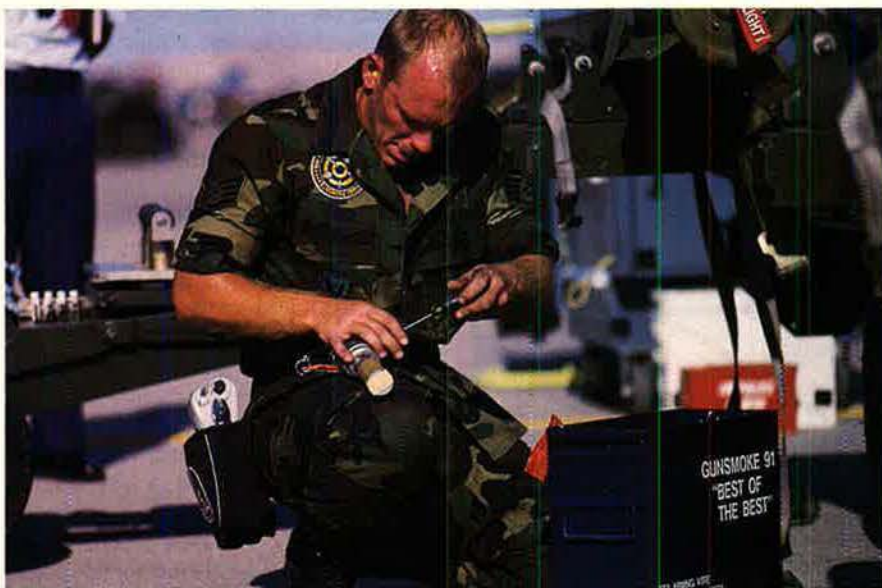
Things got off to a rocky start. The enlisted corps, top-heavy with wartime rank, was renamed and reorganized. Buck sergeants (E-4s) and corporals (E-3s) lost their NCO status and became airmen first and second class. Pfc. (E-2s) emerged as airmen third class, and privates became basic airmen. None liked the changes, least of all those whose titles suggested they were less than first-class troops.

The new catchall term "airman" did not sit well either. It was intended to be the Air Force equivalent of "soldier," but its meaning quickly became muddled. An airman could be male or female and anything from a member of the overall force to a person in a specific enlisted grade. The term also was used like the British phrase "other ranks" to mean nonofficers or, within the enlisted ranks, to distinguish between NCOs and lower grades.

Nomenclature might have been less of an issue if enlisted promotions had not slowed to a trickle. Under the system inherited from AAF, USAF still let squadrons promote against unit vacancies. An airman's future thus depended less on his talents than on being in the right place at the right time and, in some cases, knowing the right people.

The Korean War opened new opportunities, but the Air Force repeated the mistake of overpromoting against what it expected to be continuing

Staff photo by Guy Aceito



SSgt. Mark D. Hosier of the 336th Fighter Squadron, Seymour Johnson AFB, N. C., checks bomb fuzes during Gunsmoke '91. Gunsmoke awards go to the top crew chief, top maintenance team, and top weapons load team.

growth. When the buildup petered out, so did the promotions.

In other respects, enlisted life in the new force was not greatly different from that in the Old Army. Years after the Air Force was established, lower-ranking enlisted men still pulled KP and other unenviable details. They needed passes to leave base and their commander's permission to marry. Those already married were not trusted with their quarters allowances; the money was sent to spouses. Short-notice moves were common, and airmen had little say in assignments they drew or skills they entered.

When enlisted groups tried to organize and lobby for improvements, the Air Force squelched them, fearing it would have to deal with some kind of airmen's union. When airmen began to write their congressmen, the Air Force took their names but rarely acted on their complaints. It was not until sizable numbers began to vote with their feet and USAF faced a hemorrhage of experienced manpower that the Pentagon and Congress moved to give the enlisted force a better shake.

Over the years, the promotion process was centralized and geared to USAF-wide vacancies. A new point system reduced favoritism and gave contenders a fairer chance. KP and other details were given to civilian contractors. The enlisted grades were renamed not once but several times, and airman skills were redefined to provide clearer career opportunities.

To channel away some of the enlisted resentment, USAF created the post of Chief Master Sergeant of the Air Force and installed CMSgt. Paul Airey to act as advisor to the Air Staff. Privately, leaders expected him to be no more than a ceremonial figure who could answer the gripe mail. Over the years, however, Chief Airey and his successors proved themselves able spokesmen for the enlisted ranks.

Also over the years, a major change took place in the rank structure. Where the Old Army had used a few top noncoms to whip the troops into shape, the new Air Force discovered it could use thousands as supervisors and managers and even commanders. The gap



Photo by Paul Kennedy

Amn. Amy Blasingame takes instruction from SSgt. Fred Matos of the 3790th Medical Services Training Group at the Training Center at Sheppard AFB, Tex. The 3790th trains enlisted airmen in biomedical sciences, dentistry, health service administration, medical readiness, medicine, and nursing.

between the NCO ranks and the lower grades widened as the Air Force began using enlisted members in the new E-8 and E-9 grades in slots once filled by warrant officers. Under the three-tier system, the divisions grew sharper and the enlisted ranks gradually gained the career equivalent of the officer grade structure.

Big enlisted bomber crews disappeared, but new flying positions emerged for airmen, who became loadmasters, refuelers, and technicians aboard flying command posts. In Vietnam, A1C John Levitow earned the fifth enlisted Medal of Honor for his actions aboard a gunship [see "Valor," October 1984, p. 108].

Essential Partners

The lot of the enlisted force changed most dramatically on the ground. After decades of thinking of them as little more than cheap, semiskilled labor, the senior leaders of the Air Force came to see airmen as essential partners in an increasingly technical force.

For two groups, that recognition came late and was hard won.

Through the first half of the twentieth century, black soldiers served in segregated units, mainly as manual

laborers. It was not until World War II that AAF grudgingly trained some as pilots, mechanics, and technicians. Those few had an enviable record both in combat and on the line, but it was another five years before the services desegregated. Even then, a full generation of blacks endured various kinds of discrimination before the Air Force launched serious equal-opportunity programs.

For women, progress has been even slower. The new Air Force rejected the Army practice of isolating females in a separate corps and called them "Women in the Air Force." In fact, however, it offered them little more than traditional women's jobs and limited careers. Female applicants had to submit full-length photographs, and the most attractive became receptionists or hostesses on VIP flights. Other flying jobs and most flight line and technical specialties were closed to them. Under pressure from women within the force and without, the Air Force gradually opened more fields to women and improved their career opportunities, but the debate over their place in the force continues.

With the current drawdown and reorganization, the size, shape, and use of the enlisted force is bound to change still more. Whatever happens, however, airmen face a brighter future than did those detailed to hold the ropes of the Army's first dirigible and keep its first flying machine together for yet another flight. ■

Bruce D. Callander is a regular contributor to AIR FORCE Magazine. Between tours of active duty during World War II and the Korean War, he earned a B.A. in journalism at the University of Michigan. In 1952, he joined Air Force Times, becoming editor in 1972. His most recent article for AIR FORCE Magazine, "The Human Side of the Drawdown," appeared in the July 1992 issue.

What can be achieved—and at what price—by building advanced technology systems in very small numbers?

Prototypes

THE past is gone," says the president of the Lockheed "Skunk Works," Sherm Mullin, slumping in a chair in shirtsleeves and loosened tie. "It used to be a given that there would be two tactical fighter lines spewing out airplanes and two tac missiles in development. Then you wake up one morning, and everything has been knocked into a cocked hat."

Faced with falling budgets, the Pentagon unveiled a new defense strategy in August 1990, premised on keeping a small base force ready for regional warfare. Two years later, as Mr. Mullin's words suggest, Washington's strategy for developing and producing weapons to equip this force—and for preserving the means to reconstitute a large one—remains murky.

The highly controversial heart of the new approach to acquisition is a plan to place heavy emphasis on the prototyping of weapons—largely at the expense of production. The key issue is not whether prototyping, as such, is a good idea; all agree it is, for certain purposes. The issue, rather, is how it will affect the defense industrial base. Can prototyping provide an adequate substitute for volume production?

By Bruce Auster

On this score, military and industry leaders are skeptical, to say the least. They warn that even a large prototyping program cannot support the desired level of industrial capability. Retired Gen. Robert T. Marsh, former head of Air Force Systems Command and chairman of AFA's Science & Technology Committee, speaks for many with this assessment: "If there is an expectation that the prototyping scheme could sustain the industrial base, that expectation is totally false."

Daniel M. Tellep, Lockheed's chief executive officer, warned recently, "Prototyping, carried to an extreme, risks creating museum pieces, which will add little to a healthy industry or new military capabilities."

Separately, the prototyping plan generates questions about whether and to what extent the Pentagon can realistically expect to develop and perfect advanced technologies—another DoD goal—without taking a new weapon into at least low-rate production.

The 1974 flyoff between the YF-16 (shown here) and the YF-17 still stands as an example of how things can go right in prototyping. The competition produced not one but two great aircraft: the current F-16 and the much-improved F/A-18.



Though prototyping is no panacea, few question that it has industrial value. For one thing, supporters say, it is a low-cost way to keep industrial design teams working. The senior author of the plan, Deputy Secretary of Defense Donald Atwood, makes a broader claim, saying that prototyping would greatly reduce production risk. "What we're trying to avoid is getting into production and then discovering that some technology didn't work or that the tooling was bad," Mr. Atwood says. "The cost to make a change once something is in production is very high."

Prototyping is nothing new, certainly for the Air Force, which has built prototypes of dozens of aircraft over the years. Development of the F-117 Stealth fighter is one example. Two handcrafted Have Blue aircraft, the forerunners of the production F-117, demonstrated the possibilities of low-observable technology back in 1975. The avionics of the F-117 were prototyped separately from the airframe, bringing about the development of the integrated common module avionics system. The F-16 was fully prototyped in the early 1970s, as was the new Advanced Tactical Fighter in the 1980s.

However, these were built to demonstrate technologies or reduce risk, not with industrial base concerns in mind.

Three Kinds of Prototypes

No agreement exists on just what the Pentagon means when it calls for prototyping, but there are three basic possibilities.

The first comprises technology demonstrators, such as the Advanced Flight Technology Integration (AFTI)/F-16 aircraft. Full-scale engineering prototypes would be a second category. The third would be fully operational prototypes, such as the YF-22 aircraft. Some analysts outside the Pentagon would define prototyping even more broadly to include computer simulations.

Mr. Atwood says the Pentagon intends to build prototypes from weapons tooling needed to manufacture them, rather than handcraft the prototypes as Lockheed did with the Have Blue aircraft. Secretary of Defense Dick Cheney has said that the plan calls for building several of each type of prototype in order to test.

"When we talk about prototyping," says Secretary Cheney, "we're not

talking just about sort of building one of something and putting it on the shelf. We well understand that the process . . . involves developing the production process and understanding the manufacturing process that would allow you to produce in significant numbers. It also involves building enough of a particular item to get operational experience with it."

The verdict of senior industrial executives is that building a handful of each given system is insufficient. "To keep the manufacturing base and manufacturing technology, you have to have at least low-rate production," says Lockheed's Mr. Mullin. "Building two or three prototypes does nothing for the manufacturing technology base at the prime and major subcontractor levels."

The Surprise

Though many view prototyping as a money-saver, the surprise is that it is not exactly cheap. Done right, prototyping could prove enormously expensive. General Marsh suggests that it could require tripling the Pentagon's research and development budgets, to more than \$100 billion a year. The reason, according to General Marsh,

is that prototyping modern weapon systems, such as the F-22, in effect requires building the production capability for an entire aircraft.

"There was a day when you could go to a model shop, work with real craftsmen, and put together a hand-built prototype," he says. "That's increasingly difficult today. To build a B-2 prototype would almost require you to build a B-2."

Today's processes and tooling are intimately involved with a system's design. For example, the act of building a composite wing prototype would require the purchase of an autoclave to cure the composites.

Analysts doubt that, in light of the Pentagon's falling budgets, there will be sufficient money available to prototype in the manner suggested by General Marsh. One problem is the difficulty of persuading a stingy Congress to pay for research and development. "It's hard to kick the tire on knowledge," says one congressional source.

Industrial finance, the lifeblood of any manufacturing enterprise, is another major problem. In the building of prototypes, Mr. Atwood envisions profits in the range of seven to ten percent as reasonable for companies to expect. He views this as a healthy return. "We need to see that we contract with industry for prototypes on a basis that enables them to make a profit," he says. "If that costs us more money, so be it."

Industrial concerns, however, will be taking this seven to ten percent profit from a much smaller volume of business. Industry experts estimate that prototyping programs will run only to hundreds of millions of dollars. In comparison, engineering and manufacturing development for large systems typically can run as high as \$10 billion. Large-scale production brings in business to the tune of tens of billions of dollars.

In short, even highly profitable prototyping will not replace lost production business as a source of strength holding together skilled workers and large facilities, a fact readily acknowledged by senior defense officials. "Production rates will be considerably less than in the past and below the capacity of industry to produce," states Mr. Atwood. "Those companies with a good technology base that are efficient will thrive. Others may not."

That poses a serious problem, especially in light of the Defense Depart-

ment's claim that it must have the capability to rebuild a large military force if circumstances require it.

Nobody Left?

"What the Pentagon's new acquisition approach completely fails to address," charges a report by the House Armed Services Committee, "is whether any suppliers with the right capabilities will be around, first to develop new systems, and then to produce them, if we have allowed them to disappear in the interim."

The consensus seems to be that prototyping, however valuable, can at best serve as part of the solution to the US defense industrial base problem. What is really needed, say experts, is a broader approach.

One of the more comprehensive plans has been developed by Rep. Les Aspin, the Wisconsin Democrat who chairs the House Armed Services Committee, who acted after holding extensive consultations with industry executives.

Prototyping is a major component of Representative Aspin's plan, but it is more robust than the Pentagon's concept. Called "rollover-plus," the Aspin approach would emphasize not only continuous prototyping, in which technological advances are "rolled over" into the next new prototype, but building a significant number to permit operational testing.

Representative Aspin also calls for additional steps that would go well beyond prototyping. The influential Democrat calls for increased spending on upgrades to existing weapons—a step that would carry some benefits for US industry. Representative Aspin's report singles out the M1 tank upgrade program as an example. Converting M1 and M1A1 tanks to M1A2s helps sustain armor producers and other elements of tank production.

"Upgrades can preserve critical components of our defense production base, with minimum risk and at minimum cost," says a report from Mr. Aspin's committee.

He is pushing the Pentagon to maintain some low-rate production and accept the high unit cost of existing weapons, such as the F-16 fighter, which the Pentagon would like to terminate.

Low-rate production, coupled with prototyping and upgrades, could help sustain a more efficient defense in-

dustry. There is an assumption in the defense business that efficient production only occurs at high rates. "It is more costly to produce at a lower rate," says Mr. Atwood.

Critics argue that, ultimately, low-rate production could be efficient. "No one's exactly doing high-rate production now," says a congressional source. "How much would you save if you didn't tool up for 600 systems and only built half? What if you geared up for 100 and built 100?"

Representative Aspin's committee singled out Lockheed as evidence that the process can work and be profitable. According to its report, "the Skunk Works, which has developed such systems as the U-2, the SR-71, and the F-117, developed each of them in small quantities. Each pushed the bounds of existing technology, and each was profitable. We should endeavor to learn how we might apply lessons learned from this model to the procurement process at large."

Eight Per Year

According to Lockheed executives, the F-117 never went to volume production. The company produced fifty-nine F-117s over nine years. It tooled up to produce just eight aircraft per year. "When we started the -117, we knew there'd only be a small quantity," says Mr. Mullin. Consequently, Lockheed built a production line, including tooling, that would handle production rates of between eight and ten F-117s annually.

Most important, all the major F-117 subcontractors did the same thing. Mr. Mullin estimates that subcontractor tooling represents about fifty percent of all tooling costs.

Low-rate production for the F-117 worked. The average unit fly-away cost of the fifty-nine-plane fleet was \$42.6 million. With the cost of research and heavy special security precautions for the first stealthy plane, total unit costs came to a bit more than \$100 million per plane. "There is a legend that you have to produce at high rates to get acceptable costs," says Mr. Mullin. "That's just not true."

He adds, "Companies are going to have to figure out how to do low-rate production, or they're not going to be in business."

It can be done. A small manufacturer of armored vehicles in Pennsylvania, BMY Combat Systems, has

restructured its production line and builds in small orders. The firm produces M109 howitzers and M9 earth-movers. One does not see fifty-five heavy vehicles moving down the line. Since the company has only geared up to produce thirty-five vehicles, it has not sunk large amounts of money into the line. It also relies heavily on common components, such as axles, that can be put on different vehicles.

Pentagon sources cite microelectronics as an example of equipment that can be produced at low rates. "We can now routinely manufacture custom-designed integrated circuits very efficiently in small batches," says one Pentagon official. "We are still in the early stages of demonstrating what flexible manufacturing can achieve in the way of unit cost reduction."

Gen. John Michael Loh, commander of Air Combat Command, suggests that the F-22 industrial team will be using low-rate, or lean, production techniques on the program.

"We need to learn about how to develop lean production capabilities in order to keep procurement costs down," he told AFA's Air Warfare Symposium in January. "Everybody these days is talking about putting technology on the shelf without production. I believe the way we should go is with this concept of lean production."

Many analysts say that this combination of elements—low-rate production, upgrading, multiple products made at the same facility, and prototyping—is necessary to sustain the defense manufacturing base in an era when procurement will be dramatically reduced. "All would be an income source," says a congressional analyst. "Several would occupy our manufacturing capability."

Little to Save

In some areas of the defense industry, there is precious little capacity to save.

In a review of twelve industrial sectors, the House Armed Services Committee determined that, by the end of the current 1992-97 Future Years Defense Plan (FYDP), several industries will be virtually out of business. Shipbuilding and heavy combat-vehicle production are in particular jeopardy. After the end of the current FYDP, however, industry still would be producing six airframes.

Norman Augustine, chief executive officer of Martin Marietta Corp., calls for a strategy to protect "highly critical" elements of the US defense industrial base. He singles out areas with no commercial counterparts, such as nuclear reactors, submarines, stealthy platforms, precision guided weapons, and night vision technology.

The Pentagon tends to fall back on free market rhetoric about the utility of firms converting from defense to commercial business and back again when the Pentagon calls. Few in industry consider such a scenario realistic.

The Pentagon itself is not sanguine. Of particular concern, says Mr. Atwood, are three areas: nuclear propulsion, tank armor, and stealth materials. He suggests that, ultimately, the Defense Department may have to protect some elements of defense production.

"There will be some technologies in manufacturing that would be hard to reconstitute if there is a gap in production," says he. "We need to be sure to provide sustaining funds to keep them going."

Essential R&D

Whatever its impact on the health of the defense industrial base, prototyping could prove crucial if the US is to maintain a technological edge.

With less money to spend, research—and prototyping—are more important. "Production rates will be considerably less than in the past and below the capacity of industry to produce," says Mr. Atwood. "It is vitally important to push the research and development of innovative new technology."

The congressional Office of Technology Assessment, in a report last summer on the US industrial base, concluded that a properly managed prototype strategy can protect key elements of the nation's ability to innovate in defense technology.

Mr. Atwood cites a prime example of the Pentagon's intended use of prototypes for technology advancement.

"There is no need for more tanks in the foreseeable future," he explains, "yet we have available prototypes of a Block 3 [tank]. . . . We will be building some and testing them to demonstrate the technology and demonstrat-

ing the manufacturing capability, but not going into production until they are needed.

"Meanwhile, it isn't just building a prototype and testing it and setting it aside. We continue research and development on engines, on transmissions, on tracks, on armor, and on fire-control systems, so that the pipeline is full of new technologies should they be needed to reconstitute our forces at a later date."

Industry executives believe, however, that officials in the Pentagon and on Capitol Hill will have to loosen up. "We have to learn again how to accept risk," says Mr. Mullin of Lockheed. "The government has to understand that you're setting technical schedules and cost goals that are not assured to be achieved. A low-risk prototype is an oxymoron and a waste of the taxpayer's money."

Moreover, if US defense industry is going to be successful over the long run, "we cannot take the position of putting [the technologies developed by] prototypes on the shelf," says Gordon L. Williams, president of Dallas-based LTV Aerospace & Defense Co.'s Aircraft Division. He claims that contractors must be able to build new designs on hard tooling.

Critics in industry and elsewhere complain that the Pentagon has been slow getting out of the gate. "There has been no thought beyond the buzzwords," says one congressional acquisition expert.

Others say that, with the exception of the Army's Comanche helicopter and perhaps the Navy's A-X attack aircraft, no prototype program is even in the planning stage. Even with the Comanche, sources say, nothing much has happened, except that procurement money has been cut from the budget.

Critics on Capitol Hill point out that the Pentagon's acquisition bureaucracy continues to operate on the assumption it will make production decisions in the early stages of a weapon's life-cycle, perhaps after testing advanced technology demonstrators. Operational prototypes would not be built until after a decision to produce had been reached.

"That's exactly how we do business today," observes one congressional staff member. ■

Bruce Auster is the defense correspondent in Washington, D. C., for U.S. News & World Report. This is his first article for AIR FORCE Magazine.

Another selection of rare color photography from World War II, this time from the other side of the world.

Far East Color

From the collection of Jeffrey L. Ethell

Photo by Calvin Bannan



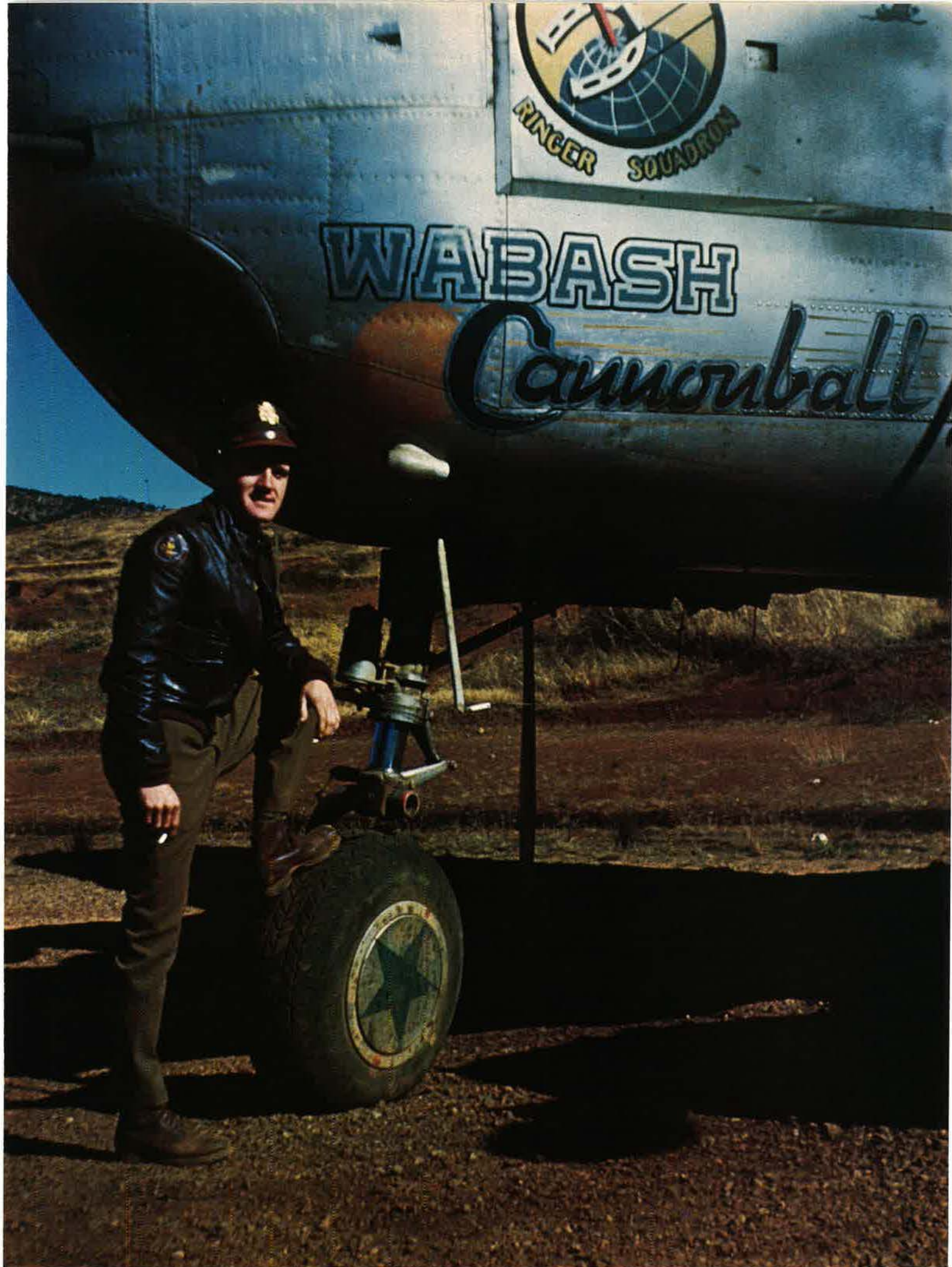
AAF aircraft often were deployed far from modern support equipment. Air Transport Command crews made do with what could be found locally. These Chinese troops used horses to unload a C-47 from the 10th Combat Cargo Squadron, 3d Combat Cargo Group, at Chanye, China, in December 1944. Opposite, in Yankai, China, in 1945, pilot 1st Lt. William V. Tascher of the 491st Bomb Squadron, 341st Bomb Group, posed with his B-25H, Wabash Cannonball, armed with a 75-mm cannon.

IN THE September 1991 issue, we presented a collection of rare World War II color photographs taken in Europe. Here is proof that not all early Kodachrome film went to the European theater of operations.

Since beginning his collection fifteen years ago, aviation author and historian Jeffrey L. Ethell has amassed more than 5,000 images. Many were obtained from the original photographers, who contributed valuable information that makes these pictures unique historical documents.

In World War II, the Pacific and China-Burma-India theaters were at the end of the supply pipeline. Ingenuity was the name of the game, from trading booze for ice cream machines to making huts out of packing crates. Crews often lived in miserable conditions with biting and flying insects as constant companions, but it was an adventure to Americans who had barely been off the farm or out of the city. Air and ground crews of the US Army Air Forces did their jobs with devotion and courage.

This fascinating collection offers an important and often candid look into a memorable period of our history.



WABASH

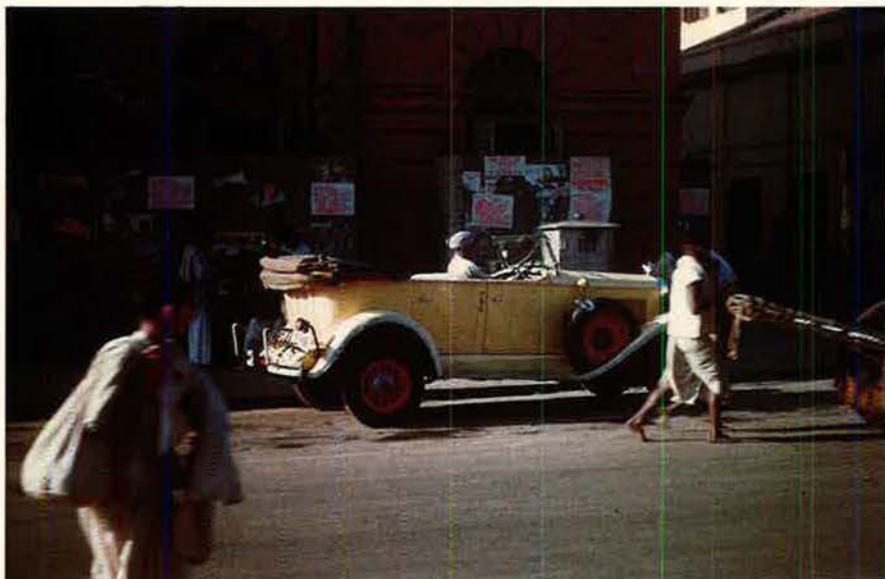
Cannonball

RINGER SQUADRON



Photo by Dennis Glen Cooper

Photo by Hank Redmond



In early 1944, pilots of the 475th Fighter Group (top) got a look at a Japanese Ki.61 "Tony" at Hollandia, New Guinea. Maj. Franklin Nichols stood on the right wing and Capt. Thomas McGuire, who would go on to become the second ranking US ace with thirty-eight victories, on the left. Hank Redmond of the 12th Bomb Group captured this shot of a yellow taxi driven by a Sikh through the streets of Calcutta, India, in late 1944.

The Pacific was the ideal theater for the Lockheed P-38 Lightning. It could stay aloft for up to ten hours, cover bombers, strafe and bomb targets—and if a pilot lost one engine, he could make it home on the other. The leading aces in the Pacific theater scored all their kills while flying the P-38.



Photo by Stoffer from the John Campbell collection

Photo by Paul A. Thomas



Pilots and ground crews of World War II took great pleasure in naming their aircraft after girlfriends, wives, cartoon characters, home towns, and a host of other things. The P-47 Thunderbolt of this 318th Fighter Group pilot carried nose art, a name, and an impressive mission tally.

On Saipan in December 1944, finding something to do was a real challenge. These ground crewmen of the 19th Fighter Squadron, 318th Fighter Group, passed the time shooting craps in the shade of a P-47 Thunderbolt.



Photo by Paul A. Thomas



When the American Volunteer Group became a part of the Army's China Air Task Force in July 1942, its distinctive shark mouth nose art began to appear on fighters like these P-51 Mustangs of the 51st Fighter Group.



Photo by Carroll S. Barmwell



By the end of the war, USAAF was a powerful presence in every major theater. After the Japanese surrender, the 5th Air Force P-47s and B-25s above were destined for the scrap heap, though a few remained as part of the occupation forces. Left, a 491st Squadron B-25 Mitchell sits on the field at Yankai, China, in the spring of 1945. All supplies to this remote area had to be transported over the "Hump"—the Himalayas. The B-29 Superfortresses (below) of the 462d Bomb Squadron went to war against Japan with a top secret, airfoil-shaped radar beneath each fuselage, previewing the electronic battlefield.

If you took color slides during World War II, Mr. Ethell would like to hear from you in order to consider them for his next book of wartime color photography. Write to him or call: Jeffrey L. Ethell, Rte. 1, Box 3154, Front Royal, VA 22630. Phone: 703-636-1816. ■



Photo by John Worth

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These missileers spent years to become the best. Now they are worried about their careers.

Angst at Olympic Arena

By David J. Lynch

FOR the 14,300 Air Force professionals of the strategic missile force, the collapse of the Soviet Union wrought change of a high order. For the first time in two generations, Washington contemplates no new ICBM deployments. Strategic Air Command (SAC) has passed into history. The service-wide USAF restructuring has left missileers pondering their futures.

In this atmosphere, the Air Force's best strategic missile crews gathered at Vandenberg AFB, Calif., for the twenty-fifth Olympic Arena, USAF's missileering competition. It was a bittersweet event that celebrated the prowess of the missileers even as they faced a declining demand for their skills.

Brig. Gen. Thomas E. Kuenning, Jr., commander of 20th Air Force at Vandenberg, observed that the mood of the missileer continues to be good because "we played a very positive role in ending the cold war." Even so, General Kuenning was quick to acknowledge that "there's also a great deal of apprehension about the future."

Change is inevitable for the men and women of 20th Air Force, which

is now the long-range missile arm of Air Combat Command (ACC). On June 1, after almost fifty years as a symbol of Washington's cold war deterrent force, SAC officially ceased to exist. Its responsibilities were divided and absorbed by ACC and the new unified Strategic Command (STRATCOM). For SAC, the missile age began in September 1959 with the test-firing of its first ICBM, an Atlas missile. The command's parting shot was an operational test of a Minuteman III, which was fired in May from a silo at Vandenberg.

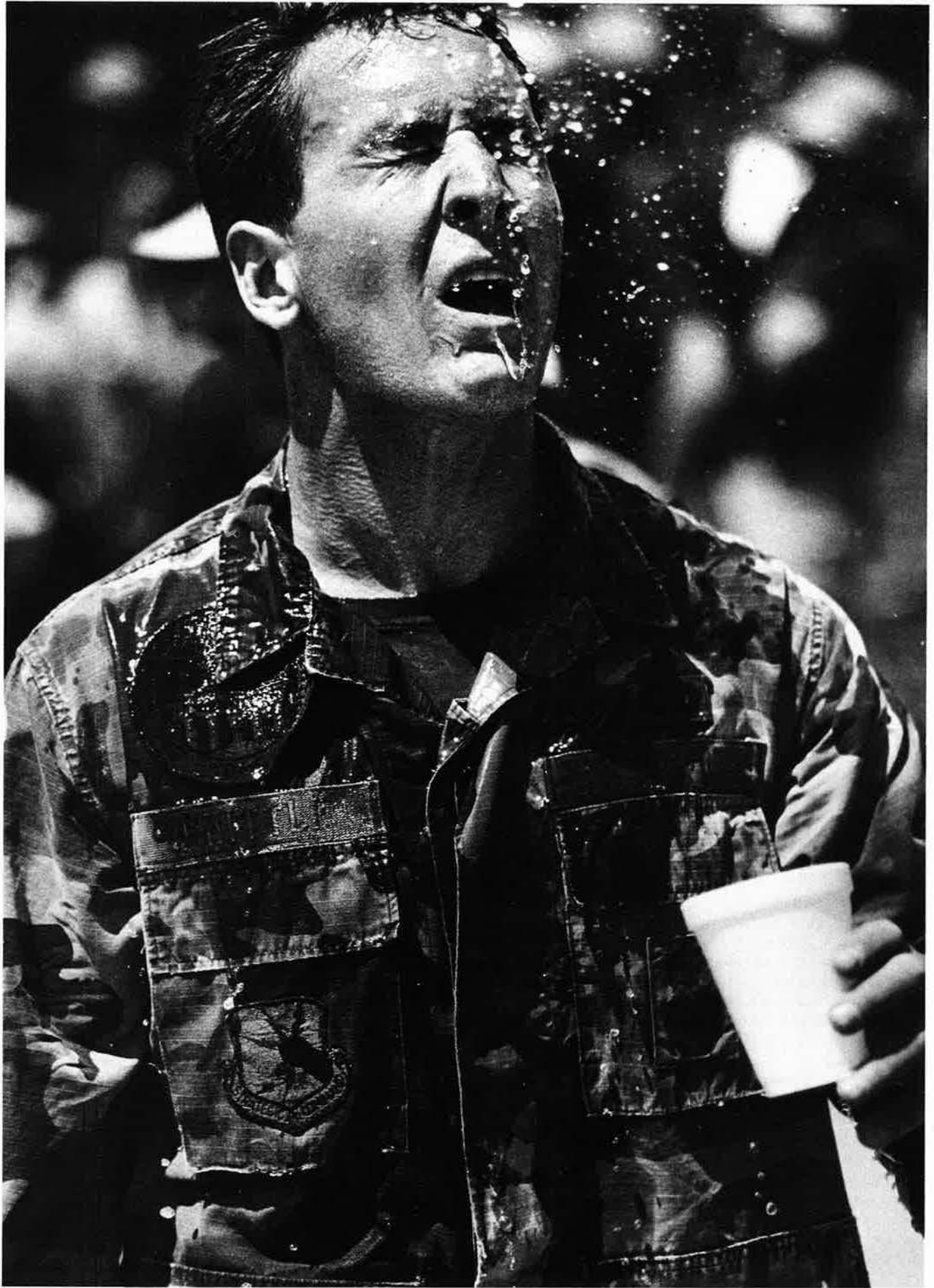
The command shift formalizes what had become increasingly obvious since the failed 1991 coup in the Soviet Union. US military organizations established to manage a struggle with a second superpower are no longer appropriate in this very different age. Institutional changes now under way are generally accepted as necessary throughout the military, yet these changes carry with them a very real and often unappreciated impact on thousands of individuals in uniform.

During the Olympic Arena competition in April, those issues were on the minds of many participants.

"People Are Worried"

"People are frankly worried about their careers," said Col. Lester Willey, director of the 3901st Strategic Missile Evaluation Squadron. "People spend a lot of time in this business, and all of a sudden, it's changing. Obviously, the Air Force is diminishing in size, and the missile business is diminishing right along with the rest of the Air Force."

The cold war's end killed Bush Administration plans to deploy an additional fifty multiwarhead Peacekeeper missiles and field up to 500 new single-warhead Midgetman weapons. Despite all the changes on the international scene, however, missileers say they do not foresee a day when they will be out of business entirely. Echoing statements by De-



fense Secretary Dick Cheney, they point to continued turmoil in the former Soviet Union, the spread of weapons of mass destruction to Third World states, and "the unknown" as long-term justification for maintaining a landbased nuclear deterrent.

"We can see for the first time an opportunity to reduce this category of weaponry," General Kuenning said, "but we're a long way yet, in terms of a military career, from ending the missile business."

That's not to say the dramatic changes in the world and in the Air Force are passing unremarked among missile crews. The constant uncertainty has left many in uniform unsure of their next step. General Kuenning, a former Minuteman I deputy combat crew commander, has resorted to periodic videotaped pep talks to rally his troops for this new era. The videos, which open with General Kuenning's hearty "Hello, troops," provide information on topics ranging from the latest Pentagon policy shift to the number of jobs available for missileers in STRATCOM and ACC.

Even those at the peak of their profession are scrambling to adjust to new realities. Under normal circumstances, an officer like Capt. Dwayne Turmelle could look forward to an important staff assignment in the Pentagon or at SAC headquarters after finishing his tour at Vandenberg. But these clearly are not normal times. Captain Turmelle is one of a handful of missileers selected for the Top Hand program, the missile business's equivalent of the Navy's aerial Top Gun. He's one of twenty-three officers, the top one percent of all missileers, selected for the program based on his service record. As a result, Captain Turmelle said, he is still better positioned than most, although the old ground rules no longer apply. The nine-year Air Force veteran may end up competing for one of sixty-two slots that have been designated for missileers at Air Combat Command headquarters.

"The future's unknown," he said. "There's still a good future out there. It's just the path isn't as clear."

Subtle Deterrent?

As he surveyed the post-cold war international landscape, General Kuenning found in the war with Iraq a validation of the missileers' day-to-day role, on two levels. In concrete terms, security police from 20th Air

Force were deployed to Saudi Arabia during Operation Desert Shield for guard purposes. General Kuenning cited an intangible contribution as well.

"There's a widely held belief in the ICBM field that during the [Gulf War] we played a very subtle role in deterring the use of weapons of mass destruction," he said. The knowledge that the US retained the option to retaliate swiftly with nuclear weapons, he believes, may have prevented Saddam Hussein from using chemical or biological weapons against front-line allied forces.

Whatever the cause and effect in the Persian Gulf, missileers say the end of the cold war is proof that their silent service over the years paid off. "The reason the cold war has ended is because we had missileers out on alert for the last twenty-five or thirty years, twenty-four hours a day, always ready and willing, if need be, to do what we've been trained to do," said Capt. Galen Mays.

The missileers' unmistakable pride in their work has not blotted out pragmatic concerns. With the military slated to undergo a force reduction of at least twenty-five percent by 1995, many in uniform have been contemplating lay-off notices. To head off involuntary separations, the Pentagon has crafted a package of early retirement benefits and cash payments for those who will leave early. In some cases, however, the offers have not been sufficient to induce missileers to walk away.

Sgt. Scott Frazier, a Minuteman maintenance specialist preparing for the recent Minuteman III missile launch, was offered \$21,000 to quit. The ten-year Air Force veteran refused. "I said, 'Hell no; I like my job,'" said Sergeant Frazier. His future is uncertain. His wife, who is also in the service, accepted a similar offer.

Sgt. Greg Poisei hopes to stay in uniform. A five-year veteran, he helps refurbish missile silos after they've been used in test firings. He said the changing world situation has prompted him to "look for something other than missiles."

Sergeant Poisei would like to find work in the Air Force as a jet engine mechanic, a profession that is expected to enjoy more stable demand. Unfortunately, he is not the only one with that idea. Few of those who want to make the switch will be successful. Sergeant Poisei is resigned to whatever outcome arises: "If I'm needed here, then here I'll stay."

The manpower issue is no "outyear problem." Leaders of 20th Air Force already are confronting possible shortages of missileer instructors. Up to twenty-five percent of its 120 instructors could be retiring—voluntarily or otherwise—later this year, according to Capt. Kurt Mueller, a missile crew instructor at Vandenberg.

New Ways of Teaching

Despite the cold war's end, modernization is under way in various aspects



Two enlisted men from the 3901st Strategic Missile Evaluation Squadron post scores during Olympic Arena competition at Vandenberg AFB, Calif., in April. Tension was high during the week-long event, fueled each time the day's scores were posted as the competitors watched eagerly to see where they stood.

USAF photo by SSGT Scott Wagners



The importance of security at missile bases cannot be overstated, and the security police assigned to missile squadrons are some of the best in the world. Here, a security police "terrorist" sneaks along a fence during the police tactics portion of Olympic Arena '92.

of the missile world. The business of teaching missileering is already far different than it was even a few years ago. Since early 1990, about thirty-five computer workstations have been introduced for automated, interactive instruction. The monitors are linked to laserdisc players with several lesson plans that walk students step by step through missile maintenance or combat crew scenarios. In case there are questions, instructors like Captain Mueller or Capt. Danny Kale are on hand.

Captains Kale and Mueller are among the 120 instructors at Vandenberg who train 386 students annually on four different versions of the Peacekeeper and Minuteman missile systems. With the ongoing retirement of the Minuteman IIs, they will soon be down to three systems. However, there is increasing complexity in the missile business related to the introduction of new command, control, and communications (C³) options involving speedier retargeting capabilities.

"It's much more demanding now because of changes in C³," Captain Mueller said. "They're putting more and more equipment into the launch control center and not necessarily changing the amount of instruction in terms of length."

Until the mid-1980s, retargeting an individual missile required time-consuming, manual replacement of computer tapes containing launch coordinates. The process took hours. Peacekeeper and Minuteman missiles can now be retargeted more quickly by using keyboards in the underground

launch facilities. That's the good news. The bad news is that the two-man combat crews Captains Kale and Mueller train must learn additional procedures and checklists to perform the keyboard retargeting.

Further improvements that will affect the ICBM force and the missileers are under way. The principal initiative is the REACT (Rapid Execution and Combat Targeting) program, which aims to bring the launch control centers of the 1960s into the 1990s. Much of the hardware in the underground launch facilities is seriously outdated, Air Force officials say. Many of the computer consoles in the underground bunkers, for example, use computers with 72K memories.

"Most people have more than that in their watch now," remarked Col. Brian Wills. As such new communications systems as the Ground Wave Emergency Network, AFSATCOM, and Milstar have proliferated over the past two decades, new computer capacity has been shoehorned into the launch centers wherever it would fit. The Air Force wants to rip out that jumble and replace it with a coherent, state-of-the-art system.

Colonel Wills said testing of REACT prototypes with actual crew members is scheduled to begin in October. If all goes well, the gear could be fielded before the end of Fiscal 1993.

Air Force Materiel Command's Electronic Systems Center at Hanscom AFB, Mass., is working with GTE



Despite the uncertain future of the missileers' careers, determination and professionalism were evident at every turn during the competition. The intensity of Olympic Arena is reflected in this security policeman's face, exhibiting little concern about job security or other worries as he focuses on the task at hand.

Corp. to develop a system that will accept various messages, eliminate redundant traffic, and process the remainder for the combat crew's use. Likewise, the Ballistic Missile Organization at Norton AFB, Calif., contracted with Loral Corp. to provide mechanisms for rapid retargeting of individual weapons.

In recent months, another sign of the complex fallout from the remaking of the Air Force has appeared in the classroom of Captains Kale and Mueller. Young pilots with no planes to fly are finding missileering a temporary haven as they await openings aloft. Since the missile business was not their first choice, "there's some resentment" on the part of these banked pilots, said Captain Mueller.

The World Series

For one week in April, General Kuenning and his troops forgot about the Soviet Union's demise, put aside worries about future job security, and geared up for the annual Olympic Arena competition. Six missile crews from military bases across the country's heartland competed for Olympic Arena's top honor, the Blanchard Trophy, named for former USAF Vice Chief of Staff Gen. William H. Blanchard. Inaugurated in 1967 as a test of the service's top missile crews, the contest has grown over the years into the World Series of the missile business.

For several days, SAC combat crews,

The thrill of competition turned to cheers of victory for the 44th Missile Wing of Ellsworth AFB, S. D., as the wing's winning scores were posted. President Bush's decision to shelve the Minuteman II essentially puts the 44th out of the missile business.



USAF photo by TSgt. Joe Coleman

security police, maintenance personnel, and civil engineers were put through their paces by the exacting taskmasters of the 3901st Strategic Missile Evaluation Squadron. Olympic Arena challenges the contestants to handle simulated emergencies with by-the-book precision. Test scenarios range from proper procedures for launching mis-

siles under varying threat circumstances to thwarting terrorist attacks against a missile base.

For missileers, Olympic Arena is serious business. It is also the only chance the men and women of the missile wings have to display their talents publicly. Apart from these few days, missile crews toil in isolation on remote bases spread across the northern plains of the US. The two-person combat crews work twenty-four-hour shifts in concrete and steel capsules 100 feet below ground. Missile wing maintenance teams begin their days with a two- or three-hour drive across windswept terrain, often encountering no other vehicle during the journey. Conditions on the six missile bases are often cold and unforgiving.

In the public's mind, the combat crews—two officers buried underground, awaiting Armageddon—symbolize the Air Force missileer. In the early days of the missile era, combat crew positions were filled with captains and colonels. Today, those slots typically are occupied by 1st and 2d lieutenants, men and women roughly twenty-two to twenty-five years old. Seated in high-backed chairs facing row upon row of computer consoles, high-speed printers, and communications gear, they consume much of their

USAF photo by TSgt. Joe Coleman



The best missile wing in the Air Force takes home the Blanchard Trophy. The "Black Hills Bandits" of the 44th Missile Wing showed their confidence early, arriving with proclamations of their number one status. These claims proved prophetic: The 44th won for the first time since 1982.

work day with equipment checks and procedural drills.

No Red Button

"You're just not sitting there for twenty-four hours with nothing to do and your finger over a red button," said Captain Kale. "There is no red button, by the way."

With all the paperwork, drills, and equipment checks, missileers are kept hopping, although Captain Kale says there are some alerts "when you're bored silly." Many officers take advantage of the enforced solitude to complete coursework toward advanced degrees. For recreation, thirteen-inch color TVs and video players are available.

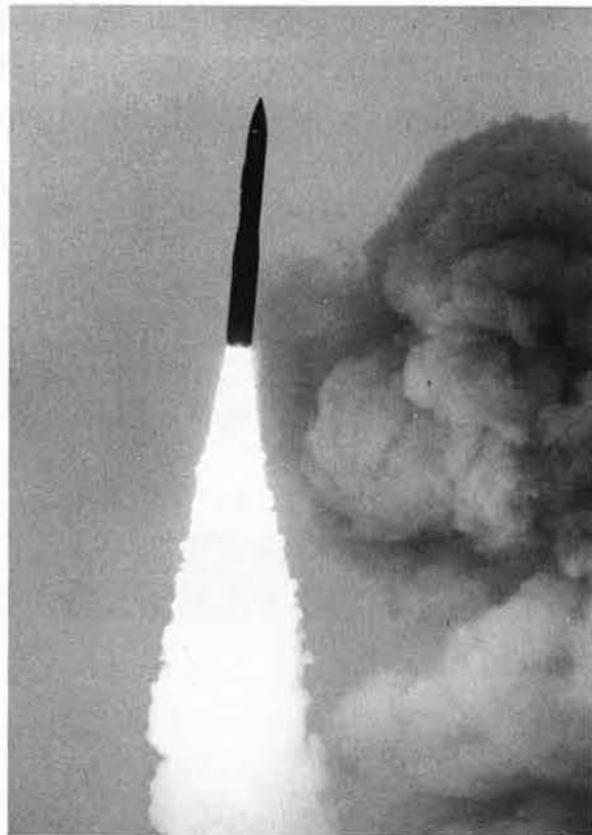
In the event of nuclear war, these young officers would turn the small keys and execute the coded instructions igniting a conflagration. Today, the chances of nuclear conflict are regarded as infinitesimal, but it was not always so. From the 1962 Cuban Missile Crisis to the Arab-Israeli conflict of 1973, eyeball-to-eyeball crises have threatened to plunge the world into war.

Colonel Willey, who early in his career pulled duty as a Minuteman combat crew commander, acknowledged wrestling with such thoughts. "After a while, it becomes part of your business and you do not really think about it," he said. "You just know if you have to, you'll do it."

During Olympic Arena, the pressure is of a different kind. Competitors are under stiff time constraints and are acutely conscious of the bragging rights that go with the Blanchard Trophy. In the actual competition, the combat crews are put through their paces in Vandenberg's missile procedures trainer, which is built to duplicate every feature of an actual launch control facility.

Instructors from the 3901st Strategic Missile Evaluation Squadron, themselves former missileers, draw up the test scenarios. The aim is to subject missile crews to situations for which they have been trained and may be called on to handle in the field. Officers' adherence to formal procedures is scrutinized. For example, what communications protocols should be used in a particular situation? What security

Symbols of cold war deterrence, missile crews performed an often unsung duty. Their success can best be measured by what didn't happen as they performed their missions underground, ready, if called on, to turn the keys that would launch the missiles.



safeguards should be taken, and in what order?

As the ninety-minute exam proceeds, a two-person evaluation team scores the combat crews' performance from inside the command capsule. Other instructors monitor the session from a control booth separated from the mock launch center by a wall of one-way glass.

"They'll never see this in an alert lifetime," said Capt. Randy Cross of the 3901st. "Hopefully, they won't, because we have that war part in there," he adds with a laugh.

As the instructors run through an exercise for a visiting reporter, a voice booms out over the loudspeaker: "For all missile units, this is the SAC Command Center. Initiate your missile launch sequence checklist."

"This is an unclassified version of how we go to war," explained Capt. Anthony Cotton.

That Unsettled Feeling

Inside the glass-enclosed control center, where another set of instruc-

tors directs the exercise, green and amber lights dance on a console. Eerie green lights illuminate buttons that read, "Missile away." Even though it's just a drill, the effect is unsettling.

"I remember the first time I turned keys," said Cross. "I knew it was just a drill, but this really eerie feeling came over my body."

The stress was vented during the raucous final ceremony at which the winning scores were unveiled. The six competing missile teams paraded into a crowded auditorium in colorful, symbolic costumes. War chants echoed back and forth. Gen. George Lee Butler, the last commander of SAC and now commander of STRATCOM, was present, as was Gen. John Michael Loh, the first commander of ACC.

Given the fundamental changes affecting the missile business, the high morale and boisterous high jinks could be likened to whistling past the graveyard.

The 44th Missile Wing from Ellsworth AFB, S. D., walked off with top honors in the twenty-fifth annual Olympic Arena. The win was a kind of last hurrah for the Black Hills Bandits. President Bush's decision last fall to shelve the Minuteman II force essentially puts Ellsworth out of the missile business. ■

David J. Lynch covers the aerospace industry and national defense topics for the Orange County Register in California. He is a former editor of Defense Week Magazine in Washington. His most recent article for AIR FORCE Magazine was "The ICBM Era Ends" in the June 1992 issue.

The nuclear weapons industry is at a standstill, and preserving even a small production capability will be difficult.

What's Left of the Nuclear Plants?

By Holly Idelson

NO ONE is likely to mistake Energy Secretary James D. Watkins for a nuclear freeze activist. Watkins, a retired admiral and former Chief of Naval Operations, was a protégé of Adm. Hyman Rickover, the father of the nuclear Navy. He served nearly three decades as a nuclear submariner and strongly supported the Reagan nuclear rearmament program.

Yet, on December 16, 1991, the man in charge of producing this nation's nuclear weapons came closer than anyone would have imagined to sounding positively antinuclear. "Nobody likes nuclear bombs," Admiral Watkins said in a speech outlining his proposed changes to the US nuclear weapons program. "We're trying to get rid of them."

Administration officials—Admiral Watkins included—are committed to keeping a potent nuclear deterrent, but defense planners in the post-cold war era are scaling back demands for nuclear systems. These trends foreshadow big changes in the US nuclear weapons complex—an array of Energy Department facilities whose scientists, engineers, and technicians design, construct, and test the nation's nuclear armaments.

For the first time since World War II, officials say, the US has no new nuclear weapon under way. Last January, President Bush canceled the only remaining in-production nuclear warhead: the W88, used for the Trident D5 submarine-launched ballistic missile. The department is knee-deep in studies and proposals for a streamlined weapons complex. Particulars are still in flux, but the plan has a clear and predictable outcome: fewer facilities, fewer sites, and fewer jobs.

Getting there will not be simple, particularly since international change continually threatens to outpace planning for the new weapons complex.

As they shrink the complex, planners must preserve technological and human capabilities to respond to future needs. In addition to maintaining this traditional "nuclear competence," the complex must tackle such new missions as arms-control verification and nuclear weapon disposal. It must also clean up billions of dollars' worth of contamination at downsized or mothballed weapons plants.

Complex 21

The nuclear weapons complex grew up behind a shroud, its roots in the

secret Manhattan Project that built the first atomic bomb. The build-down will be another process entirely, subject to intense public and congressional debate about how to proceed and how fast. Already the Bush Administration faces conflicting political pressures, with some groups demanding a rapid shutdown to save money and others mobilizing to protect jobs.

The Energy Department began modernization planning in the 1980s, as the nuclear complex began to show the strains of age. Many of the facilities are now more than thirty years old and seriously outdated. Some were built to produce materials the department no longer needs. Others are scaled to produce massive quantities of weapons required for a cold war, not the New World Order. The aged buildings also fall far short of today's safety and environmental standards. In the 1980s, for example, the US was forced to shut down flawed production facilities at Savannah River, S. C., and Rocky Flats, Colo.

Before the facilities could be repaired or replaced, arms-control initiatives and the rapid decline of the Soviet threat forced planners to reexamine the actual demand for nuclear production.

The first major modernization study was completed just as Admiral Watkins took over DoE in early 1989. He decided the study was already obsolete and ordered up a new plan that was released in January 1991. That plan calls for a "smaller, less diverse, and less expensive" weapons program for the twenty-first century. Its supporters have dubbed it "Complex 21."

The plan outlines alternate paths toward this improved complex. One path entails steps to generally modernize programs at existing locations. The other would consolidate work at a minimum number of sites. Both proposals would emphasize safer, more environmentally sound plants and transfer as much work as possible to the private sector.

Only Thirteen Sites

In 1990 the complex employed 90,000 workers at seventeen sites nationwide. It has since shrunk to only thirteen key sites, many of which are owned by the government but run by private contractors. Even some of these are beginning to play marginal roles. Admiral Watkins predicts the com-

In 1990 the US nuclear weapons complex employed 90,000 workers at seventeen sites. Admiral Watkins predicts it will eventually include nine or fewer sites and thousands fewer employees.

plex will eventually include nine or fewer sites and thousands fewer employees.

Most of the cuts would come in the production of nuclear materials and warheads. Planners predict that the nation will keep one or two plants to produce or process such critical nuclear materials as plutonium and tritium gas. Most nonnuclear parts, including detonators and electronic components, might be produced at one location rather than at today's four.

Workers at the Pantex plant outside Amarillo, Tex., would continue to disassemble weapons there. That plant is also a candidate for ongoing production work. The Administration plans to continue to operate its Nevada Test Site and three weapons laboratories—Los Alamos and Sandia in New Mexico and Lawrence Livermore in California. Admiral Watkins expects to decide on the precise reorganization in late 1993, following an extensive environmental review of the proposed changes.

The department has pledged to give threatened workers preference for new jobs, most of which will be in cleanup. It plans to pay for some retraining and economic assistance efforts and may be prodded to provide more benefits, such as addressing the unusual health risks for these workers, many of whom have been exposed to radiation.

Budget pressures and the hunger

for a "peace dividend" are helping to drive debate on the shape of the future weapons complex.

DoE initially sought to spend \$8.1 billion on defense work in the coming fiscal year. Officials have said that subsequent Pentagon cutbacks would enable them to shave \$100 million to \$200 million off that figure. The total includes about \$800 million to support the Navy's nuclear submarine program, which is reimbursed by the Pentagon and is not generally considered part of the nuclear weapons complex.

That sum represents a fairly modest decrease from the current Fiscal 1992 authorization of \$8.3 billion. It does not include the money slated for cleaning up nuclear weapons facilities.

The Military Production Network, a coalition of local watchdog groups that monitor the complex, claims Washington is still mired in cold war thinking. It urges chopping about \$1.5 billion from the Administration's pending 1993 budget request for the nuclear weapons program. The group would achieve this mostly by scaling back nuclear development and testing and by curtailing expenditures toward resuming tritium production.

Lawmakers who will dole out the program budget are generally less critical, but some share an instinctive conviction that the complex simply should not cost so much now that the country is no longer locked in a nuclear rivalry with a heavily armed Soviet Union. When Admiral Watkins testified this spring before a House subcommittee overseeing the nuclear weapons budget, Rep. Vic Fazio (D-Calif.) pressed him to justify his proposed spending.

"I really question whether this is a peacetime budget," said the California lawmaker. Citing one portion of the overall budget request, Representative Fazio asked, "Why is it still going to cost \$4.5 billion to maintain a nuclear weapons complex when there are no new weapons in production and no new designs on the drawing board?"

Administration officials have made reductions in some areas of the weapons complex but say they cannot make deeper cuts without damaging the program.

Hard to Forecast

One obstacle to both planning and cost-cutting is the difficulty of forecasting what will be required of the

weapons complex. The Energy Department is obligated to stock the nuclear arsenal and relies on specific requests and projections from Pentagon planners to gauge the demand for nuclear weapons production. Those directives can change quickly, pulling the rug from under planners' feet.

For example, DoE spent months and hundreds of millions of dollars upgrading the troubled Rocky Flats plant to build more plutonium cores for W88 warheads. President Bush decided abruptly to cancel the weapon. Now it is unlikely the Rocky Flats plutonium operations will ever resume.

When the Energy Department began planning Complex 21, the American nuclear arsenal—strategic and nonstrategic—included more than 20,000 warheads. Administration officials say subsequent cutbacks will halve that figure, while other recent agreements could lower the stockpile to approximately 3,500 warheads. Some arms-control advocates are calling for a 1,000-warhead stockpile, and even the conservative Heritage Foundation suggested in April the US might be able to go as low as 2,000.

Energy Department officials say they cannot assume that all of the proposed cuts will materialize, and they must plan conservatively. From this have come controversial Administration decisions, such as the one to restart a crippled reactor at Savannah River, S. C., that produces the perishable tritium gas used in nuclear warheads. Restarting the antiquated reactor is expected to cost hundreds of millions of dollars, an expense some lawmakers and policy analysts consider wasteful. They predict there will be enough tritium from old or retired warheads to maintain a smaller arsenal until well into the next century.

Admiral Watkins, however, says he must ensure that the reactor can produce new tritium in case proposed arms reductions fall through or there is an unexpected need to expand the nation's nuclear production. He and Pentagon officials say the nation still needs a viable nuclear weapons complex. They warn of the insecurity regarding the former Soviet Union's huge nuclear arsenal, as well as ongoing threats of nuclear proliferation.

"There will be requirements for new nuclear weapons in the future," said Dr. John H. Birely, one of the Defense Department officials overseeing the

Despite strong congressional pressure for a nuclear testing moratorium, the Administration reportedly plans six underground tests in the coming fiscal year.

nuclear weapons program. He told a House panel this spring, "We cannot with confidence say now what they [the new requirements] will be. We can only be certain that today's nuclear warheads will, sometime in the future, be incapable of meeting our national needs."

By Administration accounts, those needs could include new warheads to enhance safety or to fit new delivery systems.

More Underground Tests

Defense planners say there is a need for tests to improve the safety and reliability of the nuclear stockpile. Despite strong congressional pressure for a nuclear testing moratorium, the Administration reportedly plans six underground tests in the coming fiscal year.

In general, Energy Department officials say, the complex overhaul emphasizes flexible designs, such as modular construction, that will allow them to adjust to changing defense needs. They warn that even a reduced work load may not lead to proportional budget savings—not, that is, if they are to maintain the technical expertise to respond to new security threats. That would require DoE to retain many scientists and technicians and give them meaningful tasks, even if the facilities they help operate are not running at full strength.

"The complex will be more capability-driven than capacity-driven," said Assistant Energy Secretary Richard Claytor, who oversees the department's defense programs. "We're obviously not going to come up with some silly makework programs, but we obviously have to maintain this capability."

Retaining skilled workers and strong morale have become key concerns for Mr. Claytor and other program administrators, given the health and safety problems that have crippled parts of the complex and the political uncertainties that cloud its future.

One area where this tension is being felt is the debate over the three national weapons labs. Rep. George E. Brown, Jr. (D-Calif.), who chairs the House Science, Space, and Technology Committee, is among those who question the need to maintain all three labs. "The end of the Cold War has left the DoE weapons labs scrambling to define new missions for themselves, yet they are all reaching for the same new missions," Representative Brown wrote Admiral Watkins early this year.

Representative Brown's solution is to turn Lawrence Livermore into a civilian technology lab, let Los Alamos pursue nuclear defense and nonproliferation work, and call on Sandia to focus on verification technologies and technology transfer.

Energy Department officials dispute the wisdom of this proposal, saying it is vital to retain all three labs as part of the weapons complex. In recognition of shifting national priorities, however, DoE is steering the labs into new initiatives. They have been tapped for the Administration's technology initiative to promote US competitiveness through more cooperative research and development ventures with the private sector. Within the complex, the labs are increasingly focusing on such new areas as arms-control verification, weapons disposal, and cleanup technologies.

Huge Challenges

Those new missions pose huge and unfamiliar challenges for a complex long geared toward massive weapons production. One of them is the unexpected flood of retired warheads in the wake of arms-control initiatives. Although some of the retired warheads are being stored intact, the Administration has directed that others be taken

apart. Their nuclear materials are to be removed and accounted for and the missiles left behind.

That disassembly is done at Pantex in the Texas panhandle. Administration officials say the Texas plant is prepared to handle the increased load of returning weapons, but some arms-control advocates say the Administration may need to make more modifications there, particularly if the government agrees to dismantle more returned warheads and allow international verification as they recommend.

A more difficult problem, particularly with regard to US efforts to retard the proliferation of nuclear arms, is the disposal of critical nuclear materials—plutonium and enriched uranium—inside the discarded weapons. There are ways to get rid of plutonium—it can be spiked or burned as reactor fuel—but all have accompanying environmental and security headaches. The Administration intends to store the plutonium pits of the old weapons at Pantex, but there are no long-term plans for coping with the dangerous material.

Equally daunting is the task of cleaning up contamination at current and former weapons production sites.

By Washington's own admission, the race to build nuclear arms often caused the federal government to give short shrift to or simply ignore environmental and public safety concerns. Radioactive and toxic wastes have contaminated buildings, soil, and water at or near current and former weapons facilities. With national security pressures eased and the extent of the environmental consequences more widely known, the Administration is being pushed to halt further contamination and clean up existing damage.

New cleanup jobs will blunt the impact of layoffs in other areas of the complex, but the expense will obliterate any savings from decreased demand for nuclear weapons. The enormous task is expected to cost at least \$100 billion over several decades.

The Administration has requested \$4.6 billion toward the cleanup for Fiscal 1993, in what is by far the fastest growing portion of the program's budget. Congress has pushed the Administration to go even faster in this area, but both lawmakers and administrators have begun to acknowledge that money is not the immediate obstacle. The Department of Energy has yet to develop the technologies

New cleanup jobs will blunt the impact of layoffs in other areas of the nuclear weapons complex, but the expense will obliterate any savings from decreased demand for nuclear weapons.

and expertise to tackle some of the contamination. There is a growing realization that it is too costly to restore all the contaminated sites.

Meanwhile, the department is struggling to find storage sites for the ultimate waste. The department is in court over its efforts to open a dump in Carlsbad, N. M., to store low-level radioactive waste from the weapons complex. State officials, who want tight environmental controls on the project, have thus far blocked it from opening.

Political Pressures Increase

As proposals for the new complex move off the drawing board and into communities, Administration officials can expect to feel the political pressures increase.

As with the Defense Department's effort to close military bases, public and congressional hunger for abstract cuts can coexist with an intense aversion to specific reductions. For example, in December Admiral Watkins tentatively endorsed moving virtually all the complex's nonnuclear production work to its Kansas City, Mo., plant, which is run by Allied Signal. It would mean eliminating or moving hundreds of jobs at the Rocky Flats

plant, the Mound plant in Ohio, and the Pinellas plant in Florida and probably closing down those three plants entirely.

The department plans to make a final decision later this year, provided a pending environmental study does not turn up significant problems with that approach. Officials estimate the consolidation would save at least \$100 million a year once completed, but the idea faces stiff resistance from lawmakers whose districts would lose jobs under the plan.

Rep. Tony Hall (D-Ohio), whose district includes the Mound plant, has called for an independent commission—similar to the base closing commission—to direct the reorganization of the complex to absorb and channel the pain. “[The Energy Department] is not capable of making the technical and economic judgments to get the best deal for the taxpayers,” he told a House Armed Services panel.

Pending House legislation would block the proposed nonnuclear consolidation until DoE can prove it would save money. This reaction is a foretaste of what the Administration can expect as it tries to pare or relocate other parts of the weapons complex.

The coming year will be critical. The Department of Energy will try to move ahead on the proposed Kansas City consolidation while completing the outlines of the new complex. These choices will coincide with the end of a budget pact between the Administration and Congress that has kept a wall between civilian and defense spending—a barrier that insulated the complex somewhat from demands for increased spending on social programs and other civilian needs.

Admiral Watkins pledged to instill within the department a new culture of greater openness and dedicated to worker and public safety. While the Admiral generally earns praise from lawmakers, many say DoE is still too insular and prone to accidents and waste. Such mistrust has emboldened critics and made Congress more willing to intervene. At a time when administrators are forced to make unprecedented changes in the nuclear weapons complex, the public scrutiny will be far more rigorous than in the past, and the margin of error far slimmer. ■

Holly Idelson covers energy and technology issues in Washington, D. C., for Congressional Quarterly. This is her first article for AIR FORCE Magazine.

The Norden bombsight was one of the most closely guarded secrets of World War II.

The Blue Ox

By C. V. Glines

IT WAS one of America's top military secrets of World War II. Weighing forty-five pounds, it was taken out of a carefully guarded concrete blockhouse and carried to the bomber by an armed crew member just before a mission was to begin. It was placed in the nose of a B-17, B-24, or other type of bomber, but it was always draped with a canvas cover until the plane became airborne.

Usually only one member of a bomber crew was trained to use it. If a plane seemed likely to fall in enemy territory, a crew member would smash it with a hammer or crash ax to prevent examination of its contents. Some called it "The Football." For reasons never fully explained, others called it "The Blue Ox."

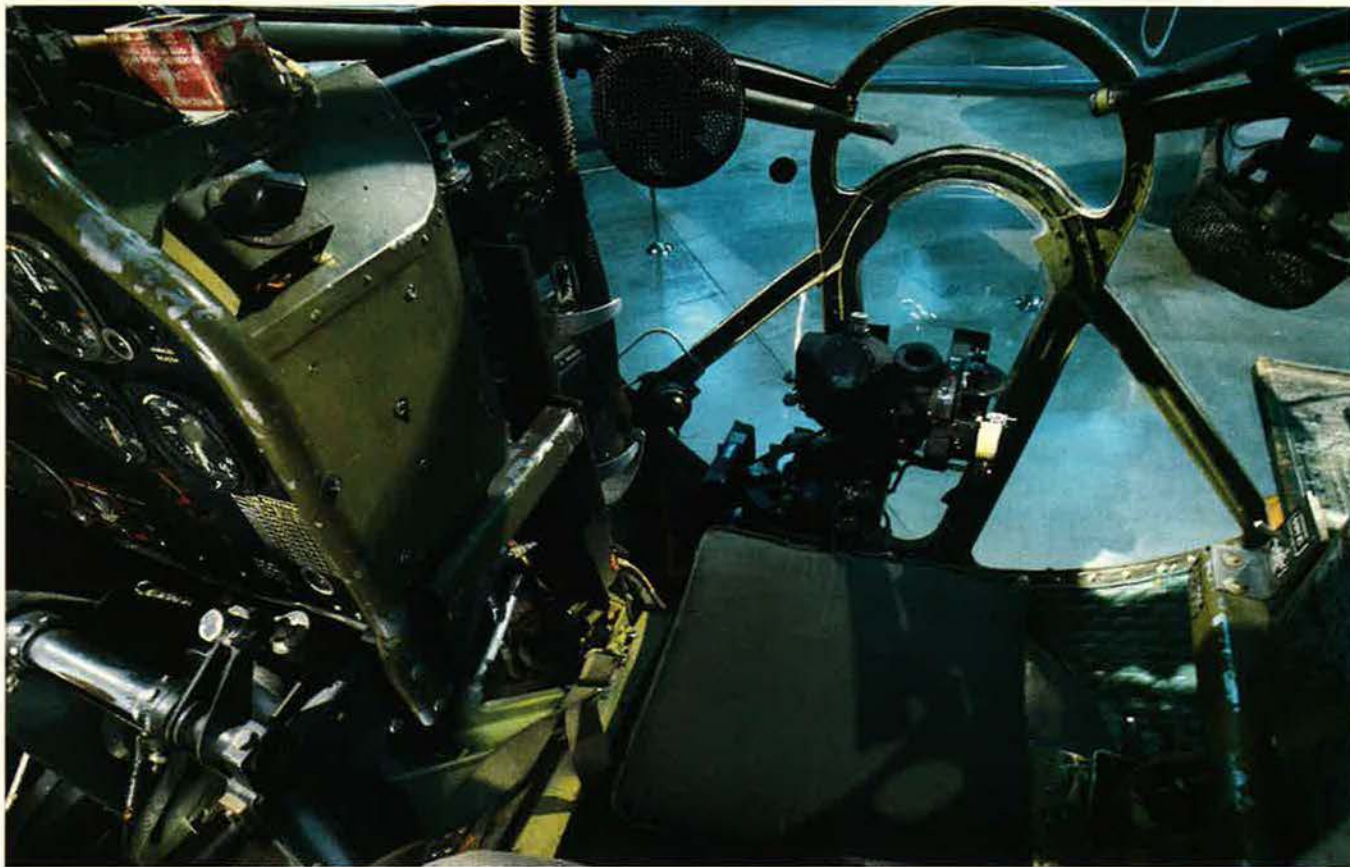
"It" was the famous Norden bombsight, a device that enabled US daylight bombers cruising at altitudes of more than four miles to place their eggs on strategic targets with "pickle-barrel" accuracy. The bombsight was the brain-child of Carl Lucas Norden, an inventive Dutchman who chain-smoked cigars, much to the disgust of his colleagues and employers. Because Norden was a dedicated, highly skilled technician who had no interest in publicity, few ever knew much about his personal background.

Norden was born in 1880 in Semarang, Java, Dutch East Indies (now Indonesia). Following the death of his father in 1885, the family returned to Holland, then moved to Dresden, Germany, in 1893. In 1896, the boy began a three-year apprenticeship in a Swiss machine shop, after which he entered the world-famous Zurich Federal Polytechnic School. He graduated as a mechanical engineer in 1904 and came to America. He worked two years for the Worthington Pump and Machine Co. in Brooklyn and for five years—1906 to 1911—at the J. H. Lidgerwood Manufacturing Co.



The Norden bombsight was so closely guarded that it was installed in bombers just before each mission (above).

The photo opposite shows the bombardier's position in the Norden-equipped Bock's Car, which dropped the second atomic bomb. That B-29 is now at the Air Force Museum in Dayton, Ohio.



Man and Stogie

At the time, Elmer Sperry, inventor of the Sperry gyro-compass and other gyro devices, was deep in negotiations with Lidgerwood for construction of a precision motor for a Sperry gyro-stabilizer that was to be sold to the US Navy. Sperry was repelled by what he called Norden's "vile black cigars," but he was impressed with Norden's expertise and hired him to help design the first gyro-stabilizing equipment for large ships produced in the United States.

Meanwhile, Sperry reserved for himself the privilege of working on what he called "pure" inventions such as an aerostabilizer. Such an instrument was needed because of the inherent instability of early aircraft, which caused many fatal accidents. In a 1913 article, Sperry explained:

"With the present machines, very long flights are nearly beyond the endurance of the aviator [because of fatigue in maintaining stability]. . . . The automatic control of stability of the heavier-than-air machines will do much to decrease the growing list of fatalities. . . . The automatic control of stability will be especially valuable to the military use of the aeroplane, as it will make it possible to fly in almost any condition of weather. . . . In reconnaissance service, only one man will be necessary as the machine may be controlled automatically while the aviator makes sketches, records information obtained, or operates the radio set to communicate with his base."

The aerostabilizer interested Norden, too, but Sperry would not let him work on it. Norden left the company in 1915 but continued to work on Sperry's marine stabilizer contracts as a paid consultant until March 1917.

Norden teamed up with another former Sperry employee, Hannibal Ford, and won several patents on control

systems for launching aerial torpedoes from Navy aircraft. He also designed and furnished many instruments and devices for US Navy bureaus, including robot flying bombs, radio-controlled target planes, and the catapults and arresting gear used on aircraft carriers.

Norden's experimentation for these patents led to the development of a military bombsight, which was in competition with one being developed at the same time by Sperry.

Norden's first bombsight was brought out in 1923 in collaboration with Theodore H. Barth. From the airman's point of view, it had disadvantages. It was a complex instrument whose timing mechanism required a bomber to operate at a stable speed during a bomb run starting a considerable distance from the target. At the same time, the pilot had to keep the aircraft level. A bomber flying at a steady, predictable speed on a straight line would be an easy target for enemy fighters and antiaircraft artillery fire.

Norden was not discouraged. He formed his own company in New York, N. Y., in 1928. In 1931, he demonstrated to the Navy a much improved bombsight in a test against the hulk of the heavy cruiser *Pittsburgh*. Navy officials were so awed by its accuracy that they promptly ordered forty sights. The Army Air Corps, also impressed, placed its own order. That year, patents were secretly granted to Norden and Navy Capt. Frederick I. Entwistle, who had worked on the improvements.

In 1935, the Air Corps installed its first batch of Norden bombsights in Martin B-10s of the 7th and 19th Bomb Groups on the West Coast, under Col. Henry H. "Hap" Arnold. Tests with the bombsight were carried out at Muroc Dry Lake in the Mojave Desert for the express

purpose of developing the tactics of high-altitude, precision, daylight bombing.

Into the Woodshed

In his autobiography, *Global Mission*, General Arnold explained that, using the Norden bombsight, "the 19th Group began on the first day by placing its eggs within 520 feet of the target, closing the gap to 480 feet at the end of seven days, to 300 feet at the end of twenty-seven days, and placing its bombs regularly within 164 feet of a target no bigger than a woodshed, at the end of forty-one days."

Improved Sperry bombsights were also tested and procured in 1933, but the Norden consistently proved more accurate.

The Muroc tests, conducted at 12,000 and 15,000 feet, were considered too low because the antiaircraft artillery of the day could reach those altitudes. Bombers like the Boeing B-17 then being designed would reach above 20,000 feet. In a future war, the Air Corps's targets would be mostly stationary, but the Navy needed a sight that would be effective against slowly moving targets. This complicated the problem, and Norden went back to the drawing board to try to meet the new specifications.

To get bombs on target with acceptable accuracy requires an aircraft to correct for drift while maintaining a constant altitude and airspeed. Even minor fluctuations can cause a miss, and the greater the altitude, the greater the error.

To overcome this problem, Norden devised a gyro-stabilized automatic pilot, which the Air Corps called Automatic Flight Control Equipment and the Navy called Stabilized Bombing Approach Equipment. On the approach to the target, the autopilot would be turned on to reduce turbulence and "overcontrolling" by the pilot. The bombardier would take over and keep the cross hairs of the sight centered on the target. At the critical point, the bombs were released, and a green light would flash in the cockpit to tell the pilot that the bombs were gone and he could resume control of the aircraft.

In the succeeding years, the device was improved. The ultimate model—designated the Mark XV—was a complex assemblage of more than 2,000 cams, gears, mirrors, lenses, and other components. With it, a fixed speed and altitude had to be maintained for only fifteen to twenty seconds.

The stabilizer consisted of two electric gyros: a directional gyro to correct for course changes and drift and a flight gyro to correct for the aircraft's roll or pitch. A 2.5-power sighting telescope was mounted on top of the stabilizer.

The Norden sight was not the complete answer for all World War II bombing because it could not be used with accuracy at altitudes below 1,800 feet. Since the Navy operated its aircraft mostly on low-level dive bombing strikes against enemy shipping, the Norden was installed in small numbers on Navy bombers.

Guards and Bodyguards

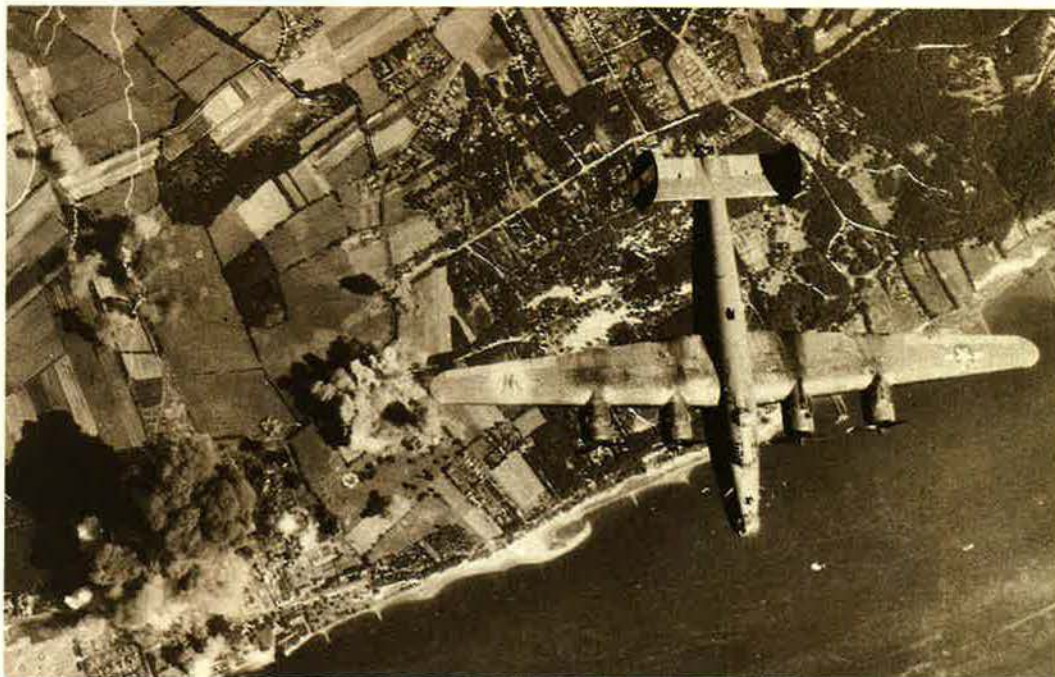
At the beginning of 1941, the Carl L. Norden factory in New York had planned an output of 800 bombsights a month, but the attack on Pearl Harbor caused immediate expansion of the facilities. Another plant was built in Indianapolis, and orders for components were farmed out to other companies. By the end of 1943, nearly 2,000 Norden sights were being turned out monthly. So valuable were the secrets of the sight's manufacture that the plants were the most carefully guarded installations of the war, with 350 guards keeping around-the-clock vigil. Employees were not allowed on any floor of the plants except the one on which they worked. Mr. Norden was accompanied everywhere by two husky bodyguards.

The Norden bombsights were first used by American forces in combat during the summer of 1942, when Eighth Air Forces's B-17s arrived in England and began daylight bombing of rail marshaling yards, Luftwaffe bases, and submarine pens. Bombing accuracy varied, depending on the experience of bomber crews, accuracy of flak, weather conditions, and activity of enemy fighters. At first, each plane on a run to the target maneuvered independently, a tactic that often disrupted the formations and opened them to

Safeguarding the bombsight was the personal responsibility of the bombardier. Even in this wartime publicity photo, Capt. W. E. Sticklen's bombsight is hidden under its custom-designed canvas cover. Without exception, the bombsights were not uncovered until the planes were airborne.



The Norden bombsight helped make pinpoint strategic daylight bombing a reality, giving US long-range bombers accuracy to within 1,000 feet. Below, a B-24 bombardier sights his target and prepares to take control of the aircraft for the bomb run.



enemy fighter attacks. Accuracy suffered. On September 5, 1942, 140 French civilians were killed in a raid on the Rouen marshaling yards when bombs missed the target area.

Col. Curtis E. LeMay, commander of the 305th Bomb Group, concluded that this was unnecessarily dangerous. He assigned the best bombardiers to lead crews; only the bombardier in the lead ship in each formation would sight on a target. The remainder of a formation would open their bomb bay doors on the lead plane's cue and toggle off their eggs when the lead bombardier dropped his. The results were seen immediately. By the spring of 1943, seventy-five percent of the 305th's bombers were hitting within 1,000 feet of their assigned targets. The idea was passed to other theaters, and the Norden sight thus helped substantiate the boast of "pinpoint" daylight strategic bombing.

The major disadvantage was that it could be used only when the target was visible. It remained for radar to solve the problem of bombing through overcast and at night.

Many Norden bombsights fell into enemy hands, but neither the German Luftwaffe nor the Japanese Air Force could take advantage of the windfall because they did not have long-range strategic bombers. During the early days of the war, the Germans used a pendulum-stabilized model, later replaced by a fully automatic, electrically driven, heated sight that showed some evidence of the influence of Norden's ideas.

The bombardiers on the two planes that dropped atomic bombs on Hiroshima and Nagasaki were ordered to bomb visually using the Norden sight. They did.

Production of the Norden was halted in September 1945 after 43,292 had been manufactured. The AAF had procured all except about 6,500 that went to the Navy.

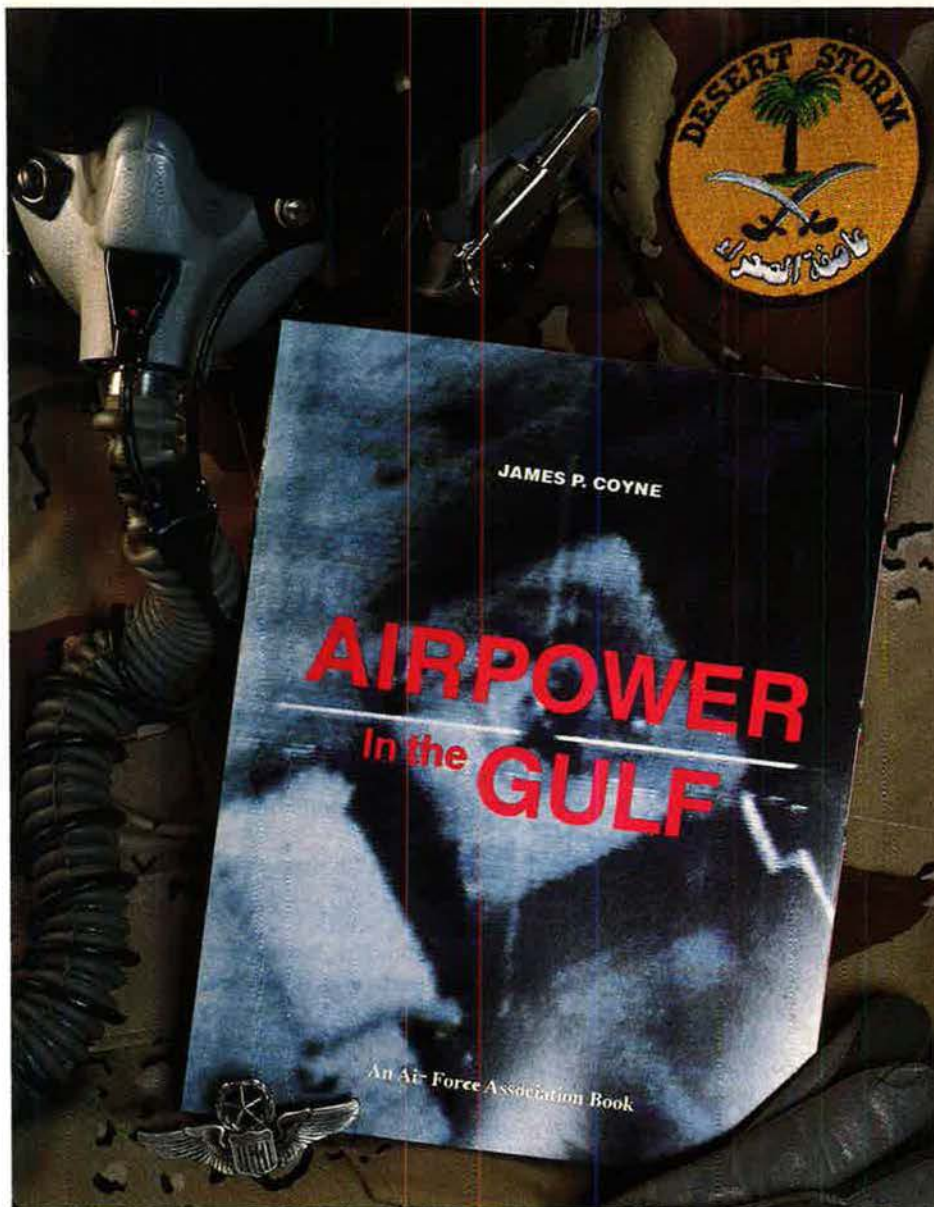
The Norden bombsight was classified "secret" until 1955, when its inventor was finally permitted to take out an open patent on all of its improvements. The plans were made available to the public, and Norden sights were sold at postwar government surplus sales for less than \$50.

The sight was used during the Korean War and on Strategic Air Command's photoreconnaissance and precision mapping missions of the early cold war. It became as valuable to precision photoreconnaissance as it had been to precision bombing.

Mr. Norden returned to Switzerland shortly after World War II and died there in June 1965. Though he never abandoned his Dutch citizenship, he had devoted more than thirty years of his life to work that benefited the military forces of the US. Though his last name was so popularly identified with the bombsight, he was scarcely known outside military aviation circles. ■

C. V. Glines, a retired Air Force colonel, is a free-lance writer and co-author, with Gen. James Doolittle, of I Could Never Be So Lucky Again, the General's memoirs. His most recent article for AIR FORCE Magazine was "The Doolittle Raid" in the April 1992 issue.

A Bolt From the Blue!



Cloaked by darkness and stealth, more than 400 allied aircraft crossed the border into Saddam Hussein's Iraq in the early morning hours of January 17, 1991, and struck a blow from which the Iraqi armed forces never recovered. It was the beginning of the most impressive air campaign in history.

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By John L. Frisbee, Contributing Editor

Always With Valor

Unique among Vietnam airmen, Ray Horinek was decorated for heroism as a FAC, a fighter pilot, and a POW.

WHEN Capt. Ramon Horinek, who grew up on a farm near Atwood, Kan., volunteered for duty in southeast Asia, he already had earned more distinctions than the average jet jockey, among them awards for superior performance as an instructor pilot and acceptance as a volunteer for thirty-day isolation in a simulated space capsule to provide data for future spaceflights. Vietnam, however, was where the action was.

In February 1965, Ray Horinek reported for duty as an A-1E pilot with the 1st Air Commando Wing in Vietnam. Six months and many missions later, he again volunteered, this time as a forward air controller involved in classified operations. There would be plenty of combat missions there, and combat was what Horinek lived for—and what he got. In February 1966, he was the key player in one of the war's most extraordinary, sustained acts of heroism in the field.

The chain of events, which can be no more than sketched here, started on February 16, when guerrilla tribesmen who were fighting the Communists were surrounded by enemy troops at a remote site. Although his light, unarmed plane was torn up by automatic weapons fire, Captain Horinek continued to direct air strikes that scattered the enemy and destroyed one of their munition storage dumps.

The following day, the guerrillas' main base came under attack. Flying a replacement aircraft, Captain Horinek took eight hits as he arrived on the scene to support the friendly force. He called in fighter strikes that eliminated several enemy positions, until radio contact with the friendlies was lost and the fluid ground situation could not be followed from the air. Horinek landed on the surrounded airstrip. Proceeding on foot, he pinpointed enemy locations and, under constant enemy fire, called in air strikes that drove the enemy off.

Friendly aircraft now could use the strip to evacuate supplies and wounded. The guerrillas withdrew from the strip as darkness fell.

The next morning, Captain Horinek led a group of guerrillas back to the strip, driving the enemy off in close combat. Single-handedly, he attacked an enemy position, killing three of four enemy troops and capturing the fourth, who turned out to be an important prisoner. Sprinting back to the airstrip, which was partially occupied by the enemy, he carried a wounded man to safety, then ran into the exploding storage area to retrieve much-needed radios. Horinek next joined a friendly unit that was under fire, calling in air strikes to within twenty-five yards of his position. He continued to control the air action while the guerrillas withdrew to safety.

Finally, Captain Horinek manned an exposed air request radio during a night mortar attack. All mortar fire was silenced by the strikes he directed. Although the base was ultimately lost, he had saved the surviv-

ing guerrillas and controlled the destruction of hundreds of enemy troops and their stores of supplies. For his inspiring leadership and heroism both on the ground and in the air, Capt. Ramon Horinek was awarded the Air Force Cross.

At the end of his tour, Horinek returned to the States, began flying the F-105, and joined the 355th Tactical Fighter Wing at Takhli RTAFB. On October 7, 1967, he was in the first flight of fighters to hit a North Vietnam helicopter parking area. In six passes while evading SAMs and MiG-17s, he destroyed six helicopters and damaged two others.

Seventeen days later, Captain Horinek's luck ran out. That day's target was the MiG field at Phuc Yen, northwest of Hanoi. His F-105 took a direct hit while on the bombing run. He continued the run, destroying two MiGs, but his aircraft was too badly damaged to make it home. He baled out, breaking bones in his ankle when he landed in the midst of a group of unfriendly locals, who stripped him of everything but his underwear.

After an agonizing trip to Hanoi, Horinek, now a major, was tortured continuously for seven days and received no food, water, or clothing, though the nightly temperature hovered near freezing. The torture stopped only when his captors decided they could get no useful information from him. Because of his persistent defiance, he was mistreated many times in the years to come and spent months in solitary confinement before the POWs were released in January 1973. Major Horinek was awarded six decorations for heroism and leadership while a POW, including an oak leaf cluster to the Silver Star he had earned for his Phuc Yen mission.

Ramon Horinek returned to flying status after recovering from his POW treatment. In February 1983, he retired as a lieutenant colonel, one of the most decorated and respected of Vietnam veterans. He now lives in Universal City, Tex., still holding firmly to a belief in God and country that sustained him in combat and during more than five years in Hanoi's prisons. ■



After recovering from more than five years as a POW in Hanoi, Maj. Ramon Horinek returned to flying status.

AFA Nominees for 1992-93

By Katie Storm

AT A meeting May 23 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 National Convention in Washington, D. C., on September 14.

The Nominating Committee consists of the five most recent past National Presidents and one representative from each of the twelve regions.

Nominated for his first 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 in 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

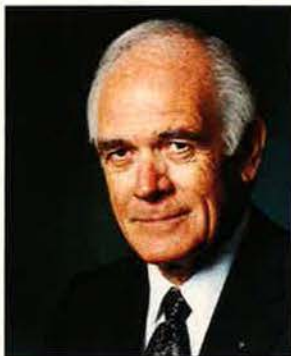
the Aerospace Education Foundation (AEF) Board of Trustees. Currently, he is National Vice President (Midwest Region), Chairman of the Membership Committee, and permanent member of the National Board of Directors. He has received AFA's Presidential and Special Citations and is a Life Member of both AFA and AEF.

ous 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 what was then 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

one units, hers is the third largest personnel office in ANG. She directs the base Family Support Program and has the collateral duty of Federal Women's Program Manager. Her previous assignments include Commander, Communications-Computer Staff Officer, Executive Officer, and Base Services Officer. She completed the



James M. McCoy



O. R. Crawford



Mary Ann Seibel



William N. Webb

O. R. Crawford of Austin, Tex., was nominated for his first term as Chairman of the Board. Mr. Crawford is a business consultant and private investor in Austin. 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; trustee, Falcon Foundation; vice chairman, American Airpower Heritage Foundation; and trustee, Southwest Research Institute. He also participates in the Austin Council on Foreign Affairs.

Mr. Crawford is a native Texan, born in Amarillo, where he attended public schools. He entered the 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 numer-

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 a Curtiss P-40 Warhawk as a colonel in the Confederate Air Force.

Mr. Crawford joined AFA in 1946 and has previously 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, and AEF Trustee. Currently, he serves as National President, Chairman of the Executive Committee, and AEF Trustee. He has received AFA's Presidential Citation, Exceptional Service, Special Citation, and Medal of Merit awards. 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 second elected term as National Secretary. Ms. Seibel is director of Personnel for ANG's 131st Fighter Wing in St. Louis.

With a base population of more than 2,000 individuals and twenty-

Air War College Seminar program in 1989. Ms. Seibel has twenty-eight years of federal civil service and fifteen years of military service. She was commissioned as a 1st 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 on the Advisory Council for Parks College of St. Louis University and on the Military Affairs Committee of the St. Louis Regional Commerce and Growth Association.

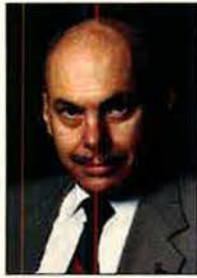
Ms. Seibel is also a past president of the Junior Women's Chamber of Commerce and a member of the National Association for Female Executives, Sen. Christopher Bond's National Affairs Policy Roundtable, St. Louis World Affairs Council, Missouri National Guard Association and National Guard Association of the United States, Missouri Committee for Employer Support of Guard and Reserve, and 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 Di-



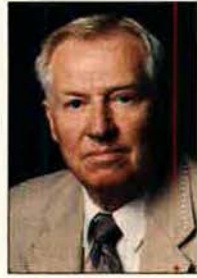
Dan F. Callahan III



Alwyn T. Lloyd



Robert A. Munn



Jack G. Powell



James E. Smith



Joseph A. Zaranka

rector, Under-40 Director, Resolutions Committee Chairman, base-membership chair for the Spirit of St. Louis Chapter, 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 and Constitution Committees, Chairman of the Resolutions Committee, and chapter aerospace education vice president. 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.

William N. Webb of Midwest City, Okla., was nominated for his sixth term as National Treasurer. He is an advisor in AFA matters for the commander of the Oklahoma City ALC.

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 fourteen 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 Award for membership. He is a Life Member of AFA.

The following 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, Earl D. Clark, Jr., M. Lee Cordell, R. L. "Dev" Devoucoux, James H. Doolittle, Russell E. Dougherty, George M. Douglas, Joseph R. Falcone, E. F. "Sandy" Faust, Joe Foss, Barry Goldwater, Jack B. Gross, George D. Hardy, Alexander E. Harris, Martin H. Harris, Gerald V. Hasler, H. B. Hencerson, 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, James M. McCoy, Edward J. Monaghan, J. B. Montgomery, J. Gilbert Nettleton, Jr., William C. Rapp, Julian B. Rosenthal, Peter J. Scherck, 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.

The six people whose photographs appear above are nominees for the six elected Directorships for the coming year.

Dan F. Callahan III, McMinnville, Tenn. Air technician (wing operations officer). Former Under-40 Director, National Director, state and chapter treasurer, and chapter secretary and

president. Current state treasurer, member of chapter executive council, and chapter vice president for communications. Life Member of both AFA and AEF.

Alwyn T. Lloyd, Seattle, Wash. Engineer. Former state president and chapter president, chapter vice president, state executive vice president, and state board chairman. Current National Vice President (Northwest Region). AFA Life Member.

Robert A. Munn, Tucson, Ariz. Retired transportation operations manager. Former state and chapter president and vice president, state treasurer, and chapter secretary and vice president for membership. Current National Vice President (Far West Region). Life Member of both AFA and AEF.

Jack G. Powell, Aurora, Colo. Retired accountant and auditor. Former National Vice President (Rocky Mountain Region), state president, and chapter president. Current national committee chairman and chapter vice president for government relations. AFA Life Member.

James E. "Red" Smith, Princeton, N. C. Retired Air Force colonel. Former National Vice President (Southeast Region), national committee member, state president, vice president, secretary, and treasurer, and chapter president. Current National Director and Council Member. Life Member of both AFA and AEF.

Joseph A. Zaranka, Bloomfield, Conn. Retired insurance industry executive. Former National Vice President (New England Region); national committee chairman, vice chairman, and member; state president and vice president; and chapter president and vice president. ■

Kaie Storm is Administrative Assistant to the Director, Volunteer & Regional Activities.



By Daniel M. Sheehan, Assistant Managing Editor

Going Mobile

The **Mobile Chapter** took home the honors as Outstanding Chapter at this year's Alabama convention, held in Birmingham. National Director Frank M. Lugo accepted the award from State President William Voigt on behalf of Chapter President William Divin and the members of the Mobile Chapter. Mr. Divin was recently elected state vice president.

Besides hosting last year's successful convention, running an outstanding recognition program for cadets, and sponsoring a well-attended dance featuring the Glenn Miller Orchestra, the chapter saw its nominee, Melba Iris Harris, win AEF's Christa McAuliffe Memorial Award for outstanding teacher. All of this helped win Mobile its Chapter of the Year honors.

Brig. Gen. Robin G. Tornow, commandant of the Air Force Reserve Officers Training Corps, gave the keynote address. Representatives from all five Alabama chapters attended, as did the Mississippi, Louisiana, Arkansas, and Tennessee state presidents.



Photo by Joe Colosso

The Nation's Capital Chapter honored His Royal Highness Prince Bandar Bin Sultan (right), the Saudi Arabian ambassador to the US, with the Distinguished Award for International Achievement. Chapter President John F. Lisella presented the award, which cited the Prince's "outstanding diplomatic efforts in furthering the close relationship between the US and Saudi Arabia."



In Illinois, Scott Memorial Chapter President Jean Schobert presents MSgt. Ruben Moreno his AEF Eagle Grant as 375th AW Vice Commander Col. William Calhoun looks on. The \$250 scholarship was awarded after Scott AFB's Community College of the Air Force graduation. Chapters throughout the US have found the Eagle Grant program to be an effective means of furthering AEF's goals.

Foley High School of Foley, Ala., was chosen as the state's Outstanding AFJROTC Detachment. The trophy was presented by Mr. Voigt to Cadet Lt. Col. Amanda Wilson and Cadet Maj. Angeline Dilatendo.

The Mobile Chapter has been busy all year, starting with a strong showing at both the South Central Region Workshop at Maxwell AFB, Ala., and the Air Warfare Symposium in Orlando, Fla., in January. Also in January, Navy Secretary H. Lawrence Garrett III spoke to a Chamber of Commerce meeting attended by Mr. Lugo, Chapter Board Chairman John Dyas, and chapter members Lt. Col. Vince Schiavoni and Rep. Herbert "Sonny" Callahan (R-Ala.).

In conjunction with the chapter's Tribute to Cadets banquet, honoring AFJROTC, AFJROTC, Army ROTC, and the Civil Air Patrol, AEF President Gerald V. Hasler conducted a business workshop with Mr. Divin, Mr. Lugo, H. L. Everett, Carl Lund, and other chapter officials. Mr. Everett was honored for his past service to the chapter as board

The Thomas B. McGuire, Jr. (N. J.) Chapter honored this group of enlisted personnel and spouses by purchasing a table for them at the Iron Gate Ball and arranging transportation for them with one of the Chapter's Community Partners.



chairman from 1990 to 1991. Mr. Dyas presented awards to Cadet Lt. Col. George Schimmer, Mobile School District Army ROTC; Cadet MSgt. Marian Arnold, Baldwin County CAP; Cadet 3d Class Nicole Rolls, South Alabama University ROTC; and Cadet MSgt. Timothy Sims, Mobile City CAP.

The chapter has been ambitious in its support of AEF's "Visions of Exploration" program, together with *USA Today*. Ten Mobile schools are already participating in the science and math program, and the chapter plans to introduce it in twenty more during the next

school year. Chapter Vice President Steve Hester is spearheading the effort.

AFA Announces New Award

The Air Force Association will present the first annual John F. Alison Award for Industrial Leadership at its Convention in September. Named for the former National President and current permanent National Director, the award will honor an industrial leader who makes significant contributions to national security. The first award will go to Norman R. Augustine, chairman and chief executive officer of Martir Marietta Corp.

Chapter News

The Lt. Col. B. D. "Buzz" Wagner (Pa.) Chapter celebrated Armed Forces Day by taking part in the Johnstown Armed Forces Banquet. The banquet culminated a week of special activities, which the Wagner Chapter helped organize and orchestrate. Lt. Gen. John B. Conaway, chief of the National Guard Bureau, was the guest speaker. The General told his audience of the many successes of the reserve forces in Operations Desert Shield and Desert Storm and the increasingly important role that the Guard and Reserve will play in the drawn-down military of the future. The crowd, containing many members of the reserve forces of all services, was most receptive to the General's speech. Chapter President Jerome Ashman, Rep. John P. Murtha (D-Pa.), and Pennsylvania Guard Adjutant General Maj. Gen. Gerald T. Sajer were among the dignitaries in attendance.

Sacramento Exceptional Performers were the honorees at a recent banquet



The Klamath Basin (Ore.) Chapter hosted this year's state convention and the city of Klamath Falls held a military ball in conjunction with the event. State President John Lee, Maj. Gen. James T. Whitehead, AFA Director of Volunteer and Regional Activities Dave Noerr, and Chapter President Ed White (above, left to right) were among the 175 members and guests who attended the ball.

Coming Events

August 7-9, **California State Convention**, San Bernardino, Calif.; August 8, **Illinois State Convention**, Rosemont, Ill.; August 14-15, **Louisiana State Convention**, Bossier City, La.; August 22-23, **Indiana State Convention**, Kokomo, Ind.; August 28-29, **New Mexico State Convention**, Alamogordo, N. M.; September 14-16, **AFA National Convention and Aerospace Development Briefings and Displays**, Washington, D. C.

held by the **Sacramento (Calif.) Chapter**. Nineteen local achievers were honored at the event. Such successful events were instrumental in garnering the chapter the award for Best Single California Chapter Program in 1991. Local television personality Jim Crandell served as master of ceremonies, and Northwest Airlines Capt. Julie Clark was the guest speaker. Chapter President Al Litzler, Sacramento Air Logistics Center Commander Maj. Gen. Michael D. Pavich, and 323d Flying Training Wing Commander Col. Joe Wehrle joined 200 other chapter members and guests in applauding the honorees.

Also in California, the **Monterey Bay Area Chapter** is lending strong support to the "Visions" program. Ten local schools will benefit from the program this fall, and a recent essay contest drew more than 400 participants. Christina Marina, a sixth-grader from Burnett Grammar School, took first place with

her entry, "How I Would Save Planet Earth," earning a citation and a \$25 check, presented by Chapter President Harold Oberg. The essays were judged by a committee led by Col. Arthur Ragen, USAF (Ret.), former director of Admissions at the US Air Force Academy.

The **Eglin (Fla.) Chapter** serves younger and older constituents alike. In addition to its continuing work on the D. N. Masone Memorial Fund for the Air Force Enlisted Widows Home [see *February and April 1992 "AFA/AEF Reports"*], it hands out thousands of dollars annually to high school students. Cadet Col. Todd J. Perlman is the latest recipient of the chapter's \$3,000 Jimmy Doolittle Scholarship Award. Chapter President Bob Patterson presented the award at a quarterly meeting at the Eglin Officers Club as the Niceville High School senior's parents looked on proudly.

Other awards, each accompanied by a \$2,000 scholarship, presented at the meeting included the Maj. Gen. Tom Swalm Award to Cadet Col. Jason Blackburn of Pensacola High School, the Maj. Gen. Bennie Putnam Award to Cadet Maj. Chris Keene of Choctawhatchee High School, and the Gen. Robert D. Russ Award to Cadet Lt. Col. Angela M. Wooden of Fort Walton Beach High School. Dr. Dan Stewart, technical director of the Air Force Development Test Center at Eglin, addressed the meeting, emphasizing the changes in the Air Force with regard to organization, manpower, and capabilities and how those changes will affect Eglin AFB and its environs.

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

Air Force Musicians

Retired Air Force Musicians will hold a reunion September 24-27, 1992, at the Radisson Inn in Orlando, Fla. **Contact:** Louis C. Kriebel, 5647 Rosewall Cir., Leesburg, FL 34748-8022. Phone: (904) 728-5966.

B-29 Anniversary

The following is a partial list of organizations participating in the fiftieth-anniversary celebration of the B-29, August 14-16, 1992, in Seattle, Wash.: 314th Bomb Wing Association, including the 19th, 29th, 39th, and 330th Bomb Group Associations; 315th Bomb Wing Association along with the 16th, 331st, 501st, and 502d Bomb Group Associations, and the 24th, 73d, and 76th Air Service Groups. **Contacts:** Paul S. Friedrich, P. O. Box 3999, M/S 1718, Seattle, WA 98124-2499. Phone: (206) 773-7577 (Bob Moffatt) or (206) 655-2034 (Karl Crosswhite).

Explosive Ordnance Disposal

The National Explosive Ordnance Disposal Association will hold a reunion September 17-19, 1992, in Tacoma, Wash. **Contact:** James D. Dwyer, P. O. Box 53688, Albuquerque, NM 87153. Phone: (505) 884-8431.

Forward Air Controllers

Vietnam-era forward air controllers from Australia, New Zealand, and the US will hold a reunion September 9-13, 1992, in San Diego, Calif. **Contact:** Darryl J. McEvedy, 10 Makepiece Pl., Auckland 10, New Zealand.

Glider Pilots

The National World War II Glider Pilots Association will hold a fiftieth-anniversary reunion October 15-18, 1992, in Dallas, Tex. **Contacts:** LeRoy Erwin, 6725 Fortune Rd., Fort Worth, TX 76116. Charles J. Giallanza, 3881 Stone Mountain Freeway, Suite 2, Snellville, GA 30278.

Kingman Field

Personnel stationed at Kingman AAF, Ariz., during World War II will hold a reunion October 9-11,

1992, at Kingman Airport. **Contact:** Rob Chilcoat, 2545 Crozier, Kingman, AZ 86401.

Korean War Vets

Veterans of the 5th Communications Group/934th Signal Battalion, 1st Radio Squadron, Headquarters Squadron, 1st T&C Squadron, 2d Communications Squadron, 2d Radio Squadron, and the 7th Communications Squadron will hold a reunion October 29-November 1, 1992, in Nashville, Tenn. **Contact:** Richard Feiler, P. O. Box 405, Ardmore, OK 73402.

S. C. ANG Pilots

South Carolina ANG pilots will hold a reunion October 3, 1992, at McEntire ANGB, S. C. **Contact:** "Jet" Jernigan, McEntire ANGB, Eastover, SC 29044. Phone: (803) 695-6241.

Thunderbirds Alumni

The USAF Thunderbirds will hold a fortieth-anniversary reunion November 19-22, 1992, at Caesars Palace in Las Vegas, Nev. **Contact:** Lt. Col. Denny Weddle, USAF (Ret.), 3900 Paradise Rd., Suite T, Las Vegas, NV 89109. Phone: (702) 791-2377. Fax: (702) 732-3900.

US Air Force Academy

Former officers, enlisted, and civilians who were stationed at the Air Force Academy between January 1961 and December 1965 will hold a reunion October 16-17, 1992, at the Air Force Academy, Colo. **Contact:** USAFA 1961-1965 Staff Reunion, P. O. Box 412, USAF Academy, CO 80840-0412.

USAFSS/ESC

US Air Force Security Service/Electronic Security Command Alumni will hold a reunion September 24-26, 1992, at Kelly AFB, Tex. **Contact:** Public Affairs, Hq. Air Force Intelligence Command, San Antonio, TX 78243-5000. Phone: (512) 977-2166.

9th Air Force "Gangway"

CORRECTION: The reunion dates for the 9th Air

Force were incorrectly reported in the June 1992 issue. The reunion is scheduled for September 9-13, 1992, in Colorado Springs, Colo. **Contact:** Jerry Stover, 4025 Druid Ln., Dallas, TX 75205. Phone: (214) 522-0227.

9th Photo Recon

The 9th Photo Reconnaissance Squadron will hold a reunion October 14-17, 1992, in Boston, Mass. **Contact:** Edward F. Ferguson, 12 Norwich Rd., Norwood, MA 02062. Phone: (617) 769-0352.

10th AB Communications Det.

Veterans of the 10th Air Base Communications Detachment, 14th Air Force "Flying Tigers," will hold a reunion August 9-13, 1992, at Days Inn in

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.

Seattle, Wash. **Contact:** Henry H. Brown, 123 N. Polk St., Mena, AR 71953. Phone: (501) 394-4664.

13th Air Force

The 13th "Jungle" Air Force Veterans Association will hold a reunion October 15-18, 1992, at the Quality Inn Northeast in Columbia, S. C. **Contact:** Roger W. Rivers, 78 Emerald Ln., Williamstown, MA 01267. Phone: (413) 458-4269.

15th Tactical Recon Squadron

Veterans of the 15th Tactical Reconnaissance Squadron "Cotton Pickers" will hold a reunion October 2-4, 1992, in Austin, Tex. **Contact:** Col. John P. Anderson, USAF (Ret.), 2703 Dunbarton Dr., Austin, TX 78723-2234. Phone: (512) 926-3094.

15th Troop Carrier Squadron

Veterans of the 15th Troop Carrier Squadron, 61st Troop Carrier Group, will hold a reunion September 23-26, 1992, at the Marriott Pavilion Hotel in St. Louis, Mo. **Contact:** Joseph J. Yuhasz, 983 Ridge Hill Ln., #31, Midvale, UT 84047-4422.

15th/20th Weather Squadrons

Veterans of the 15th and 20th Weather Squadrons will hold a fiftieth-anniversary reunion September 18-20, 1992, at the Warwick Hotel in Denver, Colo. **Contact:** Luke Campeau, 46 S. Eagle Cir., Aurora, CO 80012. Phone: (303) 364-1179.

16th TCS/309th TCG

Veterans of the 16th Troop Carrier Squadron and the 309th Troop Carrier Group stationed at Dreux AB, France, between 1956 and 1959 will hold a reunion September 17-20, 1992, in Colorado Springs, Colo. **Contact:** "Fish" Powers, 2309 Wold Ave., Colorado Springs, CO 80909. Phone: (719) 596-5804.

27th Fighter Group

Veterans of World War II who served in the 27th Fighter Group/27th Bomb Group (Light)/27th Fighter-Bomber Group will hold a reunion September 16-17, 1992, at the Pioneer Inn and Marina in Oshkosh, Wis. **Contact:** Lowell A. "Bulldog" Smith, 166 Sorento Dr., Leitchfield, KY 42754. Phone: (502) 242-7868.

30th/478th Service Squadrons

Veterans who served in the 30th Service Squadron between May 1941 and September 1944 and in the 478th Service Squadron between September 1942 and March 1946 are planning to hold a reunion September 25-27, 1992, in Dayton, Ohio. **Contact:** Floyd Rouse, 500W, Box 223, R3, Crawfordsville, IN 47933.

32d Troop Carrier Squadron

The 32d Troop Carrier Squadron (World War II) will hold a reunion October 1-4, 1992, in Abilene, Tex. **Contact:** David E. Rosengrants, 457 Jolly Rogers Rd., Abilene, TX 79601. Phone: (915) 673-7484.

35th Fighter Group

Veterans of the 35th Fighter Group (World War II), which included the 39th, 40th, and 41st Fighter Squadrons, will hold a reunion September 30-October 3, 1992, at the Hilton Hotel in Dayton, Ohio. **Contact:** Robert Sandlin, 829 Main St., Hamilton, OH 45013. Phone: (513) 863-8558.

36th Fighter Group

Veterans of the 36th Fighter Group, 9th Air Force, will hold a reunion October 8-10, 1992, at the Sheraton-Berkshire Hotel in Reading, Pa. **Contacts:** A. D. Burgazzoli, 63-44 Pleasant View St., Middle Village, NY 11379. Phone: (215) 372-3685 (Lenny Miller).

Class 42-A

Members of Class 42-A (Kelly, Ellington, and Foster Fields, Tex.) will hold a reunion October 15-18, 1992, in Scottsdale, Ariz. **Contact:** Col. Mike M. Kovar, USAF (Ret.), 24407 S. Ribbonwood Dr., Sun Lakes, AZ 85248-7749. Phone: (602) 895-8848.

43d Service Squadron

Veterans of the 43d Service Squadron, 5th Air Force (World War II), will hold a reunion September 15-17, 1992, in Moreno Valley, Calif. **Contact:** Maurice P. Vought, 3235 Grande Vista Ave., San Bernardino, CA 92405. Phone: (714) 883-4930.

Class 44-I

Members of Class 44-I (Williams Field, Ariz.) will hold a reunion November 9-12, 1992. **Contact:** Norman C. Gaddis, 665 Bermuda Run, Bermuda Run, NC 27006. Phone: (919) 998-8452.

47th Bomb Squadron

Veterans of the 47th Bomb Squadron, 41st Bomb Group, 7th Air Force, will hold a reunion October 22-25, 1992, in Anaheim, Calif. **Contact:** Capt. Frank A. Ciarochi, USAF (Ret.), 67370 Peineta Rd., Cathedral City, CA 92234. Phone: (619) 320-4658.

48th Troop Carrier Squadron

Veterans of the 48th Troop Carrier Squadron, 313th Troop Carrier Group, will hold a reunion October 1-3, 1992, in Dayton, Ohio. **Contact:** Dudley Rose, P. O. Box 123, Madison, OH 44057. Phone: (216) 428-3284.

49th Fighter Group

The 49th Fighter Group will hold a reunion November 1-4, 1992, at the Doubletree Hotel on Goat Island in Newport, R. I. **Contact:** Frederick Dick, 7 Harbour Rd., Barrington, RI 02806. Phone: (401) 245-2783 or (401) 962-4469.

50th Troop Carrier Wing

Veterans of the 50th Troop Carrier Wing will hold a reunion September 9-13, 1992, in Colorado Springs, Colo. **Contact:** Frank Ehrman, 840 Staton Place West Dr., Indianapolis, IN 46234-2162. Phone: (317) 271-8568.

Class 52-G

Members of Class 52-G will hold a fortieth-anniversary reunion October 22-25, 1992, in Sandestin, Fla. **Contact:** Jack Gilliland, 1232 Redwood Ln., Gulf Breeze, FL 32561. Phone: (904) 932-585.

55th Fighter Squadron

The 55th Fighter Squadron will hold a seventy-fifth-anniversary reunion August 7-9, 1992, at RAF Upper Heyford, UK. All former members and their families are invited. **Contact:** Lt. Chris Blackwell, 55th Fighter Squadron, 20th Fighter Wing, APO AE 09466. Phone: 011-44-869-234855. DSN: 263-4855.

62d Troop Carrier Squadron

The 62d Troop Carrier Squadron will hold a fiftieth-anniversary reunion in December 1992 at Little Rock AFB, Ark. **Contact:** David E. Mondt, P. O. Box 606, Boone, IA 50036. Phone: (515) 432-6342.

68th Fighter-Interceptor Squadron

The 68th Fighter-Interceptor Squadron will hold a reunion September 10-13, 1992, at the Holiday Inn/Casino Hotel in Reno, Nev. **Contact:** Maj. Bill L. Disbrow, USAF (Ret.), 4 Gold Hill Dr., Carson City, NV 89706. Phone: (702) 883-9102.

68th Tactical Fighter Squadron

Veterans of the 68th Tactical Fighter Squadron will hold a reunion September 24-27, 1992, at the Edgewater Hotel in Seattle, Wash. **Contact:** Lt. Col. Andrew L. Patten, USAF (Ret.), P. C. Box 251, Port Townsend, WA 98368. Phone: (206) 385-7300.

80th Fighter Squadron

Veterans of the 80th Fighter Squadron will hold a reunion October 1-4, 1992, at the Menger Hotel in San Antonio, Tex. **Contacts:** Lt. Col. James C. Ince, USAF (Ret.), 2810 Thousand Oaks, San Antonio, TX 78232. Phone: (512) 599-0251. Col. Jay E. Riedel, USAF (Ret.), 1821 St. Elm Dr., Columbus, GA 31901-1229. Phone: (404) 324-7360.

85th Bomb Squadron

The 85th Bomb Squadron will hold a reunion

September 7-16, 1992, in Sculthorpe, England. **Contact:** G. E. Watson, Jr., 2 Homestead Ave., Danbury, CT 06810.

87th/512th FIS

Veterans of the 87th and 512th Fighter-Interceptor Squadrons who served at Sioux City, Iowa, and RAF Bentwaters, England, between 1954 and 1958 will hold a reunion September 17-20, 1992, in Asheville, N. C. **Contact:** CMSgt. John W. White, USAF (Ret.), Rte. 11, Box 125M, Goldsboro, NC 27532. Phone: (919) 778-6164.

91st Bomb Group

The 91st Bomb Group will hold a reunion September 3-6, 1992, in Memphis, Tenn. **Contacts:** Frank G. Donofrio, 5647 Hinton Place Cove, Memphis, TN 38119. Phone: (901) 767-1026. Brig. Gen. Earl Pate, Jr., USAF (Ret.), 104 Skyview Dr., Hendersonville, TN 37075.

95th Bomb Wing

Veterans of the 95th Bomb Wing (B-52/KC-135 era) will hold a reunion October 23-25, 1992, at the Marriott Hotel in El Paso, Tex. **Contact:** Alan E. Mossien, 1801 Ski Slope Cresc., Virginia Beach, VA 23456. Phone: (804) 468-4811.

99th Bomb Group

The 99th Bomb Group (H) will hold a reunion in September 1992 in Rapid City, S. D. **Contact:** Marion J. Larkin, 3827 Clifton, Rapid City, SD 57701. Phone: (605) 343-1070.

102d Observation

Veterans of the 102d Observation Squadron (World War II) will hold a reunion October 15, 1992, in Lakehurst, N. J. **Contacts:** Edwin Manos, P. O. Box 787, Abbeville, SC 29620. Phone: (803) 459-5540. James McEwan, 2300 Currant Pl., Springhill, FL 34608. Phone: (904) 688-2460.

320th Bomb Group

Veterans of the 320th Bomb Group (B-26 Mauraders) will hold a reunion September 14-16, 1992, in Las Vegas, Nev. **Contact:** Stu Rowan, 108 Aspen, Hereford, TX 79045. Phone: (806) 364-4015.

339th Fighter Squadron

Veterans of the 339th Fighter Squadron and the 339th All-Weather, 339th Fighter-Interceptor, and the 339th Tactical Fighter Squadrons will hold a reunion September 17-20, 1992, at the Madison Hotel in Norfolk, Va. **Contact:** Richard Cowles, 745 Harrison St., Belding, MI 48809. Phone: (616) 794-2083.

366th Fighter Group

Veterans of the 366th Fighter Group and all attached units of the 26th Service Group will hold a reunion September 24-26, 1992, in Colorado Springs, Colo. **Contact:** John F. Peterson, P. O. Box 392, Harrodsburg, KY 40330. Phone: (606) 734-7912.

368th Fighter Group

Veterans of the 368th Fighter Group, which included the 395th and 397th Fighter Squadrons, will hold a reunion October 1-4, 1992, in Chicago, Ill. **Contact:** Bernard Ciranteneo, 3727 W. 104th St., Chicago, IL 60655. Phone: (312) 445-3656.

376th Heavy Bomb Group

Veterans of the 376th Heavy Bomb Group will hold a reunion September 23-28, 1992, in Fort Walton Beach, Fla. **Contact:** Bill McDonald, 319 Yacht Club Dr., Fort Walton Beach, FL 32548. Phone: (904) 243-8090.

379th Bomb Group

The 379th Bomb Group, 8th Air Force, will hold

a reunion October 25-29, 1992, at John Ascuaga's Nugget in Sparks, Nev. **Contacts:** Dick Fuller, 4404 Belcrest Way, Sacramento, CA 95821. Anthony S. Chong, 825 B St., Yuba City, CA 95991. Phone: (916) 673-6564.

380th Bomb Group

The 380th Bomb Group "Flying Circus" will hold a fiftieth-anniversary reunion November 4-8, 1992, in Tucson, Ariz. **Contact:** Helen H. Thompson, 2401 Lakeview Dr., Heber Springs, AR 72543. Phone: (501) 362-2891.

392d Bomb Group

Veterans of the 392d Bomb Group, 2d Air Division, 8th Air Force (World War II), will hold a reunion in October 1992 in Louisville, Ky. **Contact:** Arthur Egan, 2619 Lafayette Ave., Winter Park, FL 32789-1372. Phone: (407) 644-5439.

456th Fighter Squadron

The 456th Fighter Squadron, 414th Fighter Group (World War II), will hold a reunion September 30-October 4, 1992, at the Red Lion Inn in Colorado Springs, Colo. **Contact:** James H. Baird, 1645 Plummer Dr., Rockwall, TX 75087. Phone: (214) 771-8529.

463d Bomb Group

Veterans of the 463d Bomb Group will hold a reunion September 16-20, 1992, in Omaha, Neb. **Contact:** Rev. Eugene E. Parker, Rte. 3, Box 188, New Matamoras, OH 45767. Phone: (614) 473-1515.

466th Bomb Group

Veterans of the 466th Bomb Group will hold a reunion October 6-11, 1992, at the Galt House in Louisville, Ky. **Contact:** Louis Loevsky, 16 Hamilton Dr. E., North Caldwell, NJ 07006-4626. Phone: (201) 226-4624.

474th Tactical Fighter Wing

F-111 aircrews, officers, and assigned and attached units of the 474th Tactical Fighter Wing stationed at Nellis AFB, Nev., or Takhli RTAFB, Thailand, will hold a reunion September 17-20, 1992, in Las Vegas, Nev. **Contact:** Bill Shunney, 2305 Latigo Cir., Las Vegas, NV 89119. Phone: (707) 736-0638.

868th Bomb Squadron

Veterans of the 868th Bomb Squadron and the 63d Bomb Squadron will hold a reunion September 24-26, 1992, in Fairborn, Ohio. **Contact:** Fred Stanley Howell, 33233 Avenue F, Yucaipa, CA 92399. Phone: (714) 795-5658.

1708th Ferrying Wing

The 1708th Ferrying Wing Association will hold a reunion October 8-11, 1992, at the Menger Hotel in San Antonio, Tex. **Contact:** Maj. Ernie Davis, USAF (Ret.), 17881 S.W. 113th Ct., Miami, FL 33157-4931. Phone: (305) 238-3792.

Mosquito Aircrew

The Mosquito Aircrew Association is seeking

anyone involved with the Mosquito fighter-bomber for a reunion in 1992 in England. **Contact:** Peter R. Gilliam, 82319 Cochran Dr., Indio, CA 92201.

Class 44-G

I would like to hear from Pilot Class 44-G (Marianna, Fla.) for the purpose of holding a fiftieth-anniversary reunion in August 1994. **Contact:** Lt. Col. Charles L. Brown, USAF (Ret.), 3018 Shady Knoll Ln., Bedford, TX 76021-4120. Phone: (817) 498-7334.

Class 45-B

I would like to hear from members of Pilot Class 45-B (Marfa, Tex.) interested in having a reunion. **Contact:** David Emison, 19110 Candletrail Dr., Spring, TX 77388. Phone: (713) 353-1661.

Class 45-C

For the purpose of planning a fiftieth-anniversary reunion, I would like to hear from former members of Class 45-C who graduated from Douglas AFB, Ariz., Luke AFB, Ariz., or Marfa AFB, Tex. **Contact:** Robert L. Tank, 1348 Running Springs Rd., #6, Walnut Creek, CA 94595.

Class 51-D

I would like to hear from members of Pilot Training Class 51-D interested in a reunion tentatively scheduled for summer or fall 1992 in Las Vegas, Nev. **Contact:** Lt. Col. Gene F. Rogge, USAF (Ret.), 15713 E. Sunflower Dr., Fountain Hills, AZ 85268. Phone: (602) 837-6054.

Class 52-A

I am seeking contact with former members of Class 52-A for the purpose of planning a reunion. **Contact:** Charles Costantino, Rte. 2, Box 281-A1, Raeford, NC 28376.

Class 52-12

Aviation Cadet Class 52-12 (navigator), Ellington AFB, Tex., is seeking names and addresses of former members for a reunion. **Contact:** Morris Rozar, 201 W. Jefferson, Phoenix, AZ 85003.

Class 62-F

Seeking members of Class 62-F for a 1992 reunion. **Contact:** Maj. Gen. Shirley M. Carpenter, AFRES, Hq. Air Mobility Command, Scott AFB, IL 62225-5001. Phone: (215) 792-8557.

69th Troop Carrier Squadron

Seeking contact with former members of the 69th Troop Carrier Squadron interested in forming a reunion group. **Contact:** Donald P. Kelley, 836 Vienna Ave., Niles, OH 44446.

753d Aircraft Control and Warning Squadron

I am seeking contact with former members of the 753d Aircraft Control and Warning Squadron who are interested in a reunion. **Contact:** Jim Doyle, 15009 Rosehill Rd., Olathe, KS 66062. Phone: (913) 897-2069. ■

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Bulletin Board

For a book, I am seeking slides and photographs of Strategic Air Command aircraft, especially from the early years, including Korea and Vietnam. I also need photos of tanker aircraft and missiles. **Contact:** Michael Hill, 1405 8th St., S. W., Minot, ND 58701.

For a book, I am seeking donations of official and unofficial USAAF and USAF organizational patches. I am also interested in anecdotes relating to the development and significance of individual patches. **Contact:** Ian T. Frazier, 111 Delaware, Dyess AFB, TX 79607.

For a historical display on **Maj. Glenn Miller**, AFA's Lincoln Chapter is seeking related memorabilia, especially AAF officer brass and a patch from the band. **Contact:** SMSgt. Larry S. Brooks, Nebraska ANG, 1300 Military Rd., Lincoln, NE 68508-1090.

Collector seeks an **L-2B flight jacket**, the light-weight version of the MA-1. **Contact:** Alfredo de la Peña, C/General Pardiñas 42, 7-Int.-Pta.-6, 28001 Madrid, Spain.

I have available pictures of **B-29 nose art**, action photos, and pictures of life on Saipan during World War II for museums or collectors. **Contact:** Arno Gunther, 225 E. Jackson St., Port Washington, WI 53074.

For a book on the **A-10**, I am seeking contact with pilots and ground crew members. I am especially interested in pictures from Operation Desert Storm. **Contact:** Ken Neubeck, 1 Valley Rd., Patchogue, NY 11772.

Seeking contact with **1st Lt. John Howard**, who was stationed at RAF St. Eval Airdrome, England, in 1942-43. **Contact:** Jack Holt, 1503 Wavecrest Ln., Houston, TX 77062.

Seeking information on the B-29 **Weirite**, named after the Weirton Steel Corp., Weirton, W. Va. I would like to contact members of Lt. Paul Shernisky's crew of 794th Bomb Squadron, 468th Bomb Group, 58th Bomb Wing, West Field, Tinian. I am especially interested in the tail number. **Contacts:** John Good, 134 Sinclair Ave., Weirton, WV 26062. Angelo Semenick, 104 Webster Ave., Weirton, WV 26062.

Seeking **patches from squadrons deployed to King Fahd Airport**, Saudi Arabia, during Operations Desert Shield and Desert Storm. I am especially interested in 706th Tactical Fighter Squadron from NAS New Orleans, La., and in any special patches made for deployed units to commemorate the war. **Contact:** SSgt. F. Schlenker, 750 Clearview Dr., Charleston, SC 29412.

Seeking contact with **James R. Morris** from Oklahoma and **John H. Martin** of Hershey, Pa. Both were members of 85th Bomb Squadron based at RAF Sculthorpe, England, in the 1950s. **Contact:** Richard L. McCormick, 307 S. Meridian, Greenwood, IN 46143.

Seeking photos of two **Republic XF-91** Thunderceptors, #6680 and #6681, which were tested at Edwards AFB, Calif. XF-91 #6680 was tested with two different noses; I am interested in the nose that resembled the F-86D. XF-91 #6681 had two different tails, one of which was a butterfly or V tail. **Contact:** Dennis E. Ebeling, 62 Newcastle Ln., Willingboro, NJ 08046-1304.

Seeking historical information on **3552d Pilot Training Squadron**. Where were they stationed? What aircraft did they fly? **Contact:** Maj. L. Mark Johnson, USAF, SAM/AF, Brooks AFB, TX 78235.

Seeking information on **Capt. James Arthur McDermott**, of Boston, Mass., who served in North Africa during World War II. **Contact:** Leo J. McDermott, P. O. Box 671, Milford, DE 19963.

Aviation historian seeks a color slide of a Shorts **Skyvan operated by the Panamanian Air Force**. **Contact:** Charles A. Cooke, Unit 2, 52 Galvan Ave., Pakuranga, Auckland, New Zealand.

Seeking contact with "**Chuck**" Campbell, an American serviceman stationed with an aircrew near St. Athens, England, in the summer of

1944. He knew Eira James Elward. **Contact:** Sharon Elward, 12 Verbena Close, Bell Green, Coventry CV2 1JJ, West Midlands, England.

Seeking contact with **Maj. Charles Chambers** and others in N Flight of Sheppard AFB, Tex., Class 77-1. Also seeking **Joe Acevedo** and his wife Maria Victoria Aguilar, who were at Sheppard AFB in 1980. I am also interested in issues of *Defence Update International Magazine* and books about the Israeli Air Force. **Contact:** Mehdi Iranmanesh, P. O. Box 13595-186, Tehran, Iran.

Seeking contact with members of Lt. M. H. "Slim" Abbott's crew of 379th Bomb Group, 8th Air Force: **Sgt. Thomas L. Vance**, from Fort Worth, Tex.; **Sgt. John Gustafson**, from Omaha, Neb.; and **Sgt. Edgar C. Farner**, Shippensburg, Pa. **Contact:** M. H. Abbott, P. O. Box 229, New Berlin, IL 62670.

For an article on F-4s in the Gulf War, I am seeking information on the **deployment of 26th TRW** to Turkey for Operations Desert Shield and Desert Storm. **Contact:** Paul Minert, 9634 Cypress Ave., Fontana, CA 92335.

Seeking the whereabouts of **Ernest B. Gonza** and **James Raymond Sanders**. Both served with 10th Air Base Communications Detachment, 14th Air Force, in the China-Burma-India theater in 1944-45. **Contact:** Henry H. Brown, 123 N. Polk St., Mena, AR 71953.

Seeking information on the whereabouts of **William Emerson Brewer**, who served at RAF Burtonwood, England, in 1944-45. His last known address was in Flint, Mich. Also seeking **Robert William Brewer**, whose last known address was at Robins AFB, Ga., in 1963-64. **Contact:** Carol Ann Brewer, 20 Roscoe Ave., Newton-Le-Willows, Merseyside WA12 8BP, England.

Seeking contact with any member of **393d Fighter Squadron** (World War II), which was activated at Hamilton Field, Calif., in 1943 and flew P-38s from Lynhurst, England, and P-47s from France. The 393d was deactivated at Seymour Johnson Field, N. C., and reactivated as the 179th Fighter Squadron, assigned to Minnesota ANG. **Contact:** Capt. Penny Dieryck, 148th Fighter Group, Minnesota ANG, Duluth MN 55811.

Seeking contact with the following personnel from **99th Troop Carrier Squadron**: Marcelian A. Boudreaux, Raymond L. Upton, Bernard B. Fine, and Collins Fuqua, Jr. **Contact:** Hugo Zimmerman, 198 Fairway Cir., Winter Haven, FL 33881.

Modeler seeks photos of B-36s and RF-84s involved in the **FICON project**. I am especially looking for close-ups of the hook-up gear. General photos of the B-36 would also be helpful. **Contact:** Marc Williams, 17705 Breckinridge Ct., Granger, IN 46530.

Author seeks contact with **Korean War bomber veterans** who served with 19th, 98th, or 307th Bomb Wings; veterans who served with 22d or 92d Bomb Groups during the summer of 1950; and Bomber Command staff officers. I am also interested in letters, diaries, and photographs. **Contact:** Steve Ellis, 1754 Boyer Ave. E., Seattle, WA 98112-3021.

Seeking contact with members of **816th Medical Air Evacuation Squadron**, Air Transport Command, who flew air evacuation missions from Prestwick, Scotland, to New York, stopping in Iceland and Newfoundland. I would especially like to hear from pilots and flight

clerks who flew that route from July to October 1944. **Contact:** Elmer F. Cox, 1445 MacArthur Rd., Madison, WI 53714.

Collector seeks **B-52 squadron and wing patches**. I am especially interested in units inactivated before 1986. Also B-52-related systems, weapons, and event patches. **Contact:** Capt. Jon Drieling, USAF, 8424 Dawn Dr., Rome, NY 13440.

Seeking information on **SSgt. Edgar F. "Doc" Formby** from Arkansas, a B-17 bombardier with 19th Bomb Group in 1942-43 and 381st Bomb Group in 1943-44. **Contact:** Tom O'Brien, 9955 Montego Bay Dr., Miami, FL 33189-2347.

Seeking contact with **Darrell Peacock**, pilot, and **Michael James Donohue**, radar/observer, who were with 46th Fighter-Interceptor Squadron at Dover AFB, Del., in 1954-56. **Contact:** Fred Griffith, 15 Longview Heights Rd., Newton, CT 06470.

Seeking contact with former members of **198th Coast Artillery**, Delaware ANG, which was called to active duty in 1940. **Contact:** Ben Hollinger, P. O. Box 671, Milford, DE 19963.

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

For a book, I am seeking photos, anecdotes, and stories of World War II-era **train travel through southern Australia**, especially the town of Quorn. **Contact:** Capt. Carla Brown, USAF, 5 SWS/PA, Unit 11014, APO AP 96552.

Seeking information on **Brewster Aircraft Co.** and airplanes produced there between 1930 and 1945. **Contact:** Jerry Iannaccone, JSJ Enterprises, 330 Brookfield Ave., Staten Island, NY 10308-1444.

Seeking contact with **SSgt. Willie Loman**, who served at Offutt AFB, Neb., in 1958-61. **Contact:** Marvin Gale, 280 E St., Chula Vista, CA 91910.

Seeking a **61st Fighter-Interceptor Squadron patch** or copy from 1956-59. I would also like to correspond with anyone who was a member of that squadron during that time. **Contact:** Saul N. Kitz, 29215 32d Pl. S., Auburn, WA 98001-1464.

Seeking contact with veterans who were in the Air Force when the Japanese attacked Pearl Harbor. **Contact:** Capt. John C. Jordan, USAF (Ret.), 512T Ivy St., Kerrville, TX 78028-4657.

Seeking contact with former **F-86 pilots** interested in joining the F-86 Sabre Pilot's Association. **Contact:** Col. Charles C. Carr, USAF (Ret.), 4464 Rheims Pl., Dallas, TX 75205.

Seeking information on the tail letters of **F-4 Phantoms** assigned to Shaw AFB, S. C., in 1975-77. **Contact:** TSgt. Frederick L. Mehner, USAF, 1212 Commanchero Dr., Colorado Springs, CO 80915.

Seeking information on **Robert Little**, KIA May 22, 1942, or his brother **John Little**, from Spokane, Wash., who served with Arnold Clark in a medical unit at McClellan Field, Calif., in May or June 1942. **Contact:** H. W. Clark, 3901 Stewart, #41, Las Vegas, NV 89110.

Seeking information on **Arthur Frederick Downing**, whose last known station was at Bergstrom AFB, Tex., in 1961-62. **Contact:** Brett Welborn, 271 N. Holcomb Cir., Castle Rock, CO 80104.

Seeking contact with veterans who served with **633d Aircraft Control & Warning Squadron** at Wheelus AB, Libya, and especially with Det. 3 in Libya from 1958 until deactivation in 1961. **Contact:** Capt. Phil Eisel, USAF (Ret.), 7708 Rumsey Rd., Oklahoma City, OK 73132.

Seeking information on the following survivors of the **St. Valentine's Day Massacre**, February 13, 1943, near Bougainville in the Solomon Islands: William Henry Jones, Richard Isitt, Elbert Belcher, Jack Wycoff, Carl Eckman, and Edward LeMarquand. **Contact:** Thomas Flanigan, 1831 Alessandro Trail, Vista, CA 92084-4214.

Collector seeks correspondence with other collectors interested in trading USAF patches, insignia, and 35-mm slides of current aircraft. **Contact:** Jon W. Letzkus, P. O. Box 247, Bridgeport, OH 43912.

Seeking information on **1st Lt. William D. Sherman**, stationed at Camp Springs, Md., in 1943 and in England in 1944 with 83d Station Composite Squadron. **Contact:** Anita L. Giza, 117 Thorndale Dr., Warner Robins, GA 31093.

Seeking contact with veterans who were stationed at **Bruern Abbey**, England, during World War II, especially Sgt. Bill Kennedy. **Contact:** R. R. Mason, 55 Lord's Piece Rd., Chipping Norton, Oxon OX7 5HT, England.

Seeking information on **Lt. J. L. Christenson**, who served with 578th Bomb Squadron, No. 4 Group, Bomber Command, at RAF Burn, England, from April to September 1944. **Contact:** Bob Davies, 17A Prince Edward Mansions, Moscow Rd., London W2 4EN, England.

Seeking contact with **1st Lt. Stanley F. Kay** and **SSgt. John Miller Moore, Jr.** Both served on a B-24 stationed in Italy during World War II. **Contact:** Victor J. DeWolf, 1201 Bernalillo Pl., SE, Albuquerque, NM 87123.

Seeking contact with anyone who knew **Sgt. Hugh L. Waldroup**, a gunner on the B-24 *Sweet Sue* stationed with 817th Bomb Squadron, 15th Air Force, in Naples and Foggia, Italy. **Contact:** H. David Waldroup, Rte. 5 Box 240B, Greenville, TX 75401.

Collector seeks patches and pictures of USAF, USN, and USMC F-4 Phantoms (all models) and USAF F-15E Eagles. **Contact:** SSgt. James C. O'Connor, 4222D S. Mellen Dr., Mountain Home AFB, ID 83648-5000.

Seeking contact with anyone who knew **Lt. F. Vernon Parker**, who was with 733d Bomb Squadron, 453d Bomb Group, and was KIA May 8, 1944, in Germany. **Contact:** Fred Marston, 1075 Space Park Way, #307, Mountain View, CA 94043.

Seeking contact with a USAAF serviceman who knew **Gladys Mahoney**, who worked at the

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Empire Food Store in Piccadilly in the summer of 1942. He was stationed near London and was a chauffeur for an officer. **Contact:** Maureen Humphries, Little Poplars, 58A Poplar Grove, Maidstone, Kent ME16 0AN, England.

Seeking correspondence with anyone who was stationed at **Hurst Park**, England, during World War II. **Contact:** Anita Vellender, 182 Bedford Ln., Feltham, Middlesex TW14 9NW, England.

Seeking information on the whereabouts of **Bob Roark**, Class 44-C, Moore Field, Tex. **Contact:** Wendell L. Ridgley, 869 Deborah, Lima, OH 45801.

Seeking patches and flight crew scarves from Pease AFB N. H. **Contact:** Curtis J. Lenz, 32 June St., Nashua, NH 03060-5345.

Will pay for legible photos of the **RB-26C Lonesome Lil** showing USAF serial number and left side nose art and name. **Contact:** CMSgt. Richard H. Langill, USAF (Ret.), P. O. Box 162, Plainfield, NH 03781.

Seeking contact with anyone familiar with the **B-24J Cocktail Hour**, assigned to 43d Bomb Squadron stationed on Ie Shima during World War II. **Contact:** Tom Izbrard, 7239 W. Sunnyslope Ln., Feoria, AZ 85345.

Seeking information on **2d Lt. Peter Constandy**, KIA in November 1944 over northern Italy. He was a B-24J navigator with 376th Bomb Group, 15th Air Force. **Contact:** Mike Constandy, 1825 Jefferson Pl., NW, Washington, DC 20036.

Collector seeks military patches, stickers, and photos. **Contact:** Esteban Barbero Antón, Fuentidueña de Tajo, 28597 Madrid, Spain.

Seeking contact with **Robert Gilliam**, who was stationed at RAF Greenham Common, England, in 1957-58, where he knew Margaret Denness. **Contact:** R. Denness, 12 Mears Rd., Fair Oax, Eastleigh, Hampshire SO5 7NB, England.

Collector seeks military payment certificates used from 1946 through 1973 throughout the world. **Contact:** Nick Schrier, P. O. Box 60104, Sacramento, CA 95860.

Seeking information and photos on the history of **20th Air Corps Ferrying Squadron**, 20th Air Transport Squadron, 20th Troop Carrier Squadron, or 20th Military Airlift Squadron from 1942 to the present. **Contact:** Capt. Ron Hannenber, P. O. Box 0407, Charleston AFB, SC 29404-0407.

Seeking contact with **Lt. Col. Charles R. Schultes, Jr.**, an aerospace education instructor for the cadet corps of Hopewell High School AFJROTC in Hopewell, Pa., from 1972 to 1975. **Contact:** J. Deane Sterrett, 2880 Earlsire Ct., Deltona, FL 32738.

Seeking contact with **1st Lt. C. "Mell" Pugliese**, whose last known address was in Chandler, Ariz., during World War II. **Contacts:** William J. Auld, 8 Miller Dr., Stony Point, NY 10980. Martin J. Jablonsky, 1444 N. Recker Rd., Apt. 115, Mesa, AZ 85205.

For a history of **Embry-Riddle Aeronautical University**, author seeks contact with alumni, instructors, staff, and students from all eras and campuses of the university. I am especially interested in hearing from anyone who was involved with Embry-Riddle during the late 1920s and during World War II. **Contact:** Kimberly K. Heidt, 502 Cambridge Cir., South Daytona, FL 32119.

Bob Stevens'

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