JULY 1983/$1

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

Tactical Roles and Emerging Concepts

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Air Defense From the Ground Up

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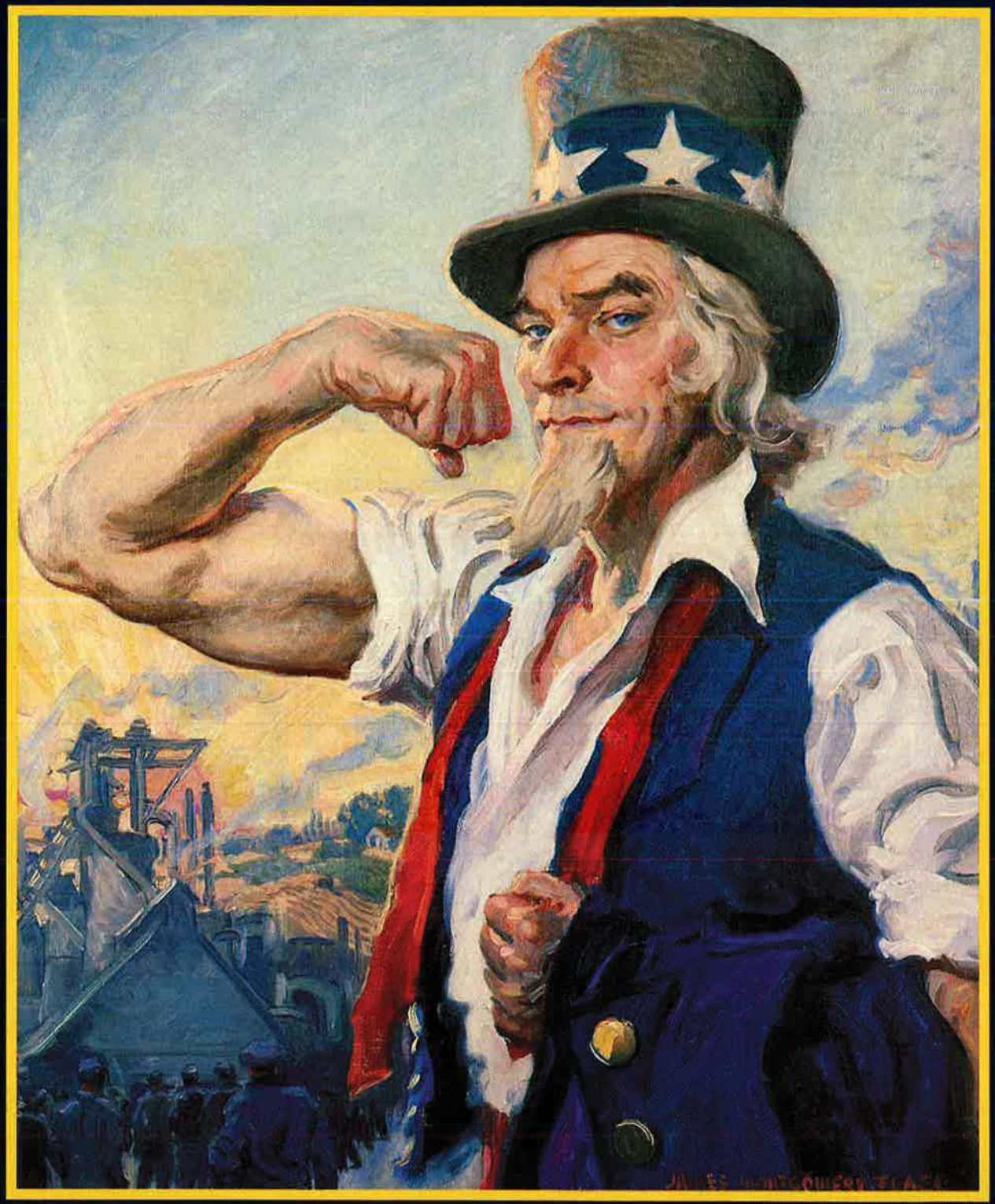

James Montgomery Flagg (1877-1960).

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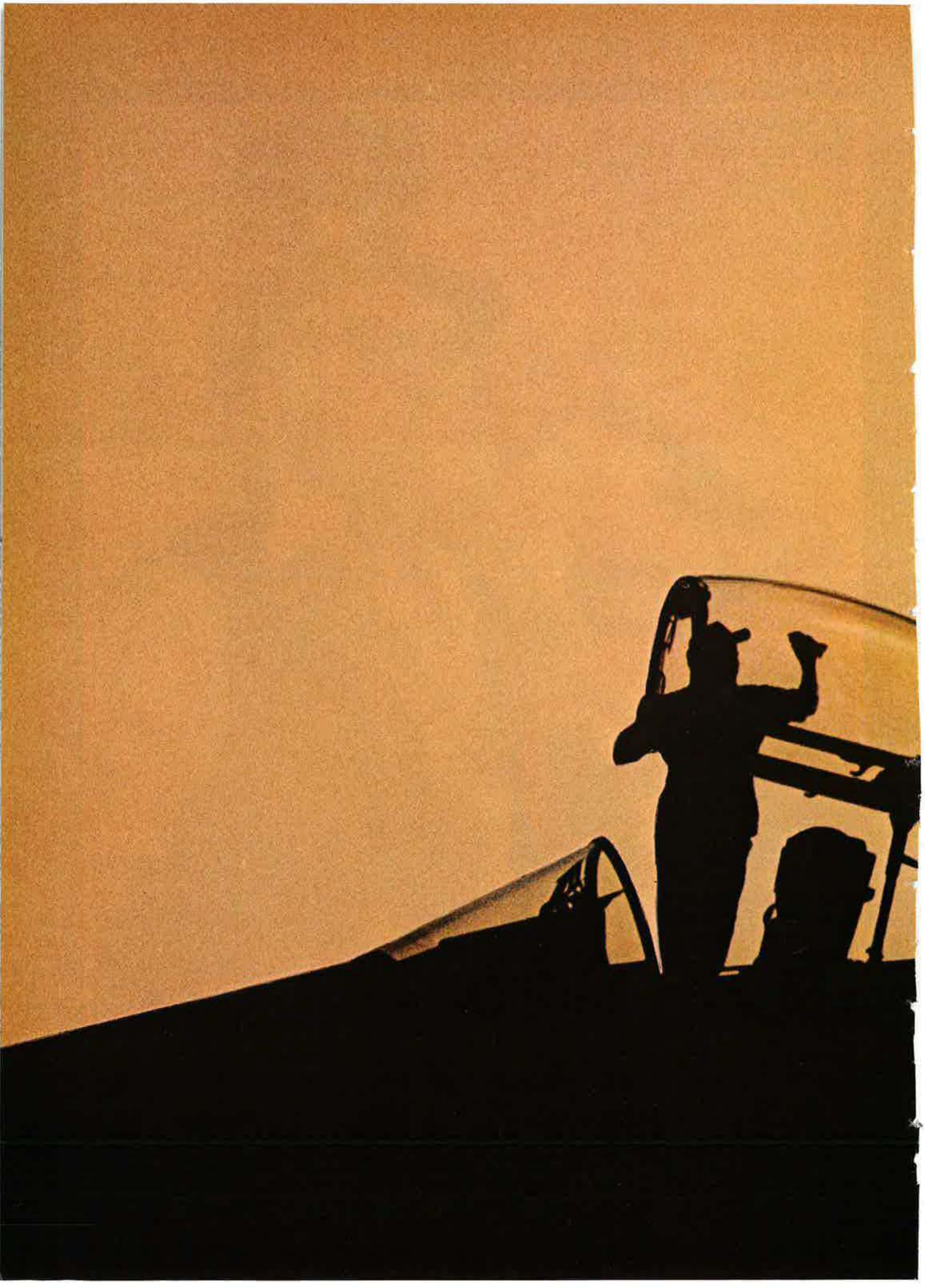

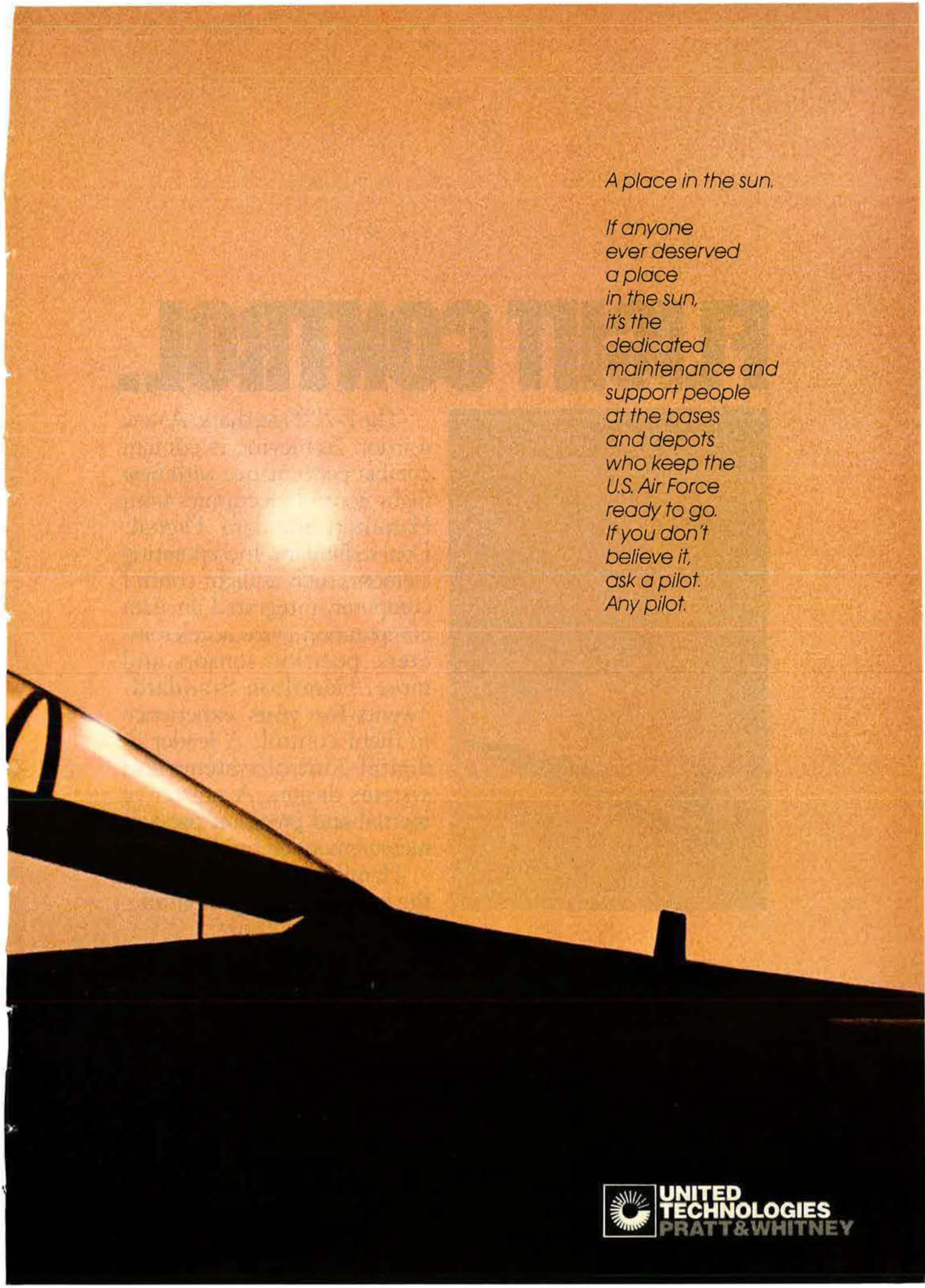
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JULY 1983
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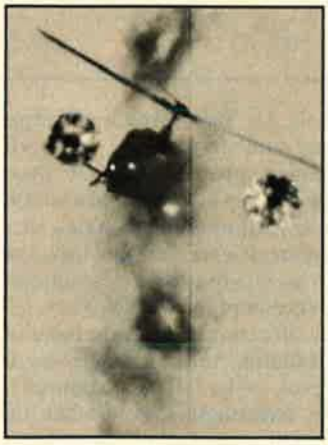

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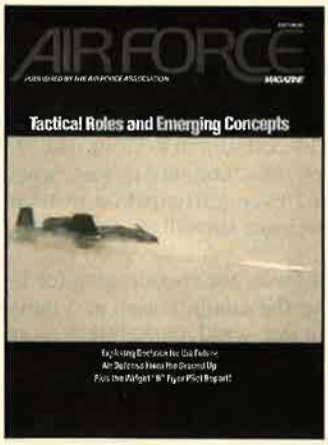

About the cover: An A-10 aircraft of ANG's 128th TFW, Truax Field, Wis., fires a Maverick missile. The special section on Joint Roles and Emerging Concepts begins on p. 34. (Fairchild Republic photo by Bill Lowenstein.)

Special Section: Tactical Roles and Emerging Concepts

Features

Departments

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AN EDITORIAL

US Fallback at Paris

LARGER crowds than normal attended the 35th Paris Air Show, which ended on June 5. Foreign trade visitors were out in greater numbers because the world aerospace market is fragmenting. More countries and companies can now share slices of the pie once dominated by the United States aerospace industry and a couple of European counterparts. The foreigners had to cope with more Frenchmen than usual, because the Socialist Mitterrand government restricted foreign travel of Frenchmen by imposing currency limits. More French are staying home this summer, meanwhile showing their dissatisfaction with the government in various ways.

Law and medical students have been out on the streets protesting education reforms. Their protests would be called riots in Washington. In the French way of dissembling, they are termed "manifestations." However, to the 150 police injured in one day's manifestations, the literary distinction was meaningless. And when the police strewed tear-gas grenades and clubbed people with truncheons, the affected students and teachers also missed the weasel-wording. They bled and shed tears just as if they'd been in a riot.

Elsewhere in Socialist France, farmers protested by destroying products and blocking roads; customs officers staged work slowdowns at frontier posts; electrical workers in Paris cut power in different districts on succeeding days, all to show their displeasure with current trends. A French businessman explained it to me this way: "They are showing their appreciation of the Socialist paradise that is France since May 1981."

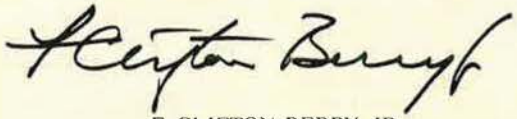
The French may be stuck with a Socialist government, but it is helping the French aerospace industry sell their products very much as a capitalist is expected to do. Their sales efforts are aggressive and the announcements of successes loudly trumpeted. Exhibitors at the Paris show from Great Britain, Germany, Italy, Japan, Brazil, Argentina, and others all bear witness to the high degree of cooperation between industry and government in aerospace. The British government is supporting development of the Agile Combat Aircraft (ACA) fighter by British Aerospace, and the French government is doing likewise with Dassault's ACX advanced fighter project.

All this is by contrast with the United States in the 207th year of its independence. The main US visibility at the show was on the part of NASA's Space Shuttle *Enterprise* on its Boeing 747 carrier aircraft, and Northrop's F-20 Tigershark export fighter. The Army's Hughes Helicopters-built AH-64 Apache attack helicopter showed well, as did Gulfstream American's Peregrine, Cammacorps's DC-8 re-engined with CFM56s, Boeing's 767 transport, and NASA's Quiet Short-Haul Research Aircraft. But that's a mighty thin showing of national power in a forum where such evidence makes a worldwide impression.

The point is that the US government does not really support strong international marketing of its own aerospace industry's products. The country, in the long run, will be worse off as a result. Worse economically in orders, jobs, and money lost; worse politically through loss of influence over markets and even participation in them, because so many other countries' aerospace industries are subsidized, supported, and encouraged by their governments.

The immediate assessment of the 35th Paris Air Show is not encouraging for the US. If, however, the Reagan Administration listens to the congressmen and industrialists who attended, and decides truly to compete in the world marketplace, some good may result.

Meanwhile, it's well to reflect that Paris, not Washington, smells of tear gas this summer. The failings of politicians and bureaucrats aside, it's still a fine thing to be an American.



F. CLIFTON BERRY, JR.
EDITOR IN CHIEF

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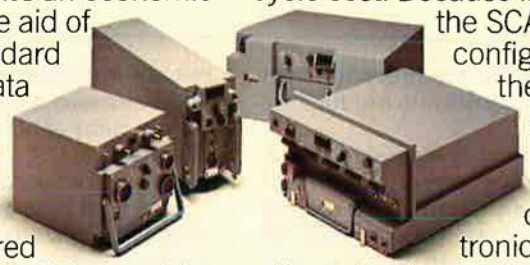

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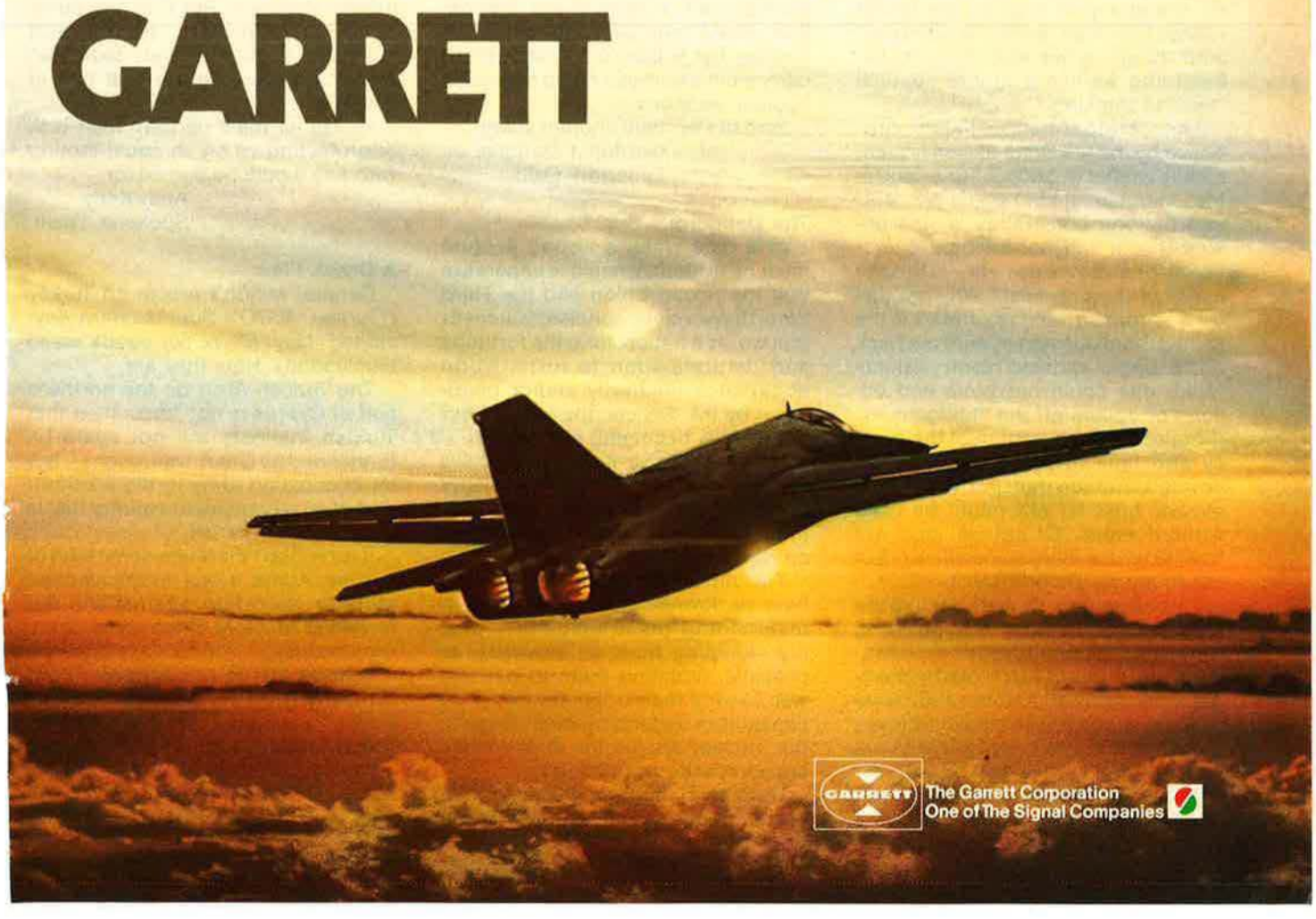

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AIRMAIL

Scowcroft Report

The recent Scowcroft Report by the President's Commission on Strategic Forces (the MX study) is a very important document. It does, however, raise almost as many questions as it answers. Given the highly controversial nature of its area of study, this is perhaps inevitable. There are some salient points that have me confused. A few short comments will be offered about these points.

What happened to the so-called "window of vulnerability" that the increasing accuracy of Soviet ICBMs had created? The MX, if memory serves me correctly, was to counteract that vulnerability of the land leg of our nuclear triad. Now we find that this "vulnerability" is more of a political liability than an actual threat. Do we hope that nothing happens, or do we do something to counter the Soviet ICBMs? Political decisions often deal with things as we wish them to be. Incoming warheads ignore political "wishful thinking."

The "Midgetman" missile proposed by the MX Commission is technically similar in concept to a "portable" Minuteman I or Polaris A-3. R&D and funding constraints should ensure that it will not become operational for at least a decade—is this the intent of the proposal? Why not just try a shrunken version of MX? If the solid-propellant stages were cut back and a single-warhead reentry vehicle fitted, one could cut years and billions of dollars off the "Midgetman" program. A good portion of the money and time invested could be recovered, and the transporter vehicles already built for MX might be used without mods. Of course, one will have to locate them somewhere ("But not in *my* neighborhood!").

This all sounds an awful lot like the kind of controversy surrounding American heavy bomber development since World War II. As I remember, only the B-36 and the B-52 were ever produced (these I recall from my childhood some twenty-five years ago), along with a few "medium" bombers. We always deferred the next bomber until a "better" one came along—and never produced the next one. The B-1 may get into production, or it may not.

Perhaps the "sticking point" of the MX controversy is that nuclear weapons are involved. Given the increasing accuracy of ICBMs, it might be possible to dispense with nuclear warheads altogether and substitute conventional warheads. For city attack, one could use fuel air explosive warheads for their blast effects. Against missile silos and command bunkers, one could use a variant of the World War II "Earthquake" bomb, which exploded deep in the earth alongside a protected structure. It would cause a camouflet—produce a cavity due to the expanding gases from the explosion. The cavity, while not breaching the surface, would cause the collapse of the soil around it when the gases cooled a bit. A missile silo foundation would thus be undermined. Of course, the ICBMs large enough to carry such a warhead could also carry nuclear weapons.

Perhaps we need another study. . . .

Gordon J. Douglas, Jr.
Fullerton, Calif.

The Dangerous B-52?

At a time when a strong posture must be evident, when it is imperative that the Soviet Union and the Third World have a clear, concise awareness that we, as a nation, have the fortitude and determination to resist world dominance (militarily and/or politically) by the Soviets, the state of our airpower is becoming evident.

In the past five months, we have suffered the loss of five B-52 heavy bombers and, even more tragically, the loss of a number of irreplaceable crews.

The Air Force personnel involved have performed Herculean tasks in maintaining these relics of a past era—keeping them as airworthy as possible, updating them to perform well beyond their originally designed capabilities, extending their usage in the nuclear era via the air-launched cruise missile adaptation.

How much longer will we ask these crews to risk their lives daily, flying twenty-eight-year-old, timeworn, flight-stressed aircraft?

How many of our "vocal" patriots in Washington, D. C., are driving twenty-eight-year-old automobiles? Are they risking their lives driving outdated vehicles on highways designed for high-speed usage? Would they enter a 1955 racing car in the Indianapolis 500 and ask a Bobby Unser or a Tom Sneva to compete with today's modern-technology surface vehicles?

Why, then, do they ask—nay, demand—that the cream of this nation's young men and women compete with the Soviet Union's Backfire bomber (and the Soviets' latest Blackjack bomber that is twenty percent larger than the yet-to-be manufactured B-1) with the equivalent of a horse and buggy?

These crews, in a newspaper, are merely statistics. But they are sons, daughters, brothers, sisters, and neighbors to all of us—very dedicated Americans who are our first line of defense.

Please let them perform their task of protecting us on an equal footing with any would-be aggressor.

Andy Kelly
Spokane, Wash.

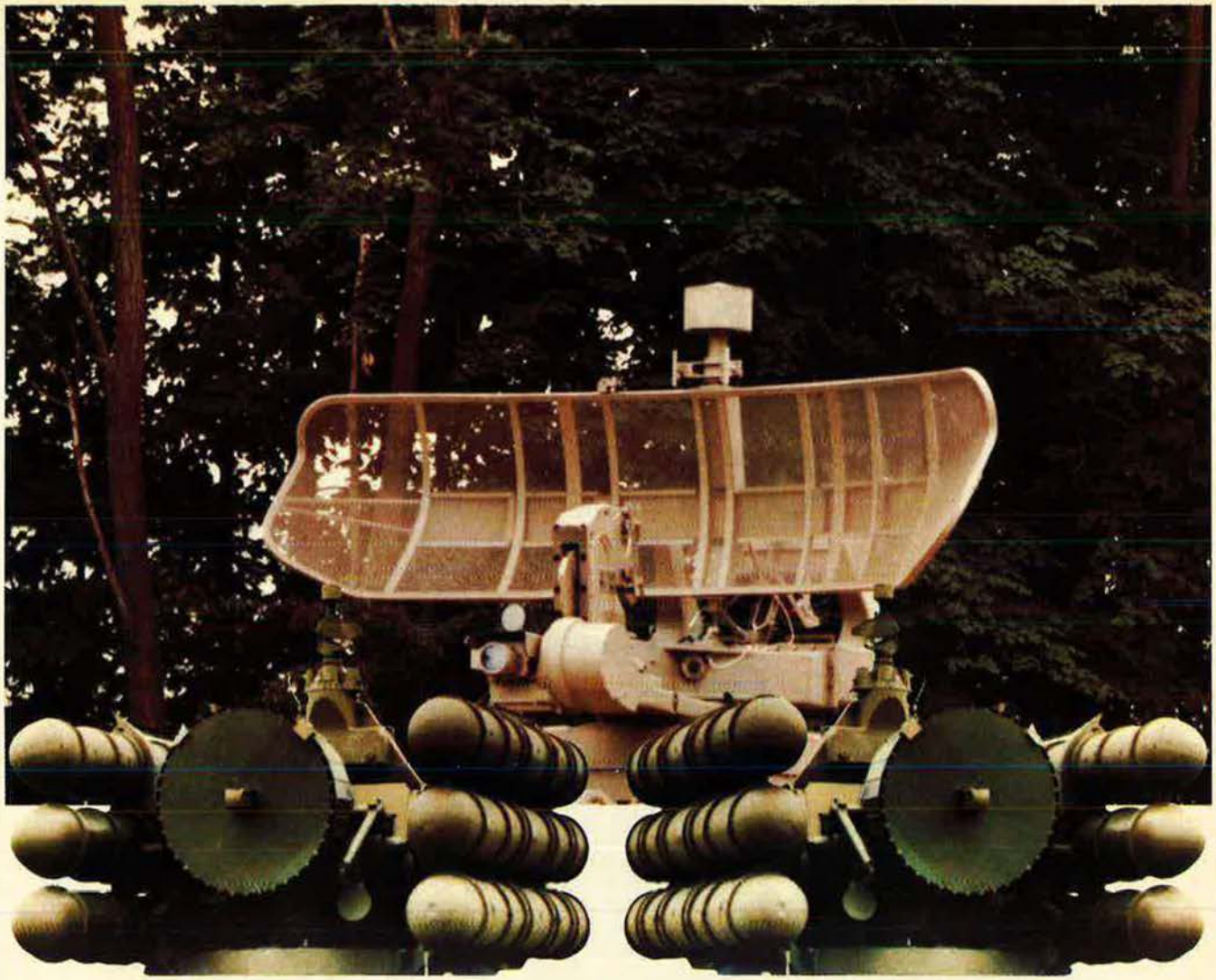
A Greek View

General Milton's article on Turkey *("Turkey: NATO's Southeastern Keystone," May '83, p. 60)* needs some elucidations. Here they are.

The Turkish Army on the northern half of Cyprus is not "insurance that Turkish interests will not again be threatened by Greek aspirations," but an occupation army in the northern part of an independent country that is a member of the UN.

If for Attilas I there was some kind of excuse, Attilas II was an unprovoked military operation against the defenseless territory of the same country (Cyprus).

Athens FIR is not Athens Flight *Identification* Region but Athens Flight *Information* Region, set up by ICAO in 1952. It has nothing to do with operational control of NATO's regions. If Greece's withdrawal from NATO's military structure in 1974 trig-



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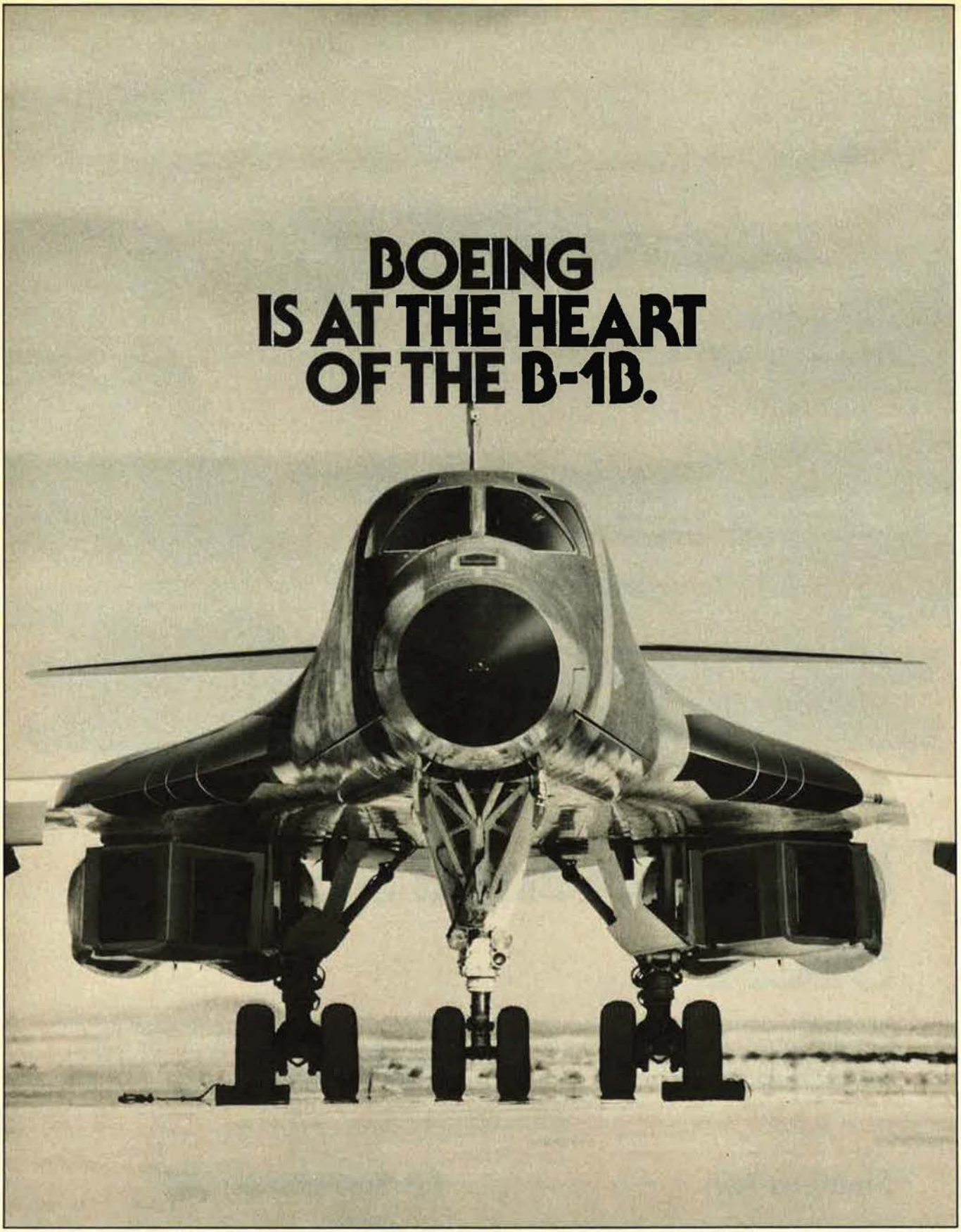

As integrator of the B-1B avionics system, Boeing plays an important role in one of our country's best deterrents to global conflict. The B-1B's strategic deterrence capabilities are unmatched in any other manned bomber. This advanced weapon system is a clear signal to friend and foe alike that our nation's resolve to restore the nuclear balance remains strong.

Avionics are the heart of the B-1B and the people at Boeing have the expertise and skill to do the job right. On every count, the B-1B is one of our country's best investments in peace.

BOEING

gered the restructuring of the Southeastern Flank, this is absolutely irrelevant to the Turkish failure to observe ICAO regulations concerning the filing of flight plans.

Up to 1974, 6th Allied Tactical Air Force was headed by a USAF major general, not a lieutenant general.

Greek Prime Minister Andreas Papandreou has not extended territorial claims to ten miles around each Greek island. The ten-mile limit has been decreed by Greek law since 1936. Since the twelve-mile limit has been universally approved, the enforcement of this rule, regardless of any Turkish interpretation, cannot be taken as a *casus belli* but as a measure of safeguarding Greek territorial integrity.

Greece is not a "curious" ally to Turkey, but Turkey is a curious ally to Greece since it was Ankara that created all the problems that led the Alliance to such disarray.

If "the best Turkish troops are probably those based on the Aegean," how does General Milton come to the conclusion that the Turkish Army is concentrating its attention on the Soviet Union?

Christos Z. Sazanides
Thessaloniki, Greece

• *A companion article on Greece by General Milton was to appear in the June '83 issue. However, the Greek government denied permission for General Milton to enter the country. His survey of the situation around the Mediterranean, "The Stout and the Strident on the Mediterranean Rim," was published in the June '83 issue (p. 96).*—THE EDITORS.

Fooling the Troops?

Talk about trying to fool the troops! Lt. Gen. Andrew P. Iosue's article concerning pay-raise comparability with the private sector *("Pay-Raise Comparability. With the Private Sector," May '83, p. 202)* was quite disturbing. I sincerely hope the General is not fooled by his specious arguments.

General Iosue notes that after 1974 pay comparability was "lost through pay caps and slippages to the point where the comparability gap had grown to nearly eight percent." He states further that as the gap grew, "so did AVF manpower shortages. Not only did we struggle through the late 1970s to recruit the types and numbers of people we needed, we had extreme difficulty keeping our experienced people on board. Faced with this hemorrhage of talent, Congress" provided pay increases that restored some measure of comparability.

AIRMAIL

Amazingly, the General forgets these lessons in his very next paragraph! He says the four-percent pay cap and subsequent pay freeze "is not what we hoped for, [but] it is important to stress that military people are not being singled out to bear a disproportionate share of the federal cost-reduction burden. To get the economy back on track, the President's budget proposes similar freezes or deferrals for numerous other entitlement programs."

The General goes on to say that "the current economic climate will require sacrifice and, as is invariably the case, we know that military people will maintain their unwavering dedication and acute sense of commitment. Putting the mission first, despite adversity, is what makes the military professional."

Three points demand consideration. First, I was not aware that military pay is considered an entitlement program by our government, like welfare and food stamps. Military people want respect, not welfare!

Secondly, military people are not foolish enough to buy rationalizations for inadequate compensation—especially rationalizations shamefully clothed in patriotic language. As the General himself notes, they didn't buy it in the 1970s. What makes him think they will now? You can't eat dedication or send your children to college on commitment.

Third, the General overlooks the fact that a major reason for recent recruiting successes has been the recession. Now that the economy is on an upswing, comparability becomes even more critical. Freezing military pay to finance procurement betrays a sorry attitude on the part of the civilian leadership.

I find it entirely fitting and proper that the General's article was buried on page 202 of your magazine. Be advised that if this lack of commitment to the military's most important asset continues, we'll soon have weapons manned by people gullible enough to buy the General's peculiar brand of hogwash.

If this is how a supposedly promilitary Administration behaves, I shudder to think what will happen when President Reagan leaves office.

Margaret Lorenzen
Chicago, Ill.

May Issues

Every year, when I receive my copy of the annual "Air Force Almanac," I shudder with the unholy feeling that you are going public with a handy-dandy order of battle.

Certainly, any of our adversaries can get this information easily enough, but can't we at least make them thumb through a maze of papers containing the information?

Lt. Col. William F. Cady, USAF (Ret.)
Suisun City, Calif.

I have just received the 1983 Air Force Almanac and was a little dismayed when I saw the picture on the top of page 84.

Above the caption, "Student navigators polish skills at crew stations aboard a T-43 aircraft at Mather AFB, Calif.," is a photograph of two *navigators* hard at work at what is unmistakably the Offensive Crew Compartment of the B-52G! Furthermore, this is actually a photo of the T-10 bombing and navigation trainer, as opposed to the aircraft itself.

Just to add insult to injury, the two crew members pictured in this photograph are operational SAC navigators assigned to the 320th Bomb Wing, Mather AFB, Calif. (note the unit patch on the radar navigator's sleeve).

Just thought I'd set the record straight, and ask you to publish a photo of the real T-43 crew station, along with a couple of real live student navigators in your next issue. While you are at it, I would like to see another article on navigator training to supplement the one you published last year *("Navigating Can Be Fun, Too," February '82, p. 68).*

There is more to UNT than joyriding in the T-37, and not all of us jump for joy at the thought of a Tweet ride. In fact, the majority of UNT graduates go to the "heavies," and the T-43 prepares future Tanker-Transport-Bomber navigators for their role as rated aircrew members.

In short, the T-37 phase of navigator training is the highlight of the program for some, but not all, of the students here at Mather, and to publish only that one view is biased and is a disservice to your readers.

1st Lt. Charles A. Grimes, USAF
Mather AFB, Calif.

I have read your publication with interest since I joined the Air Force almost ten years ago, but I'm a bit disappointed with the quality control of late. It's really slipping.

The picture on the top of page 84 of the May '83 issue is tagged as student navs in a T-43, but I believe it is actu-

ally a nav-bomb team in a B-52G/H model. I've recently seen T-43s and don't recall anything like that. When I graduated from NBT, however, I took a check ride in something incredibly similar.

Sorry to seem so picky, but attention to detail is supposed to be the hallmark of our profession, isn't it?

Capt. Harvey W. Lyter III, USAF
Mountain Home AFB, Idaho

• *We received the photograph in question with the wrong caption attached. By the time the error was discovered, the May issue had already gone to press. We apologize for the mistake.*—THE EDITORS.

As a long-time subscriber to your magazine and the sister of America's Ace of Aces, Maj. Richard I. Bong, I would like to set something straight for the records.

In the May 1983 Air Force Almanac, you have a page listing USAF Medal of Honor recipients *(p. 176)*. Under the listing for my brother, you have his hometown as Superior, Wis., which is incorrect. The correct hometown is Poplar, Wis.

I realize that the mistake is not that earthshaking, but you may as well get it right.

Joyce Bong Erickson
Poplar, Wis.

B-17 Stamp

Several years ago, postal authorities considered issuance of a stamp commemorating the B-17 Flying Fortress of World War II fame. A recent inquiry brings the disturbing news that the decision-making committee does not plan to consider the proposal until the 1991–95 period!

Gen. Carl A. "Tooey" Spaatz, who directed the strategic bombing campaign in Europe, stated that "the B-17 was the single weapon most responsible for the defeat of Germany." More than 12,700 were produced by Boeing.

Wouldn't it be highly appropriate to honor the famous airplane and the hundreds of thousands of people who built, flew, and supported it while those proud folks are still living?

If enough of us blow hot, maybe we can create a tailwind to carry the proposal into the present age. If you agree, please write your congressman and/or the US Postal Service.

Brig. Gen. Harold W. Bowman, USAF (Ret.)
Jupiter, Fla.

512th TFS

The 512th Tactical Fighter Squadron is attempting to collect photos and memorabilia from former squadron members to make a mural display depicting our vast history.

If there are any former squadron members who have memorabilia, especially photos of previous 512th aircraft that we could borrow, we would appreciate it if they would please contact us at the address below.

Attn: Capt. Linda H. Koff, USAF
512th TFS/CC
APO New York 09012

AFROTC Det. 105

Attention, AFROTC Detachment 105 graduates!

I am putting together an informative yearbook of all past graduates from Detachment 105 at the University of Colorado. I would appreciate a letter from all past graduates. We would like to know about your accomplishments, your assignments, and, maybe, some advice as how better to prepare ourselves so that we might be better officers.

Any assistance or information along these lines will be greatly appreciated.

Scott Wilson
1010 Alsace Way
Lafayette, Colo. 80026

Beers Away!

I was a member of a fifty-man OSS team assigned to the British 15th Indian Army Corps during the Arakan campaign in Burma during WW II. A US Air Corps squadron, the 40th Photo Recon Unit, was also assigned to that Corps.

No American PX was available, and the Indian-issue rum was a little raw. So the pilot of a P-38 from the 40th (who needed "flying time") flew from Akyab Island to Calcutta, with me riding piggyback, to get some canned American beer. We loaded 120 cases in the two belly tanks (a world's record), and took off for Akyab.

Halfway between India and Burma, over the Bay of Bengal, we were caught in a violent monsoon thunderstorm. The pilot lost an engine, dropped the belly tanks, and flew on the one remaining engine to an emergency field at Chittagong, 190 miles away. The burned-out engine expired when the pilot touched down.

Obviously, the lieutenant flying the plane was a magnificent pilot, and I owe him a great deal. But I am ashamed to say that I have forgotten his name. I left Akyab for Rangoon a day or two later, and never saw anyone from the 40th PRU again. (I believe the CO of the unit was a Maj. George Allen from Iowa.)

Can any reader identify my favorite pilot?

Maj. Gen. Evelle J. Younger, USAFR (Ret.)
700 South Flower St.
Los Angeles, Calif. 90017

Collectors' Corner

I have, for the past eighteen months, been trying to find out where I may buy an orange flying suit—not a jump suit, but a flying suit with all the pockets in the legs. They are just like the Army and Air Force olive flying suit, but what I need is an orange suit (though I could possibly settle for a red suit).

I am a photographer, and I need this suit to carry extra lenses, film, etc. If anyone knows where I may obtain this suit, could they please contact me at the address below?

John Graham
750 W. 33d St.
San Pedro, Calif. 90731
Phone: (213) 547-0660

I am in the process of collecting information and photographs for a book on military hard-shelled flight helmets and accessories from all countries (1950 to the present). I would be willing to pay for these items.

I am also interested in purchasing these kinds of helmets for my own collection. Any help would be greatly appreciated.

Michael S. Gazo
130 Sheldon Ave., Apt. 204
Chatham, Ontario N7L 3M7
Canada

I am a collector of USAF and Vietnam patches, and would like to trade with other collectors.

I have some patches from the 1st TFW and some other units that I will trade for patches sent to me.

Please contact me at the address below.

Rick Szulczynski
28 Willowood Dr., #102
Hampton, Va. 23666

401st Bomb Group

The 401st Bomb Group flew B-17s with the Eighth Air Force in Europe during WW II, and today it is a veterans' group organized as the 401st Bombardment Group (H) Association, Inc. We have met in reunion five times in the past ten years, and every

Air Force Association Balance Sheets

Assets	December 31, 1982 General Fund	Life Membership Fund	Total	December 31, 1981 General Fund	Life Membership Fund	Total
Current Assets						
Cash and marketable securities, at cost	$6,098,081	$1,092,217	$7,190,298	$5,535,137	$648,571	$6,183,708
Receivables, inventories and prepaid expenses	1,505,047	472,735	1,977,782	2,449,752	123,709	2,573,461
Other Assets (including fixed assets, funds on deposit, etc.)	1,489,814		1,489,814	1,378,140		1,378,140
Total Assets	$9,092,942	$1,564,952	$10,657,894	$9,363,029	$772,280	$10,135,309
Liabilities and Fund Balance						
Current Liabilities (including payables, accrued expenses, etc.)	$2,177,863		$2,177,863	$2,966,856		$2,966,856
Deferred Revenue (including advance membership dues and magazine subscriptions)	1,281,125		1,281,125	1,392,112		1,392,112
Fund Balance	5,633,954	$1,564,952	7,198,906	5,004,061	$772,280	5,776,341
Total Liabilities and Fund Balance	$9,092,942	$1,564,952	$10,657,894	$9,363,029	$772,280	$10,135,309

reunion has been bigger and better than the last.

We are still searching for former members of the group from when we were stationed at Deenethorpe, Station No. 128, in England. We were in the 1st Division of the Eighth Air Force.

For further information about becoming a member of the 401st Association, contact the address below.

Ralph Trout
P. O. Box 22044
Tampa, Fla. 33622

Looking for . . .

I am looking for two items.

I earned my Caterpillar Club pin on the February 26, 1945, Berlin raid, from Irvin Air Chutes. The original pin was lost, and I am desperately trying to find another. It was roughly seven-eighths of an inch long and three-thirty-seconds of an inch wide, and golden in color with red enameled eyes.

I have worn my San Marcos Navigation School silver ring for almost forty years now, and it is worn. If possible, I would like to get another one in better shape.

If any readers have any information on where I might find these two items, they should contact the address below.

Eric E. Ericson
1639 S. Flower
Denver, Colo. 80226

I am looking for a World War II Army Airways Communications System (AACS) shoulder patch. I am also looking for a metal AAF Technician badge, preferably with a radio mechanic bar.

Air Force Association Statements of Revenues and Expenses

General Fund	Year Ended December 31 1982	1981
Revenues		
Membership	$1,829,920	$1,589,462
Patronship	155,928	135,409
Magazine	2,167,661	1,914,368
Industrial Associates Program	86,968	65,962
Data Processing Services	118,432	137,710
Insurance Programs—Administration	1,465,833	1,320,390
Annual Convention	293,915	274,044
Aerospace Development Briefings	600,793	517,738
Other Income	116,202	52,941
Total Revenues	6,835,652	6,008,024
Expenses		
Membership	2,379,655	2,057,257
Patronship	175,795	165,058
Magazine	1,914,337	1,698,885
Industrial Associates Program	94,410	92,124
Data Processing Services	310,254	305,409
Insurance Programs—Administration	2,060,655	1,879,979
Annual Convention	381,530	333,463
Aerospace Development Briefings	352,047	311,103
Total Expenses	7,668,683	6,843,278
Net (Loss) from Operations	(833,031)	(835,254)
Non-Operating Revenues		
Investment Income	875,939	735,640
Insurance Programs—experience credits and interest on reserves	585,420	888,341
Net Income—General Fund	$628,328	$788,727

Expenses include chapter commissions, state commissions, and other direct support for field units totaling $566,752 in 1982 and $433,799 in 1981.

Life Membership Fund		
Revenues from Investments	$90,398	$53,460
Less: Transfer to General Fund for annual dues	65,376	35,952
Net Income—Life Membership Fund	$25,022	$17,508

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

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Data Bus	**MIL-STD-1553B**
High Order Language	**MIL-STD-1589B**

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Division of General Motors
Santa Barbara Operations

Any readers having these items are invited to contact the address below.

MSgt. James B. Walker, USAF
1407 Rickenbacker Circle
Charleston AFB, S. C. 29404

I would like to acquire AAF and USN sterling regulation-size wings, and leather squadron and group patches. I have wings, flight jackets, miscellaneous badges, and some shoulder patches for trade only.

Please contact me at the address below.

Jerry F. Keohane, Jr.
16 St. Margaret's Ct.
Buffalo, N. Y. 14216

I would like to obtain a book titled *Mission With LeMay,* by Gen. Curtis E. LeMay and a coauthor.

Anyone having any information on this book is invited to contact me at the address below.

John L. Pfeiffer
RFD #3
Milton, Vt. 05468

I am interested in contacting anyone who may have served with my father, Lt. Col. John J. Burgmeier. He died on February 20, 1983. Any anecdotes or information on his career activities would be gratefully appreciated.

Also, I am assembling a model collection of aircraft flown by my father and could use any information from squadron mates or other knowledgeable persons on aircraft markings and squadron codes, etc., used by the following units:

Pilot Class 44-B; 9th Weather Reconnaissance Squadron; 353d Fighter Squadron; 27th, 2602d, and 1st Tow Target Squadrons; 40th Fighter-Interceptor Squadron; 323d Fighter-Bomber Wing; and 30th Military Airlift Squadron.

Any photographs sent will be copied and promptly returned, and all correspondence will receive a personal reply. Please reply to the address below.

John J. Burgmeier III
411 43d Ave.
Yuma, Ariz. 85364

I am trying to gather information for a biography of my father, Sidney L. Look.

The biggest blank seems to be the years from 1938, when he graduated from the University of Maine (ROTC cadet), until he left the Army Air Forces as a major in 1945. I know he was in Washington, D. C., in late 1940, when I was born and my mother died. He served with Eighth and Ninth Air Force units—intelligence work, I believe.

I would be interested in hearing from any readers who served with him.

Joel S. Look
Box 25
Claremont, N. H. 03743

AIRMAIL

I am attempting to locate a past student of Frankfurt American High School in Frankfurt, Germany.

Her name is Candy Parrish, and she would be approximately thirty-four years of age. We attended Frankfurt High together during 1964–66. Both of our fathers were stationed at Rhein-Main AB at the time. I believe her hometown was Athens, Ga.

Anyone who might be able to help me with a lead of any kind is welcome to write me at the following address.

Marcia Morabito Scrivener
P. O. Box 7551
Charlottesville, Va. 22906

During World War II, I served as an aerial navigator with the Fifteenth Air Force in Italy with the 484th Bomb Group, 824th Bomb Squadron.

For the past several years we have been trying to find the address of our former engineer, George E. Davis. We have tried several sources, but could not get his address because of the Privacy Act. We do know that he made a career in the Air Force and retired one or two years ago.

Any readers with information on the whereabouts of George are asked to contact the address below.

George Bouras, M. D.
Suite 204
Bryn Mawr Medical Building
County Line Rd. and
Lindsay Ave.
Bryn Mawr, Pa. 19010
Phone: (215) 525-1525

On behalf of Edwards AFB Boy Scout Troop 388 and the Roma, Australia, Scout Group, I am seeking information on the whereabouts of relatives of five US servicemen who crashed in Australia on November 16, 1943. The Roma Group plans to memorialize the allied airmen who lost their lives in this crash.

They are: 1st Lt. R. L. Anglin, 2d Lt. J. W. Kennedy, Sgt. F. J. Ropinski, Sgt. H. L. Baunstein, and Sgt. R. L. Adkins.

Readers can forward information on the whereabouts of relatives or questions about the memorial program to the address below.

Lt. Col. Ron Carpenter, USAF
USAAEFA
Mail Stop 217
Edwards AFB, Calif. 93523

I am looking for information regarding an ANG pilot named Miles Towslee, who flew F-94Cs with the 179th FIS in Duluth, Minn. He flew there from 1957 to 1959.

Any photos or personal recollections would be greatly appreciated.

Lt. Michael Casmey, USA
CMR #2, Box 5815
Fort Rucker, Ala. 36362

I am trying to locate an old friend of mine who was from Philadelphia.

He is MSgt. Bernard Ussit, and the last time I saw him was at Keesler Field in Mississippi when he was crew chief for Gen. Curtis E. LeMay.

Please contact the address below.

Emanuel I. Rasper
1232 Levick St.
Philadelphia, Pa. 19111
Phone: (215) 289-0122

I am trying to locate the following B-29 crew members who flew on the *Star Duster* from Saipan in late 1944 and 1945 with the 73d Bomb Wing.

They are: Charles Rogers, William Hudson, and James Stevenson.

If anyone has any information as to the whereabouts of these men, please contact the address below.

Arthur H. Holmes
84–22 117th St.
Richmond Hill, N. Y. 11418
Phone: (212) 846-0162

I am trying to locate anyone who might have known Lt. Harold R. Holmes.

He flew B-17s during World War II. He was recalled when the Korean conflict broke out, and he flew B-29s until he was shot down sometime during the summer of 1952. He was first listed as MIA, then finally KIA.

Please contact the address below.

Jay R. Schooler
2139 W. 2500 N.
Farr West, Utah 84404

Wanted: Information on Lt. Col. John J. Lynch. He received the DFC and Bar as Squadron Leader of 249 Squadron on Malta in the summer of 1943. I saw him last in 1950; I heard that he was later killed in a B-52 accident.

Please contact the address below.

James A. Gray
7283 Kolb Pl.
Dublin, Calif. 94568

IN FOCUS...

The Critical R&D Challenges

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

The list includes the small, single-warhead ICBM and the Advanced Cruise Missile.

Washington, D. C., June 6

The SICBM, or small, single-warhead ICBM that is now in concept definition at a special new program office established by the Air Force Systems Command's Ballistic Missile Office, is likely to be a very "manpower-intensive weapon system," according to Under Secretary of Defense for Research and Engineering Richard D. DeLauer.

Initial Defense Department estimates envision a force of 1,000 SICBMs. If deployed in a fully mobile mode, such a force would require about 25,000 people to operate and maintain it. If the choice is to "garrison" these missiles—meaning that they are confined to specific areas from which they would be "flushed" on receipt of strategic or tactical warning—the number of people required to operate and maintain the SICBMs might be somewhat lower, Dr. DeLauer believes. In either case, however, the Defense Department is concerned about getting the required additional manpower at a time when demographic factors can be expected to curtail sharply the military manpower reservoir.

Another problem associated with small, single-warhead ICBMs—whose deployment beginning in 1992 is recommended by a special Presidential panel known as the Scowcroft Commission—is that they would require one guidance system to deliver one reentry vehicle to its target, compared to the MX, which is able to dispatch ten warheads with one guidance unit, Dr. DeLauer told a group of Pentagon correspondents recently. As a result, one of the make-or-break criteria determining the economic feasibility of such an ICBM will be the ability to make its guidance system "cheaper and smaller." This factor, in turn, makes it compelling that terminal guidance and maneuvering reentry capabilities be considered in the design of such weapons, he said.

In the past, military and other technical experts have opposed the use of terminal guidance on ICBMs and SLBMs on grounds that these weapons could then be put out of commission by enemy electronic countermeasures. For this reason, terminal guidance of ballistic missiles has been confined to the US Army's Pershing II, a theater weapon that operates in a manner and under circumstances that make the use of electronic countermeasures less of a threat.

Because of the challenges associated with a small, single-warhead ICBM, there are "differing views in the [Defense] Department" over whether a competitive flyoff involving two or more designs is necessary or competition can be confined to the subsystems level. Competition at the subsystems level is deemed unavoidable, "but we really would like to have two suppliers [in order to maintain] competition throughout the life of the system," he said. So far as the SICBM's rocket engine is concerned, competition is narrowed automatically because there are only four companies qualified for such work and only two of them have recent program experience.

The pivotal question attending the design of the proposed SICBM, informally called Midgetman, is the degree of mobility such a system will require to bolster its survivability, according to Dr. DeLauer. If the system is made "superhard," it might be possible to keep the entire force on military reservations. Conversely, he pointed out, if the system is confined to a relatively low hardness level, the missiles will have to be moved around on public roads and require "more real estate."

It would not be prudent to substitute nuclear-armed cruise missiles with intercontinental range for strategic ballistic missiles because cruise missiles, too, are manpower-intensive and can be shot down, he suggested. The Defense Advanced Research Projects Agency (DARPA) is examining the possibility of developing cruise missiles with intercontinental range, however, as a potential substitute for air-launched cruise missiles, Dr. DeLauer said. Such weapons would be cost-effective because they require no airborne launch platforms.

The purpose of DARPA's work on a next-generation cruise missile is to provide longer range, greater accuracy, enhanced survivability, and new basing and employment options. Emphasizing increased range and/or payload, these cruise missiles will use advanced propulsion systems, sophisticated materials, and high-energy fuels. The engine of this third-generation cruise missile, according to Dr. DeLauer, will include components made of coated carbon/carbon materials to permit high operating temperatures, which translates into high efficiency and low fuel consumption. Other objectives of the DARPA program include greater accuracy, self-contained all-weather guidance, and a "stealthy" terrain-following and obstacle-avoidance capability. Operationally, the third-generation cruise missiles will be able to operate over interhemispheric ranges, perform multiple attack roles, and incorporate on-board "intelligence" for bomb-damage assessment and target discrimination, he said.

The limited but growing Soviet capability to intercept first-generation air-launched cruise missiles (ALCMs) has already forced the US to shift to the longer-range Advanced Cruise Missile (ACM), which employs "low observable" or Stealth technologies, he said. The new Soviet SA-10 surface-to-air missile, a very sophisticated and expensive system, is entering the operational inventory at a slow but steady rate, he said, adding that this weapon has "a pretty good capability against ALCM." Both the Army's Missile Intelligence Agency and the Air Force have evaluated the SA-10 carefully to establish its effectiveness against bombers and cruise missiles.

While the precise findings of these assessments are classified, Dr. DeLauer did disclose that the SA-10 would not pose as "tough a problem for the B-1 [as] for B-52s and ALCMs." The B-1 knows when it's "being painted" by radar because of its nose and tail radar warning receivers, and it "can do something about it." SAC, therefore, seeks a range of at least 2,000 miles for the new ACM–"which we can get"—to let cruise-missile-carrying B-52s stand off at greater distances to keep out of harm's way, according to Dr. DeLauer.

USAF's ACM, under development by General Dynamics, will either force the Soviets to develop a new high-performance "SA-X" or to proliferate the SA-10 to a massive extent over the number required to threaten the more easily detectable ALCMs. He stressed that long-term US assumptions about declining ALCM effectiveness deliberately made no allowance for certain aspects of US strategic doctrine, such as the opening up of attack corridors by destroying SA-10s with ballistic missiles and short-range attack missiles (SRAM). Also, it "is a lot cheaper" to proliferate cruise missiles than to deploy the number of SA-10s required to defend against them. He likened the relationship between SA-10s and advanced cruise missiles to the effects closely spaced (Dense Pack) basing of ICBMs would have had on the Soviet capability to attack them within a given period without resorting to totally new weapons of questionable feasibility. Actions of this type, he suggested, force the Soviet Union to respond in a way that "costs them too much and therefore makes arms control feasible."

The US, he said, is trying to replicate an SA-10 at an unnamed US test range in order to pinpoint its precise effectiveness against the ACM. What is clear already, he said, is that the Soviets have only three options so far as ACM is concerned: They can proliferate the enormously expensive SA-10 batteries and the associated mobile radars; they can, over time, attempt to develop an even more costly, high-performance SA-X; or "they can negotiate" an arms accord.

Turning to rapid advances in Soviet theater missile technology, Dr. DeLauer expressed alarm about the threat posed by the new SS-21, SS-22, and SS-23 medium-range ballistic missiles. The latter, especially, combines the range, accuracy, and payload to put NATO airfields under direct "blanket attack." The SS-23 Superscud theater missile comes close to the range and payload of the SS-20—which managed to garner the West's major attention—but is more insidious because its payload can be nuclear, chemical, or precision-guided conventional munitions.

As a result, "the Soviets now have the accuracy and munitions to get our runways," he said. This new dimension of the Soviet threat places a premium on the development of US and other NATO V/STOL and STOL combat aircraft. Yet, as he ruefully acknowledged, "we don't even have a follow-on effort to the Pegasus engine" powering the AV-8B Harrier.

Steps to correct this deficiency, he told this writer, include formation of a bilateral study group comprised of US and British defense officials and industry experts to draft a roadmap for the development of high-performance V/STOL and STOL combat aircraft. Key emphasis, he said, will be on advanced technologies to overcome the payload and range limitations that handicapped aircraft of this type in the past.

Conventional air warfare, Dr. DeLauer suggested, stands on the threshold of dramatic change if service opposition toward new doctrines and concepts can be overcome. "We now have platforms that can't be seen [by microwave sensors] and we have munitions with essentially zero-miss distances," he said, adding that these capabilities—applied to manned and unmanned air vehicles operating in concert with ground-to-ground missiles—could make possible a "concept of deterrence" in the field of conventional weapons similar to that in the nuclear arena. Deterrence by conventional weapons would require concepts and doctrines based on a broad, cohesive approach, in place of what he claimed is a current fixation with "monolithic service" orientation, he complained.

Even though there are plans to intensify the research and development effort in the area of strategic defense, it will take four to five more years to find out whether such systems should be put into production, according to the Pentagon's research chief. He warned that if the Soviets proliferate their offensive systems in an "unrestrained" way, *no* defensive system will work adequately. President Reagan's call for stepped-up investments in strategic defenses, Dr. DeLauer said, has led to the formation of an interagency group, chaired by Deputy Defense Secretary Paul Thayer, which is drawing up a relevant five-year plan. (So far, it appears that the Air Force will not be asked to participate in the initial study efforts.) The Pentagon will spend about $2.6 billion on various strategic defense programs in FY '84 and will probably increase this total by about $500 million in FY '85, he predicted. This is about "all we can digest right now," he claimed.

If eventually the decision is made to develop and deploy a layered strategic defense, the Soviet ballistic missile threat would have to be dealt with in three specific areas. Dr. DeLauer identified these areas as the boost phase, lasting about seven to nine minutes; the midcourse phase of about twenty minutes' duration; and the reentry phase, which averages about one minute. Each of these phases poses different problems for the defender. Obviously, there is compelling reason to try to intercept the enemy's ballistic missiles while they are still in the boost phase and before the individual warheads of MIRVed systems have separated, Dr. DeLauer pointed out. But the lead time for such an early intercept is obviously short. Interception of ICBMs during their midcourse phase is also difficult because at that time "decoys are hard to deal with" and the challenge at the terminal end is "that you have to do things in a hurry," Dr. DeLauer said. So far, most of the US ballistic missile defense program has been concentrated on interception in the terminal phase because existing technology is largely confined to short-range defense. He explained, however, that "we will now look at the full range of technologies that could permit a generalized solution. We will then fund and develop those technologies that have more than one systems solution."

The problem, he suggested, is largely at the engineering level, and not with scientific theory. A key target in FY '85, he said, is research on power sources for short-wavelength laser systems, which is a "tough challenge." Laser pointing and tracking mechanisms pose another difficult task. At this time, he said, the Pentagon "leans toward" stressing short-wavelength laser R&D as the most promising approach to strategic defense. At the same time, there are tentative plans to continue work on USAF's largely dormant Airborne Laser Laboratory (ALL) that employs a chemically powered long-wavelength laser.

Another challenging DARPA R&D program, according to Dr. DeLauer, is the so-called "supercomputer," an attempt by the Defense Department to leapfrog the fifth-generation computer under development in Japan. DARPA, he said, will allocate about $500 million to this program over the next five years. Most of the research will be carried out by academic research fa-

cilities, and will concentrate on parallel processing, artificial intelligence, and extremely-high-speed electronics. He said that "we have an opportunity to gain almost an order of magnitude increase in capability over what is postulated for the [Japanese] fifth-generation computer." The US supercomputer, Dr. DeLauer said, will be an "*n*th-generation system, one generation ahead of the Japanese."

Washington Observations

★ Congressional sources report that the Soviets tested a third new PL-5 ICBM on May 30 of this year and, in seeming violation of the SALT II accord, encrypted all associated telemetry data. Also, the Soviets have practiced a two-hour reload of the SHO-8 endoatmospheric ballistic missile interceptor that is part of the ABM (antiballistic missile) system around Moscow. The SALT I ABM treaty prohibits rapid reload of ABMs. These same sources also report that the SS-16 ICBM, outlawed by SALT II, continues to be deployed by the Soviets.

★ An unclassified chart submitted by the Air Force upon request to the Strategic and Theater Nuclear Forces Subcommittee of the Senate Armed Services Committee indicates that by 1989, assuming a worst case scenario, only one percent of the current Minuteman silos might survive a perfectly executed Soviet first strike. Release of this chart triggered widespread media reaction and Defense Department chagrin.

IN FOCUS...

Lt. Gen. Lawrence Skantze, USAF's Deputy Chief of Staff for Research, Development and Acquisition, subsequently explained that the range of surviving silos extends from about eight percent down to one percent. The worst case figure of one percent survivors, according to General Skantze, is based on the assumption that the Soviets launch a perfectly executed first strike with ninety-nine percent reliability, that the number of warheads of the SS-18 is not constrained by SALT II, and that the US undertakes no interim hardening.

By focusing on this worst-case assumption and equating it with the survival rate of the MX, which because of its advanced shock-isolation system is intrinsically harder and more survivable and which by 1989 may well be housed in superhardened silos, the media coverage was clearly detrimental to the Administration's strategic force modernization program.

★ Initial Administration and congressional support of the so-called two-for-one builddown formula for strategic weapons reduction is fading rapidly. This concept, developed in several versions on Capitol Hill, calls for the scrapping of two or more warheads or strategic delivery systems for every new unit deployed after such an arrangement is accepted by the US and the Soviet Union.

The basic catch of this approach is that the Soviets have almost completed a top-to-bottom modernization of their strategic forces, while the US has not. While there is superficial appeal to "building down" the slightly larger US warhead arsenal if the Soviets were to undertake a corresponding reduction of their inventory, this scheme overlooks the fact that the Soviets won't have to modernize their brand-new forces for years to come, and hence won't build down until they do. The US, on the other hand, is a long way from completing its SLBM

modernization and air-launched cruise missile deployment programs and is years away from deploying its first B-1 bomber and MX.

★ A polarization of views is taking place within the Pentagon and among congressional staffers over whether an Advanced Missile Warning System (AWS) will be needed in the next decade or growth versions of the current Defense Support Program's (DSP) early warning satellites might be adequate to provide initial warning of a missile attack. The AWS research program is meant to let DoD decide by 1987 whether the system should enter full-scale engineering to achieve operational status in the 1990s.

The basic purpose of AWS is to ensure continued operation throughout a nuclear conflict and to incorporate comprehensive data processing so that warning information could be transmitted directly to users. AWS, which is expected to cost about $10 billion according to initial industry estimates, would use staring CCD (charge coupled device) sensor arrays, meaning that thousands of infrared detectors would take a panoramic view rather than scan in the fashion of a searchlight. The DSP satellites use scanning sensors that rotate with sufficient speed—once every few seconds—to provide adequate data about missile trajectories.

For the moment, the DSP system comprised of three satellites on orbit includes temporary blind spots in its coverage of potential Soviet SLBM launch areas. Deployment of a fourth satellite would correct this deficiency in the view of those experts who favor continued evolutionary enhancements of DSP rather than the costlier route of shifting to AWS in the next decade. They also argue that new DSP satellites replacing those now in orbit in the mid- to late-1980s could be equipped with enough on-board data-processing capability to ensure their ability to downlink data even in a nuclear-disturbed environment. Also, they will be provided protection against laser attacks. Steps are already being taken to deploy six mobile ground terminals to augment DSP's vulnerable fixed ground-based processing stations. In addition, there are plans to put DSP terminals on E-3A and E-4B aircraft to receive, process, and disseminate missile-warning and other data.

Proponents of AWS stress that an ancillary mission of that system is detection of strategic aircraft. DSP supporters counter by pointing out that even the present complement of early warning satellites detects with regularity aircraft using their afterburners. They contend that enhanced DSP satellites, with roughly three times the number of sensor elements of the currently orbiting units, will probably be able to detect strategic and other aircraft that are not using afterburners.

Lastly, they point out that aircraft detection from space ought to be the primary function of DARPA's TEAL RUBY demonstration program, under way since 1974 to establish the feasibility of detecting strategic air vehicles by using space-based infrared sensors and to provide a future option for warning of bomber attacks against North America or against Naval Battle Groups.

DARPA officials told Congress that TEAL RUBY will use large mosaic arrays arranged in thirteen fixed, narrow-band, spectral filters to detect weak aircraft signatures against the earth's strong background clutter. These sensors will be sufficiently sensitive to detect targets the size of strategic bombers, but "experiments will also be conducted against much dimmer targets, such as cruise missiles. . . . In addition, the feasibility of using the sensor to measure high-altitude signatures is being examined." ■

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CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., May 27

First Step for MX

The House and Senate vote to release $625 million in FY '83 funds for MX basing development and missile flight testing was motivated mainly by concerns over the need to modernize strategic forces and to gain arms-control leverage. As Sen. Ted Stevens (R-Alaska) said, approval of the MX resolution represents "a preliminary endorsement of the entire Scowcroft Commission recommendation" which encompasses both concerns.

Many MX skeptics, including some key congressional moderates, supported the President's program primarily because of the Administration's commitment to develop a small, single-warhead ICBM. This, they believe, could reduce the nuclear hair trigger allegedly caused by reliance on large, multiple-warhead ICBMs.

Two other major factors led to the MX victory. One is the Administration's commitment to seek a reduction in the warhead-to-launcher ratio. The second is the agreement to explore a flexible "builddown" of forces wherein a specified number of warheads would be dismantled for each new one deployed. The key, as Rep. Les Aspin (D-Wis.), Pentagon critic turned MX defender, argued, was whether the US could entice the Soviets to negotiate these approaches without "dangling the MX over their heads."

Approval of the FY '83 funds is only a first step for the long-embattled program. Getting procurement funds—some $2.5 billion in FY '84 for twenty-seven missiles—may seem the logical next step, but it is not assured. The Administration was put on notice by nineteen GOP Senators that continued support for MX will depend primarily on the "Administration's continued sincerity in developing and implementing a framework for weapons modernization and arms control—in particular, its attitudes and actions on the builddown proposal—and developments in arms-control negotiations with the Soviet Union." The MX has by no means received final approval from Capitol Hill.

Paring Tactical Programs

The House Armed Services Committee has made some significant changes in USAF tactical requests for FY '84 in order to find needed savings and to redirect some programs.

The panel recommended cutting F-15 buys to only thirty aircraft; the Administration wanted forty-eight. This was tied to Committee deferral of the continental air defense role for the F-15 and recognition of the need to increase the numbers of the cheaper F-16 in order to meet USAF future goals of buying 270 fighters a year. F-16s were recommended to be increased from 120 to 144 to make up for the lost F-15s. The F-16 is to be fitted with the new air-to-air missile, AMRAAM, which, along with multistage improvements, will bring its performance close to that of the F-15, according to the panel.

If the committee gets its way, the development of a derivative of the F-15 or F-16 for the ground-support role will be consolidated with the Advanced Tactical Fighter (ATF) program. In an effort to streamline fighter programs, all R&D funds for the derivative aircraft, ATF, alternate fighter engine, and F-15 and F-16 squadrons were deleted and $350 million was added for a newly created Advanced Tactical Aircraft program. As envisioned, the new program would probably yield a multirole fighter aircraft. The committee thinks such a streamlined approach will release more funds for future buys of inventory aircraft. The Air Force is against any such consolidation, and early indications are that the Senate agrees. The Senate probably will keep the programs separate, but strongly urge the Air Force to decide on a derivative fighter and get it into production.

The Air Force's Night Precision Attack program, LANTIRN, fell under the House budget ax, as did HAVE CLEAR, the advanced antijam communications system for USAF fighters. DoD, meanwhile, terminated HAVE CLEAR in favor of an Enhanced Joint Tactical Information Distribution System (JTIDS), which should meet congressional concern for providing interoperability with Navy aircraft and provide secure voice communications for all users.

B-1B Multiyear Buys

The Air Force wants Congress to approve multiyear procurement (MYP) for the B-1B in FY '83 supplemental appropriations legislation in order to keep the program under cost. With an MYP go-ahead in FY '83, the Air Force would not sign MYP contracts, but would make some economic order quantity buys to save money. The House is balking at the request, although approval in FY '84 is not in trouble there. The Senate may save the program since it appears to be on its way to approving MYP in the bill. Without the FY '83 approval, the B-1B could lose as much as $400 million in the anticipated savings of some $800 million and probably even put at risk the $20.5 billion program limit, according to a USAF spokesman.

Air Base Defense

The House wants USAF to take more seriously last year's instruction to initiate air base defense in continental Europe. Last year, $50 million was appropriated for this purpose. Using the Rapier program in the United Kingdom as a model—*i.e.*, missiles to be bought by USAF and manned by the host nation—$200 million is included to buy missiles for point air defense of US air bases in Europe. The House wants the Patriot missile, critical to NATO defense, for West Germany. In conjunction with Patriot, West Germany would also buy and man the Roland missile for point air defense of US bases there, as well as for its own and collocated bases. Other off-the-shelf air defense missiles for NATO air bases are also to be bought by USAF.

Getting agreement with West Germany on the air defense plan, in the committee's view, has been hampered by USAF and Army jurisdictional debate. Hence, the Secretary of Defense is instructed to assume oversight of the issue to expedite an agreement with the Germans. ■

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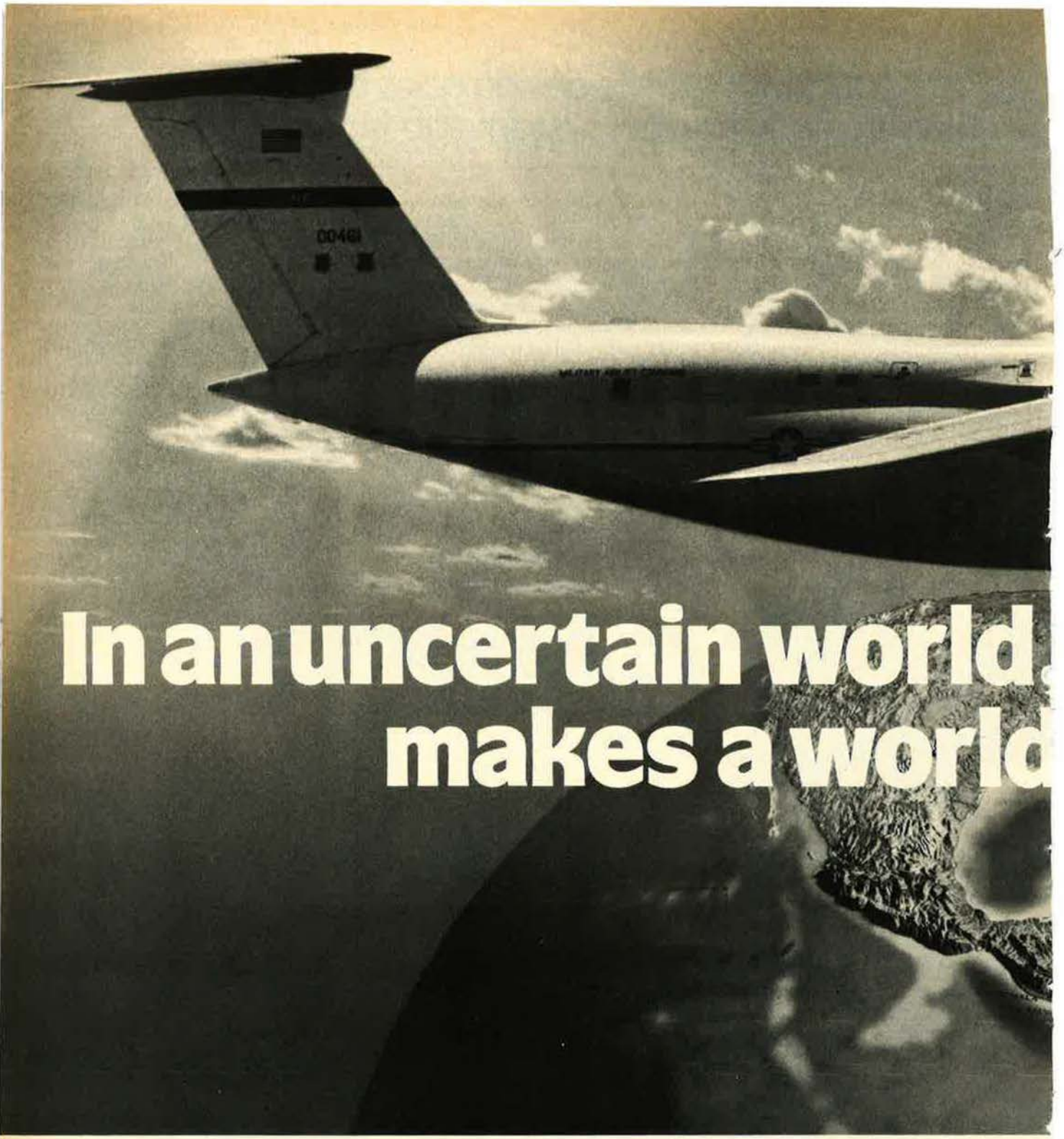

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The Lockheed C-5 gives America's Military Airlift Command global mobility.

It can carry huge loads impossible for any other aircraft.

And with its in-flight refueling, it can fly those loads to virtually any point in the world in hours.

It takes only four C-5s to deploy a whole squadron of the Army's newest attack helicopter, the AH-64. That's 24 AH-64s. Those C-5s also provide unit integrity, carrying air and maintenance crews for the helicopters. Within minutes after the C-5s land, the first AH-64s can be unloaded and in the air.

The C-5 also can carry other vital, outsized equipment like infantry fighting vehicles and self-propelled artillery, ready to drive down the low cargo ramp and carry out their mission.

Off-loading the C-5 goes fast. In actual crisis situations, more than 200,000 pounds of desperately needed cargo have been off-loaded in less than 30 minutes.

The C-5's fore and aft doors and ramps make this possible, as does the airlifter's ability to kneel to lower the cargo deck within five feet of the runway. The C-5 can even taxi off-runway in dirt, sand, or snow to unload. And because it can use

short, austere fields, the C-5 gives strategic planners more options.

The C-5B: Off to a fast start.

Now entering production, the C-5B is running ahead of schedule. It will have improved avionics, including a simplified automatic flight control system, lighter and more reliable color weather radar, and a digital air data computer, among other systems.

The C-5B's new production engines will include all the improvements now being retrofitted on the C-5A's engines. And advanced aluminum alloys, developed since construction of the C-5A, will give the C-5B airframe greater structural strength and corrosion resistance.

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Lockheed C-5

AEROSPACE WORLD
News, Views & Comments

By William P. Schlitz, SENIOR EDITOR

Washington, D. C., June 6

★ The Air Force has opened a Small Missile Office at Norton AFB, Calif., to manage development of the single-warhead ICBM recommended by the President's Commission on Strategic Forces. *(See also p. 16.)*

The President endorsed the commission's recommendation when he forwarded its report to Congress in late April.

The missile could be ready for full-scale development in 1987 and deployment by the early 1990s, officials said.

Col. William Weisinger will head the new office, which is charged with developing requests for proposals, awarding contracts, and working with industry and other Air Force agencies to undertake system designs.

The office will also study such basing options as mobile and silo systems.

To finance the development effort, the Air Force is requesting $600 million in the FY '84 budget.

The missile is envisioned as a three-stage weapon of about fifteen tons, thirty-eight feet in length, and forty-two inches in diameter. It will probably be designed to deliver a payload of about 1,100 pounds at a range of 6,000 nautical miles, officials said.

★ The Air Force also reports progress in developing a number of other new weapon systems.

• An inert Peacekeeper ICBM is being tested to determine how well it withstands the electromagnetic pulses of a nuclear explosion.

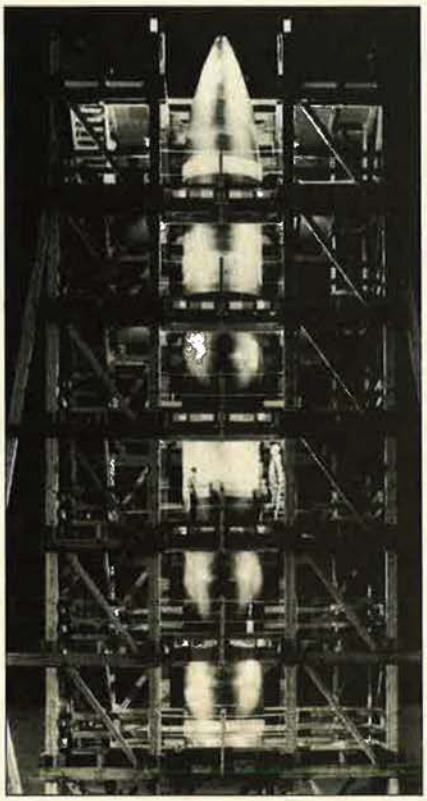
The tests are being conducted at the Defense Nuclear Agency's advanced electromagnetic research facility near Albuquerque, N. M., by Martin Marietta Aerospace, prime contractor.

Testing will produce data on the amount of electric current created by the pulses and the amount reaching critical components. This information will be used to locate any points of entry that may need further shielding. Testing for ability to withstand electromagnetic pulses is common for defense equipment, officials said.

• Contracts valued at more than $20 million have been awarded to supply components for the Gator Mine System. The major companies are Honeywell Inc., Minneapolis, Minn.; Aerojet Ordnance Co., Los Angeles, Calif.; and Motorola, Inc., Scottsdale, Ariz.

The Gator Mine System is an air-delivered cluster weapon that disperses antitank/vehicle and antipersonnel mines. These are designed to spread out when released from the Tactical Munitions Dispenser and free-fall to the ground to create a minefield.

Because of color and size, according to project engineers, the mines are extremely difficult to detect after emplacement. Minefield density is controlled either by the dispenser or by simultaneously releasing a number of dispensers, the engineers said.



Seventy-one-foot-tall Peacekeeper missile undergoing electromagnetic pulse tests at Defense Nuclear Agency facility. (See adjacent item.)

Gator is viewed as an advanced state-of-the-art system that will provide the US military with delivery flexibility, mixed minefields, multitarget capability, and countermeasures resistance. Other characteristics will be Gator's ability to "respond to combat support requirements anywhere in the world, in any weather, and in any visibility conditions," officials said.

Gator has been tested extensively at Eglin AFB, Fla., and at the Naval Weapons Center, China Lake, Calif., in all its modes of operation including "a complete live test of the entire system against actual armored targets," officials noted. The weapon is expected to enter the Air Force inventory in 1985.

• Also at Eglin was the recent first successful guided launch of the Wasp antiarmor missile. Through the use of a millimeter wave radar seeker, the missile guided itself to a target when launched from a 3246th Test Wing F-16.

Development of Wasp marks the first use of such a seeker, which will enhance aircraft survivability by allowing the aircraft to withdraw after weapon firing. The missile gets its name because it is designed to be launched in swarms against enemy armor. Wasp is suited for use on most US and certain NATO tactical aircraft, officials said. Hughes Aircraft Co.'s Missile Systems Group, Canoga Park, Calif., is prime contractor.

• Again at Eglin, the Ballistics Branch of the Air Force Armament Laboratory recently conducted successful testing of the first "significantly new formulation aircraft ammunition propellant since World War I," officials said.

"The new technology is expected to be applied to improving the performance characteristics of the GAU-8 30-mm cannon aboard the A-10," they added. Conventional propellants are characterized by severe gun barrel erosion and the potential for secondary gun gas ignition, which causes severe muzzle flash.

The new "Nitramine" propellants are expected to eliminate such prob-

lems while increasing muzzle velocity and lowering ignition temperatures.

★ The Air Force intends to procure no more than 240 of the current generation of ALCM-Bs in FY '84 to ensure "an orderly transition from ALCM-B to the Advanced Cruise Missile (ACM), a program that is progressing smoothly," officials said.

With President Reagan's approval to develop and deploy the ACM, the Air Force last September issued requests for industry proposals and now has selected General Dynamics Corp.'s Convair Division, San Diego, Calif., to develop the ACM.

A fixed-price, firm contract will provide full-scale development of the ACM and includes "not-to-exceed" cost options for the first two production lots, officials said. Due to the classified nature of the program, the contract value, production quantities, and program schedules are not releasable.

In July 1982, the Air Force concluded an assessment of the requirement for a next-generation cruise missile. This strategic cruise missile "road map" reviewed emerging technologies in light of threat projections through the 1990s. The study determined that it would be feasible to develop an advanced cruise missile "that capitalizes on significant advancements in cruise-missile technology while providing a logical and timely upgrade to the ALCM force."

The ACM will join current-generation ALCM-Bs in a mix of about 3,000 strategic ALCMs deployed on B-52 and B-1 aircraft. The ACM will have improved range, accuracy, survivability, and targeting flexibility.

AFSC's Aeronautical Systems Division, Wright-Patterson AFB, Ohio, will manage development and production of the ACM. ASD also manages the ALCM-B, produced by the Boeing Aerospace Co., Seattle, Wash.

★ The Air Force's new T-46A next-generation trainer is being designed from the outset for ease of maintenance. The aircraft is expected to enter the inventory beginning late in 1987.

Program officials at the Air Force Acquisition Logistics Division at Wright-Patterson AFB, Ohio, are adhering to a concept that nearly all repairs of the aircraft can be accomplished locally rather than at a depot.

Another objective is a mission-reliability rate of ninety-nine percent, with equipment that does fail designed to be easily removed and replaced or repaired quickly. To this end, nearly all the T-46A's avionics are to be built into a waist-high compartment in the aircraft's nose, and the engine is being tailored for a replacement time of thirty minutes. There will be no programmed maintenance for the T-46A, although major parts needing repair will be shipped to a depot.

Officials said that while only proven technology is to be incorporated in the trainer, the goal is not state-of-the-art technology "but rather an easily maintained, reliable aircraft" that will provide the optimum number of flying hours for undergraduate pilot training.

Two sources contributed significantly to the NGT's design based on experience with previous trainers: ATC and the AFALD Directorate of Lessons Learned pooled their data and extracted much of it for use in designing the new trainer.

Officials said that only ten percent of the necessary support equipment for the T-46A will have to be specifically designed by the contractor; the rest will be furnished equipment already in use by USAF.

★ The first major depot-level modifications of the F-16 fleet are being completed under a program dubbed Pacer-Loft I. A second round of modifications is being readied.

Pacer-Loft I was a package of 150 modifications to enhance the aircraft's avionics and weapons delivery systems. The new program—Falcon

TOP: This derivative of the T-46A Next-Generation Trainer—the FRC 225 Full Spectrum Trainer—was unveiled by Fairchild Republic at the Paris Air Show. Shown are four underwing ordnance stations. From left, a Triple Ejector Bomb Rack, General Electric SUU 11/A 7.62-mm Gatling gun pod, FVV .50-caliber machine gun, and LAU 68 2.75-inch folding-fin rocket pod. ABOVE: The Skyfox twin-jet tactical trainer, derived from the Air Force/Lockheed T-33 "T-Bird," has been "transformed into a new, advanced-performance aircraft," according to the company, which plans to market it to US government-approved foreign nations.

Rally 2—is designed to provide direct power to the F-16's flight control system and up to seventeen other engineering changes.

Pacer-Loft I involved work on 140 F-16As and Bs at the Ogden Air Logistics Center, Hill AFB, Utah, and is scheduled for completion in August.

F-16s are built in groups called "blocks," with later blocks receiving advances in technology while on the assembly line. Pacer-Loft I was designed to bring the earlier blocks produced in 1978, 1979, and 1980 to the most-advanced block technology level.

"One of the modifications," noted Maj. Bob Barrett, Ogden ALC F-16 test pilot, "put in a movable stick that gives better response and the pilot a better feel of the airplane." The original F-16 had a stationary stick that relayed information based on pressure from the pilot's hand to a flight control computer. While this arrangement was satisfactory, veteran pilots complained of a lack of real feeling in controlling the aircraft. A new stick with some flexibility was designed as a remedy.

The F-16 is the first aircraft with no mechanical linkage between the cockpit and the flight controls. Instead, "fly-by-wire" technology allows the pilot to control the aircraft via computer. According to O. Dale Quinlan, chief of the F-16 Production Management Branch at Ogden ALC, "Most of the equipment on the F-16 is new and innovative and will set the pace for the next decade."

AEROSPACE WORLD

Under Falcon Rally 2, the major modification calls for installing a generator in the flight control system to provide an uninterruptable power source, officials said. Modifications will begin in December at Ogden ALC.

Contractors will conduct the work for PACAF and USAFE. NATO F-16s will be similarly modified. The program is scheduled for completion in FY '86.

★ An all-women C-141 crew from the 18th Military Airlift Squadron, McGuire AFB, N. J., became the Air Force's first to fly a round-trip mission across the Atlantic.

In May, the crew flew a medical aircevac mission to Rhein-Main AB in Frankfurt, Germany, with stops in the Azores. Air Force family members were airlifted to CONUS for specialized treatment.

"The flight represented the extent the Air Force has reached in equal opportunities for women in air crew jobs," noted Lt. Col. Brem Morrison, squadron commander.

Aircraft commander was Capt. Guiliana Sangiorgio, of Sergeantsville, N. J. Other members of the crew were Capt. Barbara Akin of Dallas, Tex., pilot; 1st Lt. Terri Ollinger of Cincinnati, Ohio, copilot; TSgt. Donna Wertz of Baltimore, Md., flight engineer; SSgt. Denise Meunier of Westfield, Vt., flight engineer; Sgt. Kathy Eiche of Lakeland, Fla., loadmaster; and A1C Bernadette Botti of Buffalo, N. Y., loadmaster.

Pat Muldrow, chief of media relations at McGuire, noted that USAF has about 64,000 women in its force of 572,500 and some 175 female pilots among its 23,061 pilots.

The crew of the C-141 was not inexperienced. Members have logged a total of 10,700 military flying hours, from Sergeant Meunier's 2,200 to Airman Botti's 500. The three pilots have a combined total of 4,000 flying hours.

★ Boeing Aerospace Co., Seattle, Wash., has been selected to develop a survivable airborne communications system for the Navy's submarine ballistic missile force.

The system will serve as a vital link between the nation's National Command Authorities and the Navy's Trident submarine ballistic nuclear fleet, officials said.

The system is to be known as the E-6 and will use an airframe almost identical to the E-3 AWACS aircraft. The Navy needs fifteen E-6 aircraft.

Some $34 million has been authorized to begin a program expected to grow to an eventual $1.6 billion. The last of the fifteen systems is to be delivered in 1991.

The Navy's airborne very low frequency communications system is to be installed in the modified E-3 AWACS airframes. The airframe is to be produced on the E-3 production line and retain about ninety-five percent commonality.

Currently, two major communications systems serve the SSBN fleet. The primary land-based system is vulnerable to attack, and the EC-130Q airborne system is being stretched to its limits by the expansion of the SSBN fleet, officials noted.

The new aircraft will be powered by the CFM56-2 engine developed by CFM International, a joint company of SNECMA of France and GE.

★ Three hundred F-100 Super Sabres currently in storage at Davis-Monthan AFB, Ariz., are to be recalled to active duty as "superdrones" for air-to-air and ground-to-air weapon systems test and evaluation.

The QF-100—the "Hun"—will replace the PQM-102 drone—a conversion of the F-102 Delta Dagger—in use as a full-scale, remotely controlled flying target.

The QF-100s will be based at Tyn-

The first Air Force all-women flight crew to fly an overseas mission, from left, Capt. Guiliana Sangiorgio, aircraft commander; Capt. Barbara Akin, pilot; 1st Lt. Terri Ollinger, copilot; TSgt. Donna Wertz, flight engineer; SSgt. Denise Meunier, flight engineer; Sgt. Kathy Eiche, loadmaster; and A1C Bernadette Botti, loadmaster. (See item above for details.)

PHASE IV.
The decision that had to be right.

There are decisions that affect lives, and there are decisions that affect history.

A decision with a potentially profound impact on both is not a judgement to be lightly drawn. Rather it is one that demands listening closely to all options.

For the past 26 months, a decision has been in the making on a new worldwide computer system for the United States Air Force. A project called Phase IV.

The need was for a state-of-the-art system of awesome proportions. One that could handle the critical needs of the Air Force, across America and around the world. A system that could react, adapt, and remain state-of-the-art well into the next century.

And the need was pressing. But before deciding on the system, the Air Force decided on something else; when the final decision was made, they wanted to hit the ground running.

So rather than make judgements on proposals alone, the Air Force decided to make judgements based on the actual ability of commercially available systems to meet their tough demands, now and for the future. In other words, no blue sky.

They pitted the finalists against each other in a "Compute-off", a head-to-head competition lasting over two years and encompassing over 20,000 individual tests.

And when it was all over, the Air Force had brought the project in on time with a savings of over $300 million. They chose a system proven effective even before implementation.

The choice of the U.S. Air Force: the 1100/60 from Sperry.

SPERRY

We understand how important it is to listen.

SCIENCE/SCOPE

Many different aircraft can carry the new AMRAAM missile because of a special electronics package. The equipment allows the same on-board missile electronics to process both target data and guidance data received via the launching aircraft's radar. It can process data-link radar signals of a variety of aircraft with only minimal modifications to the aircraft's radar fire control system. Among the aircraft that will carry AMRAAM are the F-14, F-15, F-16, F/A-18, F-4, and Tornado. Hughes Aircraft Company designed and developed the Advanced Medium-Range Air-to-Air Missile for the U.S. Air Force and Navy.

The infrared Maverick missile has impressively passed an important reliability trial leading to high-rate production. The weapon, which adds critical nighttime air-to-surface multitarget attack capabilities to the U.S. Air Force arsenal, underwent vigorous testing to validate design modifications made to resolve problems found in earlier test programs. In captive flight tests that simulated tactical missions, five Mavericks combined to operate over 103 hours with just one minor mechanical failure. Similarly, in lab tests that included high and low temperature cycles and vibration, three guidance units operated 192 hours with only one failure. Both problems have been corrected. The missile, which creates TV-like images using temperature differences, is in pilot production at Hughes.

Europe's defensive radar umbrella will be vastly improved when a new command and control system goes into full operation by the mid-1980's. The system is called AEGIS (Airborne Early Warning/Ground Integration Segment). It will relay radar surveillance information from AWACS aircraft to NATO ground centers. Computers will process this information and correlate it with ground radar data to provide commanders with a very reliable overall picture. Hughes will install AEGIS equipment to serve 42 ground sites from Norway to Turkey.

A wide-field-of-view head-up display can provide pilots with critical sensor and steering information in low-altitude flights at night and under poor visibility conditions. Head-up displays save a pilot from looking down at his instruments by superimposing such data as airspeed, heading, and target information on a glass-like combiner mounted at the pilot's eye level. Hughes pioneered the technology used in its HUD, which incorporates diffraction optics made through a process involving holographic techniques and lasers. The display is brighter, more transparent, and doesn't obstruct the pilot's forward vision. It also resists glare, reflections, and hot spots caused by the sun. Another important advantage is its ability to display scenes from infrared sensors.

An advanced air defense radar is designed to be extremely reliable, operating an average of three weeks without failure and then averaging 48 minutes for repairs. The Hughes Air Defense Radar is inherently reliable because it uses solid-state technology, carefully screened parts, and redundant features. Also, most of the electronic components are operated at less than 30% of their rated value. (Operating components at lower powers or voltages is an economic way to improve reliability because failure rates increase exponentially with operating stress.) HADR systems are being installed in West Germany and Norway.

dall AFB, Fla., and Holloman AFB, N. M., and will be used by Tactical Air Command and the US Army.

Sperry Flight Systems, Phoenix, Ariz., will undertake the first twenty-one conversions, with the initial QF-100s going to Tyndall. Plans call for Holloman to receive them beginning in FY '85.

A variation of the drone, the YQF-100, will be equipped to be flown by a safety pilot to test remote-control systems and to return the aircraft to base should they fail.

The unmanned drone will be capable of Mach 1.3 at altitudes between 200 and 50,000 feet.

★ Japan has disclosed a plan to strengthen its mine-laying capability by installing mine-sowing equipment in C-130H transports being procured from the US.

The idea would be to blockade the island nation's three major straits—Soya (or La Pérouse), Tsugaru, and Tsushima—"in case of an emergency," officials said.

The C-130Hs would supplement P-3C and P-2J antisubmarine warfare aircraft already capable of laying mines. Laying mines by air would require significantly less time than by using surface vessels, the officials point out.

Japan also announced a plan to deploy radar picket vessels in Soya Strait, which faces the Soviet island of Sakhalin, as part of the "sea-lane defense" that was discussed during visits to the US by Japanese officials.

Along with the C-130Hs, the mine-laying equipment is also being built in the US.

AEROSPACE WORLD

★ In mid-1984, Japan plans to orbit a meteorological satellite to monitor the rapidly changing and often perilous weather conditions throughout the Western Pacific.

The satellite, GMS-3a, is based, except for minor redesign, on Japan's GMS-2 that is currently providing day and night photographs of weather scenes over Japan, China, Southeast Asia, and Australia. Japan has its own launch facilities and space center on the island of Tanegashima off the southern tip of the home island of Kyushu.

The satellites are the work of Hughes Aircraft Co.'s Space and Communications Group, El Segundo, Calif., and Nippon Electric Co. (NEC) of Tokyo.

The satellite will carry visible/infrared spin-scan radiometers that record "full-disc" images of earth every thirty minutes. These will help meteorologists identify, monitor, and track severe weather phenomena, includ-

Air Force Academy Update

With education in the US earning poor grades for quality, a clamor has arisen for a return to basics. But with its core curriculum stressing engineering, basic and social sciences, and humanities and languages, the Air Force Academy doesn't have to return—it never left.

That's the opinion of Brig. Gen. Anthony J. Burshnick, Class of 1960, the second Air Force Academy graduate to return as Commandant of Cadets.

In an interview with AIR FORCE Magazine, General Burshnick noted that the Academy academic program offers many more opportunities than during his student days when all cadets planned on becoming pilots. "Now, cadets can prepare to serve in such other Air Force career fields as personnel, procurement, finance, and intelligence," he underlined.

As for the use of computers as educational tools, "We're undertaking many studies to see just how we can incorporate them better," General Burshnick commented. "We are already using computers in teaching and research. We have computer centers in both dormitories which are plugged into the academic building's main computer. But we think we can do more," he added. "We're now exploring the idea of individual table-top terminals for the cadet rooms."

As for women cadets at the Academy, among other subjects the Commandant discussed during the interview, "they do just as well as males in all facets of Academy life. They have become cadet commanders, Rhodes scholars, and All-American athletes."

In the area of cadet recruiting, "we are not pleased with the number applying. We are picking a class of 1,450 from about 3,200 qualified candidates. We think this latter figure should be at least 6,000," General Burshnick noted. "To this end, we are beefing up our liaison officer force and bringing members of it to the Academy for additional instruction on how to improve recruiting. We've aligned ourselves with the Air Force Recruiting Service to utilize its resources and efforts to find good candidates," he added.

"We've called this our 'marketing plan'—to sell the Academy just like any other good product in the country," the Commandant stressed. "In this, we are probably a lot closer to ROTC than ever before. ROTC is on the lookout for Academy-caliber people for us. By the same token, high-quality prospects who perhaps don't meet the stringent Academy physical or academic standards are given an ROTC alternative," General Burshnick noted.

"We are also bringing high school counselors to the Academy for briefings as well as congressional staffers who play a part in the cadet candidate selection process," the General underlined. "The parallel objective is also to select the better entrants to reduce the attrition rate, that at thirty-seven percent by the end of the senior year is too high. We'd like to see it down around thirty percent," he added.

"We are attracting quality. While Scholastic Aptitude Test scores around the country have been slipping in recent years, the Academy's have long since leveled off," the Commandant stressed.

"While undergraduate pilot training is not necessarily the next step for all our graduates, we have expanded flying programs at the Academy," General Burshnick noted. "Besides the basic navigation course, there are orientation rides in sailplanes, helicopters, and the T-41. Every cadet will be given the opportunity to solo in sailplanes. We are purchasing powered sailplanes, a type of aircraft new to the US that we are pioneering," the General said.

"The powered sailplane is a very economical training tool. The engine allows the cadet to practice touch-and-go's and to correct mistakes. Once the students get the hang of approaches and so forth, then we can put them into towed sailplanes," the Commandant noted.

"The free-fall parachuting program that currently trains 500 cadets annually is to be expanded to 800 per year. A number of them are also acquainted with HALO—high-altitude low-opening—techniques used by the Air Force's combat control teams," he added. A quota of cadets also attends the Army's static-line jump school at Fort Benning, Ga.

In the next three years, the Commandant noted, a major renovation of the twenty-five-year-old dormitory facilities will be completed as well as an expansion of the dining hall.

"The Air Force Academy should be a leadership mecca of the nation," the General affirmed. "What we need is a facility where this leadership training can take place, where we can use simulation and modeling, where we can explore air battles through the use of a computer and demonstrate the decision process," he added.

That facility should pretty much complete the construction program at the Academy for the next four or five years, General Burshnick concluded.

ing typhoons, heavy thunderstorms, and tidal waves throughout the 65,000,000-square-mile region.

GMS-3a will be backed up by GMS-3b, also built by Hughes and NEC.

★ Theoretically at least, the ramjet as a propulsion concept has few limitations as to the velocities it can attain. (In practical use, the speed of such a device is constricted by the weaknesses of the materials of which it is built and the laws of physics, plus fuel limitations.)

Even now, though, propulsion engineers are thinking in terms of ramjets capable of Mach 6, or about 4,500 mph. Such engines are visualized as the propulsion systems for future military missiles.

The interest is due to the unique features that could be incorporated. These include small size—allowing missiles to be carried in quantity aboard aircraft. Besides high velocities, ramjet-powered missiles could also offer simplicity of design, which translates into high reliability and low cost.

Making this possible has been the development in recent years of the ramjet's integral rocket. This is sort of an internal propulsion system that boosts the ramjet to operating speeds. (The ramjet depends on speed of flight to develop the compressed air it needs to operate.)

One company currently developing working systems for military applications is United Technologies' Chemical Systems Division, Sunnyvale, Calif. According to CSD, it flew the world's first successful internally boosted ramjet in the mid-1970s for the Navy and is a front-runner in developing ramjet technology.

While ramjet power is currently destined for military use, CSD officials note that engineers are already looking down the road to applications in the space program and commercial aviation. They foresee giant ramjet engines as boosters on Space Shuttle-type vehicles. Such ramjets would be "the ideal powerplant for advanced supersonic transports which would make the French Concorde a space age 'Jenny.' These airplanes would use regular jet engines to reach supersonic speed and then switch to ramjet power," according to CSD.

★ AFSC's Electronics Systems Division, Hanscom AFB, Mass., has given the go-ahead for the production of four transportable Intelligence Analysis Centers for Marine Corps use.

"Since the mid-1960s, the Air Force and the Marines have been jointly developing computerized intelligence processing equipment that can operate at remote battle areas anywhere in the world within a few hours after delivery," noted Marine Maj. Jerry Hudak, ESD program manager.

American Development Corp. of North Charleston, S. C., is to produce the equipment under a $17 million-plus contract. Deliveries are to take place in late 1984 and early 1985.

Basically, the intelligence center is housed in two van-type shelters—one containing a computerized data bank that is like a library, said Major Hudak. "It has all we know about the enemy and is constantly updated from other sources."

Typewriter-like keyboards linked to video screens in the second shelter are used to analyze data and compose intelligence reports. These are sent at the touch of a key by teletype or digital data link to the battle commander's headquarters. Up to three analyst shelters can be connected to the data storage unit.

The Intelligence Analysis Center is the heart of a larger, transportable Marine Air-Ground Intelligence System called MAGIS. The system also has units to develop and analyze aerial photography. Another MAGIS segment processes electronic intelligence information gathered by aircraft specially equipped to locate enemy radars and radio communications jammers.

All MAGIS equipment is packed into shelters that can be transported by ship, aircraft, train, or mounted on wheeled mobilizers for towing.

AEROSPACE WORLD

★ **NEWS NOTES—Fifty paintings by aviation artist Keith Ferris,** whose work has appeared on the cover of AIR FORCE Magazine, will be on display at the Air Force Museum, Wright-Patterson AFB, Ohio, through much of the summer. The one-man show is the first sponsored by the Museum. Ferris's "Fortresses Under Fire" adorns an entire wall of the National Air and Space Museum's World War II Gallery.

Lt. Col. Monica S. Messer, USAF, NC, has been presented the **E. Ann Hoefly Award** for excellence in clinical nursing and research for 1983. Colonel Messer is Chairman, Department of Surgical Nursing, at Wilford Hall USAF Medical Center, Lackland AFB, Tex. She is a nationally recognized specialist in wound management. ■

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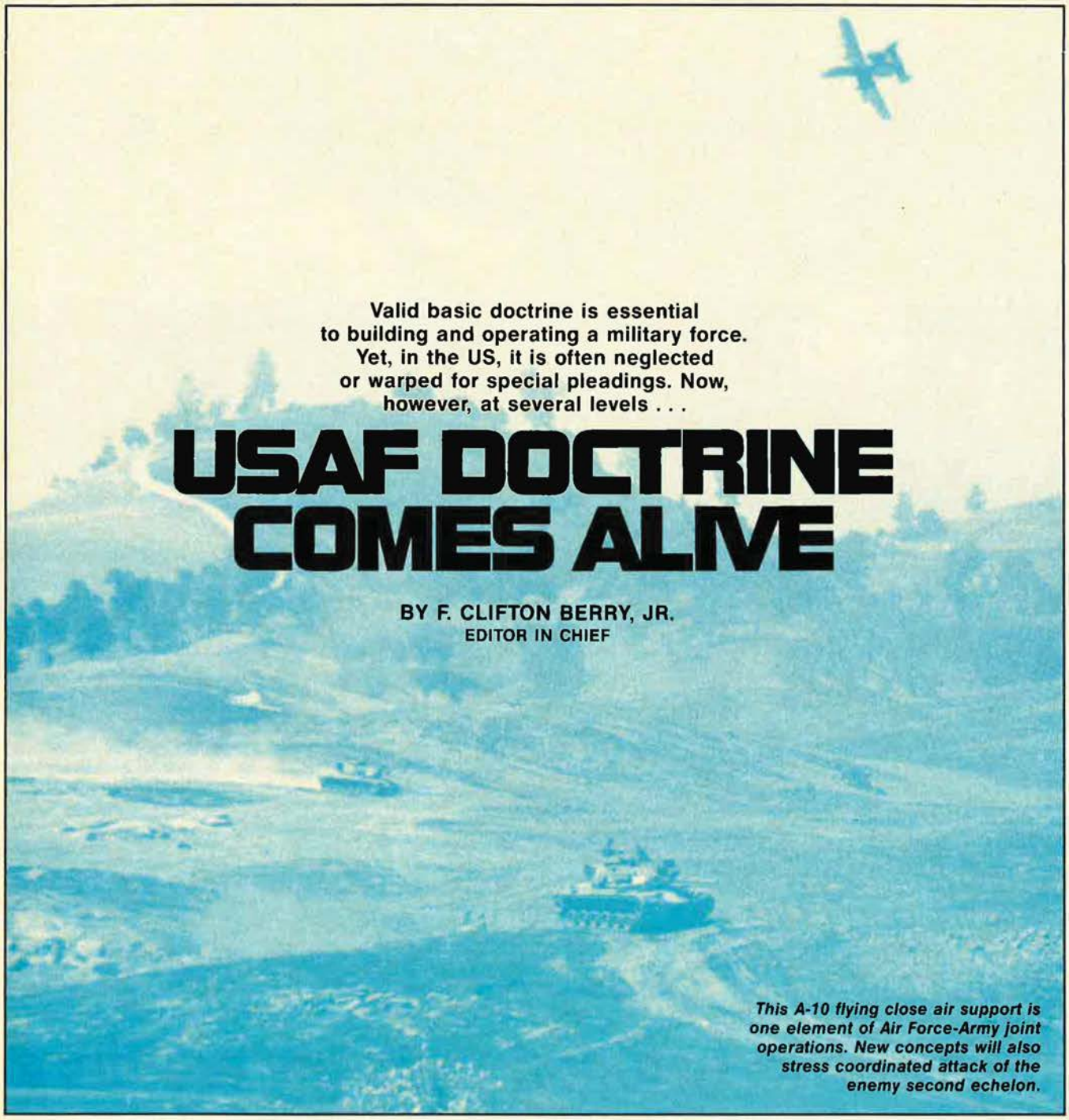
Valid basic doctrine is essential to building and operating a military force. Yet, in the US, it is often neglected or warped for special pleadings. Now, however, at several levels . . .

USAF DOCTRINE COMES ALIVE

BY F. CLIFTON BERRY, JR.
EDITOR IN CHIEF



This A-10 flying close air support is one element of Air Force-Army joint operations. New concepts will also stress coordinated attack of the enemy second echelon.

SOME doctrine is dull as dishwater. A sort of "motherhood and apple pie" topic studied as part of professional military education, then promptly forgotten in the press of the real world. Too many USAF people have treated doctrine that way. The process of neglect has had the effect of weakening the underlying rationale for building and operating USAF forces and equipment.

For more than a year, with the strongest direction from its top leaders and major commanders, the Air Force has been examining its basic doctrine closely. The examination has coincided with others, such as Project Air Force 2000 and the US Army's promulgation of its Airland Battle doctrine and the accompanying Airland Battle 2000 concept. At the same time, the Air Force has taken the initiative to work more closely with its sister services in preparing forces to be ready to fight and win should the nation require it.

Results of all this self-examination and coordination are now beginning to appear. Three examples of doctrinal actions can be cited. At the top, and the most abstract, level is the revision of Air Force Manual 1-1, "Basic Aerospace Doctrine of the United States Air Force." It is the fundamental doctrine manual of the Air Force, last revised in February 1979. At the next level, USAF's

major commands are revising their 2- series of operational doctrine manuals. Then, at the individual level, when the revision of AFM 1-1 goes into effect later this year, an extract suitable for personal study and use will be prepared and released. It will be called "The Air Warrior's Guide."

The watchword in development of doctrines and concepts is "jointness," reflecting the newfound spirit of cooperation now prevailing in the Pentagon. Rapport between the Air Force and the Army has been building for some time, and was enhanced by the recent Air Force endorsement of the Army's Airland Battle doctrine.

The Maritime Relationship

Navy-Air Force relationships, however, have traditionally been less than good. Neither service felt that it could be helped much by the other, and there was a perceived rivalry across the entire spectrum of mission areas, including strategic nuclear, tactical nuclear, theater warfare, and special operations roles.

With the enormous increase in the Soviet threat to US naval forces from maritime-specialized bombers as well as from various types of long-range missiles, the Navy has now acknowledged, albeit reluctantly in some cases, that AWACS, F-15s, KC-10s, and KC-135s all can be very helpful, allowing the Navy to carry out its missions and, at the same time, adding to the survivability of the fleet. The mutuality of interests is somewhat unbalanced in that the Air Force can contribute more to the Navy than the Navy can contribute to the Air Force.

As for joint initiatives, last autumn the Air Force and Navy signed a Memorandum of Agreement for closer cooperation in training and operations. This has already paid off in several areas. Successful tests of Harpoon antiship missile firings from Strategic Air Command's B-52s have been completed. One squadron on each US coast will be trained and equipped to employ the Harpoon missile against seagoing targets.

Also, the Air Force participated heavily in large fleet exercises in the Caribbean and North Pacific this year. In the latter case, the participation included F-15 Eagle, E-3A AWACS, and KC-10 Extender aircraft working with a three-carrier battle group. The results are encouraging. A joint steering group with two-star representation from both the Air Force and the Navy was established to execute the terms of the MOA. Among actions under way by the steering group are increased use of interservice exchange flying slots and increased use by the two services of each other's tactical course quotas.

Army/Air Force Cooperation

In April 1983, the Air Force signed a Memorandum of Understanding with the Army. The objective of the MOU is to enhance joint employment of tactical forces. The elements of the understanding are that "each Department will commence efforts to enhance their combined effectiveness in Airland Battle operations." As the MOU says, "These efforts will, in particular, be directed at increased joint training and exercising. . . ."

Specific objectives include: Increased integration of Army and Air Force forces in tactical field training and command post exercises, including JCS-sponsored exercises; continued efforts to enhance interservice interface during planning and programming processes; increased interservice dialogue on Airland Battle concepts; increased cooperation in the development and coordination of deep attack/battlefield air interdiction/interdiction programs; increased cooperation in the development and coordination of airlift requirements to meet battlefield mobility needs; and resolution of any doctrinal and procedural concerns as Airland Battle doctrine is integrated into joint theater operations.

In entering the Memorandum of Understanding with the Army, the Air Force is acknowledging that Airland Battle doctrine as set out in Army Field Manual 100-5 is Army doctrine. However, the MOU does not mean that the Air Force is adopting completely the Army's Airland Battle concept itself. Air Force basic doctrine will appear in the revised AFM 1-1 later this year. Senior Air Force officers believe, however, that working together under the terms of the MOU can have two significant benefits: as already mentioned, improving the effectiveness of joint operations; and, second, helping to identify and iron out doctrinal differences between the Air Force and Army.

Year 2000

In a separate planning effort called Focus 21, the two services are working toward joint concepts for the longer range—this century and beyond. In the 1981–82 period, both the Air Force and Army concurrently had groups working on separate "Year 2000" studies. The Army's was called Airland Battle 2000; the Air Force's effort, Air Force 2000, was not a concept but rather a broad study of the future and the Air Force's role in it. As those documents were completed and disseminated, the services recognized the limitations of unilateral approaches to warfare and the need for closer integration, beginning with concept development. Therefore, the Army and the Air Force decided to establish a small group to develop a joint future warfare concept, to see where the studies diverged, and to determine each service's concerns about the other's ideas.

The Focus 21 group is doing that, and more. Its purpose is to enable the services to build together beyond the year 2000, specifically looking toward the decade 2005 through 2015. The strength of the Focus 21 product lies in its joint preparation from the outset. A first draft is imminent. Persons close to the work say that, even more than the 2000 studies, the Focus 21 product could show innovative approaches to future warfighting problems. The same sources say that the product should be ready for briefing within the services by early fall.

Fundamental Beliefs

A fundamental basis for all the Air Force doctrinal work is AFM 1-1, mentioned earlier. Its revision is a response to the growing demand from inside the Air Force for a basic doctrine manual that takes a distinct

A USAF KC-10 and a Navy A-6 fly over the USS Midway *in the northern Pacific during Exercise Fleetex '83. The two services have begun closer cooperation in training and operations.*

stand on how the Air Force is going to fight when the nation calls on it. The revision is now in the final coordination process with the major commands, SOAs, DRUs, and the Air Staff. It has gone through earlier reviews by them, with comments and concerns from those reviews addressed and coordinated. Also in the manual is a short section on maritime operations—recognition of USAF's ability to contribute to missions at sea. The revision recognizes that space is a place, not a mission, and that multiple Air Force missions can potentially be performed or supported in space. A side note here: This aligns AFM 1-1 with AFM 1-6 on space doctrine, which was published last October.

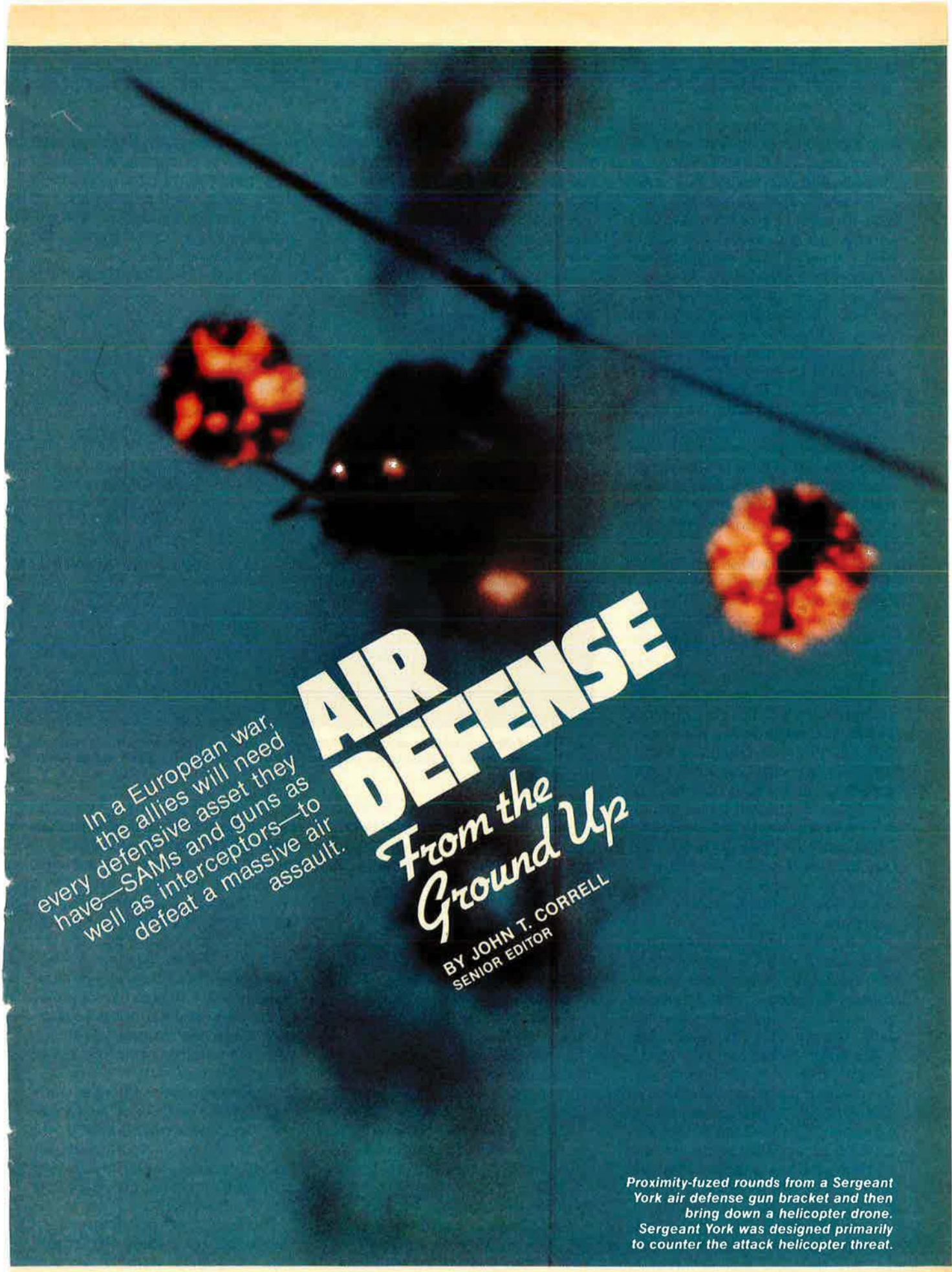
The revised AFM 1-1 makes the definitive statement on how USAF will fight, and describes clearly its fundamental beliefs as a service. The revision is significantly different from its 1979 predecessor, with a new focus on warfighting, leadership, and unified action. It is a fundamental answer to the challenges facing the Air Force today and tomorrow. Underlying this philosophy is a recognition that the Air Force must be prepared to fight and win when the nation requires it. Preparing a basic doctrine from that viewpoint is prudent, not pugnacious.

A second annual USAF doctrine conference was held at the Air Force Academy in early May. Its primary focus was on theater warfare and on how doctrine guides the services in unified action. Participants included the chiefs of plans from the Air Force's major commands. Each of the general-officer planners from the major commands presented a briefing on how his command sees USAF basic and operational doctrine applied in theater warfare.

In addition, the Army made two substantive presentations. The discussions led to clearer understanding among all the commands of special requirements for fighting jointly. The conference should accelerate and improve the process of preparing operational manuals throughout the Air Force.

All this doctrinal development is useful and long overdue. However, one should not assume that everyone is marching in perfect step. The Air Force and the Navy, for example, have not resolved all of their differences about priorities, weapon systems, and doctrines. The Army and the Air Force are working well together in tactical training and joint exercises, and they have made great strides in procedures for close air support and joint attack of the second echelon. But there remain some differences of view on such fundamental issues as point air defense and control of airspace in the theater. They also diverge on a fundamental point: centralized control of all air resources in a theater and decentralized execution (the Air Force view) vs. corps control of air resources delegated by the theater (the Army's view).

These doctrinal differences, while significant, will provide a good deal of thinking, negotiation, and spirited debate in the months ahead. However, that should not impede the basic momentum already established and will pay dividends in improved unified warfighting capability. ■



AIR DEFENSE

From the Ground Up

In a European war, the allies will need every defensive asset they have—SAMs and guns as well as interceptors—to defeat a massive air assault.

BY JOHN T. CORRELL
SENIOR EDITOR

Proximity-fuzed rounds from a Sergeant York air defense gun bracket and then bring down a helicopter drone. Sergeant York was designed primarily to counter the attack helicopter threat.

THE Army and the Air Force weigh their words when talking about their shared mission of air defense. The prevailing mood at the moment is one of cooperation and joint planning, but the partnership has not always been an easy one.

Ground-based defenses—surface-to-air missiles (SAMs) and antiaircraft guns—belong to the Army, which is also responsible for point defense of air bases. Air-to-air defense is an Air Force mission.

There is absolute agreement about the importance of air defense. The Army has not fought a battle without the cover of air superiority since 1942, and there are few illusions that Western Europe could be held if Soviet and Warsaw Pact attackers were able to establish control of the air. There is also agreement that existing air defenses are thin, and that neither the Army nor the Air Force can do the entire job alone.

But as with any joint responsibility, there has been friction about roles and missions. Beyond that, the two services have sometimes differed about approaches to air defense.

The Air Force is mightily concerned about the vulnerability of its air bases, particularly in Europe. The classic scenario for war begins with an all-out air assault in which the Pact attempts to knock out NATO air bases early. In the not-too-distant future, air bases will almost certainly come under threat of attack by conventionally armed tactical ballistic missiles. If western air forces cannot operate, any conventional war in Europe would be a short one.

In a 1981 funding squeeze, the Army canceled a US version of the Roland missile, which was in production to upgrade point defense of air bases and other high-value targets. The Air Force learned of the cancellation by reading the Army's budget submission. The Army says that while it failed to coordinate its decision with the Air Force, the requirement for air base defense was considered, and the conclusion was that this could be properly provided for with a combination of Improved HAWK and Chaparral missiles.

Over the objections of the Army, the Defense Department subsequently directed procurement of British Aerospace Rapier missiles, to be manned by the Royal Air Force Regiment, for defense of USAF bases in the United Kingdom. Within the Army community, this was widely perceived as the first step toward the Army's loss of its traditional air defense mission.

A similar arrangement for defense of air bases in Germany, probably with the Euromissile version of Roland, has been percolating in Washington and Bonn. Rumors vary about how well or how poorly the negotiations are going, but at this writing no decision had been announced.

The Air Force does not covet the Army's ground-based air defense mission or the budget headaches that go with it. What the Air Force has wanted all along is for the Army to perform that mission and to give it adequate priority. That is still what it wants.

A joint Air Force-Army study of air defense requirements worldwide is in progress. If the Army cannot or will not meet the air base defense needs identified by that study, the Air Force will probably make arrangements on its own.

Blunting the Attack

Air defense in its broadest sense includes more than interceptors, SAMs, and guns. It also incorporates such passive measures as camouflage and tone-down of high-value assets, a capability to repair cratered runways rapidly to get them back into operation, and even interdiction of enemy airfields to keep penetrators from generating attack sorties in the first place.

The most demanding air defense environment is Central Europe, the focus of this article.

The NATO interceptor force is small, but it includes American F-15s, the finest air-superiority aircraft in the world today. Given enough warning time, US and allied air defense units in Europe would be reinforced by squadrons deploying from the United States before the war starts. Most analysts believe there would be some warning time, with the enemy telegraphing his punch to a degree by the preparations necessary for attack. However, a surprise assault at 5:30 a.m. some Christmas morning cannot be altogether ruled out.

Improved HAWK missiles, arrayed in a belt along the inter-German border, constitute NATO's forwardmost surface-to-air defenses. Some I-HAWKs have been redeployed to protect air bases.

Depending on the extent of warning, fighters with dual air-superiority and attack roles, such as the F-16, would probably be employed for air defense, alongside fighters dedicated to that mission, in the early part of the battle.

The task in the first few hours of war would be to blunt the assault, then to regain the initiative from the

attackers, keep the airfields open, and preserve airheads on the continent for reinforcements.

Blunting of the attack will have to be done quickly. Otherwise, the enemy will throw thousands of aircraft into successive waves of assault and blow holes through the defenses. Against a ground-based defense that is necessarily dispersed, the attackers can concentrate on selected approach corridors. Defenses would soon become saturated, would run out of missiles, and would collapse.

The scenario explains the current emphasis on mobility and extending the air battle to the enemy's side of the line, destroying some of his capability to mass and regenerate his assault waves.

A mix of aircraft, missiles, and guns for both area and point defense is required.

As defenses go, SAMs and guns are cheaper than interceptors, and they also have higher readiness rates. Historically, air defense artillery—especially the guns—has taken a punishing toll on aircraft. The problem with ground defenses is that they are fixed, or effectively so. There is never enough air defense artillery to cover all of the airspace, and any given point on the defensive belt can be overwhelmed.

The advantages of interceptors are that they have the flexibility, speed, and range to defend at the point of attack, wherever that may come. They are better suited to carrying out an active defense, taking it into the enemy's backyard if need be. The air-to-air war is analyzed regularly in AIR FORCE Magazine, so the remainder of this article concentrates on the other part of air defense: ground-based systems and concepts for their employment.

Army Systems in Europe

Ground-based defenses in Europe range from a belt of large radar-controlled SAMs along the inter-German border to small systems fired from one man's shoulder. Several NATO nations contribute to the belt, which is an Alliance asset. It is "pre-chopped" to the allied air defense commander, even in peacetime, because if it has to be used there would be little time to waste on arranging for transfer of operational control.

I-HAWK. The forwardmost SAM in the belt is the Improved HAWK. It has a range of forty kilometers. This is a derivative of the original Raytheon HAWK system fielded in the 1960s before low-level approaches had come to dominate tactics for penetrating aircraft. US forces have never fired HAWK in combat, but in its basic configuration the missile destroyed more than a score of high-performance aircraft in the 1973 Middle East war. In the wake of the US Roland cancellation flap, some of the I-HAWKs were redeployed for defense of air bases. The Army had planned to phase I-HAWK out of the belt by 1987 as the new Patriot system deployed, but will now keep some of the I-HAWKs in service longer.

The ultimate purpose of air defense is not to win duels with penetrating aircraft, but to prevent the enemy's making attacks that advance his war aims.

Nike-Hercules. Back of the I-HAWKs is an inner belt of aging Nike-Hercules SAMs. They have a range of more than 140 kilometers, but can engage only one aircraft at a time and have a low rate of fire. The Western Electric Nike-Hercules has been operational since 1958. It is characterized as "semimobile," and that is inadequate on the modern tactical battlefield. It will be withdrawn when Patriot is in place.

Patriot. The Raytheon Patriot is just now deploying. It uses a concept, new to the SAM world, called "track-via-missile" guidance. As the missile nears its target, it downlinks data to its radar, and a computer updates the missile onto a sure-kill path. It can engage several targets at once. Each missile is a "certified round," meaning that it can be shipped, stored, and fired without testing or maintenance in the field. Range is greater than eighty kilometers. By some estimates, Patriot is eight times better than HAWK at low altitudes. The Army is now considering the internetting of Patriot radars so that fire-control units can be served by more than one radar. This would provide flexibility and also a backup in case a radar is destroyed in action or neutralized by electronic countermeasures.

Chaparral. The Ford Aerospace Chaparral, with a range of ten kilometers, is the Army's current short-range SAM. It is currently a daytime, clear-weather system with infrared guidance. It fires a modified Sidewinder missile and is used around air bases as well as for forward defense. The all-weather US Roland would have replaced it for air base defense in Germany. Now, Chaparral is being upgraded with a forward-looking infrared (FLIR) night sight and will have some adverse weather and nighttime capability.

Vulcan. The General Electric Vulcan is a 20-mm Gatling gun for short-range defense. Some are deployed around air bases. Vulcan lacks range and lethality, and the Army does not think it is up to meeting the current threat in Europe, much less the future one. It is a fair-weather system with a radar rangefinder to acquire its targets. It will be replaced by DIVAD in the Army's heavy divisions and in battalions providing defense for air bases, but will be upgraded and stay in service with light divisions.

Sergeant York/DIV[illegible]rd Aerospace Division Air Defense Gun (DIVAD), also called Sergeant York, mounts twin 40-mm Bofors guns on a modified M-48A5 tank chassis. It was designed primarily to counter Soviet Hind and Hip attack helicopters. DIVAD is an all-weather system, and its radar has high commonality with that in the F-16 fighter. At least one NATO nation is reported considering it, mounted on trailers, for air base defense, but the US Army intends to use it for protection of its field forces. The biggest problem with DIVAD may be that its funding future is shaky. It is said to be number one on the Army's cut list. The Army denies that this is so.

Stinger. The General Dynamics Stinger is an infrared, shoulder-fired SAM that weighs just thirty-five pounds. It replaces Redeye, which was limited to stern shots at

aircraft. Stinger can be fired from any angle to the target. It is credited with downing one Argentine aircraft in last year's Falklands War. When its regular operator fell in action, untrained comrades picked up his Stinger and later shot down an airplane with it. The US Air Force is buying Stinger for Security Police use in defense of air bases in Korea. Stinger's range is in excess of four kilometers.

Air Base Defense

Unless the Army devotes more of its attention to protecting USAF bases abroad, further solutions along the lines of the Rapier arrangement in the UK may be sought. The Air Force is projecting initial operational capability for Rapier defenses in Britain by the last quarter of this year, with full system deployment by 1986.

Rapier performed well in the Falklands. The British White Paper on the campaign credits it with fourteen Argentine aircraft kills and six probables. Most of the engagements were below 100 feet, often in mist or poor light. The Argentine aircraft were flying so low that one crashed into a ship's mast. Rapier has a range of about six kilometers. The basic system has been operational since 1971, and its all-weather Blindfire radar since 1978.

The leading contender for USAF base defense in Germany, the Euromissile Roland, was also in the Falklands fighting. A background paper being circulated on behalf of Roland repeats the claim that the Argentines fired eight Roland missiles against British Harriers, destroying four and damaging a fifth, and that still another Roland hit a Harrier-released bomb in midair. British spokesmen call these claims "absolute nonsense." They admit to only one loss to Roland—a Harrier flying at about 12,000 feet—and say their other aircraft losses were essentially to small-arms fire.

There is little prospect for an exact "Rapier role model" solution—the US buying a short-range air defense system to be manned by the host nation—in Germany. Instead, the approach being negotiated is that the Germans will buy, man, and maintain Roland for the protection of both USAF and German bases. In return, the US would procure twenty-eight Patriot fire units on behalf of Germany, and the Germans would man them for forward defense.

German officials have made it clear that it is politically impossible for them to buy Patriot to upgrade their contribution to the belt without some form of "industrial compensation." They will not keep on purchasing American systems unless the Americans begin purchasing some systems made in Germany. The Euromissile Roland is a joint venture by Messerschmitt-Bölkow-Blohm in Germany and Aérospatiale in France.

The emerging threat to air bases and other high-value targets is from tactical ballistic missiles with the potential to neutralize airpower early in the fighting.

Roland is a highly mobile all-weather system with a range of about six kilometers. The configuration proposed for air base defense in Germany would mount Roland on an eight-wheel-drive M.A.N. truck, with the radar and all fire-control elements contained on a single chassis. Inside the vehicle, the crew is protected against chemical, biological, or radiation attack. Euromissile Roland is in service with several armies, including the German Army. A version of this system, mounted on a tank chassis, has been reported to be effective for the Iraqis in their war with Iran.

Meanwhile, the Air Force is pursuing yet another option to supplement existing base defenses and to provide some defense to bases that have none.

The project is called the Mobile Weapon System and would put together a variety of existing components into a sort of war wagon, mainly for use against light ground forces but with some capability against airborne threats. Air Force Systems Command's Armament Division at Eglin AFB, Fla., issued a Request for Proposals in late April, seeking a contractor to assemble what it has in mind for a capability demonstration.

The Mobile Weapon System will mount a Stinger missile and a lightweight 30-mm Gatling gun—the four-barrel GAU-13 in a GPU-5 pod—on the basic chassis of an eight-wheeled LAV-25 armored vehicle. The system will have a FLIR set to acquire targets at night and in bad weather, a laser rangefinder, and an optical sight.

Guns and SAMs

The last three wars in the Middle East have been instructive about the matchup of aircraft against guns and SAMs.

SAMs were developed originally to counter high-flying aircraft, and early systems were effective against that specific threat. In the Six-Day War of 1967, Egyptian SAM defenses consisted of high-altitude systems. But Israeli airmen approached from the sea and on the desert deck, sweeping in beneath radar coverage and below the range of the SAMs. They destroyed more than 400 Egyptian airplanes on the ground.

Modern defenses are designed with the expectation that penetrators will come in low and fast. By the Yom Kippur War of 1973, Arab defenses included weapons to counter the low-level threat, and that time the Israelis took heavy losses.

In last summer's Lebanon campaign, the Israelis practically conducted a tutorial on defense suppression when they took out the Syrian SAMs in the Bekaa Valley while losing none of their fighters to defense batteries. The Syrians made the job easier by doing almost everything wrong.

The Syrians did not move their SAM batteries around. Some of them had been in place for more than a year. Missiles were wasted shooting at decoy drones. Radars kept emitting, even when there was no need for them to be turned on. This attracted Israeli antiradiation missiles (ARMs). The Syrian transmitters came up on the same frequency every time, adding to their predictability and to the danger to themselves. The Syrians did little in the way of camouflage or deception. The Israelis also managed to em-

ABOVE: The shoulder-fired Stinger is an all-aspect weapon, but eyeball-identification rules of engagement may mean that gunners will have to use it mostly for tail-chase shots. RIGHT: Patriot is the Army's front-line SAM of the future. By some estimates, it is eight times better than I-HAWK at low altitudes.

ploy airborne jamming to good effect.

The air defenders in this case apparently came about as close as possible to total failure, but the proper measure of air defense is not always the number of enemy airplanes it knocks down. The ultimate purpose is not to win duels with penetrators, but rather to prevent the enemy's success in attacking targets to advance his war aims. Blowing penetrators out of the sky is one form of prevention, but there are others.

To begin with, there is a deterrent effect. The enemy, considering the price he would have to pay in attrition, may decide not to attack a well-defended target. Further, a strong air defense system denies options and tactics to the enemy. He cannot make long, straight runs on his targets or fly at higher altitudes where his standoff weapons might be more effective. He must also divert considerable portions of his airpower away from targets important to him in order to provide for defense suppression.

Targets and Identification

An airplane flying at 100 feet can penetrate unseen to within about thirteen miles from the average ground radar. Farther out, he is hidden behind the curvature of the earth.

A battery of air defense artillery dependent on its own radar to pick up a low-level penetrator has less than two minutes to spot the target, acquire it, and shoot. If the terrain is to the enemy's advantage, there is even less time—especially if the penetrator is an attack helicopter using pop-up tactics.

Getting the radar higher, as is the case with the E-3A Airborne Warning and Control System, enables defenders to detect low-flying aircraft earlier. So far, the NATO AWACS has concentrated on the airborne early warning mission, but it can feed target information by data link to interceptors and to SAMs in the forward belt.

The target acquisition problem is compounded by inadequate IFF (Identification, Friend or Foe). Air defense gunners often have to pass up their best shots because they are not certain the target is an enemy.

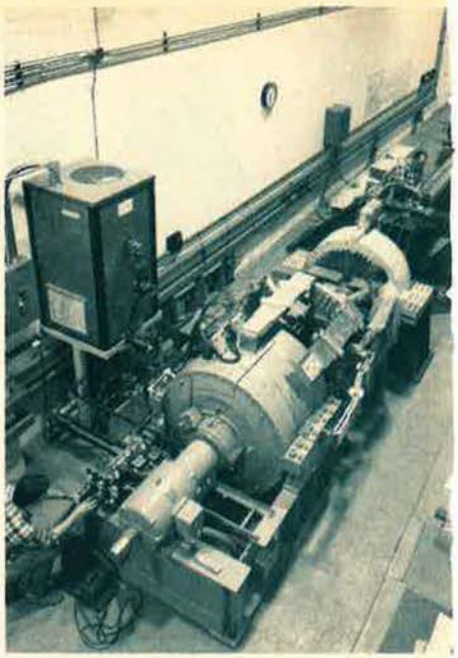
The current IFF system is the Mark XII, which can identify a friendly aircraft if its IFF is on and is working properly. Noncooperating friendlies remain unidentified, as do foes. When pulsed by an electronic query, the Mark XII transponder on the aircraft answers with the appropriate electronic countersign. This system has not always inspired great confidence among its users, and not all of the allies use it. Progress on the follow-on system, the Mark XV, has been slow because of the difficulty in getting all of the allies to agree on a NATO-wide frequency.

Procedures—such as airspace lane and corridor arrangements—are used in addition to the black boxes for IFF. Various sensors and procedures, working together, build up an enhanced picture of the order of battle that is stronger than any of them could produce alone.

Still, allied airmen do not have as much freedom as they would prefer to operate in allied-controlled airspace without risk of being shot down by friendly fire. Defense sources say they do not foresee the likelihood of SAMs and interceptors being able to work the same airspace zones in the near future.

Rules of engagement for short-range air defense systems require eyeball identification of a target before gunners can shoot in most cases. The gunners understand the problem, but point out that these rules prevent their taking full advantage of new capabilities in Stinger, DIVAD, and Improved Chaparral. They say, for example, that they will probably be limited by the rules of engagement and use Stinger for tail-chase shots rather than as an all-aspect weapon.

Because IFF is so important, the search is always on for new ways of



ABOVE: Hypervelocity rail guns, such as this one built by Westinghouse, use electronic energy instead of powder for a propellant. They shoot with fantastic velocity and have, as one developer says, "real nasty terminal effects." LEFT: Rapier, which performed well in the Falklands conflict, will soon be in place to protect USAF bases in the United Kingdom. LOWER LEFT: Leading contender for point air defense of bases in Germany is the Euromissile Roland. This system comes in various configurations, but the one proposed for air base defense in Germany would mount it on an eight-wheel-drive truck.

achieving it. Westinghouse, for example, claims that its independently developed W-2000 radar is good enough to "tell ours from theirs." The W-2000 yields not only data to describe an airborne target in terms of height, range, azimuth, and velocity, but also provides a high-resolution target profile that can positively identify aircraft by type. In addition, it can count closely spaced targets. Westinghouse says there is very high probability of correct identification within thirty seconds of detection. The limitation is that concentrated focus and multiple scans—perhaps ten passes—are necessary to identify a single aircraft, so it is not yet a solution to the IFF problem in Europe, where time will be short and the sky full of airplanes.

The Army's long-range doctrinal plan, Airland Battle 2000, calls for IFF systems that use "inherent air vehicle signatures" to identify airborne targets, with or without transponder cooperation from them. This system would further discriminate among types of vehicles, separating airplanes, drones, precision-guided munitions, and missiles from each other.

Survivability

Air defenders also continue to search for ways to reduce their vulnerability. Radar is the best target acquisition technology now available for most purposes, but its emissions give away the locations of the transmitters and enable antiradiation missiles to home on them.

A principal countermeasure here is "emission discipline"—shutting down the radar except when it absolutely has to be on. Another tactic is "blinking," several radars working together, alternating on and off and pooling their information. Decoys, including dummy transmitters, can be used as well.

Under attack by an ARM, a battery must either shut down or try to shoot down the missile in flight.

As illustrated in the Bekaa Valley example, air defense assets need to be mobile and moved often. NATO still has a number of fixed radar sites. The consensus is that they would not be in operation much beyond the first minutes of the war.

Airland Battle 2000 notes that air defense systems today depend primarily on active radar for target acquisition, but proposes future systems with "multimode, quiet, passive sensors and the capability to engage threats completely by remote cuing."

The plan does not specify what technology might be used to achieve that. Other than radar, the main target acquisition sensors now in use are either infrared or electro-optical, which are limited by such natural factors as night and bad weather. Radar can be "quietened down" somewhat by such design features as reducing the beam sidelobes to present a smaller target.

As Warsaw Pact aircraft become more technologically complex and electronics-dependent, they also become more susceptible to a receiver tracking them by their radar emissions.

Free-wheeling speculation about passive target acquisition systems of the future might include acoustic and scent-sensitive sensors, both of which were used in the Vietnam War, but their adaptability for air defense purposes requires a substantial leap in imagination.

The Future

Air defense is an area of intense activity, both for military planners and for the aerospace industry. The systems previously described here are only a sampling of those in being or in prospect.

Near-term options include other SAM systems already available. Thomson-CSF, for example, thinks the Air Force should take another look at its Crotale SICA for defense of air bases abroad. Proponents point out that SICA was designed specifically for air base defense. It has an eleven-kilometer range, as opposed to six for Roland. Its greater reach and more lethal warhead give greater defense against attacking aircraft before they can release standoff weapons. Reliable sources predict that Thomson-CSF will submit an unsolicited proposal, offering SICA for defense of air bases in Germany. Advocates claim their system would be "at least as German as Roland" with sixty percent of the project going to Siemens, the German partner in the endeavor. The strong indication, however, is that the German government prefers to go with Roland as its part of the air defense upgrade.

Another set of options would adapt existing aerial weapons for ground use. One such proposal is to try the Hughes Advanced Medium-Range Air-to-Air Missile, called AMRAAM, in a SAM configuration dubbed "SAMRAAM."

Looking further ahead, Airland Battle 2000 sees a whole new generation of systems and capabilities for air defense. It postulates "smart" air defense weapons and directed-energy devices—lasers, high-energy microwaves, and particle beams. A concept for aerial mines, barriers, and other obstacles is left vague, but the plan says antiair mines would "thicken low-altitude defenses" and "deny landing zones and nap-of-the-earth routes" to enemy air assault forces.

The Airland Battle 2000 forecast of hypervelocity "rail" guns is especially intriguing. Basically, these weapons use electronic energy instead of powder for propellant, sending a charge from a generator down a rail to launch the bullet. Westinghouse, which is working on a system for the Army, reports having fired a projectile weighing 317 grams—about eleven ounces—at a velocity of 13,780 feet per second.

Rail guns give better range, accuracy, and penetration than present weapons do. So far, however, these guns are huge, and the problem is getting them down to a practical size.

The Air Force is interested in rail guns, too, and has begun some exploratory development work, looking generally at the technology for a broad range of possible applications. An electromagnetic gun would pack a devastating wallop. As one Air Force developer puts it, rail guns have "real nasty terminal effects."

Command and control has always been a problem in air defense, especially where the short-range systems are concerned. Some networking is possible and improvements are being made, but fire units now depend mainly on their own sensors. Airland Battle 2000 speculates that while centralized control would be attempted under the present arrangement, "autonomous operation" would be more likely in actual practice.

The solution foreseen in the plan lies in the vastly improved IFF of the future. The C^2 problem is taken care of largely by eliminating the requirement for so much of it: "As identification and discrimination capabilities approach the near perfect, using active and passive means, the need for centralized control is greatly diminished."

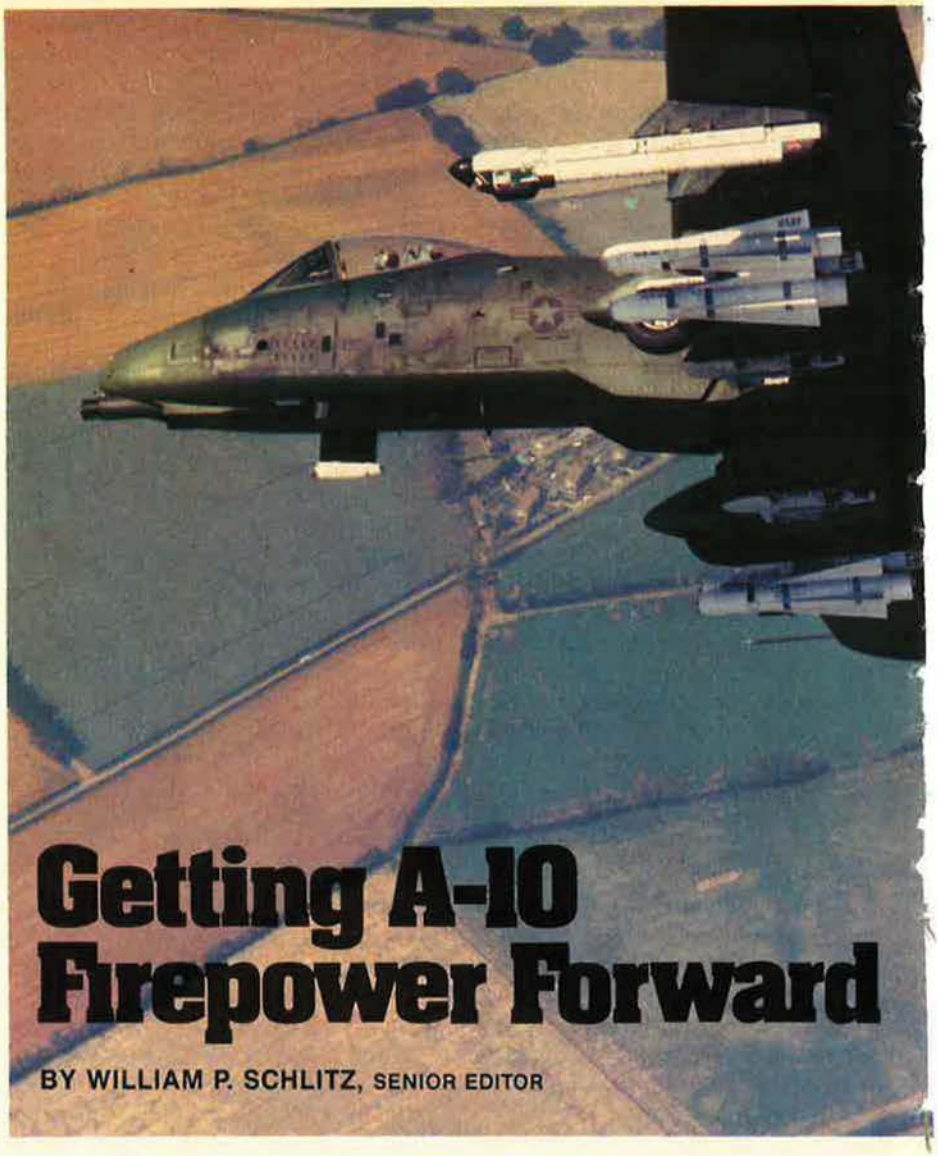
But even as air defense technology and concepts advance, so do the capabilities of the offensive forces they defend against.

The emerging threat to air bases and other high-value targets is from tactical ballistic missiles. This approach has the potential to neutralize air bases as early as possible in the fighting, and lessens the need to send manned aircraft into high-risk areas.

Among other things, an antimissile defense requires fast reaction, good targeting information in a hurry, and excellent accuracy. By and large, air defense planners say that target acquisition is more of a problem than actual intercept of the incoming missiles. The big part of the intercept problem is devising a weapon that can destroy the attacking missile without a direct hit—and without a nuclear warhead. Passive measures, and perhaps more dispersal bases for aircraft, will be necessary as well.

The air defense task is formidable, both in scope and in complexity. In wartime, the combined assets of the services—defenses in the air and from the ground up—would be hard pressed to meet the requirement. ■

Configured lean and lizard green, they deploy to support the Army from the European treetops.



Getting A-10 Firepower Forward

BY WILLIAM P. SCHLITZ, SENIOR EDITOR

"THIS place was designed and built to be fought out of. We have bullets and aviation fuel and in wartime could be strictly autonomous," noted Lt. Col. Paul E. Dembrowsky, Commander of Detachment 1 that manages a forward operating location (FOL) at USAFE's Sembach AB in southern Germany.

Operating out of the Sembach FOL and three others in Germany are A-10 Thunderbolt IIs deployed from the 81st Tactical Fighter Wing stationed at RAF Bentwaters/Woodbridge in the UK. This arrangement is what gives the wing its split operational profile *(see box).*

"The 81st has a permanent party of from fifty to seventy people at each of the FOLs," continued Colonel Dembrowsky. "The detachment includes—besides the commander—operations and maintenance officers, crew chiefs, supply personnel, and transportation specialists," he added.

"In terms of aircraft maintenance, we make quick fixes only—remove and replace. For major repairs, the A-10s are flown to England. If an aircraft is unflyable, a repair team with the necessary parts and equipment may be airlifted in from Bentwaters," Colonel Dembrowsky explained. "The objective is to keep the logistics base out of proximity to a potential war zone. Thus, deployed to each FOL is a lean, mean fighting unit relying on a minimum of logistics support," the Colonel stressed.

Simple and Rugged

"The aircraft simply does not need sophisticated bases and extensive support equipment. It has excellent short-field characteristics and single-point refueling," noted Colonel Dembrowsky. "An onboard auxiliary power unit provides electric and hydraulic power and air for engine starts and the aircraft has very few 'cosmic black boxes' to go wrong. Even then, there is good accessibility for easy repair," he added.

"Two-thirds of the plane's area expected to take hits is repairable within twelve hours," the Colonel stressed, "and three-fourths within twenty-four. In a typical antiarmor close air support mission, the aircraft could fly 150 miles and remain on station for an hour. To view the capability from another perspective, the A-10 can remain on station ten times longer than any other aircraft. During this time it could deliver Maverick TV-guided launch-and-leave missiles and make fifteen or so GAU-8 30-mm gun attacks. During the mission, the aircraft could operate at combat power for thirty minutes and still have twenty minutes fuel for landing," Colonel Dembrowsky declared.

"In terms of the A-10 mission tailored to operations in NATO's Central Region," noted Colonel Dembrowsky, "we are prepared to respond to Army requests for close air support with the appropriate ordnance from sunrise to sunset. Our objectives in providing that support are that it be continuous, responsive, and effective. To help in this, several Army liaison people are permanently assigned to the FOL," Colonel Dembrowsky added.

"Flying from the FOLs is pretty well compacted," commented Colonel Dembrowsky. "For example, the East German border is only twenty minutes' flying time from the Ahlhorn FOL and the Czech border only forty-five minutes from Sembach. We have the luxury of knowing that there are only so many places from which the enemy can come. Our training, then, is tailored to fighting a very high-threat land war in Europe," he stressed.

In the States, in contrast, the A-10s committed to the strategic

A-10s over the English countryside en route from RAF Bentwaters/Woodbridge to a firing range.

worldwide mission train in a much more varied fashion for theater war, for example, in the Mideast. "For them," Colonel Dembrowsky underlined, "low-, medium-, and high-threat training is more heavily emphasized."

A typical A-10 training sortie from the FOL lasts about an hour and a half. Pilots can expect to be diverted—it's part of the scenario—from their originally scheduled target to one that in war would be more urgent. This training is a direct reflection of the aircraft's flexibility in a constantly fluctuating battle situation.

Almost without exception dry strafing with the 30-mm gun takes place on these missions. Experience is also gained through the use of a "training Maverick" that duplicates target selection, lock-on, and firing.

Regarding flying safety, noted Colonel Dembrowsky, "Constant training at low level, careful understanding of the aircraft's dynamics, and a mature approach to the mission are key training objectives. Familiarization with the terrain is essential to accomplish our close air support mission," he added.

"We won't spend all our time in the treetops but only that period required by the mission. After all, in combat we wouldn't be in a high-threat area all the time," he stressed.

Deploying to the FOLs

Of the three flights of an 81st Wing squadron, one consisting of eight aircraft and eight pilots is in training (and prepared for war) at each of the four FOLs at any given time. They rotate there for a two-week TDY followed by four weeks at home at Bentwaters/Woodbridge. Deployed with the flight are three load teams and operations and life-support personnel.

At the FOL, the TDY flight commander is in charge of his pilots; however, he is under the direction and control of the FOL commander, who functions, in effect, as a mini-wing commander.

"For the aircraft deployed here it is 'gas, gun, and go' combat train-

The 81st's Split Operational Profile

The 81st Tactical Fighter Wing, with its six squadrons and some 108 A-10 Thunderbolt IIs (known as "Warthogs" on the flight line), is the largest fighter wing in NATO and the US Air Force.

While this strength reflects the emphasis on the close air support mission, the 81st's *modus operandi* is also unique in that the wing has a split operational profile.

The wing headquarters and the squadrons are stationed at the main operating base (MOB) at RAF Bentwaters/Woodbridge in the UK. But because of the constant rotation of A-10s and support services to four forward operating locations (FOLs) in Germany, wing people are equally at home there.

Two squadrons—the 510th and 92d—operate out of FOLs at Sembach and Leipheim Air Bases respectively and support the 4th Allied Tactical Air Force defending the approaches to southern Germany. Two other squadrons—the 91st and 78th—fly from the FOLs at Ahlhorn and Norvenich ABs respectively and are assigned to 2ATAF in Germany's northern region.

To complete the organizational picture, the 81st's remaining two "swing" squadrons—the 509th and 511th—rotate into the FOLs to give the others a break for either additional training or other activities in the UK. The 509th goes to Ahlhorn/Norvenich and the 511th to Sembach/Leipheim. In war, each would be deployed to its own FOL, the locations of which are classified.

The 81st Wing is quick to point out that these assignments are not rigid. The A-10's mobility is such that aircraft can be switched from one battlefront to another as needed.

Previously, the 81st Wing at Bentwaters/Woodbridge consisted of three F-4D squadrons. Its buildup to six squadrons and transition to the A-10 were completed in 1980.

ing. We stress the close air support role, and that means strong rapport with both ground and airborne forward air controllers," noted Colonel Dembrowsky. "We also team up with Army AH-1S Cobra attack and OH-58A Kiowa scout helicopters in the Joint Air Attack Team role." *(For a report on the development of JAAT tactics, see the September '80 issue, p. 44.)*

"Routine mission-capability qualification flying is conducted in England," Colonel Dembrowsky pointed out.

The FOL detachment commander and operations officer are fully qualified pilots who fly two or three missions a week to remain so while supplementing the sorties flown by the deployed crews. This provides each FOL with thoroughly seasoned veterans familiar with the terrain, procedures, and every aspect of the mission. "It's interesting that when weather closes down air operations here, to remain qualified I might have to go TDY back to England to fly," Colonel Dembrowsky pointed out.

USAFE and NATO "have a well-thought-out tactical air control plan with a list of priorities to use to the best advantage the limited A-10 fleet and such other close air support assets as British Harriers and German Alpha Jets."

List of Priorities

While a particular A-10 squadron is designated to support a specific Allied Tactical Air Force, there is flexibility to shift the aircraft to where they are needed on the war front. "We have a well-thought-out tactical air control plan with a list of priorities to use to the best advantage the limited A-10 fleet and such other close air support assets as British Harriers and German Alpha Jets," noted Capt. Greg Lewis, a veteran Warthog pilot who spent the better part of four years with the 81st Wing and was among the original cadre in the unit's transition to the A-10 from F-4 Phantoms.

"It must be kept in mind that close air support is not called for indiscriminately but is tailored for specific missions. For example, to get at targets Army artillery can't hit," Captain Lewis asserted. "The need to effectively manage allied airpower is a major factor in the drive toward upgrading NATO's command control and communications," Captain Lewis added.

"Before the A-10s, NATO didn't possess a dedicated close air support aircraft. When the A-10s first arrived in Europe we faced two problems. One, we had to educate the air and ground forces of the allies about our capabilities, a process that is still continuing. And also about our limitations and survivability. For example, there is no sense sending us deep into heavily defended hostile territory on airfield strike missions if other options exist. The aircraft is not designed for that mission," Captain Lewis explained. "We spent a lot of time briefing allied tactical air force and army field headquarters on what we could and could not do.

"Second, we had to shape a NATO standardization for forward air control procedures, no small task with the air and ground forces of all the nations having to agree on the specifics," Captain Lewis commented. "But this has been accomplished and is working beautifully.

"Even so, the most experienced A-10 pilot faces a severe challenge when he's assigned from the States to the 81st Wing," asserted Captain Lewis. "No matter how sharp he is, it will take a year before he fully understands the A-10 mission in the European context," warned Captain Lewis, who became the first pilot to log 2,000 flying hours in the A-10. "For example, how many

fighter pilots are familiar with the NATO chain of command and Tactical Air Control System?

"Experience counts. After three years of operations in the area, the A-10s can go anywhere without preplanning or even maps," Captain Lewis said. "The pilots are trained in low-altitude tactical navigation by dead reckoning using such familiar landmarks as roads, rivers, and terrain features. Also with the recent addition of the inertial navigation system, the pilot's demanding low-level mission is easier and his work load significantly reduced."

With an A-10 squadron's eighteen aircraft operating from a FOL in wartime, six in the standard tactical "two-ship" formations would assume stations near the forward edge of the battle area (FEBA), six would be en route, and six would be on the ground being serviced.

"Although we practice defensive maneuvers against enemy aircraft, we don't consider the MiGs our worst threat. First of all, they'd have to find us at extremely low altitudes. And our lizard-green camouflage scheme is superb. We don't even have colorful squadron markings to spoil it," Captain Lewis noted.

"Often at low level a Warthog pilot has lost visual contact with his wingman, even though he knows the whereabouts of the aircraft," Captain Lewis said.

"And if enemy aircraft do spot us, they'd have to come down to get us, and we're highly maneuverable and have terrific firepower," the A-10 veteran asserted. "I think they will have their hands full with such air-to-air assets as USAFE F-15s and RAF and German Phantoms.

"We train using the 'worst-case' scenarios," noted Captain Lewis, "which means the pilots may have only a few moments of radio communications with a forward air controller before jamming interferes. We have procedures for working in a jam environment, and equipment is being developed that is jam-proof, but for the present we have to assume that we'll be jammed," the pilot noted.

"FACs in OV-10s are an invaluable asset because with their radio packages they are in contact with both air and ground elements," Captain Lewis stressed. "They'd act as 'rear-area' FACs, in effect policemen at intersections keeping traffic sorted out. They'd direct us to, say, IP—initial point—Alpha and give us our contact on the ground and the NATO radio frequencies we'd be using," Captain Lewis said.

During a combat quick turn at RAF Bentwaters, two munitions specialists use the Automatic Loading System to arm an A-10's GAU-8 Gatling gun with 30-mm ammunition.

"Air liaison is provided by the OV-10s, which through their capacity for four-hour watches are able to cut through the confusion and 'fog of battle' to provide continuity," noted Colonel Dembrowsky. "Through contact with ground-unit FACs, the OV-10s are likely to know, for example, where enemy thrusts are coming from and perhaps where hostile AAA is concentrated. They also provide a vital link with the Tactical Air Control System for reporting back to higher authority. The forward FAC who is either on the ground or in a helicopter, on the other hand, can fine-tune attacking aircraft's direction to hot targets," Colonel Dembrowsky added.

"Because ground FACs are right up front—maybe 500 to 1,000 yards from where the shooting is—they'd have information about battle conditions and are very useful in making us more effective," Captain Lewis noted. "That FAC often picks us up visually and conveys such details as 'Your target is armor along a main road. Turn ten degrees left,'" Captain Lewis commented.

"But," the pilot noted, "when all is said and done, we can operate without direct FAC contact. All we need is map reference points for target location. And the ace in the A-10 hand is our familiarity with terrain and the local Army units.

"When the Army Cobras know we're coming, they might attack the target with their TOW missiles and rockets. When we come up over the ridge line at treetop level and see them and the smoke from exploding ordnance, we know we're on target. The Cobras are always pointed toward the target. They operate from the treetops on down and the A-10s from the treetops on up. We might fly right over them to attack the target. The Cobras then might attack again to cover us as we withdraw," Captain Lewis explained.

"Most likely, we will attack several targets on the same sortie, falling back to a jam-free and safe area to confer on tactics between attacks."

A Lethal and Complementary Team

"The A-10s and Cobras working together make a very lethal and complementary team," commented Captain Lewis. "Each partner has its characteristic strengths and weaknesses. For example, the A-10 is relatively fast and can cover a lot of territory. With its 30-mm gun it can deliver an awesome punch. The problem is feeding that firepower in at the right place at the right time. Another drawback," noted Captain Lewis, "is that the aircraft must keep moving, in contrast to the attack helicopters that can land and talk things over with the ground elements or each other. Being Army, they also have ease of coordination with the artillery and heavy mortars," he added.

The drawback with helicopters, it was explained, is that they "can't carry tremendous loads of ordnance and are limited in covering long distances quickly." They are also more vulnerable to enemy fire than the ruggedly built Warthogs.

"Since our lives might depend on each other," stressed Captain Lewis, "a major objective is to get to know each other personally. To this end, we'll fly into an Army helicopter airfield and spend several days flying missions with them to exercise the Joint Air Attack Team

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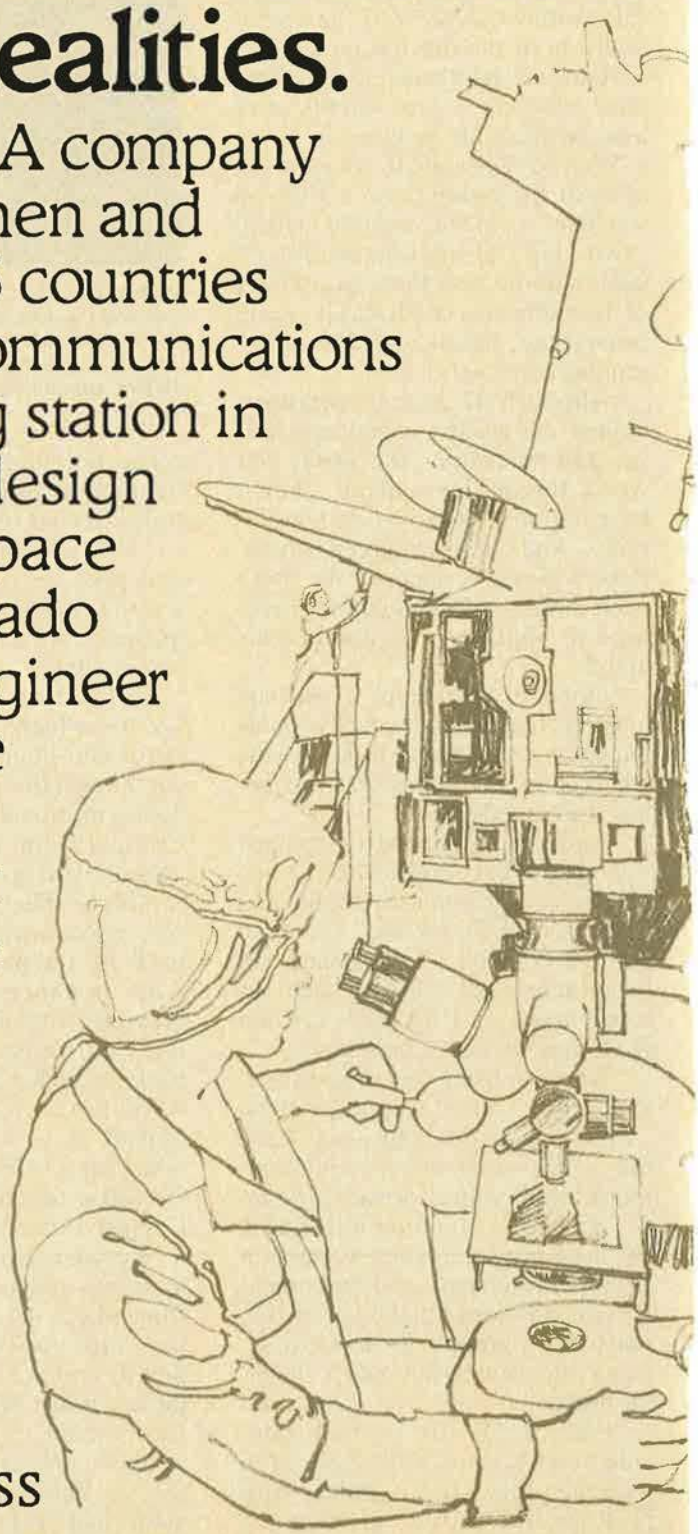

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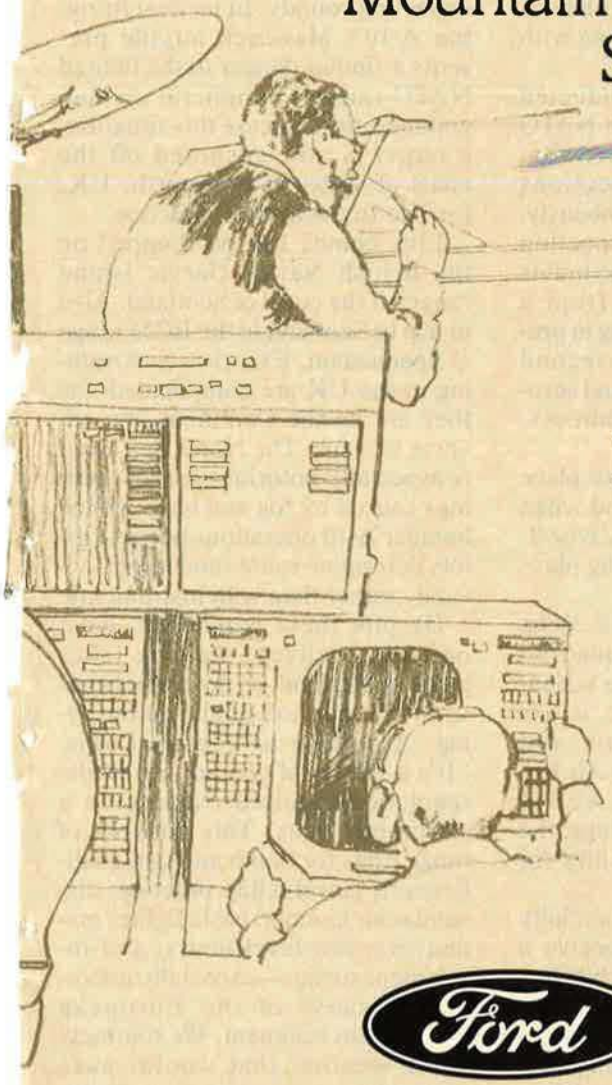

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tactics. At night, we'll talk shop with them and any tank unit commanders in the vicinity." With the same objective, Army helicopters occasionally visit the FOLs.

The Army personnel permanently attached to the FOLs are also essential in providing feedback on the effectiveness of A-10 operations. "We'll also put A-10 pilots up front with the ground FACs to observe the A-10s conducting attacks," Captain Lewis said.

In terms of forward air controllers, the situation in NATO is rather complex. The A-10s operating from the Sembach and Leipheim FOLs in southern Germany fit into the Tactical Control System managed by USAFE's 601st Tactical Control Wing. Thus, they work with 601st forward air controllers assigned to US ground forces and airborne FACs aboard the 601st's OV-10 Broncos based at Sembach. (The A-10s from these FOLs are also responsible for providing close air support for German and Canadian ground forces defending southern Germany. Thus, 601st airborne FACs may find themselves flying in German Army Gazelle helicopters in that role.)

Besides the OV-10s, 601st airborne FACs could also fly in Army OH-58 aeroscout or even AH-1S attack helicopters.

On the ground side, it's not unusual for 601st tactical air control personnel to be in the field six weeks of each quarter, "married" as they are to the ground units and their training schedules. To upgrade their ability to keep pace with the ground forces, an agreement has been worked out to replace the FACs' jeeps with armored personnel carriers "on loan" from the Army.

Headquartered at Sembach, the 601st TCW has mobile radar and command control and communications elements located all across the 4th Allied Tactical Air Force's area of operations. As such, it is the largest wing of its type in the Air Force. Under 601st management at Sembach is one of four NATO Allied Tactical Operations Centers and the only one in the world operated by USAF.

The A-10s based at Ahlhorn and Norvenich FOLs in the 2d Allied Tactical Air Force area face an even more complicated situation. They work with British, Dutch, Belgian, and German forward air controllers, who also use Gazelle helicopters in the airborne FAC role.

"Exercises are scheduled just to address the problem of multinationality," noted Captain Lewis, "with students from perhaps half a dozen nations attending 'FAC schools' in the field and taking turns directing close air support sorties."

At least once a quarter, the 81st goes to a "war mode" and deploys a full squadron of eighteen aircraft and two dozen pilots TDY for three weeks to a month. Airlifted with them from Bentwaters/Woodbridge are thirteen load teams and a logistics/support package totaling about 200 people.

The squadron deployments are not necessarily to an 81st FOL in Germany. Italy, Norway, Greece, and Denmark are among NATO allies that have played host, with their ground forces usually working with the A-10s for the first time.

These exercises are conducted under strict guidelines, with NATO Tactical Evaluations and USAF Operational Readiness Inspections often taking place simultaneously. The first phase in the inspection process is to determine if the unit is capable of transitioning from a peacetime to wartime footing in prescribed time limits. The second phase is more operational, and scrutinizes tactics, combat readiness, and the like.

Such inspections also take place at the FOLs in Germany and when conducted at Bentwaters/Woodbridge, "everyone in the wing plays war."

In the late 1970s, the 81st Wing was building to full six-squadron strength. When an A-10 was scheduled for depot maintenance, it was flown across the Atlantic and CONUS to the Sacramento Air Logistics Center at McClellan AFB in California. Among other things, the ALC is the Air Force's facility for A-10 depot maintenance.

The pilot then flew commercially to Hagerstown, Md., to receive a brand-new A-10 off the Fairchild Republic production line. The aircraft was then flown across the Atlantic (with aerial refuelings) to England. This assured that all 81st Wing A-10s were of top-of-the-line quality and underscored the importance with which the close support mission is viewed. Now, with Bentwaters conversion to the newest A-10s almost complete, A-10 depot maintenance is conducted at RAF Kemble in the UK.

Hardening the FOLs

Under NATO's air base hardening program, the 81st's A-10s at the FOLs are to be housed in steel-reinforced TAB-V aircraft shelters equipped with blast doors. Hardened squadron operations buildings are also taking shape with such chemical warfare safeguards as air-filtering systems and decontamination provisions.

A major drawback confronting NATO fighter pilots: They lack the vast tactical gunnery ranges found in the US. A special problem for Warthog pilots is that their 30-mm cannon leaves a huge "footprint" of impacting rounds. In tactical firing, the A-10's Maverick missile presents a similar danger to the limited NATO ranges' peripheral civilian communities. To ease this situation, a target is now anchored off the coast of Wales at Aberporth, UK, for live-fire Maverick practice.

Live bombs can be dropped on the British Navy's Garvie Island range off the coast of Scotland. Also in use in Scotland is the ECM range at Spadeadam. Exercises and training in the UK are complicated—as they are on the Continent—by adverse weather. The North Sea coast is especially notorious for low ceilings caused by fog and haze, which hamper A-10 operations because pilots determine routes and targets visually rather than with instruments.

Despite these handicaps, most ordnance delivery training takes place in England, as does most conventional mission qualification flying. According to Captain Lewis: "It's a matter of conducting all the regulation-required training on a six-month basis. This consists of range rides for bomb and gun qualification; air-refueling practice; dissimilar air combat; basic fighter maneuvers; low-level hours; and instrument sorties—especially important because of the European weather environment. We routinely fly in weather that would cause Stateside units to stand down," added Captain Lewis.

Forward air controllers assigned to the 601st Tactical Control Wing use jeeps and armored personnel carriers to keep pace with US Army units. They use sophisticated radio equipment to coordinate air strikes with airborne FACs and A-10s on their way to their targets at treetop heights.

"Making sure these requirements are met is a function of the squadron and a challenging job for the squadron commander, who has at least one-third of his pilots away at any given time," noted Captain Lewis. It has been determined that wing pilots are TDY twenty-eight percent of the time, not counting time away for exercises, static displays, and flying demonstrations.

"This situation is further complicated in that aircraft might be broken, in routine maintenance, or otherwise not available. With the requirement to have a full complement of combat-ready aircraft in Germany, we scrimp on flying time in England. Even so, the remaining serviceable aircraft are taxed to the limit," Captain Lewis stressed.

It was pointed out that the A-10 pilot in England averages two sorties a week. His counterpart at the FOL typically averages two or three sorties a day, for a total of up to twelve a week. (To quote some interesting statistics, in FY '82, the 81st flew 53,391 hours, a record for any tactical fighter wing in peacetime. That, according to wing logisticians, was twenty-four percent of all flying hours in USAFE and more hours than the next two wings combined.)

In England, A-10s fly against F-5 Aggressors from RAF Alconbury. Other aircraft also play, such as F-15s from Camp New Amsterdam in the Netherlands, F-16s from Hahn in Germany, and any number of RAF aircraft from throughout Great Britain. Rotational SAC KC-135s out of RAF Mildenhall provide aerial refueling practice.

Flying in the compacted airspace over the UK and Europe is further complicated by "mindboggling" civil air traffic procedures. In Europe, national law places stringent restrictions on low-level flying due to the population density.

Finally, a short note on the role of A-10 CONUS units that may be required to fight in Europe.

"With the A-10's excellent ferry characteristics, active-duty, ANG, and AFRES units deploy A-10s to Europe periodically," noted Maj. Joe Williams, a veteran Warthog pilot who spent three years with the 81st Wing and who currently is assigned to the National Guard Bureau in the Pentagon. There, he's with the Current Operations Branch responsible for ANG FAC and A-10 matters.

"In wartime, the CONUS A-10s would supplement NATO aircraft in the close air support role independently of 81st Wing activities," Major Williams stressed. "As is the 81st, the CONUS units are assigned to FOLs that are kept stocked with a minimum of warfighting materials," he added.

From Major Williams's ANG perspective, "The problem is budget shortfalls that restrict Stateside A-10 deployments to Europe. This is compounded by the necessity to give CONUS pilots as much training as possible in the European environment," he added.

"To resolve the dilemma, the ANG is currently involved in a program known as 'Operation Boarswap.' The objective is a mutual exchange of pilots from the 81st and ANG units," Major Williams noted.

"The benefits are that the CONUS people get to fly 81st A-10s from Bentwaters/Woodbridge and from the FOLs in Germany—in an environment in which they'll be expected to fight," he declared. "On the other hand, the 81st pilots—flying CONUS unit A-10s—are afforded the opportunity to engage in such Stateside exercises as Red Flag, Maple Flag, etc., that are not conducted in Europe."

Major Williams pointed out that the airlift for the exchange pilots headed across the Atlantic in either direction is provided by ANG KC-135 tankers in normal rotation to the UK, thus performing an economical double duty.

Deployed A-10 pilots from the States also get a boost from 81st instructor pilots, who brief them on NATO procedures and the facts of life of flying in the European environment. ■

Sea Power and the Central Front

BY JAMES D. HESSMAN, EDITOR IN CHIEF, *SEA POWER* MAGAZINE
US Navy Photos by PH2 David B. Loveall

THE US Navy was not, in the late 1970s, ardently supportive of what came to be called "the Central Front Strategy," developed under then-Secretary of Defense Harold Brown. As the Navy saw it, this strategy would result in reduced funding for Navy and Marine Corps units around the world in order to build up and modernize US air and ground units assigned to the Central Front in Europe.

The impact on the Navy's budget, and therefore on morale, is perhaps best exemplified by one telling statistic: In the five-year shipbuilding plan forwarded by the Carter Administration with the Fiscal Year 1978 budget, the Navy was programmed to receive in FY '80 funding for thirty-eight ships. These included two *Trident* ballistic-missile submarines, twelve frigates, three *Aegis* fleet air-defense cruisers, and six mine-countermeasures ships (MCMs).

When FY '80 itself rolled around, however, the Navy's great expectations had been thoroughly soaked by a sudden downpour of reality —the Carter Administration requested funds for construction of only fifteen ships. In the end, Congress appropriated money for twelve, including one *Trident* and six frigates, but no *Aegis* cruisers or MCMs.

Making allowance for the fact that outyear projections tower majestically over such lower gradations of falsehood as insincere promises and "statistics," the plummet from thirty-eight ships to the twelve actually funded was a bitter pill to swallow. Navy partisans and their supporters in Congress fought the cutbacks vigorously, but with only partial success. The truth is that they pulled their punches to a certain extent, and for two eminently good reasons: (1) They remembered only too well that previous bouts of "interservice bickering," as it was called by the joyfully unsympathetic press, had always ended with several losers and no winners; and (2) there was no plausible way to refute the fact that US forces in Europe did indeed need augmentation and modernization.

These days, cooperation begins at the water's edge and extends both seaward and inland.

The problem was not that additional funds were being allocated to the Army and the Air Force. Indeed, those services were still receiving far less than wartime needs dictated. The hitch was that the aforementioned additional funds were being made available not through a straightforward increase in the overall defense budget but through what one angry (but prudently anonymous) Navy spokesman called "a redistribution of insufficiency."

"A Maritime Strategy"

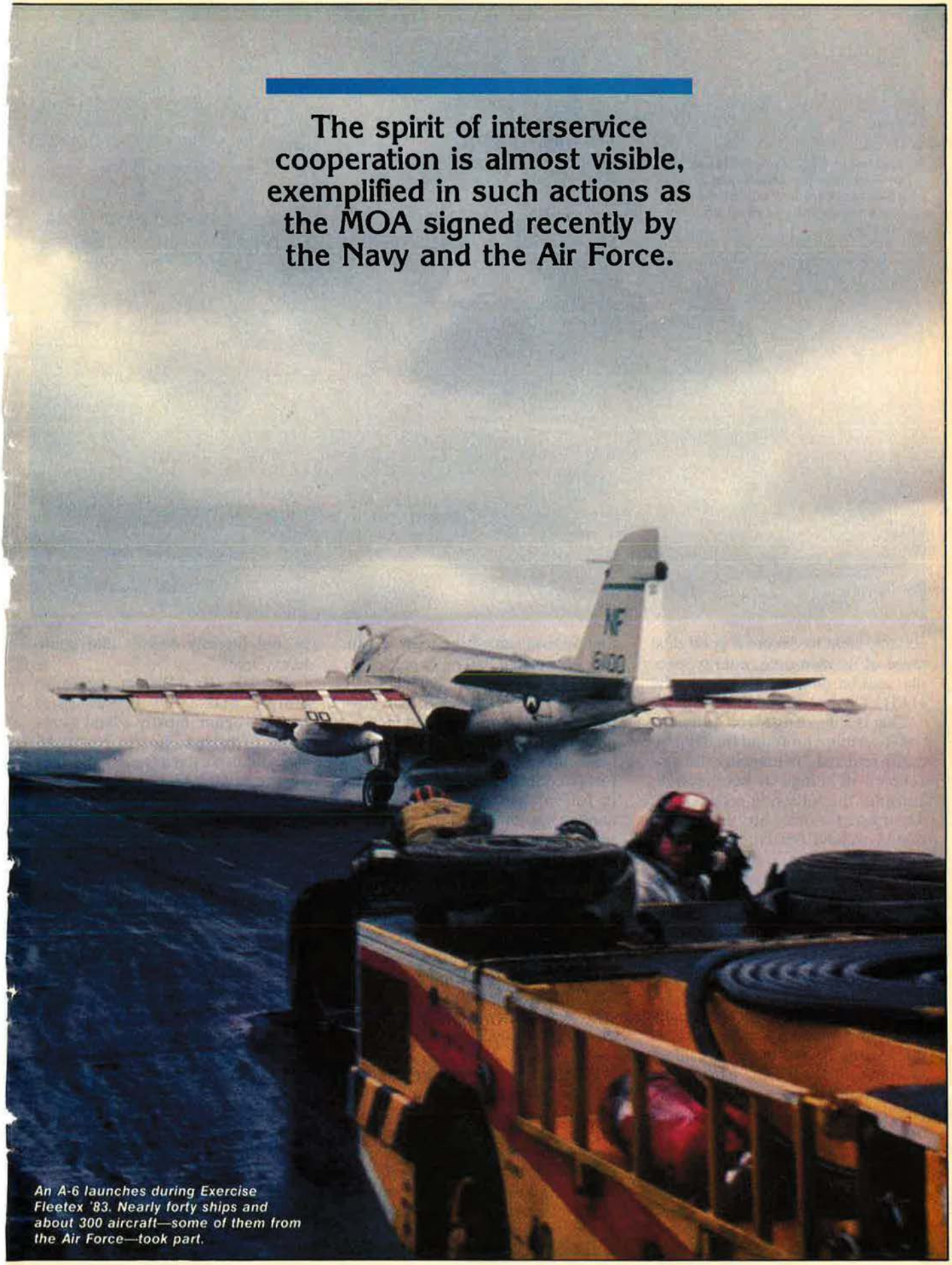
It is safe to suggest that, while remaining fervently apolitical, none of the services has been overly dismayed by the larger defense budgets being sought by President Reagan. The Navy has been particularly pleased not only by the Administration's commitment to rebuild the active fleet to a minimum of 600 ships (from the approximately 450 in the inventory at the close of the Carter Administration), but also—and perhaps more so—by its ideological embrace of what Secretary of the Navy John Lehman defends enthusiastically and articulately as "a maritime strategy." It has a nice nautical ring to it, but one with which the other services can live in reasonable comfort and sufficiency.

There is another important factor that has contributed to the Navy's "gruntlement," and that is the almost visible spirit of cooperation among the services, perhaps best exemplified by the united front on the MX and the memorandum of agreement (MOA) between Air Force Chief of Staff Gen. Charles Gabriel and Chief of Naval Operations Adm. James D. Watkins. The MOA provides for, among other things, a much greater role for the Air Force in such areas of previous Navy monopoly as maritime surveillance, reconnaissance, and antisubmarine warfare (ASW).

It used to be said—and still is, but with lessening accuracy—that politics stops at the water's edge. The same is true, but with a slight twist, of interservice cooperation in modern warfare. The twist is that, in today's conflict scenario, cooperation *starts* at the water's edge, with the Air Force lending the Navy an important hand seaward and the Navy in good position to return the favor inland.

Indeed, one of the more important joint side effects of the maritime strategy *cum* Watkins/Gabriel MOA is that the Navy is now rea-

The spirit of interservice cooperation is almost visible, exemplified in such actions as the MOA signed recently by the Navy and the Air Force.



An A-6 launches during Exercise Fleetex '83. Nearly forty ships and about 300 aircraft—some of them from the Air Force—took part.

At Oceana NAS, Virginia Beach, Va., an F-14 from the USS Nimitz is prepared for a training mission. (Photo by William A. Ford, Art Director)

sonably able to devote a good deal more of its own time, energy, people, and hardware resources to the NATO Central Front in Europe.

That is a departure from previous tradition more profound than is generally realized. To consider the new scheme of things in perspective, consider the following proposition: The history books are unanimous that there have been in this century two "world wars." But there has not been even one. There have been, rather, two intense and prolonged but mostly regional conflicts, each of which, with some slight differences, consisted of two phases: a sea phase and a land phase.

In World War I, which was mostly a land war, fought mostly in Europe, the United States under President Woodrow Wilson joined in on the Allied side only because Germany had, on February 1, 1917, resumed unrestricted submarine warfare. Two days later, the US broke off relations with Germany, but it was not until April 6, more than two weeks after German U-boats had torpedoed three American ships, that Wilson signed the joint resolution of war that had been passed by the House earlier that day (373–50), and by the Senate (83–6) two days before. The unprecedented menace posed by the German U-boats might have completely thwarted US efforts to reinforce the Western Front in Europe had it not been for the convoy system set up to protect the troop ships. That may well have been the difference.

As Paolo E. Coletta points out in *American Secretaries of the Navy* (Annapolis: Naval Institute Press, 1980), "Shipping losses to U-boats were cut from about 300,000 tons in January 1918 to 112,000 in October." More important, "not a man convoyed under American protection was lost because of enemy action."

World War II was even more intense, of longer duration, and spread over a much wider geographic, not to mention oceanographic, area of the world. But it, too, lacks credibility as a "world" war; despite the formalities of their alliance, Germany and Japan waged two separate wars—simultaneously, but literally oceans and continents apart.

The US, Great Britain, the Soviet Union, and a few lesser allies fought—again, mostly a land war—against Germany first in North Africa and in western Russia and then on the continent of Europe. They emerged victorious only after the Battle of the Atlantic (sea phase of the war in Europe against Nazi Germany) had been won.

Naval War Against Japan

At the same time, in the Pacific and on the land areas bordering that massive ocean, the US and, to a much lesser extent, Great Britain, Australia, China, several of the smaller Pacific powers, and, in the closing days of the war, the Soviet Union fought mainly a naval war against the Japanese. The outcome of the numerous land battles of the war, except those on the continent of Asia itself, was almost always the same whether in the Philippines, at Wake Island, Iwo Jima, or Tarawa: Whoever controlled the seas eventually emerged victorious on land.

Ignoring the more complex geom-

A side effect of the MOA is that the Navy can now devote more of its own time, energy, people, and hardware resources to the NATO Central Front in Europe.

etry of World War II in the Pacific, it seems well established that both wars in Europe had at least one thing in common: In neither conflict could the land-war phase have been won if the Allies had not first won the sea-war phase.

In light of that grim historical truth, the following facts are relevant to any consideration of the US Navy's role in the event of a NATO/Warsaw Pact conflict in central Europe.

- Hitler started World War II with only thirty-five operational U-boats, yet almost won the Battle of the Atlantic—and, with it, the land phase of the war in Europe. As it was, the Allies lost 20,000,000 tons of shipping. The low point for the Allied side, in fact, probably occurred in early 1943 when U-boats, then equipped with radar and traveling in squadrons or "wolf packs," sank ninety-six ships in twenty days.
- The USSR today has in its active fleet an estimated 189 nuclear attack submarines as well as 198 diesel attack submarines. The least capable of the Soviet nuclear boats is infinitely more capable, more lethal, faster, deeper-diving, and possessed of much greater range and endurance than the best of the Nazi U-boats.
- There will still be—even after all the airlift, POMCUS matériel (Prepositioned Overseas Matériel Configured in Unit Sets) in Europe, and allied assets are factored in—an urgent need for a massive US/NATO sealift immediately after (if not before) the start of conflict.

Adm. Isaac C. Kidd, USN (Ret.), former NATO Supreme Allied Commander Atlantic (SACLANT), told Congress in his farewell testimony on September 20, 1978, that an estimated 3,000 to 6,000 merchant ships would be needed for resupply and reinforcement in the early stages of fighting. Even if enough ships were available—they wouldn't be, for a variety of well-documented reasons—the losses, Admiral Kidd said, "would be staggering . . . would be horrendous."

- The US itself is seriously deficient in merchant bottoms. US-flag ships, moreover, carry less than four percent of the nation's two-way tonnage (exports and imports combined). And the trend in ship numbers has been steadily downward over the past three decades—from 1,170 merchant ships in the privately owned US-flag fleet as of December 31, 1950, to 1,008 ships ten years later. A decade after that the figure stood at 793 and is now at 569 ships listed at the beginning of this year by the Transportation Department's Maritime Administration.

The US-flag fleet has increased significantly, however, in deadweight tonnage (dwt) in recent years, building from 14,100,000 dwt at the end of 1960 to 21,300,000 as of July 1, 1981 (latest available figures). What those statistics mean in tandem is that today's US-flag merchant vessels are considerably bigger than their immediate predecessors, but that there are fewer of them. And that translates into bigger and more lucrative targets for Soviet submarines.

- Finally, the USSR's formidable submarine fleet is today augmented and supported by several fleets of Soviet surface combatants that collectively outnumber the US surface fleet by better than a four-to-one ratio. US naval combatants are generally bigger and of higher quality. Training is also better, and the US maintains its near monopoly on sea-based naval aviation.

Soviet Aircraft Carriers

The Soviet Union now has three *Kiev*-class V/STOL (vertical/short takeoff and landing) aircraft carriers operational, has launched a fourth, and is building the first of a newer, larger class of nuclear-powered carriers that will be able to launch and retrieve conventional takeoff and landing high-performance aircraft.

Add to that a formidable force of land-based aircraft, including supersonic Backfires being employed in a maritime reconnaissance/surveillance role, a huge fleet of mine warfare ships (the USSR has an astonishing 395:3 edge over the US in this important area of naval warfare), close to 300 surface combatants (cruisers, destroyers, and frigates), and more than 1,000 patrol craft, logistics ships, and auxiliaries, and it is evident that the US Navy faces a daunting challenge indeed.

And even that is not all. The USSR, which unlike the US is virtually self-sufficient in raw materials, now boasts the world's third largest merchant fleet, 2,541 ships, and uses it regularly to service and resupply the Soviet Navy all over the world. Soviet fishing vessels and oceanographic research ships also are used to develop vital intelligence for the Soviet Navy and to provide comfort and assistance in numerous other ways.

All of this does not mean the US Navy must throw in the towel. The US Navy, with its powerful CVBGs

James D. Hessman is Editor in Chief of Sea Power *Magazine, the official publication of the Navy League of the United States. A 1954 graduate of Holy Cross College, he served on active duty in the Navy for eleven years, and was at* Armed Forces Journal *for six years before moving to* Sea Power *in 1972. His by-line appeared most recently in* Air Force Magazine *in the September '81 issue with the article "Dangerous Dependence on Foreign Minerals."*

(carrier battle groups) and new SAGs (surface action groups, each headed by an *Iowa*-class battleship), is still the most powerful armada of naval power ever assembled under one flag. But it does have its work cut out for it.

Fortunately, the huge Soviet lead in numbers is in some important respects a two-edged sword. Any sudden or abnormal deployment—or withdrawal—of large numbers of Soviet Navy surface ships or even submarines would be quickly detected by US satellites, reconnaissance aircraft, and/or underwater sensor systems. The latter, incidentally, are extremely sophisticated and able not only to detect, at a considerable distance, the presence of intruders on the surface or underwater but also—thanks to the large "library" of ship signatures (screw noises and other sounds peculiar to the individual ship) already collected, analyzed, and classified—to identify them by name, rank, and serial number.

What is perhaps the US Navy's most highly classified "unsecret" today is that several arrays of the most sophisticated sensors are already in place along the so-called GIUK (Greenland-Iceland-United Kingdom) Gap in the North Atlantic. The Gap is, therefore, for Soviet submarines, also a gantlet. Cross it in time of peace: immediate detection; in time of war: detection and probable destruction. (Provided, of course, that the US is able to hold on to its seabed listening posts in Iceland—and that's another tricky part of the overall strategic equation.)

Geography is no kinder to the Soviets in other areas of the world. Ships in the Soviet Baltic Fleet can egress to the North Sea and North Atlantic only by transiting first the Kattegat between Denmark and Sweden, then the Skagerrak just north of Denmark's Jutland peninsula.

The Black Sea Fleet faces a similar obstacle course. It must pass through the long and narrow Bosporus, past Istanbul, thence through the relatively safe waters of the Sea of Marmara before plunging into the even longer (thirty-seven miles) Dardanelles Strait—the ancient Hellespont—finally to exit into the Aegean and Mediterranean.

NATO members Denmark and Turkey are, of course, in excellent position to interdict surface combatants, and it would be criminal negligence on the part of US and NATO planners if those same straits were not also well carpeted with seabed sensors.

Hobson's Choice

The Soviet Pacific Fleet, homeported in Vladivostok, faces a similar Hobson's choice—which is to say, no choice at all: a long sea-leg south through the Sea of Japan and the Korea Strait, with Korea-based US aircraft undoubtedly riding shotgun overhead, or a shorter leg north through the narrow and easily patrolled La Pérouse (or Soya) Strait between Hokkaido and Sakhalin.

So the situation is this: As in tanks, aircraft, SAM sites, and virtually all other quantifiable types of equipment, weapons, and weapons platforms, the Soviet Union has a huge numerical advantage in ships. But, unlike the other hardware items mentioned, it cannot exploit the advantage.

Deployment patterns are already well established—and known to the West. Any large outpouring of surface ships and/or submarines into the North Atlantic, Mediterranean, or Pacific would put the West on worldwide alert. Not deploying them, however, means the Baltic and Black Sea Fleets, at least, would probably be bottled up in the early days of the war and unable to exert any significant influence thereafter.

The Northern and Pacific Fleets would have somewhat greater freedom of movement, but not much. And before reaching the relatively safe waters of the open ocean, they would have to get past a surly lynch mob of SAGs, CVBGs, sensors, and land-based ASW aircraft. As well, there might be a few surprises that US newspapers and, therefore, Soviet planners haven't heard about yet.

Attrition would be considerable, obviously. But to the USSR it might be worth it if the SLOCs (sea lines of communication) between the US and Europe could be closed long enough or often enough to tilt the balance on the Central Front.

If the Soviet fleet goes to war, it may find a few surprises that US newspapers, and thus Soviet planners, haven't heard about yet.

There's another consideration the Kremlin's decision-makers have to factor into the battle equation: Soviet fishing trawlers, oceanographic research vessels, merchant ships, and even the Soviet Navy's surface combatants scattered over the seven seas would have to be written off. Many would probably seek asylum in some neutral port, of course, to sit out the war—as some German ships did in World War II.

The Soviet Navy's ships might be willing to fight it out and could probably give a good account of themselves for a while. But they're short on reload capability, limited in the number of overseas bases, and deficient in at-sea refueling and resupply capabilities.

All of the preceding is relevant to the US Navy's first and probably most important assignment in the event of a Central Front conflict: resupply and reinforcement. It would accomplish that mission in several ways: by blocking in/bottling up the several Soviet naval

The Navy has been pleased by the Administration's commitment to a maritime strategy and to a 600-ship active fleet.

fleets, insofar as possible; by interdicting those surface ships and submarines already deployed or that manage a successful exit after the commencement of hostilities; by long-distance escort of the container ships, tankers, and other merchantmen ferrying rolling stock, ammunition, POL, ordnance, and other consumables across the Atlantic to the NATO resupply ports in northern Europe; and by keeping those ports open and clear of mines.

The old convoy system that eventually turned the tide in World Wars I and II, it might be noted, is no longer feasible—bunching ships up is the best way to lose large numbers of them in a very short time. What is feasible is use of nuclear attack submarines and surface-ship ASW groups as "outriders" maintaining a mobile and forward-moving *cordon sanitaire* across the Atlantic that Soviet submarines could penetrate only at very high risk.

Major assistance also would be available through rapid deployment of one or two Marine Corps divisions, either to the Central Front or to one of the flanks. Northern Norway would be the most likely locale for a USMC deployment, but the Marines also have exercised on the Central Front itself and would provide a helpful backup capability for the US/NATO ground units already there.

More important targets for the Marines, however, might be in areas far removed from the Central Front itself—Cuba, perhaps, or Cam Ranh Bay in Vietnam, or Soviet naval repair and resupply bases almost anywhere else in the world, or perhaps even in eastern Siberia (the last-named is a most unlikely possibility, but shouldn't be completely ruled out).

Those suggestions may seem surprising, or audacious, or even outrageous, or all three, but they shouldn't. They're all part of what the Navy calls "horizontal escalation," and the Kremlin would be well advised to take that concept seriously. Horizontal escalation wouldn't really be the Navy's second mission in the event of a Central Front war; it would be more of a parallel first mission. "Horizontal escalation" has a nice academic ring to it—somewhat the way "megadeaths" does, and just about as innocuous. It's the Navy's way of saying a Central Front war would be confined to the Central Front for only about as long as it takes the Pacific Fleet to get under way.

There should be no misunderstanding of the true meaning of horizontal escalation. It means that war in Europe, whether it starts on the Central Front or on one of the flanks, escalates at the very start into a true world war. Soviet ships in the Indian Ocean would be the immediate targets of US CVBGs and submarines in that area.

Soviet bases and facilities in eastern Siberia would be subject to attack and interdiction also—and that possibility, incidentally, is what would keep Soviet air and ground units in the Far East from reinforcing the Central Front.

The So-Called China Card

The much-vaunted "China card" is a deuce and not a wild one. The men who rule in Peking may not be on speaking terms with Moscow, but they don't really like the US,

Aboard a carrier in the northern Pacific, Navy crews load aircraft with Sidewinder missiles during Fleetex '83.

A European war would stay European only about as long as it takes the Pacific Fleet to get under way.

either. China's most likely course of action during a superpower war would be inaction. Wait until it's over, then help the winner pick up the pieces. That could be Japan's policy as well. US planners should at least be alert to that possibility.

Why would Cuba and/or Cam Ranh Bay be possible targets of the horizontal escalation policy? Because both are major overseas bases for the Soviet Navy. Cam Ranh Bay, where the Soviet fleet has access to some of the finest ship repair and maintenance facilities ever paid for by US taxpayers, possibly could be ignored. But it probably would be mined, with no apologies to Hanoi.

Cuba is another matter. Much of the resupply shipping to northern Europe would necessarily have to exit Gulf ports and traverse the Caribbean before starting the Great Circle leg to Amsterdam, Antwerp, or Bremerhaven. It would be suicidal for the US to permit Soviet submarines in Caribbean waters to claim sanctuary in Cuban ports.

In addition to the missions already enumerated, the US Navy would have another key mission that in time of conflict—and depending on the timing, state of USN readiness, and other factors—might well be decisive for the West: direct combat support.

Again, however, one must consider geography. The US Sixth Fleet in the Mediterranean would undoubtedly be deployed in support of Italy, Greece, and Turkey in the event of a diversionary Soviet attack on the southern flank. Bulgaria would be within its reach, as would Yugoslavia and part of Anatolian Turkey. Both of these, in some scenarios, are possible targets for Soviet ground forces. The Alps and the distances involved would keep the Sixth Fleet from playing any direct role on the Central Front, however.

The situation is different in the North Sea, on the other side of the continent. US sea-based aircraft and cruise missile ships and submarines would have ample sea room to maneuver, yet would still be able to launch some direct strikes against Soviet/Warsaw Pact airfields, troop concentrations, tank columns, and—the most likely targets of all—command posts and communications centers.

With terrain guidance and every inch of the Central Front already in the computer, the high-speed, low-flying Tomahawk missiles would find it very hard to miss their assigned targets.

There are several large caveats, however. One is that the North Sea is within easy reach of the Backfires and other land-based Soviet naval aircraft based in the USSR itself, so US surface ships would clearly be going into Harm's Way. Another is that Tomahawks are likely to be in very short supply for at least the next several years, and even battleship magazine capacities are limited. The latter problem could be partially remedied by including in the SAG an ammunition resupply ship, itself an inviting target.

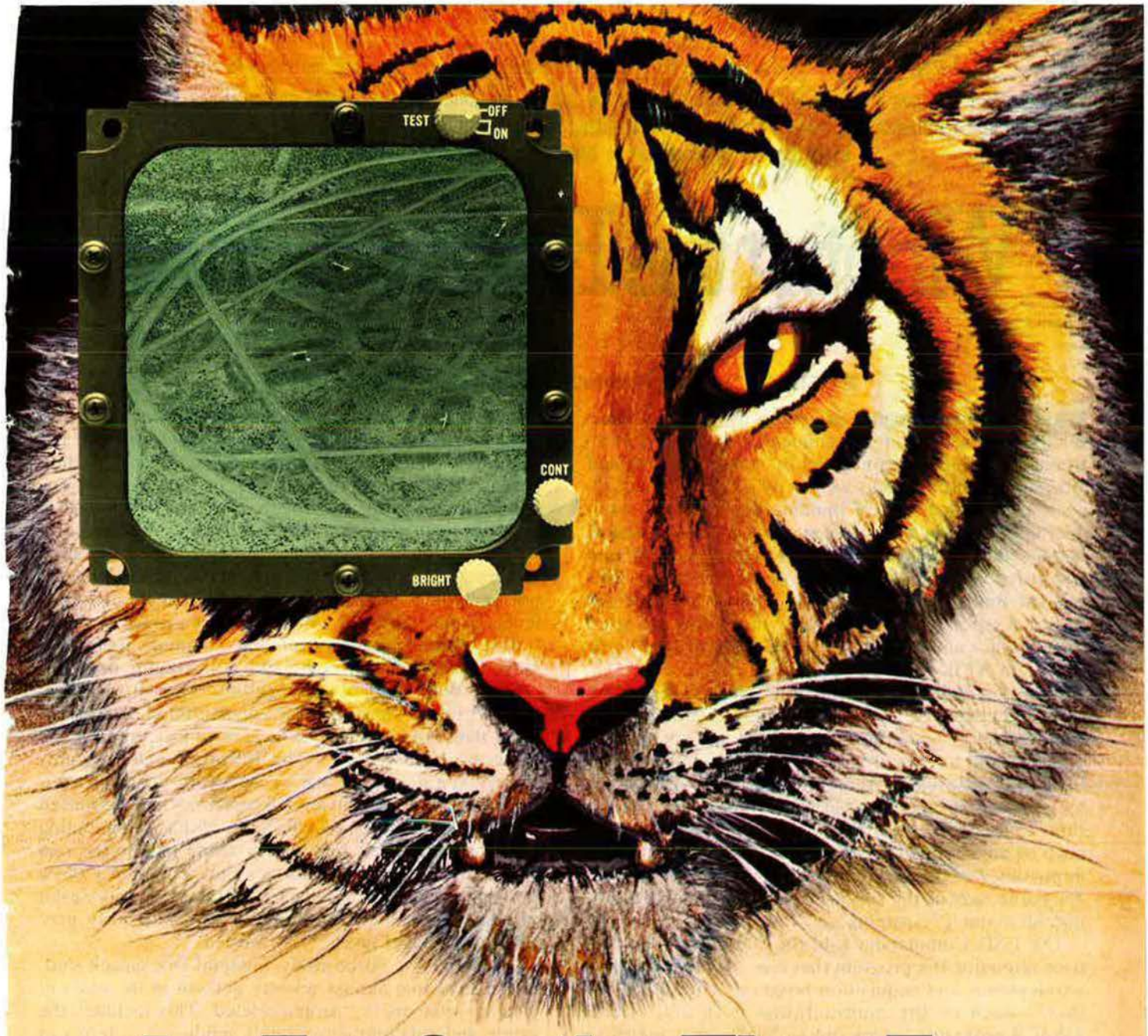
The third and most important caveat, however, goes back to the matter of numbers: The US Navy still does not have enough ships to be able, from the beginning of conflict, to carry out simultaneously all of the many important missions assigned to it. Until the numbers increase, those missions will, therefore, have to be carried out sequentially.

After all the preceding is taken into account, there is an "X" factor that also might be thrown into the equation, presented here in the form of a question: What would happen if USN aircraft or cruise missiles—or even land-based US/NATO aircraft and nonnuclear missiles—were to follow an intratheater horizontal escalation policy by, say, carrying out strikes against Soviet bases and troop facilities in Poland—while, of course, very carefully and overtly avoiding any "Polish targets" per se?

The joke in Moscow is that the Soviet Union's massive military buildup was mandatory because the USSR is "the only country in the world completely surrounded by hostile Communist states." Strikes against Soviet facilities in the less-docile satellite countries could bring home the truth of that rueful jest.

This possibility is another potential problem that should give the Kremlin pause. A multitude of such problems—and the others caused by horizontal escalation, interdiction of Soviet naval and maritime assets worldwide, and the resupply of US air and ground units on the Central Front—might even collectively be enough to enable the US Navy and its sister services to carry out the most important Central Front mission of all.

It's called deterrence. ■



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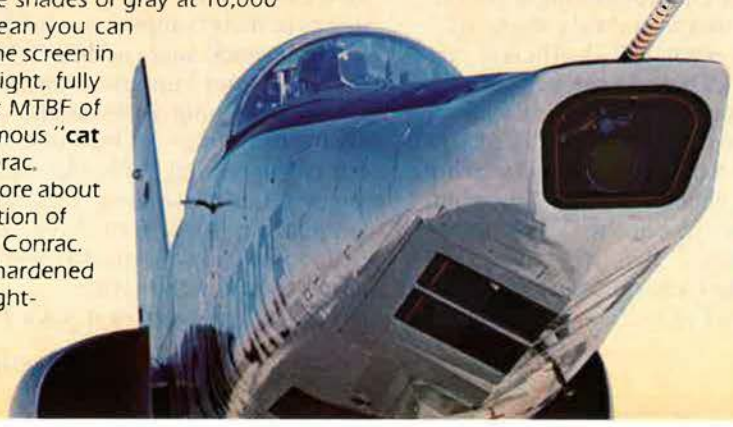

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Winning the Electronic War

BY EDGAR ULSAMER, SENIOR EDITOR (POLICY & TECHNOLOGY)

PROLIFIC technological growth in the fields of command control and communications (C^3) and electronic warfare is being negated by worsening cost and affordability problems as well as by a lack of standardization. The challenge of building flexible and "interoperable" military electronic systems within affordable bounds, therefore, has become central and decisive, and will probably remain so for the foreseeable future. This was the fundamental message to emerge from the Air Force Association's national symposium, entitled "Electronics and the Air Force," held April 28–29 near Hanscom AFB, Mass.

In his keynote address, Lt. Gen. James W. Stansberry, Commander of AFSC's Electronic Systems Division, forcefully drove home the point that "cost growth control is our top requirement." Concomitantly, the Air Force will give added weight to past cost performance by contractors competing in source selections. At the same time, he stressed that "people who fight together must be able to talk to each other" and underscored the importance of designing interoperability—within the Air Force, among the services, and with allied forces—into all major C^3 systems.

The ESD Commander told the 500 industry executives attending the program that it is "ironic" that joint development and acquisition programs with allied nations—such as the multinational F-16 and NATO AWACS programs—work out so "well yet it seems so tough to get our own act together" in the case of joint-service programs. The reason why multinational programs are usually more successful than joint efforts by the US services is that "once the allies have made a commitment [to a given program], the funding stays level on a multiyear basis." Joint US programs, General Stansberry suggested, "should come up from the services—after the services have gotten together in a coalition—rather than be [dictated] from the top." Also, they need to be based on a "front-end commitment by the services at the highest levels that everybody sticks to."

One way of getting a program going at an efficient rate and turning over hardware quickly to a user, he said with tongue in cheek, "is to make it a 'black' [classified] program" because then the developer doesn't have to contend with large numbers of committees and a string of visitors. He referred to a specific "black" program where it was possible recently to cut the development cycle from "four to two years." It is working "very well" in Europe, according to General Stansberry.

USAF's Assistant Vice Chief of Staff, Lt. Gen. Hans H. Driessnack, examined the affordability problem from a broad perspective, stressing that "we must get more defense capability for the dollars spent." Citing recent, detailed Air Force studies, he said that the principal culprit behind cost growth and schedule slippage is program instability that in turn is caused "by the compounding effects of a real growth—[resulting from] such factors as engineering changes, requirement changes, but excluding inflation—and budget reductions below levels projected at the time of program initiation."

The result is program stretchout entailing "inefficiencies, increased unit cost, and still greater program costs." With stretchouts begetting other stretchouts, the end result "has been the acquisition of less equipment than could otherwise have been procured for the same available dollars." The 109 Air Force programs undertaken since 1970 that were recently analyzed averaged about five percent annual cost growth. If permitted to continue, this trend "—because of the compounding effect over the next five years—could reduce the real buying power of our budgets by as much as twenty-three percent. That is, we could carry out only seventy-seven percent of planned acquisitions with currently programmed budget levels," he warned.

A related Air Force study, General Driessnack said, established that almost seventy percent of the costs of weapon systems is "people-related. This includes the prime and subcontractors [and] vendors," in terms of direct and indirect manpower costs as well as benefits. Direct labor costs were examined first, with a study of salaries, fringe benefits, and overhead now in progress.

The conclusions, so far, are that aerospace wages are increasing faster than those in other manufacturing and durable-goods industries; that aerospace wages are increasing faster than inflation; and that aerospace workers' wages are higher than those paid for similar services in the local area. Most other industries were making concessions either to keep their companies afloat or to increase their competitiveness in world markets, General Driessnack said, adding, "I'm here to tell you that defense is not immune to market pressures and unless we do something in this country to curtail [accelerating] cost growth, parts of this industry may find itself priced out of the market." The Air Force is concerned that "if we continue as we have, we cannot buy the systems and support currently in the Five-Year program. . . . I don't believe we can continue to raise the bridge—the time has come to lower the river."

Corrective steps by the Air Force include stabilizing

of programs in "our budgeting discipline and in our contracting," he explained. In developing the 1985–89 program objective memorandum (POM), the Air Force allocated adequate funding of individual programs in the outyears and "programmed more efficient [production] rates and stabilized those rates," even though that means canceling some programs and curtailing others. It makes no sense, he said, "to continue to do a little bit of everything—inefficiently." Calling for a "more constructive relationship between government and industry," General Driessnack said that Congress's tendency to insist on "Made in USA" labels in the defense sector has caused "us to become a little lazy and sloppy."

C³ on a Joint Basis

"We are entering a new era of cooperation among our military services in which there will be a lot of give and take on traditional roles and missions," Lt. Gen. Robert T. Herres, Director for C³ Systems, OJCS, told the AFA symposium. The US Readiness Command, for instance, was named by the Joint Chiefs of Staff recently as the manager for coordination issues that involve just tactics, techniques, and procedures in order to head off potential problems involving multiservice tactics and procedures that might "occur on the battlefield where we can least afford the time to work them out." He explained that "joint exercises, joint test and evaluation programs such as the recently established C³ Countermeasures Joint Test and Evaluation Program at Kirtland AFB, and joint training efforts such as the Joint C³ Staff and Operations Course and the Joint EW (Electronic Warfare) Staff Officers Operations Course at Norfolk are becoming increasingly important." These tests and exercises recognize that to be successful on the battlefield, "our forces must learn to fight together." Epitomizing this trend, he said, is the recent agreement between the Air Force and the Navy to undertake a series of cooperative efforts, including command and control functions associated with joint ocean-surveillance and maritime operations.

Asserting that joint and combined warfare is here to stay, General Herres said that "coalition warfare"—which has been preached within NATO circles for years—is now on the threshold of realization and is prompting the US to pursue a "strong interoperability policy." One of the payoffs of the move toward interoperability, General Herres suggested, is that the HAVE QUICK (a secure airborne voice communication system) waveform is about to become the UHF (ultrahigh frequency) Electronic Counter-Countermeasures standard in Europe.

The road toward interoperability, however, leads past snares that can "entrap the unsuspecting," he warned. For one, interoperability should not be extended to "service-unique missions" that can be met economically and efficiently with service-unique equipment. In the same vein, there are "degrees of interoperability and we seem to have forgotten this. Making sure that a system is totally interoperable is going to cost time and money and may not be necessary in the first place. Partial interoperability may cost less and still meet the operational need."

Because interoperability is expensive, its costs must be weighed in terms of operational effectiveness, a consideration that is often overlooked, he said. Also, the cost of interoperability frequently skyrockets because specific requirements tend to be added late in the development cycle with disastrous impact on the program. Interoperability costs also escalate when compatibility is forced on "noncompatible equipment," such as forcing secure communications systems to interoperate with nonsecure nets or coupling high data rate radios to low data rate systems.

Among the joint programs that cause concern at present at the Joint Chiefs of Staff level are HAVE QUICK, HAVE CLEAR (a secure voice communications system designed for future advanced jamming threats), and JTIDS, the Joint Tactical Information Distribution System, designed primarily for the transmission of data. *(See p. 43, June '83 issue. The Defense Department has subsequently decreed a compromise solution whereby an "Enhanced JTIDS" is to perform the HAVE CLEAR function.)* At the root of the difficulty, General Herres explained, are differences in requirements of the Air Force and the Navy, with the latter operating, in general, in a less dense jamming environment than the former.

Adding further uncertainty, at least from the JCS vantage point, is that it is "not quite clear when HAVE CLEAR will be needed; nobody really knows," General Herres said. He added that while there is an official DIA estimate on when the Soviet jamming threat will reach levels requiring a shift from HAVE QUICK to HAVE CLEAR, there are questions about "how good" that estimate actually is. What seems certain is that at "some time something better than HAVE QUICK will be needed [and that] the Navy has got to understand that there always will be a need for jam-resistant voice" communication capabilities, especially for air operations in Central Europe and other Air Force missions.

The Navy, on the other hand, is "not at all interested in the Air Force's approach to high AJ [antijam communication and claims that it] would cost $2 billion to modify all its aircraft. So, we will have to make some tradeoffs." The JCS position, he added, is to insist "on as much interoperability as we can sensibly afford, [but] that we shouldn't be in too much of a hurry" to make determinations concerning JTIDS before the HAVE CLEAR issue is resolved.

The Navy, he stressed, is committed to using data to control its aircraft, while the Air Force relies on voice communications. He suggested that as the Air Force becomes acclimatized to the use of data with JTIDS, its tactical forces might find out that this approach works well and might learn to "like it." The Joint Chiefs, he told the AFA meeting, are considering the creation of a joint tactical C³ agency patterned after the Defense Communications Agency.

ASD's Electronic Systems

AFSC's Aeronautical Systems Division, its Commander, Lt. Gen. Thomas H. McMullen, told the symposium, spends almost $2 billion annually on avionics, sensors, and ground-based processing and control systems, with "a total value of these programs in excess of $20 billion. These systems are aimed at significantly enhancing our capability to fight and win on the increas-

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ingly complex tactical electronic battlefield under all conditions of weather and illumination."

Obviously, a key task is to find the enemy, he said: "We have several programs under way to this end. For instance, the UPD-8 is an upgrade to the side-looking ground-surveillance radar system aboard the RF-4C aircraft. It is a low-cost, low-risk program based on hardware we developed for our allies which significantly increases the range at which we will detect hostile systems. We are also adding a data link for real-time imagery transfer. This means the battlefield commander will have a reconnaissance product ready for his use in minutes instead of hours."

USAF's newest reconnaissance aircraft, the TR-1, provides "continuously available, day and night, all-weather, standoff surveillance. We have delivered six aircraft to date, including a two-seat trainer, with deliveries extending in the late 1980s." The TR-1 can accommodate a variety of sensors in its "quick-change nose, fuselage bays, and wing pods. One of the most impressive is the advanced synthetic aperture radar system (ASARS). The avionics system architecture enables several sensors to provide real-time cues to tell the radar where to look. ASARS provides radar pictures of near-photographic quality at remarkable standoff ranges and makes available either wideband or high-resolution coverage. These modes are interchangeable instantaneously," according to the ASD Commander.

The TR-1 can provide images of areas that because of "particular boundary configurations cannot currently be mapped by radar at all. It will provide a near-real-time capability to verify and identify ground targets both near the line of battle [and] en route there. The combined increase in range, resolution, and area coverage represents a quantum jump over currently operational systems. In recent operational utility evaluations, ASARS received a rating of excellent."

Raw data from the airborne ASARS sensor will be down-linked, processed, and provided to US and allied users within minutes of initial collection. ASARS, he said, will achieve operational status within a few years. The TR-1 will also carry sensors of the precision location strike system (PLSS). In its normal operating mode, a triad of PLSS-equipped TR-1s will carry highly sensitive receivers that can detect enemy radars over a broad frequency range, pinpoint their locations, and classify them by type. It can also direct penetrating aircraft or standoff weapons to destroy them with high precision. This system, General McMullen explained, is tailored to cope with advanced emitters "in difficult-to-detect wartime operating modes in the dense electromagnetic environment we can expect." PLSS, he said, brings to the ground electronic war what AWACS brought to the air electronic war.

Allied tactical airpower confronting Warsaw Pact forces is at present limited largely to operating during daylight hours, yet "we must have the option of operating at night, under-the-weather, primarily to deny the enemy his darkness sanctuary; but we also need to negate the effectiveness of his IR [infrared] and optically augmented air defense systems, and to increase the length of our fighting day so as to get more sorties on target every day," the ASD Commander said. The current sortie rate in winter is "something less than two sorties per day per aircraft."

Opening the "night window" would boost that rate to four sorties per day, General McMullen said. The currently available Pave Tack system is dated and requires manual operation, thus limiting its use to two-seat aircraft. Hence, there is a clear-cut need for the low-altitude navigation and targeting infrared system for night, or LANTIRN, which provides a high degree of automaticity and the capability to fly at low altitude. LANTIRN's navigation pod, General McMullen said, "has a wide-angle, forward-looking infrared system which is fed to a wide-angle head-up display with a one-to-one size correspondence to the outside world. This provides a night window that enables the pilot to approach flying as if in daylight. It also has a terrain-avoidance radar that lets him fly at ground-hugging altitudes to avoid all the things that can be hurled at him."

LANTIRN's targeting pod includes a high-resolution FLIR, a laser range designator, and a missile boresight correlator. The designator, he explained, gives the pilot the capability to deliver laser-guided weapons, resulting in dead-on accuracy. The missile boresight correlator works with the high-resolution FLIR and Maverick missile sensor to lock the missile automatically on its target, thereby significantly reducing pilot work load. LANTIRN includes a future growth option—an automatic target recognizer that identifies and "prioritizes" targets for the pilot. Flight testing of the two types of LANTIRN pods is about to get under way, with production start set for August 1987.

The ASD Commander told the AFA meeting that 700 sets of pods will be purchased. The Air Force plans to use the system on the F-16, the A-10, and on the "dual role fighter—a long-range, low-altitude penetration version of either the F-15 or F-16, whose mission will be to attack key second-echelon targets."

In the crucial area of air defense suppression, ASD is upgrading the F-4G Wild Weasel—which, he said, is effective against the threats "as we knew them when it was designed more than a decade ago"—for the threats of the 1990s. This includes the addition of the high-speed antiradiation missile (HARM) and modification of the F-4G's AN/APR-38 electronic warfare receiver/processor. Structured as a two-phase program, Phase I will quadruple the processing power of the system and improve its supportability. This boost in processing capa-

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bility, General McMullen said, is required to accommodate HARM and to support the growth envisioned for Phase II. In that phase, the F-4G's frequency capabilities will be extended, along with other modifications of its electronic systems. The first upgrade phase is to begin in 1986 and the second one in 1988, he said.

In similar fashion, modernization of the EF-111 tactical jamming system is being pursued by ASD in anticipation of future threat growth. Involved here might be an upgrading of the ALQ-99 jamming system whose design was frozen in 1974. Provisions for such an upgrade are in the FY '84 Program Objective Memorandum.

In the field of aircraft self-protection, ASD, in concert with AFLC, is upgrading the ALQ-131 airborne terminal threat self-protection pod by adding power management capabilities to enhance the system's ability to function in a dense signal environment. But the Air Force's most important step in the field of self-protection of aircraft is the joint development with the US Navy of the airborne self-protection jammer (ASPJ), according to the ASD Commander: "It will provide greatly improved survivability for our F-16 fleet because of its advanced processing capability, sophisticated jamming techniques, and the fact that it doesn't require an external stores station." More than 1,600 jammer systems are to be produced, with first deliveries scheduled for 1986. In addition, the ASPJ's receiver/processor system is to be adapted for integration into the ALQ-131 pod, according to General McMullen.

Among the advanced technology electronic warfare systems of potentially revolutionary impact that ASD is working on is the integrated electronic warfare system (INEWS). INEWS is a joint Air Force/US Navy development program.

Integrated with other on-board avionics to provide aircraft self-defense, INEWS will "go beyond the capabilities of current airborne EW defensive systems to provide integrated, multispectral warning and automatic countermeasures capability for the total electromagnetic threat. Advanced technology and integration concepts will be required to yield the necessary performance in the projected environment of high signal density—on the order of millions of pulses per second—and multitudes of radars with frequency agility, pulse rate agility, spread spectrum radiations, and other features . . . to confound countermeasures. It will use a modular building-block approach to permit tailoring for specific mission requirements," according to the ASD Commander.

INEWS is to go on the next generation of combat aircraft, such as the Air Force's Advanced Tactical Fighter and the Navy's Advanced Multimission Tactical Aircraft, to ensure aircraft survival under future severe threat conditions. INEWS is to exploit a new technology called monolithic microwave integrated circuits (MMIC) that permits extremely low voltage operations. When combined with advanced array antenna technology, General McMullen said, highly effective MMIC solid-state jammer amplifiers can be designed that have an effective radiated power rating of greater than ten kilowatts and that are both small and light. They cost less and are far more reliable than currently used traveling wave tube amplifiers that require voltage levels nearly a thousand times greater.

One of the major challenges in the EW field facing the Air Force is the development of new electronic systems and techniques to meet the special requirements of air-breathing and other vehicles employing low observable, or Stealth, technologies. Vehicles of this type, he said, provide "completely new opportunities for EW concepts that are impractical for our conventional aircraft or missiles because current [radar] signatures are so high. There is a direct relationship between radar cross section (RCS) and required jamming power." Platforms with lower cross sections require less power for self-protection while standoff jammers can mask Stealth vehicles over far greater ranges than they can conventional aircraft, drones, or missiles. The synergistic effect of combining Stealth technologies with EW, General McMullen said, is revolutionizing USAF's approaches to low cross section designs, but at the same time poses new problems since external antennas and EW pods compromise low-cross-section designs: "We need to do some hard thinking in this regard."

Soviet Radioelectronic Combat Doctrine

Soviet radioelectronic combat (REC) doctrine has a clearly stated, central goal—the "systematic disruption of the opponent's C^3 by using appropriate lethal and nonlethal means as the situation warrants"—Maj. Gen. Gerald L. Prather, then USAF's Director of Command, Control and Telecommunications, told the AFA symposium. The Soviets, he explained, demonstrate their commitment to that doctrine "through the organization and equipment of their forces, as well as through extensive practice during Warsaw Pact exercises."

USAFE's Deputy Chief of Staff for Operations, Maj. Gen. William L. Kirk, added that the Soviet REC threat to NATO is "significant. The Soviets spend megabucks [on this mission, and] have whole divisions working that problem. Their doctrine is simple and clear: They say they will jam one-third of our electronic capability, they will kill another third by lethal means, and the remaining one-third will collapse. That is exactly what they will do."

The Air Force, on the other hand, has not been idle in the face of the Soviet jamming threat. The principal response is the triad of HAVE QUICK, JTIDS, and HAVE CLEAR (now known as the Enhanced JTIDS),

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according to General Prather. These systems form an "antijam architecture" and are being adopted by other NATO forces. Belgium, Norway, and the Netherlands are equipping their F-16s with the HAVE QUICK secure radio modification.

In the field of data communications, the JTIDS program is meant to grow in step with the increasing Soviet threat, including development of a follow-on system, according to General Prather. "Known as the Class II JTIDS in the Air Force, the Army, and the United Kingdom, and as the Multifunctional Information Distribution System, or MIDS, in NATO, the follow-on system will give the armed forces of all the NATO nations a means of sharing time-sensitive operational information among their command and control, sensor, and weapon elements—as well as among those of each other." MIDS, General Prather stressed, will "provide a significant increase in combat capability by distributing tactical data to many other sensors, command and control facilities, and weapon platforms, in addition to the E-3A AWACS-to-ground link." Each of the three AJ systems will "provide a needed increment to our ability to withstand the threat from Soviet radioelectronic combat."

In the strategic arena, General Prather said, preservation of the chain of command through reliable, survivable C³I capabilities for the strategic triad is "the key to our deterrent strength, [yet] years of inattention and underfunding have resulted in a gravely weakened C³ system while Soviet capabilities to attack and disrupt US strategic networks have greatly increased." The answer, in part, entails increasing "the capacity, connectivity, and survivability of our satellite communications systems. These improvements include on-board signal processing, dispersed control centers, satellite and terminal EMP hardening, and different operating frequencies, in addition to advanced antijam techniques."

Lastly, development of the multiservice MILSTAR (military strategic tactical and relay) satellite constellation and GWEN, the ground wave emergency network, will round out the current strategic C³ improvement to provide the National Command Authorities (NCA) with adequate command and control over the nation's strategic forces. General Prather said.

USAFE's Warrior Preparation Center

In recognition of the grave and growing challenge that faces NATO battle managers, United States Air Forces in Europe (USAFE) last year created an innovative facility at Ramstein AB, Germany, called the Warrior Preparation Center. As General Kirk explained, its purpose is to replicate in the NATO environment the US command and control system and the supporting intelligence element in order to introduce and try out new techniques and devices in a coalition environment. The Center, he explained, consists of two parts, a battle management training facility (BMTF) and threat training facility (TTF).

The function of the former is to create "tomorrow's battlefield" through computer simulation of all of NATO's command and control agencies, which then play "in an interactive scenario." Explaining that just as TAC's Red Flag exercises in the US are "designed to put the first ten combat missions under the aircrew's belt," he said, "the BMTF will put those first couple of days of war under the battle manager's belt. In a lot of ways it complements TAC's Blue Flag and TAC's and ESC's Senior Battle Management Course." The scenario will play present and future systems and the players "will be the real thing, not staff officers or engineers" but operational battle managers, according to General Kirk.

The Center's threat training facility lets NATO battle managers actually confront the enemy "through exposure to the man, his philosophy, and equipment." The Center, although started from scratch only last fall, is making impressive progress: "At first, the Warrior Preparation Center was, physically, two dilapidated buildings and a surplus soccer field [about five miles southeast of Ramstein]. Today it is two almost completely renovated buildings, with yet another new one to be completed this summer. The facility started with a few people working there as an additional duty, but it will have a full-time staff of forty-nine by FY '85 in order to train more than 1,000 US and NATO personnel each year," according to General Kirk.

In the area of electronic combat, USAFE is countering the growing Soviet threat with such systems as the Compass Call communications jammer and the Pave Tiger minidrone, which is about to achieve operational status in Europe. The purpose of the latter is to jam Soviet communications systems as well as to destroy critical Soviet jammers with its seeker/killer head.

C³CM Strategy

Coalition C³I, in order to be effective, must solve specific difficulties in three basic areas, according to Maj. Gen. Doyle E. Larson, Commander of Electronic Security Command: "Unified control of coalition forces, information exchange among allies, and keeping our systems from interfering with each other." The case for coalition C³I rests to a large measure on the fact that "we are building disruption assets, our own jamming capability—communications jammers, not just radars—to deny our opponents control of their forces and reduce the effectiveness of their own attack. Use of those assets has to be coordinated with care that we don't commit electronic fratricide and degrade our own and allied C³I," General Larson warned.

The need is for "dynamic, responsive C³I systems on the electronic battlefield to weld C³CM [command con-

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trol communications countermeasures] and other warfighting assets into an efficient, coordinated force, with an informed commander knowing what to jam, when to jam, what and when to deceive, what to exploit [and] when to exploit. [In short, we need] systems that can let the commander know what's going on, and provide the means to control it."

Under an ESC program called Comfy Shire, he said, USAF is building a C³CM data base in order to solve the "fratricide problem by collecting and maintaining data on both US and allied systems. With today's communications, we must know which of our frequencies must be protected, [and] which systems are vulnerable. In addition to avoiding fratricide, the data . . . help us protect our systems from hostile jamming or deception."

Augmenting Comfy Shire in electronic fratricide avoidance is another ESC program, Comfy Fred, a desk-top computer that keeps track of both friendly and potential enemy frequencies, General Larson told the AFA meeting. Performing a library search function in milliseconds, Comfy Fred reports which frequencies are on the no-jam list and which would be interfered with by US jammers. "We have used the system to good advantage at exercises in Alaska, Korea, and Europe supporting real-time jamming decisions. We are also working on desk-top computers to put the list of hostile C³I targets and their characteristics in the hands of those who operate or task jamming systems," the ESC Commander said. One of the decisions NATO battle managers might make if they find that their own frequencies are being jammed by the Soviets, he suggested, "is to use Russian frequencies."

One of the toughest problems in regard to assembling a C³ data base is the acquisition of information from allied forces, he said, since "there is no real-time system for tracking frequencies in use, reporting unit locations, and the like."

No focal point has been agreed on as yet to make C³CM decisions in Europe, he said. With various forces commingled on the battlefield, "it makes little sense to talk about avoiding fratricide just within the Air Force or within US forces only" in light of the range and power of modern jammers. Understandably, "the allies simply won't allow" the introduction of C³CM systems until the US can demonstrate that it can operate them without disrupting allied command and control, he warned.

The TAC Side of C³

Serious training deficiencies in the field of C³ and electronic combat are being corrected by two major TAC exercise programs, Red Flag and Green Flag, Maj. Gen. Thomas S. Swalm, Commander of the Tactical Air Warfare Center, told the AFA meeting. Blue Flag, he said, trains TAC's augmentation forces in theater battle management and leadership. Each theater and its associated C³I systems differs in terms of structure, philosophy, and opposing threat. "The Blue Flag mission is to conduct four exercises per year to train our people committed to these theaters in the integration of land, sea, and air forces, [and to] focus in on how airpower can best support overall theater objectives as defined in existing real-world plans and documents," according to General Swalm.

Each Blue Flag exercise, he said, "focuses on a specific theater of operations, such as NATO's 4th Allied Tactical Air Force in Europe, the Air Component Command in Korea, or the Rapid Deployment Force in Southwest Asia. Exercises are planned for a total of seven days, with the first three days devoted to academic training and exercise preparation. The next four days comprise the employment phase of the exercise. The number of participants varies in accordance with the theater structure being emulated." Among the Blue Flag participants are officers not only from various Air Force commands but also from the other services and allied forces who, in the intensive exercise environment, "control twenty-five to thirty tactical fighter squadrons, and task from 3,000 to 6,000 sorties during their training."

Green Flag, General Swalm stressed, is another key component in TAC's electronic combat training. Green Flag provides aircrews a chance to practice realistic electronic combat tactics in an environment involving composite forces and severe threats. Green Flag typically involves aircrews and aircraft from "twenty-five tactical wings and an Army HAWK battery, as well as aircraft from MAC, SAC, USAFE, and ANG and the Reserve," for a combined total of more than 1,250 aircrews and 2,000 maintenance personnel.

In the last Blue Flag exercise, "opposing Red forces and Blue forces were employed to provide a modern warfare scenario. More than 3,600 sorties were flown, with some 625 aircraft participating." Virtually every type of combat and support aircraft in the inventory of the tactical forces was represented in that exercise, including E-3A AWACS and the EC-130 Airborne Battlefield Command and Control Center (ABCCC), he said. Among the special electronic combat support aircraft involved in Green Flag are the EF-111, the F-4G Wild Weasel, and the EC-130H Compass Call communications jammers, as well as such specialized signal intelligence collectors as the RC-135 Rivet Joint and the C-130 Comfy Levi, and the RF-4C Terec (tactical electronic reconnaissance) aircraft that provides near-real-time threat information to ground units.

Arrayed against these forces is as realistic an enemy threat as can be mustered at the Nellis ranges, according to General Swalm. This includes a range of Soviet SAMs and their associated C³ networks, and various "aggressor" aircraft simulating Soviet assets, including

"Technology now provides us—if we choose to pursue it—with the means for unmanned, remotely piloted collection vehicles and the means for masking against enemy detection, thus ensuring a complementary mix of platforms and increasing the probability that valuable battlefield information will be available to joint and combined commanders."

jamming pods and an assortment of ground-based jammers.

TAC is complementing Red Flag and Green Flag with the recently implemented Senior Tactical Battle Management Course that familiarizes the senior decision-making level with the complexities of C^3I and C^3CM, according to General Swalm.

The Logistics Challenge

The Air Force Logistics Command at present supports 349 electronic systems valued at more than $15.5 billion, Maj. Gen. Dewey K. K. Lowe, Commander of the Sacramento Air Logistics Center, told the AFA meeting. This year alone, the Center is spending almost $250 million on these systems, whose mission ranges from tactical air control to navigation aids. Logistics support of electronic systems, General Lowe explained, means much more than repairing and supplying parts, since maintenance of these systems "now involves a great deal of engineering. Our job is not limited to just seeing that the system works, but that the system can do the job." This includes changing military electronic systems in line with changing deployment requirements.

Maturing technology, especially the ability to diagnose faults at the circuit-board level, is driving AFLC toward a two-level maintenance concept: "Remove and replace at the field level and repair at the depot level. At the same time, equipment reliability will drive down the requirement for highly skilled people at the field level. But highly skilled people will still be needed to calibrate the equipment . . . and to do preventive maintenance." At the same time, he warned that "we are seeing the effects of reduced field-level skills in the quantity and kinds of damage repaired at the depot. The number of components repaired by my communications-electronics division has increased from 9,000 units a quarter in 1980 to 13,000 units for the second quarter of FY '83."

Gregory S. Kolligian, Lincoln, Mass., brother of Koren Kolligian, Jr., for whom a USAF trophy is named, signs up as an AFA member as Russ Dougherty (left) helps and TAWC Commander Maj. Gen. Thomas S. Swalm looks on.

At the root of the problem are declining basic maintenance skills that lead to a "dramatic increase in damage to components and assembly."

Dr. Victor H. Reis, Assistant Director of the White House Office of Science and Technology Policy, stressed the "synergism" of advanced technologies in aeronautics applied in concert with sophisticated electronics, especially in the area of low-observable (Stealth) designs. Vehicles of that type, he suggested, "require special flight-control considerations to maintain performance." In the case of strategic bombers incorporating these technologies, he told the AFA symposium, the "primary flight control challenge is to develop flight control laws and concepts for highly unstable, low-observable configurations having little or no external control surfaces. The flight control may be integral with the wing through variable camber, or may use propulsive force" in the form of engine-bleed air to produce control forces, Dr. Reis said.

Advanced integrated flight/weapon/propulsion controls, the White House official said, can be expected to yield significant improvements in the performance and operational capabilities of future air-breathing systems, including dramatic improvements in terms of aircraft survivability.

Artificial, or machine, intelligence has potential for solving a variety of C^3I problems, Col. James R. Clapper, Jr., Hq. USAF Director of Intelligence Plans and Systems, told the AFA symposium. This technology can meet increasing demands for time-sensitive information by supplementing conventional analysis and "help us get away from three-by-five card files in shoe boxes." Turning to reconnaissance, Colonel Clapper said aircraft such as the RF-4 in the tactical arena and the SR-71 and U-2 in the strategic sector meet most current needs. Yet, there usually is a significant delay between acquisition of information in the target area and return of the aircraft to their bases where the recorded information is turned into useful intelligence.

Because of this delay and the possibility of aircraft losses, there is an opportunity for innovative solutions, mainly by means of advanced electronics, such as on-board data processing and down-linking information. There also is the option to exploit new collection capabilities, he said, adding that "technology now provides us—if we choose to pursue it—with the means for unmanned, remotely piloted collection vehicles and the means for masking against enemy detection, thus ensuring a complementary mix of platforms and increasing the probability that valuable battlefield information will be available to joint and combined commanders." ■

VIEWPOINT

Morality at Greenham Common

By Gen. T. R. Milton, USAF (Ret.)

Monsignor Kent's campaign to disarm Britain has drawn considerable support from people who are not leftist—just scared. The media event rolls on.

London in May, even as wet a May as this past one, has a certain celebratory air about it. One more dark winter has passed, and it is time for window boxes and strolling in the parks. This year there were the additional signs of a recovering economy: buildings getting a bath, new ones going up, and showrooms full of cars with astronomical price tags. Even the musty old offices in the Ministry of Defence were spruced up, as befits the only such ministry to have supervised a winning war lately.

Britain's military, like ours dependent on volunteers, has just received a ten percent pay raise, a move that keeps military service attractive from a financial standpoint, especially in a land where 3,000,000 are unemployed. The disagreeable side to British military life comes from the endless, and apparently unsolvable, situation in Northern Ireland, along with Falklands duty, where 3,000 British military shiver in those forlorn islands as security for the 1,500 natives. These things aside, however, the armed services are enjoying life under the Thatcher regime. And, as we have seen, they also know how to fight.

Elsewhere in Britain there is a movement afoot that has a decidedly different view of how to maintain Britain's security. It calls itself the Campaign for Nuclear Disarmament—CND for short—and it is campaigning strenuously against the introduction of cruise missiles and for the elimination of American bases in the UK. The leader of the CND is a Catholic priest, Monsignor Bruce Kent, an articulate and telegenic former tank officer. Since his enthusiasm is taking him perilously close to political activism, the Archbishop of London, Cardinal Hume, has issued a caution, although Monsignor Kent remains at the head of CND.

The continuing demonstration at Greenham Common, the first cruise missile base, has the wholehearted support of the CND. Aside from special events like the linking of arms around the base perimeter, for which participants were bused in from all over, the Greenham Common protest is a dreary affair. A few score women, dirty and militant, are camped in makeshift tents near the main gate. The absence of sanitary facilities together with a wet spring have not added charm to the scene. Nevertheless, this Greenham Common camp-in has provided a lot of footage for television cameras as well as money for CND's coffers. And while this British disarmament movement may depend on the militant left for the hard jobs like Greenham Common, it has considerable support from people who are by no stretch of the imagination either radical or left—just frightened. That they are also naïve is beside the point.

> A disquieting by-product of CND's noisy rhetoric is anti-Americanism, a sentiment that will doubtless increase . . .

As an additional distraction, various retired military figures are speaking out against the cruise missile deployment. There is a detectable note of wistfulness in this old soldier protest for the days when wars were fought by military men against one another and, for the most part, out of sight of civilian eyes. The Falklands, now, *that* was a proper war!

What with the hard left, well-meaning ordinary civilians, and a sprinkling of retired military types to lend the campaign a certain authenticity, the CND is a troublesome opponent to NATO's nuclear modernization scheme. A disquieting by-product of CND's noisy rhetoric is anti-Americanism, a sentiment that will doubtless increase as the cruise missile deployment date nears.

Few would deny that nuclear war is an unimaginable nightmare to most people on this planet, although there seem to be some Soviet generals who, judging from their writings, view the prospect with equanimity. The argument in the West, however, is solely about the best way to prevent such a war. The CND quite clearly believes in capitulation before the Soviet threat, a reaffirmation of the Better Red Than Dead philosophy of Bertrand Russell and the Ban the Bomb movement. Eliminating the cruise missile and American bases in the UK would presumably cause Britain to be not only helpless but innocuous in Soviet eyes.

The irony in all this is that the cruise missiles, the whole program for modernizing NATO's nuclear weapons, are in response to a European request. Quite apart from any military purpose the cruise missiles may serve—and on purely military terms their usefulness is open to question—the truly important role they play is that of tying the United States ever tighter to European defense. Soviet nuclear weapons aimed at Europe must take into account American nuclear weapons in Europe. It is a perilous game, but the score is still love-all, the longest period of peace in Europe since the days of Charlemagne.

That leaves the question of morality. The Campaign for Nuclear Disarmament leans heavily on the morality issue, one that condemns any contemplation of the use of nukes. It is an issue that makes easy an anti-American swipe. American Catholic bishops have wrestled for two years with this nuclear morality issue and have, in the third and final draft of their pastoral letter, come to terms with it in a convoluted way. Governments, they agree, have a duty to defend their people, a fundamental right of defense. And in Europe especially, for the time being, deterrence of a nuclear attack may require the possession of nuclear weapons. The pastoral letter, 155 pages replete with contradictions, will best serve if it is retired quietly to the archives, but it does represent a certain return to reality on the part of the American Catholic hierarchy. This final draft will not in any case give CND the kind of support the earlier two would have provided.

While the muddy creatures at Greenham Common continued their vigil, and Monsignor Kent raised the level of his campaign to disarm Britain, Alexander Solzhenitsyn came to London to accept an award. He took the occasion to make a speech, "Godlessness, the First Step to the Gulag." In this speech, Solzhenitsyn, like an avenging Biblical prophet, warns the West of the dangers of Godlessness, dangers that lead to a surrender to communism, in his mind the ultimate evil.

And so we have morality at the root of the argument once again. In Solzhenitsyn's view, and it is an informed one, a supine and morally depleted West will get the perdition it deserves—an end to all liberty in a Godless state.

A good theme, come to think of it, for a pastoral letter. ■

What the Computer Hath Wrought

USAF moves in new directions to meet its data management needs.

BY WALTER N. LANG

If Ed Rawlings had whistled up a Commander's Call of Air Force computer experts in the early 1950s, he probably would have presided over the whole event in a medium-size conference room.

Not so today. An equivalent number of experts could be rounded up in a minute—at just about any Air Force installation in the world. And Gen. Ed Rawlings, USAF (Ret.), would be the first to applaud that development.

Rawlings, first Comptroller of the Air Force, released funds to bring the first general-purpose computer into the service of the Air Force—a Sperry UNIVAC I. It was used for budgeting purposes.

Computer use has grown exponentially since then. Its application to Air Force mission and support roles is so pervasive that nobody bothers to ask any more if they are essential. The question is more likely to be: "Where *aren't* they being used?" A bright young officer on the Air Staff has the answer to that: "The pilot's relief tube. There's no need to computerize that function!"

New Office Created

That particular nonapplication aside, the explosive growth in information resources—largely made possible by the computer and computer technology—clearly needs to be harnessed to the needs and mission of the Air Force in an intelligent, farsighted, and cohesive way. On June 1, a new office in the Air Staff was established to handle part of "what the computer has wrought."

The Office of Assistant Chief of Staff for Information Systems (AF/SI) was formed from elements of the Directorate of Command and Control and Telecommunications, the Directorate of Computer Resources, the Office of Information Resources Management, the Directorate of Cost and Management Analysis, and other agencies.

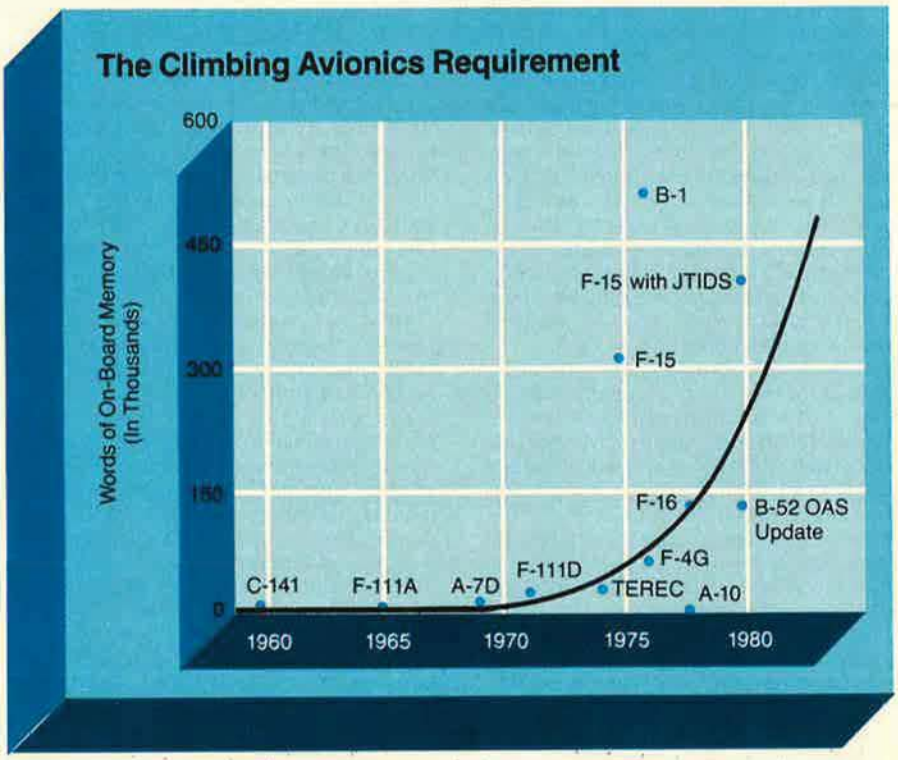
AF/SI will be headed by Maj. Gen. Gerald L. Prather, who will bring his communications and operational expertise to bear on putting together a modern information system that combines elements of command and control, telecommunications, automatic data processing, and office automation.

The restructuring—it is not a "merger of functions"—underscores a trend that has become apparent in both industry and the Air Force: a blurring of the distinctions between communications, automatic data processing, and office system technologies.

Computers are embedded parts of switching and transmission hardware; and modern automation is made possible by the ability to move data between computers. They feed upon each other to the point where the sum is more than equal to the parts ("synergism"), forming an information system in the process.

The term "embedded computer" is a useful, though by no means all-embracing, way to classify computers. In a sense, it's the other half of "what the computer hath wrought." By formal definition (DoD Directive 5000.29) embedded assets are defined as "computer resources incorporated as integral parts of, dedicated to, required for direct support of, or for the upgrading or modification of, major or less than major systems."

The first airborne digital computer to qualify as "embedded" in this



As the Air Force modernizes its tactical and strategic fleets, the requirement—as well as the capability—for avionics software climbs sharply.

sense was part of the Hughes MA-1 Mod VI fire-control system of the F-106. Eventually, 545 of these computers were purchased for the Air Force. They were heavy, slow, occupied a lot of space, and were replaced by another Hughes computer, the HCM-204, within ten years. The replacement gave reliability of ninety-nine percent plus in a 1.7-hour mission and an 821-hour mean time before failure (MTBF), which was twenty times greater than that of the earlier version.

Computer Dependence Grows

This type of performance and reliability, coupled with the rapid momentum in the state of the art, help explain USAF's increasing dependence on computers.

In addition to providing better warfighting, defensive, and support capabilities, they have an inherent flexibility to meet changing threats and requirements.

Several major actions, complementing the Air Staff reorganization, are in progress:

- In January, Sperry was selected to replace obsolete base-level computers at 118 major installations and 276 other facilities. The $476 million acquisition, known as the Phase IV Program, will keep track of such things as inventory, payroll, aircrew management, maintenance, contracting, and medical administration for the Air Force around the world. A total of 153 computers and more than 7,000 remote terminals will be installed by mid-1985; the first Phase IV system was installed last month at Langley AFB, Va.
- The tactical air forces (TAC, USAFE, PACAF, and AAC) have signed a contract with Virginia Communications Associates to buy up to 1,500 Cromemco microcomputers. They are now going to operational flying squadrons to support new work in preparing flight plans, evaluating weapons delivery options, and other operational tasks.
- An Air Force-wide request for proposals is now out, with a September 15 award date, for 10,000 small computers that will be adapted to a wide range of operational uses. Only a few years ago industry observers predicted there would be almost 30,000 computers (many of them minicomputers) in the DoD inventory by 1990. The fact that this two-year-old prediction is already proving to be an underestimate is less a tribute to the art of prognostication than to the state of the art.
- A new, 14,500-square-foot research and development computer facility opens for business in July at the Air Force Weapons Laboratory at Kirtland AFB, N. M. It will house the largest scientific computational capability in the Air Force—indeed, in DoD—and will be used to support directed energy and nuclear weapons effects research.
- The existing automated data-processing capabilities of the World-Wide Military Command and Control System (WWMCCS)—recognized as having substantial deficiencies—are being upgraded. Fiscal Year 1984 funds are targeted for the WWMCCS Information System (WIS) in six separate projects, including hardware at NORAD and

Computers and the resources to operate them consume about ten percent of the Air Force budget. The big cost is software, which eats up eighty cents of every computer dollar.

General Rawlings and USAF's First Computer

The Air Force got its first computer because of an arithmetic problem and the farsighted boldness of its first Comptroller, Lt. Gen. Edwin W. Rawlings, who had assumed that position in 1947. Rawlings's staff was struggling to interpret cuts made in the budget by Congress.

"It was a problem in arithmetic, but it took so long to do by hand that the results were generally meaningless," General Rawlings recalls. "It was clear that some kind of numbers manipulator was essential if the job was to be improved. The Bureau of Census had a somewhat similar priority. They had vast quantities of data that it was almost impossible to handle."

The Census people and the Air Force began cooperating to solve their mutual problems.

"One day my men came in and advised me that the Bureau was out of funds and that the project would halt," General Rawlings continues. "I said we must have that numbers manipulator; what can I do? It was a matter of money. I looked over our budget and found an account called 'Industrial Planning.' I rationalized that this project was industrial planning and so transferred $100,000 to the Bureau without telling anyone—not the Chief or the Secretary.

"The project was thus kept alive, and some time later the Air Force got the first computer outside the Census Bureau. In fact, the Air Force received the first computer in the Department of Defense.

"The cost of preparing the room for the computer was more than the cost of the computer. The computer had hundreds of vacuum tubes, so it generated enormous amounts of heat, which had to be dissipated if the tubes were to be kept from breaking down. The computer did what we wanted. It did the arithmetic to bring budgets and programs into balance."

The Air Force moved on from there, and so did Ed Rawlings. He headed Air Materiel Command for eight years and retired as a four-star general in 1959. He joined General Mills as financial vice president and retired as the company's Chairman of the Board in 1969. He continued to serve as a board member until 1976.

Computer pioneer Rawlings has kept his special feeling for those "numbers manipulators." The Air Force makes a computer excellence award in his name, and Hamline University in St. Paul, Minn.—actively assisted by alumnus E. W. Rawlings—has become the first college in the nation to require completion of a computer literacy course before graduation.

Ed Rawlings's interests go beyond computers, though. (He holds the Distinguished Flying Cross and once parachuted from a burning biplane at 500 feet.) He has long been a stalwart of the Air Force Association, and AFA presents the General Edwin W. Rawlings Award for Energy Conservation each year.

He also finds time for energetic participation in the activities of one of AFA's newest chapters—the E. W. Rawlings Chapter in Minneapolis, Minn. During the formation stages, General Rawlings recruited substantial numbers of members from among his many friends in business, industry, and the retired Air Force community. Working with President Paul Markgraf and other chapter officials, he is organizing a "Wing-Ding" to be held July 9 in the Twin Cities.

computer system upgrades at USAFE and US Central Command.

And so it goes across the Air Force, down to and including announcements such as that by the Air Force's San Antonio Contracting Center on April 15 that it will be using the latest in computer technology to provide automated contracting support for Brooks, Kelly, Lackland, and Randolph AFBs.

Returns on Investment

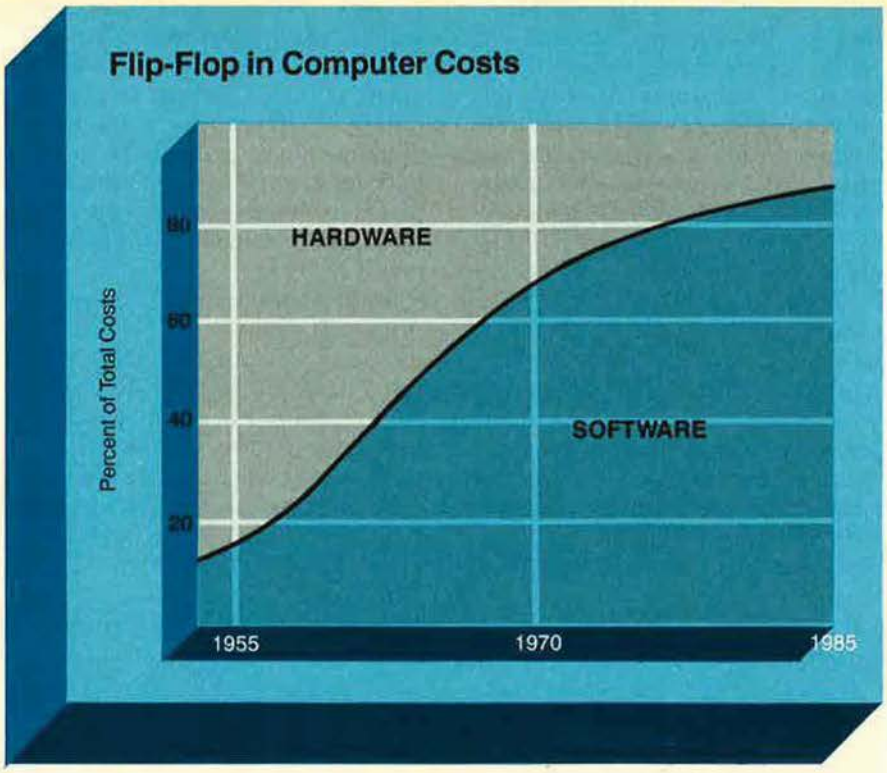
As might be expected, the price the Air Force pays to keep pace with this kind of computer activity is high. A 1980 study by the Electronics Industries Association titled "DoD Digital Data Processing Study—A Ten-Year Forecast" observed: "The total value of the computer resources within DoD is unknown." Nor is an exact value total for Air Force computers available, although officials say an annual price tag of $8 to $11 billion is not unrealistic—which comes to about ten percent of the Air Force budget.

These costs cover the computer hardware, the software, communications circuits and satellites, operating costs to run them, and the personnel to program and otherwise tend to their needs—in short, what it takes to place computer resources at the disposal of today's Air Force.

Those resources are either mission critical or business/administrative in nature—a distinction that governs the way they can be purchased. Mission critical applications are: weapon systems, intelligence systems, crypto and national security, command and control, and direct support of any of these applications. The business and administrative category generally covers all other uses, including payroll and financial management, personnel management, medical management, and office automation.

It's fair to ask what the Air Force, and the nation, get for the money spent on computer resources. Fair, maybe, but not an easy question to answer. And while the following is by no means a comprehensive list of "returns on investment," it does give an indication:

- The present radar signal processor for the F-15 weighs fifty pounds, uses 1,600 watts of power, occupies 1,915 cubic inches of space, has 100 hours MTBF, and costs $250,000. Because of a new technology—Very High Speed Integrated Circuits—the follow-on processor to be in use by 1986 is expected to weigh three pounds, use fifty watts, occupy thirty-five cubic inches of space, have 10,000 hours MTBF, and cost an estimated $50,000.
- Effective management techniques have driven down the cost of the computer for the B-1B strategic bomber from about $143,000 per copy to about $67,000—a reduction of fifty-three percent. By using a military standard instruction set architecture (ISAs are the way a computer is rigged so the programmer can communicate with the computer at the lowest level), it was possible to avoid buying the IBM 101D, with its proprietary ISA, at the higher cost. Moreover, by specifying the ISA, it was possible to compete, on the open market, for the hardware of any number of companies.
- Phase IV improvements themselves will not only contribute to more effective support for the Air Force, but will also save something in the neighborhood of $1.6 billion over the life of the system. For example, the Core Automated Maintenance System pilot program at Dover AFB, Del., has just demonstrated increased availability of aircraft for sortie requirements, more effective allocation of maintenance personnel, reduced cannibalization and more effective use of spare parts, and elimination of less effective and more cumbersome data systems.
- Many other functional area im-



In the early days of computers, most of the expense was for hardware—the computer itself—with software a comparatively minor consideration. Over time, the situation has reversed. Software development and maintenance now account for the lion's share of computer costs.

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provements are either under way or in the planning stages. Among these are eliminating dependency on punch cards, acquiring better and more effective terminals, and using available software to improve day-to-day operations. Prototype efforts can be found in personnel, finance, budget, contracting, civil engineering, and operations.

A Demanding Job

"We aren't going to wave a magic wand and get these things done overnight," says Col. Stephen M. Hunt, Chief of the Integration Division in the new Information Systems Office. "The average guy in the field won't know the difference right away." It's going to be a demanding job in the managerial and technical sense, he says, to pull these plans together, integrate them properly, and then move on out to where they will do the Air Force the most good.

"The facts of life in the computer/communication business today," says Maj. David A. Herrelko, program element monitor for standoff weapon systems, Directorate for Development and Products, DCS/Research, Development and Acquisition, "are that hardware is advancing at the speed of light, software is proceeding at the speed of sound, and systems are developing at the speed of human thought."

He adds a corollary: "Systems are agreed upon and developed at the speed of human consensus," which is certainly an influence on the cost of doing business.

But then so is the cost of software. Trend lines from the early 1950s, when software was practically nonexistent, have moved sharply upward, to the point where software consumes eighty percent of the information system dollar. Hardware, on the other hand, has experienced a thousandfold improvement per decade in capability in relation to cost and is best explained in terms of "generations."

The machine that ushered in the computer age in 1946—it was funded by the Department of Defense and used to calculate ballistic missile trajectory tables—was the Electronic Numerical Integrator and Calculator (ENIAC). In the shorthand of the industry, ENIAC was a "first-generation" computer because it used vacuum tubes. The transistor (1948) marked the "second" generation. More important, it started the miniaturization of electronic circuits.

Inch by inch, mile by mile, USAF pushes the outer boundaries of computer technology. "Brilliant" (as opposed to "smart") systems are in the offing.

Small-scale integrated circuits became the identifying characteristic of the "third generation" of computers. This development took several transistors and hooked them together on a silicon chip about a centimeter in size. Large-scale integrated circuits were the next step up—the "fourth generation." These are the current state of the art and can be found in computers being used by the Air Force for embedded applications, in Phase IV, and in other efforts described earlier.

The "fifth generation" is now approaching rapidly and is being billed as a race with Japan for a new "super computer" capable of simulating human thought. That, in the opinion of Air Force experts, is an unfortunate way of describing the objective. The idea is to field the best possible warfighting capabilities. (The lessons of a computer-guided Exocet missile being successfully fired at the *Sheffield* during the Falklands conflict—it took less than twenty seconds to reach the target from twenty miles away—are not lost on these observers.)

The fifth-generation effort incorporates three prime areas of work: materials technology, which will result in faster circuits that consume less power; more sophisticated computer architecture that will put those circuits together more efficiently; and the engineering in of "artificial intelligence" advances.

A Question of Intelligence

Artificial intelligence allows computers to go beyond the mere "numbers" stage and to make human-like inferences. A computer, for example, that could "sense" its way around stationary objects and deal with a variety of unexpected situations (the robot maid from the old "Jetsons" cartoon series, for example) would be considered a "genius" by today's computer standards.

Does this mean we're approaching the point where we can raise our wine glasses, as a zealous young officer did at a dining-in, and toast: "To the aircraft, whose only purpose is to carry the computer into battle"?

Highly unlikely. Major Herrelko, a witness to the misguided toasting, adds, "Saying a computer can outthink a man or vice versa is a little silly. It's like comparing apples and oranges. Computers are certainly gaining more and more capabilities,

A Word Winner

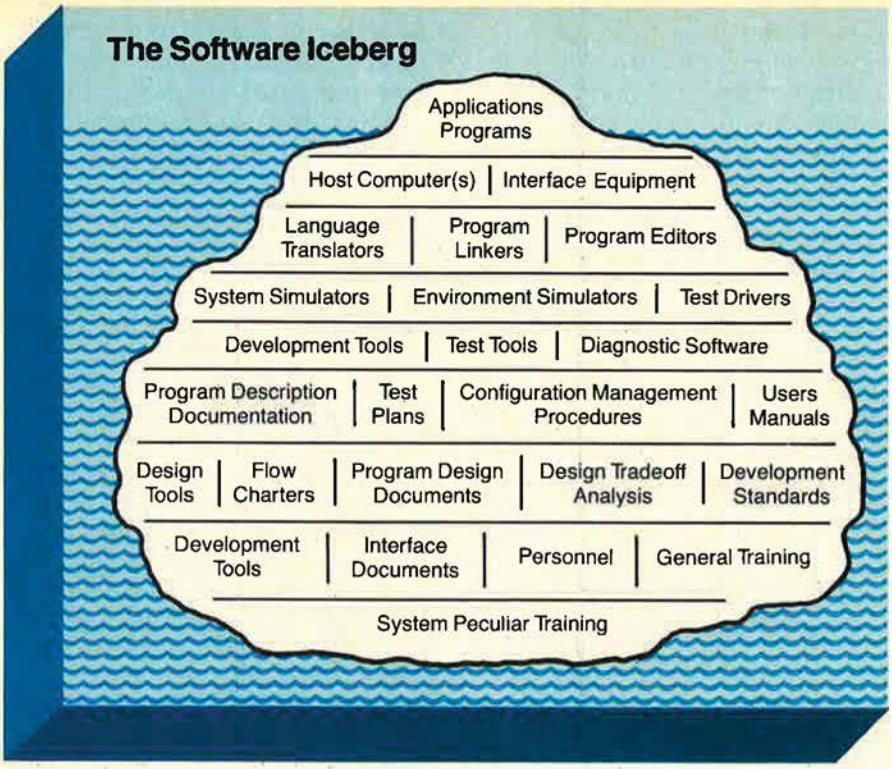
Just two years ago, the General Edwin W. Rawlings Award was officially established by the Air Force to recognize "excellence in data automation." General Rawlings, the Air Force's first Comptroller, was on hand to present this year's award to the winner, Maj. John E. Newton, at a conference at Maxwell AFB, Ala., March 10.

Newton, assigned to the Resources Management Branch at Hq. Air Force Manpower and Personnel Center, Randolph AFB, Tex., earned the honors for his work in adapting Ada programming language—designed for use in computer applications in weapon systems—to AFMPC's ATLAS information retrieval system.

Without Newton's effort, years of use of the new language in specific nonembedded applications would have been lost, with a corresponding loss in cost savings, system reliability, and programmer productivity.

The use of Ada was at the core of Newton's "software transition strategy," which is now in testing and development. In the words of the citation, that strategy will be "the single most important factor in AFMPC's ability to move operations to new computer hardware without a major, extended disruption of personnel user support across the entire Air Force."

The ATLAS information retrievel system handles more than 7,000 personnel inquiries per month from AFMPC directorates and Air Force major commands.



The unseen factors in software support help explain why software is so troublesome and expensive.

but people will always be needed to do intelligent things with those capabilities. The payoff comes in their application."

Col. Ted Ackerlund, Director of Computer Resources Acquisition and Development at Air Force Systems Command, Andrews AFB, Md., puts it this way: "If a man is in the system, the kinds of assessments he can offer are limited only by his imagination. An artificial intelligence application known as knowledge-based systems has great potential for assisting the pilot of the future.

"What this will do is put the knowledge of the guy who designed the engine right into the cockpit. It will also put the guy who designed the sensors in the same place. And you can extrapolate that for any system we develop, whether it be of the aeronautical, space, missile, electronic, or munition variety."

Since its charter is to be on the front end of research, development, test, and evaluation, it's not surprising that AFSC is also the Air Force focal point for implementing Ada, a standard language that is expected to be used in the programming of military computers of the future. Today there are literally hundreds of languages available to use with computers—including JOVIAL, which is widely used in the Air Force for embedded applications. "JOVIAL is on the way out," says Ackerlund, citing a four-phase program to bring that about. "As you would expect, we're doing some testing in our laboratories at the Rome Air Development Center and the Air Force Armament Lab. In phase two, we'll run some tests in parallel with other standard languages, such as FORTRAN."

> Hardware advances at the speed of light, software at the speed of sound, and development at the speed of human thought. Real progress, though, is at the speed of consensus, which is much slower.

Next step is to take appropriate programs where Ada can be fitted into the schedule—the long lead times in the weapon systems acquisition business dictate this—and finally, Ada can be incorporated into all systems.

Pushing the Barriers

Inch by inch, mile by mile, USAF is constantly pushing the outer boundaries of computer and communications technology. Robotics, simulation techniques, increased productivity, smarter ("brilliant" is often used) weapon systems—are all here, with more in the offing.

So are the "federated systems" of small computers that plug together through communications units, thus permitting the user to take advantage of their shared capabilities and information. "User friendly" hardware and software that require little or no expertise from the person using it (the marriage of video games to a television set is a good example) are also on the way. This should, to some extent, help overcome a projected shortage of technical experts in the Air Force. Policies and procedures for acquiring computer resources are being evaluated constantly.

New specialty codes are being developed for Air Force personnel. Major attention is being given to driving down the cost of software. Computers that "talk" to the user are not improbable. The Advanced Fighter Technology Integration program managed by the Aeronautical Systems Division at Wright-Patterson AFB, Ohio, has a talking computer with a thirty-six-word vocabulary right now. *(See "The Future Forms Up at ASD," January '83 issue, p. 40.)*

Joint operational use and collocation of base-level computer and telecommunication centers are on the way. The first testbed was at Peterson AFB, Colo. Another is at Grand Forks AFB, N. D.

"But let's not get overly carried away by tomorrow's possibilities—or even today's testbeds," cautions Colonel Hunt. "That may have rung people's chimes before, but I don't think it does any more. How you make the operational Air Force of today more effective is what we're talking about. It's not glamorous work, but implementing, developing, and operating effective systems never is." ■

The Presidential Commission looks beyond basing modes to postulate a force mix to deter a uniquely Soviet adversary.

ABIDING REALITIES AND STRATEGIC NEEDS

BY COLIN S. GRAY

In the conclusions to its recent report, the President's Commission on Strategic Forces encapsulated the major problem: "Finally, the Commission is particularly mindful of the importance of achieving a greater degree of national consensus with respect to our strategic deployments and arms control."

Although it is too early to claim definitive success, at least there is a strong probability that the Commission may have achieved what seemed almost impossible only a few months ago—the forging of a politically workable consensus that is generically supportive of the ICBM program. Without playing down the contentiousness of some details discussed below, the carefully crafted package of arguments contained in the report has effected what appears to be a sea-change in the terms of debate over ICBMs. Early in 1983, the public debate shifted rapidly from the issue of "which MX basing mode?" to the fundamental question of "why does the United States need an ICBM force at all?"

Critics of the Reagan Administration have insisted that the President take proper account of all the recommendations of his Commission—with particular reference to the arms-control arguments. In its turn, the Administration is insisting that the Congress, too, take all the recommendations into due account, with specific and immediate reference to the report's strong endorsement of MX deployment.

Prominent among the virtues of the Commission Report is its skillful interweaving of elements that are very dear to the hearts of different constituencies. However, given the heat that ICBM and arms-control controversies have generated in past years, and given the skepticism that pervades the ranks of those who debate these issues, the interwoven character of the arguments in the Report is a potential source of major weakness, as well as an element of strength.

Everyone prefers a Chinese menu, from which they can pick and choose the items they prefer. The Commission Report is a set meal with no substitutes permitted as yet. This situation will probably change, of course, as the Soviet Union responds to a new Commission-inspired START proposal, and as critically important details concerning the new, proposed small ICBM begin to emerge.

Overall, whatever one thinks of the merits of the Commission Report, it would seem to have bought time for a renewed, much more bipartisan approach to the evolution of the ICBM program and to related issues of arms control. By any standard, that is a major achievement—given the terms of the debate following congressional rejection in December 1982 of Closely Spaced Basing for the MX.

Changing the Question

The Commission decided, early on, that the question that had been central to ICBM debate for the previous four years could not be answered in a positive way with any prospect that the solution (or solutions) offered would fare any better politically than had previous, technically ingenious answers.

The problem impossible of resolution is defined as follows in the Report: "How can a force consisting of relatively large, accurate land-based ICBMs be deployed quickly and be made survivable, even when it is viewed in isolation from the rest of our strategic forces, in the face of increasingly accurate threatened attacks by large numbers of warheads—and how can this be done under arms-control agreements that limit or reduce launcher numbers?"

The Commission did not so much pass negative judgments on the array of MX basing modes that have been the focus of recent controversy; rather, it broadened the question. The question was reformulated to ask what kind of total mix of strategic forces the United States should sustain and develop to deter a uniquely Soviet adversary. The case for ICBMs in general and the MX in particular flowed naturally and very persuasively from that analysis.

Prior to its discussion of the details of the ICBM program, the Commission Report provides a compelling and relentless argument regarding deterrence. The Report broadens the sense in which strategic stability is discussed, away from examining the possible implications of theoretically vulnerable ICBMs in silos toward the strategic (and hence political) instability that would be the consequence were Soviet leaders to believe that they could coerce the West through intimidation or through military action on a limited scale.

The Report stresses again and again the need for the US to "be able to put at risk those types of Soviet targets—including hardened ones, such as military command bunkers and facilities, missile silos and other stor-

age, and the rest—which the Soviet leaders have given every indication by their actions they value most, and which constitute their tools of control and power."

The Report goes on to argue that "a one-sided strategic condition in which the Soviet Union could effectively destroy the whole range of strategic targets in the United States, but we could not effectively destroy a similar range of targets in the Soviet Union, would be extremely unstable over the long run."

Hence, for the quality of deterrence mandated by the overseas security commitments of the United States, *vis-à-vis* a Soviet state not known to be overly squeamish over prospective loss of life among its civilian population, the distinctive attributes of an ICBM force are essential.

Denying any crumb of comfort to those still attracted by counter-city, assured-destruction reasoning, the Report concludes its discussion of deterrence with the flat assertion that " . . . the deterrent effect of our strategic forces is not something separate and apart from the ability of those forces to be used against the tools by which the Soviet leaders maintain their power. Deterrence, on the contrary, requires military effectiveness."

Given what the Report has to say later on about the uncertainties of communications with submarines and about the accuracy of submarine-launched ballistic missiles, it must follow that the US has no responsible policy choice other than to modernize its ICBM force.

Basing the MX

The Commission Report was compelled to tread a narrow line between endorsing the traditional verities of crisis stability, which have as their centerpiece the axiom that forces should not be so deployed as to invite preemptive attack, and stressing the deterrent and stability merits of forces not independently survivable. In essence, the Report says that the independent survivability of ICBMs is desirable, but not truly essential (so long, that is, as the Soviet Union lacks an SLBM force sufficiently accurate as to pose a prompt threat simultaneously to missile silos and to bomber bases, and so long as there is no serious doubt concerning the invulnerability of submarines).

The Report argues that ". . . whereas it is highly desirable that a component of the strategic forces be survivable when it is viewed separately, it makes a major contribution to deterrence even if its survivability depends in substantial measure on the existence of one of the other components of the force."

Independent survivability traditionally has been an attribute of the ICBM force, and it has been the endeavor to continue this feature that has so convulsed defense politics since the late 1970s. What merit is there in the Commission's judgment that the silo housing of 100 MX missiles will be a "good enough" solution to the problem of providing the prompt hard-target counterforce capability that the United States needs for deterrence or for escalation control?

On balance, the Commission is surely correct. With reference to day-in, day-out diplomacy, and to most phases of crises, silo housing for the MX will be quite good enough. An MX-armed United States will have an appropriate competitive response to the counterforce challenge posed by Soviet fourth-generation ICBMs. A United States so armed will pose a credible prompt threat to many of the most valuable assets of the Soviet state. This will be a more dangerous United States, in Soviet eyes, which will be healthy for deterrence.

Politically, as Commission members have stressed, it would be very damaging were the United States to "fail the course" on MX deployment. Notwithstanding the excellent military and arms-control rationales for a modest MX deployment, by far the strongest argument lies in the realm of Soviet and Western-allied political perception. Four presidents have endorsed the MX missile as essential to American security.

There is no cheap and simple way to deploy and operate a force of many hundreds of small ICBMs.

Moreover, the deterrence arguments for the MX are so strong that a failure to field this system would be, and would be seen abroad to be, an unambiguous failure of the American political system to do that which it acknowledged to be strategically necessary.

Strong though the case is for MX basing in silos, it must not be forgotten that it is a politically coerced choice. There are good reasons why it is desirable, if not absolutely essential, for the ICBM force to be independently survivable. There is tension between the argument of the Commission that MX deployment is urgently needed because of the value for deterrence stability of the potency of the threat it will pose, and the counter-argument that silo-basing will be "good enough" because of the survivability inherent in the triad.

The stronger the Administration makes its argument for the deterrence value of the threat posed by MX, the stronger it has to acknowledge the Soviet incentive to neutralize that threat. Notwithstanding the large and different threats posed by the bomber and SSBN forces, it is undesirable that (for the late 1980s and 1990s) the most militarily effective American strategic weapon should not be able to ride out an attack.

The Commission has not sought to deny the validity of this concern, though it has—rightly—stressed the extreme nature of the scenario. Theoretically, vulnerable basing in silos could prove to be fatal for crisis stability only in a situation where the Soviet Union was willing to launch a massive attack against the ICBM fields, thereby giving tactical warning for US manned bombers and cruise missile carriers to take off, and assuming that a US President would not—or would not be able to—launch ICBMs on warning or under attack. Should the Soviet Union attack US bomber bases first, the Commission Report notes that launch of the MX/Minuteman force would be a case of "launch *after* attack—launch after massive nuclear detonations had already occurred on US soil."

Overall, one must grant that the case against silo

basing of the MX rests upon a long-odds scenario. In this context, the Soviet leadership might choose to escalate to central, out of a theater, war because of the quality of threat it confronted in the MX force, because, in theory, the MX force could be neutralized, and because they would reason that the US would have to employ the MX promptly for fear of losing it.

Although long-odds scenarios do turn up, the odds in this case can be lengthened still further in the US's favor. Above all else, the US can increase the technical plausibility of launch under, and after, attack for the silo-housed MX force. It may be very important that Soviet leaders not believe that their SLBMs could pin down the MX, or disrupt its command and control, pending arrival of the hard-target killing ICBM salvos. In addition, it is far from obvious that silo housing the MX is incompatible with independent survivability. The technical promise of silo superhardening (as developed in connection with the discarded Closely Spaced Basing option) is almost certainly far greater than the Commission Report suggests.

It is probably fair to say that there really is no controversy over the silo housing of the MX. Everybody would prefer an independently survivable basing mode, but those preferences are so diverse as to make it almost certainly impossible to construct a politically viable consensus. In short, silo housing is nobody's first choice, but it is the only basing scheme that is politically workable and that will enable the US to field the missile to enhance the stability of deterrence through the remainder of this century.

The Small ICBM

In endorsing survivability—in part to compensate for the silo-housing proposal for the MX—the Commission recommended development of a small, single-warhead ICBM. Commission members have had to be careful lest they paint so attractive a picture of the small missile that it be used as an excuse for the near-term abortion of the MX. Such a small missile would have many attractive features in comparison with the MX. Its small size and weight would facilitate agile deployment, and its single warhead would render the missile a relatively low-value target. According to classic criteria of stability, the proliferation of small ICBMs should be an important gain.

However, attractive though the idea of the small missile is, the Commission is understandably nervous lest the idea be overemphasized. The Commission Report is careful not to suggest that MX is an interim solution—though housing in nonsurvivable Minuteman silos may be only an interim measure—pending availability of the small missile. On the contrary, the Commission said that it "would not insist on seeking a single solution to all the problems—near-term and long-term—with which the ICBM force must cope." Plainly, the Report looks to an ICBM mix of MX and the small missile (and perhaps some residual Minuteman missiles).

The Commission, and the Administration, is right to insist upon the MX, not only because of the powerful political-perceptual reasons cited earlier, but also because the US ICBM inventory should contain a force of missiles with a throw-weight sufficiently large to permit high-yield warheads, provision of penetration aids against the far-from-trivial possibility of Soviet deployment of much more extensive active missile defense, and the delivery of space assets into orbit.

Without denying the attractiveness of the small ICBM, there is a host of reasons why its prospective development should not be permitted to have an adverse impact on MX deployment. First, the small missile, at present, is a "vu-graph system." Opinions differ as to the rapidity with which the missile can be developed. While there would seem to be no associated high technical risks, the fact remains that a strategically significant number of small ICBMs could not be deployed before the period of 1993–95 (assuming an initial operational capability in 1992).

Second, although newspaper readers may be excused the belief that the Commission, Rep. Albert Gore, Jr., and Henry Kissinger have just discovered the idea of the small ICBM, this idea has been studied off and on for nearly twenty years. Although small size and low weight would facilitate agility in deployment, just how would a smaller ICBM be deployed? And at what cost?

The kind of truck-borne mobility to which a small missile would lend itself is plainly a political impossibility because of public interface. Paradoxically, given the advantages over the MX of ease of handling, it is at least arguable that the basing problems of a small missile could prove to be no more tractable than those of the larger missile. There is no cheap and simple way to deploy and operate a force of many hundreds of small ICBMs. Suggestions that the small missile might be deployed in very heavily armored vehicles for mobility on military reservations are simply suggestions.

Yet another major debate over ICBM basing can be foreseen. A mobile small missile may be vulnerable to barrage attack, and its communication links and accuracy could be affected adversely by movement. Casual talk of "mixed basing" for the small missile, far from solving the difficulties, may serve to compound them. The point here is not that survivable basing modes cannot be found for the small missile, but that on the basis of the MX experience it is difficult to be optimistic. Any critic of the MX who claims to have found in the small missile *the* solution to crisis stability should be compelled to think through the prospective basing scheme for his preferred system.

No Less Expensive

Third, while there are no inexpensive ways in which the ICBM inventory can be modernized, it is very likely indeed that a small missile deployed in a highly survivable manner would be an extraordinarily expensive way to provide ready ICBM warheads. Housing only one

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warhead on a missile means the purchase of one launcher per warhead, one guidance system per warhead, one armored truck per warhead—and so on. It is too early to offer dollar estimates, but it seems safe to say that a small missile worth purchasing on strategic grounds—one truly mobile or heavily defended by concrete and steel—will be almost inevitably in deep trouble on budgetary grounds.

Fourth, the arms-control dimension to the new stability thesis may not be as encouraging as proponents of the small missile suggest. It is probable that the USSR will decline any invitation to effect a START-licensed restructuring of its ICBM force. The Soviet Union is not known to share American fears of crisis instability, almost certainly judges its very substantial force of heavily MIRVed SS-18s and SS-19s as a very efficient means of packaging an opening counterforce punch, and already has a mobile, small single-warhead ICBM, in the form of the SS-20 IRBM (if two warheads are offloaded) and the new PL-5.

Moreover, the verification problems associated with a small, genuinely mobile ICBM may not lend themselves to easy solution in the predictable absence of "on-site" counting procedures.

Notwithstanding the negative points registered above, it is necessary to agree with the Commission in noting the synergism between the MX and the small single-warhead ICBM. The threat posed by the MX to many Soviet ICBMs in silos may encourage Soviet interest in deploying a more survivable and less-threatening ICBM force. It is arguable, at least, that unless the USSR can be persuaded by the MX (and, eventually in the mid- to late-1990s, to a lesser degree by the Trident D-5) threat to draw down the quantity of its ICBM payload, it is virtually impossible for the US to deploy a genuinely survivable, small, single-warhead ICBM at a bearable cost.

Panaceas and Sound Programs

It is evident that the elements for a national consensus on strategic force modernization and strategic arms control have been assembled. It is no less evident that, as the Commission maintained very strongly, no single element in the package can stand on its own. Deployment of the MX ICBM must be the first priority in the ICBM/arms-control story, because it is the basis for everything else.

In the absence of a visibly healthy MX deployment program, it is inconceivable that the Soviet Union will be interested in drawing down the payload of its ICBM force, at least during the 1980s. Also, a US ICBM force comprising, eventually, several hundred small, single-warhead missiles and perhaps a very modest-size force of very old Minuteman IIIs would lack the throw-weight needed for payload flexibility in the face of what certainly would continue to be very stressful threats.

Furthermore, one cannot be certain that a small ICBM will be politically feasible, once the costs involved come to be appreciated. It follows that the US cannot prudently forgo MX deployment, for in that unhappy event there may be no modern ICBMs in the arsenal of the 1990s.

The small ICBM could be a valuable element in a timely shift toward a more stable strategic force posture. Properly, that is to say survivably, deployed, it should lend useful assistance for deterrence to an MX force housed in silos. The overall value of a counter-MX strike would be reduced to an important degree were Soviet targeteers to confront, simultaneously, the difficulty of finding, tracking, and striking a truly mobile force of small, but hard-target capable, single-warhead ICBMs.

The MX alone or the small ICBM alone are not panaceas for strategic problems. Neither are the several radical START ideas currently fashionable. Politicians and journalists are apt to forget that the basis for arms-control negotiations is the reality or perceived reality of the strategic balance.

If the US does not correct the strategic balance, it will find no solace through the design of ingenious START proposals. Indeed, heretical though it may be, the fine print of our START approach matters relatively little. What will be negotiable will depend on the strategic stability that the US builds unilaterally into its force posture and its strategic C^3I.

The idea of a strategic forces "builddown" has attracted attention, support, and even highly conditional Administration backing. The basic "builddown" scheme proposed by Sens. Sam Nunn of Georgia and William S. Cohen of Maine of retiring two old warheads for every new warhead added is a nonstarter (and non-STARTer). Elementary arithmetic demonstrates that this basic "builddown" idea would compel the US to retire the Minuteman force in exchange for deployment of 100 MX missiles—a move that would be extremely detrimental to strategic stability. In addition, little imagination is required to picture the devastation that deployment of 100 B-1Bs (with 2,000 to 3,000 new weapons on board) would have on the rest of the triad. Where would the 4,000 to 6,000 older weapons to be retired come from?

As the President wrote in a letter to the Senate authors of the basic "builddown" scheme, the idea would have to be applied "appropriately" and "flexibly." In practice this would entail variable ratios (three-for-one, two-for-one, or even one-for-one); it may not be permitted to apply at all to certain categories of weapons deemed inherently stabilizing; it might need a floor on inventory numbers in some categories; it would need to be negotiated and fully verifiable. In short, once one looks at the real implications, the idea—as a simple panacea—fades very rapidly. At the very least, it is evident that a "builddown" would be very difficult to negotiate.

The President's Commission on Strategic Forces is correct in its recommendation that the US should revise its START proposal away from a constraining limit on ballistic missile launchers. Such a limit (the US has proposed 850) encourages the packaging of maximum firepower on each missile.

Instead of raising the launcher limit, or shifting exclusively to a warhead count, the time is right for the Administration to consider very seriously employing throw-weight as the major unit of account and leaving each side at liberty to design its mix of forces according to its own strategic preferences. To repeat a familiar refrain, ingenuity in proposal design is strictly of secondary significance for the prospect for START success as compared with the primary influence of *real* weapon programs. ■

The Loneliness of Command

Experts called the mission impossible. One man, with the courage of his convictions, knew it could be done.

BY JOHN L. FRISBEE

MANY A heroic deed has been done in the heat of battle, when adrenaline flows and there is no time to count the cost. Another, seldom recognized, kind of valor lies in deliberate, measured decisions made for high stakes, without the support of superiors or subordinates, and with the cost of failure almost incalculable. Such is the loneliness of command.

Brig. Gen. (later Maj. Gen.) Haywood S. "Possum" Hansell, newly appointed commander of XXI Bomber Command and a former Eighth Air Force bombardment leader, flew the first B-29 into Isley Field, Saipan, in early October 1944. XXI Bomber Command was the major element of Twentieth Air Force, headed by Gen. H. H. Arnold and reporting directly to the Joint Chiefs of Staff. General Arnold had insisted on that arrangement to avoid having the AAF's B-29 force parceled out to theater commanders and thus diverted from the strategic campaign, as had happened in Europe.

Primary targets assigned to XXI Bomber Command were Japanese aircraft and engine factories in order to win air superiority, pave the way for destruction of the enemy's war economy, and, it was hoped by airmen, defeat Japan without a bloody invasion. Hitting those targets required precision daylight bombing conducted in large, high-altitude formations.

The operational problems confronting Possum Hansell were enormous. Only one of the two fields on Saipan was ready, and only marginally. The B-29 bases at Tinian and Guam were not yet completed. The B-29 was still having engine problems. Hansell's crews averaged fewer than 100 hours of experience in the Superfort and fewer than twelve hours of formation time. The bombers, designed for a takeoff weight of 120,000 pounds, would be lifting off, heavy with fuel, at 140,000 pounds. They would fly for the first time in large formations, which eats up fuel, and would be operating at the extreme limit of their range. Iwo Jima had not been taken, so there would be no fighter escort and no emergency landing field between Japan and Saipan.

Despite all this, General Hansell was determined to fulfill the AAF's promise to the JCS that the B-29 assault on Japan would begin in November against the top-priority targets that demanded precision daylight bombing. He was also determined to lead the first strike, SAN ANTONIO I, since many 73d Bomb Wing crews did not share his conviction—based on tests he had run while Chief of Staff of Twentieth Air Force—that B-29s in formation had enough range to do the job.

General Arnold reviewed the plan of attack and immediately ordered Hansell, who was privy to JCS strategic plans and who knew that the Japanese code had been broken, to stay on the ground. Arnold also advised Hansell that his experts in Washington said the mission couldn't be flown as planned, and that unescorted B-29s would be sitting ducks for Japanese fighters. Arnold did not cancel the mission, nor would he approve it. He left the decision to Hansell. Then, the 73d Bomb Wing commander, who subsequently led the mission, advised Hansell in writing that he shared Arnold's view. He recommended substituting night sorties against urban area targets, flown by individual planes or small formations.

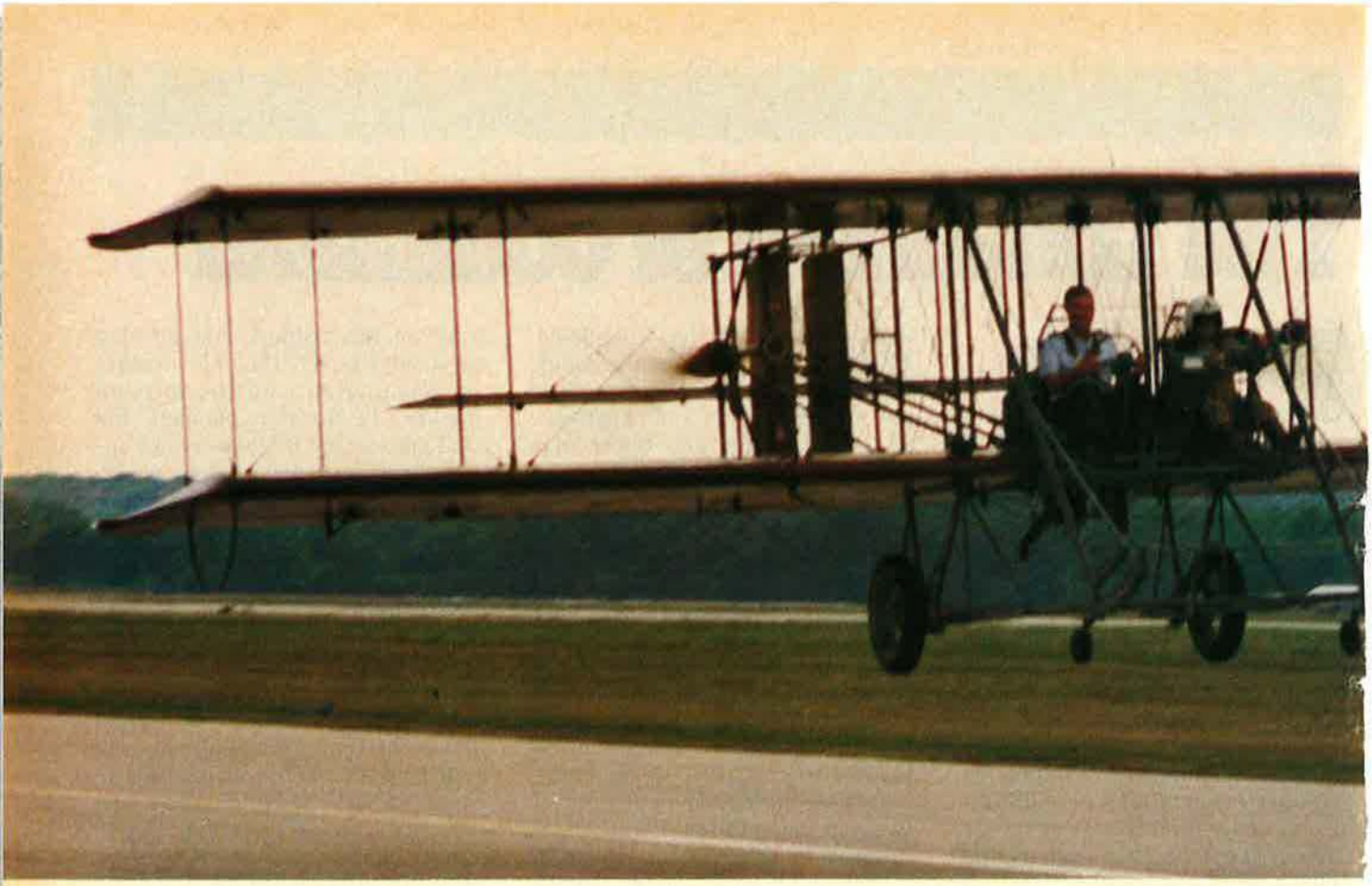
General Hansell briefs XXI Bomber Command for the first B-29 raid from Saipan.

If Hansell cleared the mission in spite of these warnings and was wrong, he would be putting at risk ninety percent of the B-29 force then in the Pacific, more than 1,000 lives, the strategic air campaign against Japan as then envisioned, and perhaps the future of the Air Force as an independent service. His own distinguished career would end in disgrace. He made the decision to go.

On November 24, 1944, 111 B-29s roared down Isley Field's one runway for a formation attack on targets in the Tokyo area. Eighty-eight hit either primary or secondary targets, twenty-three turned back safely because of fuel or mechanical problems, one B-29 was lost in combat, and one to unknown causes.

From that day on, the B-29 assault on Japan gathered momentum, leading to Japan's surrender without invasion on August 10, 1945. Before the surrender, the strategic air campaign had shifted emphasis from daylight precision attacks to night area bombing, but for reasons not associated with B-29 capabilities or the desirability of precision bombing.

Valor has many faces, among them Brig. Gen. Haywood S. Hansell's lonely, courageous decision to launch the strike that was the beginning of the end of World War II, and the final vindication of strategic air warfare. ■



Here's airmanship as basic as it gets—in a modern look-alike of the machine Orville Wright first flew in 1910.

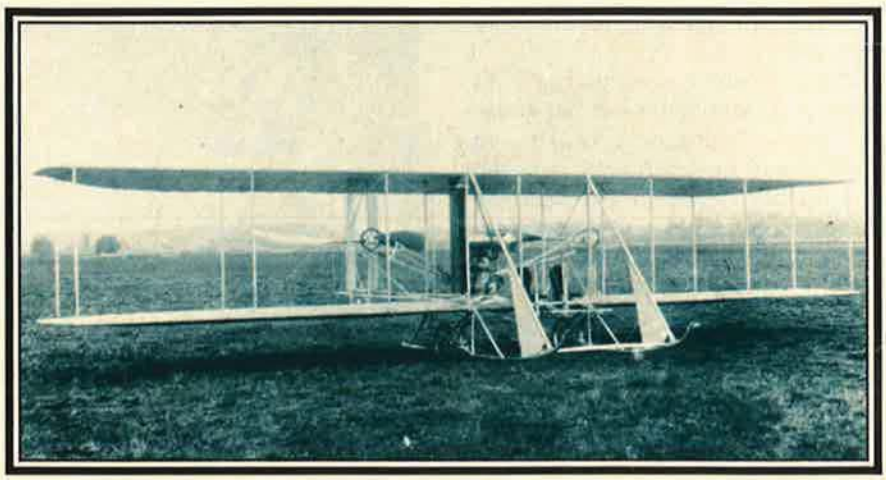
IT WAS a relief climbing into the cockpit of the Wright "B" Flyer for the first flight after seven years of begging for parts and money, as well as the many hours of coordinating the VIPs and media with the proper weather conditions required for this first flight. I was happy I could leave the administrative problems behind for a brief period.

This first flight encompassed a takeoff, one flight around the pattern, and one landing. The downwind part of the flight was to be extended to permit a pass over the site of the Wright brothers' hangar on Huffman Prairie. Although the weather conditions were marginal, I was very anxious to get this milestone behind us so we could get on with the test program leading to FAA certification.

Just before I started the engine, Ray Glaug, Vice President of the Wright "B" Flyer, informed me that Auburn was trailing Alabama in their annual gridiron battle. Since I am an Auburn alumnus, this wasn't very good news for starting anything, let alone the first flight of the Wright "B" Flyer.

After a brief review of our emergency procedures with copilot Bill Sloan, I got the engine to start on the first try. A quick check of the power section by Miles Jorgensen revealed no problems and, with everyone in place, our plane captain, Tim Warlick, gave the thumbs-up sign and we started the long taxi out to Runway 5R. On the way we passed the crash trucks and ambulance stationed alongside the takeoff runway. This procedure always gave me a strange feeling that maybe they knew something I didn't.

The airfield was closed to all other traffic and we were cleared into position. With the aircraft lined up with the centerline of the runway, Fred Simmons, who was in our chase van, locked the nose wheels



This is a Wright Type B Flyer at Simms Station, near Dayton, in 1911, similar to the Air Services Type B being flown by Lt. Benjamin Foulois at Fort Sam Houston, Tex.

PILOT REPORT

The Wright 'B' Flyer

BY JOHN H. WARLICK
CHAIRMAN OF THE BOARD, WRIGHT "B" FLYER INC.

ABOVE: With John Warlick as pilot and William A. Sloan, Jr., as copilot, the Wright "B" look-alike takes off from Huffman Prairie November 27, 1982. LEFT: Members of the Wright "B" Flyer team, from left: Jack Pettitt, Miles Jorgensen, Charles (Chuck) Dempsey, pilot John Warlick, copilot Bill Sloan, Carlton (Fred) Simmons, and Hubie Miller. (Scottiefoto)

in place. Rudder control is very marginal in the Wright "B," thus by locking the nose wheels, the adverse effect of a crosswind during the ground roll of the takeoff and landing phases is greatly reduced. The Wright brothers seldom encountered this problem because they usually operated from an open field, thus permitting them the advantage of takeoff and landing directly into the wind. Our aerodynamics indicated that we should not try operating in more than a ten-knot direct crosswind.

After a few minutes delay waiting for Fred to return to the chase van and a final wind check (twelve knots from the right side at about twenty to twenty-five degrees), we released the brakes and added power at a fairly rapid rate. The quicker we reached takeoff speed, the less effect the crosswind would have.

The aircraft picked up speed very rapidly to thirty mph at which point the drag effect started to slow the acceleration. In fact, Chuck Dempsey, President and Chief Engineer of the Wright "B" Flyer, later told me that he had trouble keeping up with us in the chase van.

At thirty mph the rudders started to become effective so I was able to keep the aircraft in a fairly straight line. At fifty mph I started back on the control column with a target of fifty-five mph for liftoff.

Airborne at Last

We were supposed to lift off in front of the media located approximately 2,000 feet down the runway. However, it became apparent we were going to lift off before reaching them, so I slowed the rotation and at sixty mph we were airborne. Everything looked perfect. We kept full power on and the airspeed at sixty mph to about 300 feet altitude. At this point I leveled out and reduced power to eighty-one percent, which produced an airspeed of sixty mph. Slight wind gusts were encountered, and it quickly became apparent that we could not relax because I had to be fast on the controls to keep going in the right direction.

The straight and level flight was shortlived because we had to make

our first turn (180 degrees) before reaching a hangar located just off the end of the runway. The turn had to be completed inside a row of aircraft and hangars located on the downwind side of our flight pattern. This meant a turn with a radius of 1,300 feet. Should it become apparent the turn could not be made, I would stop at the ninety degree point and fly straight ahead over the Miami River and a wooded area to a point outside the airfield before completing the remaining ninety degrees to the downwind leg. Even though I had a lot of confidence in the Flyer, I preferred not to venture that far from a landing spot on the first flight.

However, we made the complete turn as planned despite the fact that our airspeed did drop to fifty-five mph at the midpoint. Bill Sloan increased the power to ninety-three percent, at which time the airspeed held at sixty-five mph. Bill was monitoring the airspeed and fine-tuning the power settings, thus permitting me more time to concentrate on flying the aircraft in the preplanned pattern.

On the downwind leg, power was reduced to seventy percent, thus maintaining sixty mph airspeed. At this stage I was feeling real good because everything was proceeding as planned.

At the south end of Runway 5L, I started a forty-five-degree turn toward the site of the Wright brothers' hangar located next to the access road. It was important that we fly directly over the road to the site because deviating east of the road meant a tighter 180-degree turn back to the runway and flying west of the road placed us over a hunting area. Before taking off I could hear the hunters shooting, and I hoped they were hunting rabbits, not birds.

Historic Photograph

Tension started to build as we approached the hangar site since we had approval for only one pass to have this historical event photographed. I could see the photographer on station, and I hoped he remembered to remove the lens cover and check his film.

Directly over the hangar, I started a much tighter 180-degree turn to the left, and this time Bill added power ninety-three percent going into the turn. In addition, I dropped the nose slightly to make sure we had sufficient airspeed. Although this turn went very well, we were pretty low at about 200 feet altitude. So we kept the power on and started to climb since we were too low to make the runway in case of a power failure. At about 300 feet altitude I felt we could now make the runway so I leveled out and reduced power back to eighty-seven percent.

By the time Bill had the power set, we were in position to start a forty-five-degree right-hand turn to Runway 5L. This runway was 13,000 feet long and 300 feet wide, which gave me plenty of area to attempt our landing. At this point I wasn't much interested in the photographers—I just wanted to get down without damaging the aircraft.

Power was reduced to thirty percent. At this point it felt as if any further reduction would result in the propellers windmilling, thus driving the engine. This could cause a problem in the left propeller drive chain because it is crossed to produce counterrotating propellers. Loading the offset or return portion of the chain could cause a failure in the chain guard.

Anyway, the glide angle felt comfortable, and as we approached the runway at sixty mph, power was increased to forty-four percent as I started the flare for landing. The wind was drifting us to the left so I lowered the right wing and held fifty-five mph to touchdown. In fact, the right wheel actually touched down first. Our calculated stall speed was forty-five mph, but since I wasn't anxious to find out if that number was correct on this flight, we used fifty-five mph for touchdown. Even though this touchdown wasn't the normal type carrier landing I usually make, it was rather soft, which held the load on our bungee cords (rubber bands) supporting the landing gear to a minimum.

Easy Landing

At touchdown the power was reduced and the nose wheels quickly lowered to the runway to keep the aircraft from turning into the wind.

The flight lasted seven and one-half minutes, and after Fred Simmons unlocked the nose wheels we cleared the runway so the field could be opened again. Orville Wright first flew the "B" Flyer here at Huffman Prairie on May 21, 1910.

As we slowly taxied back to the flight line, which gave everyone time to arrive before us, Bill and I suddenly realized that we were extremely cold. With the windchill factor, we had been flying in a temperature of fifteen degrees below zero, so after a brief meeting with the media, we took off for Operations and some hot coffee.

Upon entering Operations, Lt. Col. Russ Temperley, the Operations officer who had spent many hours of his free time helping us prepare for this flight, turned the television on to that most important football game. There was the final score (Auburn 23, Alabama 22) and in the background people were tearing down the goalposts. Needless to say, it was a very exciting way for me to end seven years of effort in preparation for making this historical flight.

Our thanks go to Col. Leonard R. Peterson, Commander, Wright-Patterson AFB, Ohio, and his staff who spent months securing Air Force approval of our 1975 dream, which became a reality at 2:29 p.m., November 27, 1982. We also appreciate the gracious hospitality of Col. Ronald W. Yates, Commander, 4950th Test Wing, and his staff for making space available to us so we could assemble the Flyer. ■

Helping the Flyer Fly

Wright "B" Flyer Inc. is a nonprofit organization formed in 1975 to build and fly a full-scale replica of the 1911 Wright brothers aircraft and to reenact the historic flights of Orville and Wilbur Wright on Huffman Prairie, near Dayton, Ohio, adding a dimension to Dayton's prominence as the cradle of aviation. Support for the Wright "B" Flyer project has come from as far away as the Republic of China, Sweden, and Egypt. Since this is a nonprofit corporation dedicated to the preservation and reenactment of the historic achievements of aviation, contributions are tax-deductible. Anyone wishing to support this cause may send a contribution to:

Wright "B" Flyer Inc.
P. O. Box 308
Wright Brothers Station
Dayton, Ohio 45409

AIRMAN'S BOOKSHELF

The Father of the Air Force

Hap: The Story of the U.S. Air Force and the Man Who Built It, by Thomas M. Coffey. The Viking Press, New York, N. Y., 1982. 416 pages with photographs, notes, sources, and index. $19.95.

If there ever was a man for his time, it was Henry H. "Hap" Arnold. At West Point, Hap Arnold envisioned an Army career as a dashing cavalryman, but after graduation was channeled into the embryonic field of military aviation almost by chance. Posted as a shavetail to the Wright brothers for flying training, he earned US Army Pilot's License No. 2 in 1911.

As the subtitle indicates, this book parallels Arnold's life and the growth of US airpower. Strangely, it is the first biography of the aviation pioneer who became the architect of the modern Air Force. (Arnold's autobiography, *Global Mission,* was published in 1949.)

While other nations were quick to regard the powered aircraft as more than a novelty, the US was, so to speak, slow to get off the ground. Also a hindrance was the nation's traditional reluctance to maintain a large defense force. Thus, Army aviation was on a slender budget from the beginning.

In terms of military preparedness, it wasn't until the late 1930s that the nation's leadership awoke to the potential of the aircraft as a mass weapon of war, despite prophets like Arnold and Billy Mitchell.

When Arnold took command of the Army Air Corps in 1938, it consisted of a few hundred mostly obsolete aircraft operated by a uniformed force of 20,000. It was no match for many of the air forces of the other industrialized nations.

Following what many judged was America's unnecessary involvement in World War I, US isolationists believed they had an unimpeachable argument: The country had begun to emerge from the Depression, and tax dollars could not be spared for an unwarranted defense buildup. Hitler might pose a threat to Europe but not to the US. And the US Navy and the Pacific Ocean stood between America and the increasingly belligerent Japanese.

In certain military and political circles, the effectiveness of airpower during the Great War had been inconclusive. Discounted was the tremendous evolution of aviation in the postwar years.

Arnold and a handful of other advocates recognized in the 1920s and 1930s the potential of airpower—especially in the hands of an enemy. But he cautioned Billy Mitchell to temper his outspokenness. Along with Mitchell, though, he fell from grace—but only temporarily. It was, however, one of several instances that brought him to the brink of terminating his career.

Against the odds, Arnold and his associates eventually prevailed, especially when backed by a President alarmed by reports of the devastating power of Germany's Luftwaffe.

When war did come, the US was barely ready. But by its height in 1944, Arnold, more than any other contributor, had built the mightiest air force in the world—80,000 planes and 2,400,000 people. As its commander, Hap Arnold pinned on five stars, one of only nine men in US history to achieve such rank.

Even before the guns fell silent, Arnold—ever the visionary—was lining up the technological and theoretical talent to blueprint the modern Air Force to come.

The author presents Arnold with the bark on, including his penchant for profanity. The chapters on the earliest days of military aviation are enlightening. Inspiring is Arnold's early battle to overcome the fear of flying that grounded him, triggered by his own close call in a near crash and reinforced by all those comrades killed in the accident-prone stick-and-fabric planes.

The author served during World War II as a pilot who received his initial flying training under the civilian school system established by Arnold just prior to the war in anticipation of the need of a pool of experienced manpower. The General did this on his own initiative, characteristic of the man to climb out on a limb when the need was great enough. The school operators all over the country geared up for the war effort strictly on Arnold's word that funding would be forthcoming.

An extraordinary mark of Arnold's leadership was his ability to grasp and exercise authority to get things done. But there was one costly miscalculation: Arnold's failure—later corrected—to champion the development of long-range fighter aircraft as bomber escorts.

Mr. Coffey offers more than a presentation of Arnold's contributions to the development of US airpower. The author had the cooperation of the Arnold family as well as access to the General's private and public papers and those of many associates.

With the help of these materials, Mr. Coffey has provided broad personality sketches of those closest to Arnold, including such friends as Carl A. Spaatz, who would be instrumental in shaping the modern Air Force. Intrinsic and poignant is the story of the trials and tribulations of Arnold's family and the effects of his career on their lives.

While the highpoints of Arnold's service to his country are legendary, he suffered frequent pain from past injuries, fought a lifelong bout with stomach ulcers, and died in 1950 of a heart ailment—exacerbated by his devotion to duty—at the relatively young age of sixty-three.

He had lived long enough to witness the achievement of many of his major objectives, including the establishment of the Air Force as a separate service.

The book is a fascinating study of a rare kind of military leadership.

—Reviewed by William P. Schlitz, Senior Editor.

USAF's European Challenge

*U*S*A*F*E: A Primer of Modern Air Combat in Europe,* by

Michael Skinner, with photography by George Hall. Presidio Press, Novato, Calif., 1983. 138 pages with photographs and glossary. $9.95.

In writing this book, the author's goal was to produce a work "about the balance of power in the skies of Europe, about the changing nature of modern air combat, and most of all, about airmen and their world." He has succeeded admirably in all respects. His painstaking research and attention to detail have resulted in a highly enjoyable and very readable survey of the tactical air forces in the European theater.

The book opens with a description of the Zulu air defense alert forces, chartered with the task of policing the airspace of Germany twenty-four hours a day. A detailed examination of the air-superiority mission follows this introduction. Mr. Skinner's grasp of fighter pilot mannerisms, vocabulary, and idiosyncrasies provides an excellent insight into one of the world's unique fraternities. His discussion of the evolution of air combat tactics from Vietnam to the present, as well as his description of a typical training mission, should give the reader an appreciation of the complexities of air-to-air combat in the modern threat environment.

The author grants equal time to the surface attack forces with an excellent description of the interdiction and close air support missions and associated aircraft. His additional emphasis on electronic warfare highlights the critical contribution such forces will make in future conflicts.

The crucial importance of the defensive counterair mission is stressed as Mr. Skinner addresses Hawk missile defenses, Ground Control Intercept (GCI) capabilities, and E-3A AWACS operations in support of the defense of the Central Region. He also traces the development of air-to-air missiles and offers an incisive analysis of the problems associated with the identification of hostile aircraft in beyond-visual-range (BVR) missile employment.

No survey of USAFE would be complete without a discussion of the command structure. The author obliges with a humorous, and only slightly irreverent, observation of the trappings of power associated with USAFE Headquarters personnel. In a more serious vein, he follows with a summary of the overall USAFE force structure as well as the capabilities of corresponding NATO air forces. The allied posture provides a good departure point for an excellent chapter on the Warsaw Pact air order of battle and current trends in Soviet aviation technology.

The author deviates slightly from his central theme with a concluding chapter on expected technological developments in air warfare. Nevertheless, aviation enthusiasts should find his educated guess on Stealth design possibilities particularly instructive.

The value of this book is that it provides an informative and technically accurate assessment of the United States Air Forces in Europe. Mr. Skinner writes in a very engaging style, and the text is richly complemented by the superb photography of George Hall. *U*S*A*F*E* should prove a delight for the active and armchair aviator alike.

—Reviewed by Maj. Jack C. Overstreet, Jr., USAF, who flew F-15s with the 1st Tactical Fighter Wing at Langley AFB, Va., and with the 36th Tactical Fighter Wing in Germany before attending the Air Command and Staff College, 1982–83.

AIRMAN'S BOOKSHELF

New Books in Brief

The American Jeep in War and Peace, by Kurt Willinger and Gene Gurney. Just a few years before the outbreak of World War II, the US Army began a search for a small, general-purpose vehicle that could serve as a utility weapons and personnel carrier. The now-defunct Willys-Overland firm snared the contract with a four-wheel-drive vehicle that the Army designated "GP," for general-purpose vehicle, and the jeep was born. This well-illustrated book tells the full history of the versatile vehicle that was called the "most important contribution" to allied victory in WW II. With a foreword by Gen. William C. Westmoreland, USA (Ret.), and appendices and index. Crown Publishers Inc., New York, N. Y., 1983. 160 pages. $17.95 hardcover; $8.95 paper.

ECM and ECCM Techniques for Digital Communication Systems, by Ray H. Pettit. As more and more communications networks are modernized from analog to digital systems, the vulnerability of digital systems to jamming or interference becomes a subject of increasing concern. This book is a general survey of current ideas and concepts about digital electronic countermeasures and electronic counter-countermeasures, and an overview of techniques to protect various kinds of digital communications systems from exploitation. The author states that his book is meant as preliminary reading for the technical professional; the layman would probably find the text somewhat difficult. With index. Lifetime Learning Publications, Ten Davis Drive, Belmont, Calif. 94002, 1982. 180 pages. $30.50.

Spacelab, Space Platforms and the Future, edited by Peter M. Bainum and Dietrich E. Koelle. Volume 49 of the American Astronautical Society's Advances in the Astronautical Sciences series, this book is based on the proceedings of the joint AAS/*Deutsche Gesellschaft fur Luft- und Raumfahrt* Symposium and the 20th Goddard Memorial Symposium held in March 1982 at NASA's Goddard Space Flight Center in Maryland. The papers presented here are devoted to an interchange of views and information among the American and European government, industry, and academic/scientific communities concerning projected civil space exploration. The highlight of this volume is a comprehensive update on the Space Shuttle/Spacelab effort. With illustrations and index. Available from Univelt, Inc., P. O. Box 28130, San Diego, Calif. 92128, 1982. 489 pages. $55 hardcover; $45 softcover.

The War Magician, by David Fisher. A fascinating biography of Jasper Maskelyne, the "War Magician" of the title, this book is an account of this man's amazing feats of illusion and camouflage in the service of the British armed forces. Maskelyne was the scion of a noted family of British stage magicians; when World War II erupted, he offered his unique services to a skeptical British Army. He and a handpicked group of men known as the "Magic Gang" were soon conducting a highly successful concealment and deception campaign against Rommel in North Africa: The Gang "hid" the Suez Canal, "moved" Alexandria's harbor, and made vital contributions to Montgomery's victory at El Alamein. Author Fisher's fast-paced storytelling belies his careful research in bringing this tale to the reader. With photos. Coward-McCann, Inc., New York, N. Y., 1983. 315 pages. $16.95.

—Reviewed by Hugh Winkler, Ass't Managing Editor.

THE BULLETIN BOARD

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

GI Bill Activity Heats Up

There are currently twenty-three bills pending in Congress that in some way are related to GI Bill educational programs. The granddaddy is Rep. G. V. "Sonny" Montgomery's (D-Miss.) H.R.1400. It provides for a basic educational benefit of $300 per month for three years of service, paid for by the VA. A supplemental benefit of $300 per month, paid for by DoD, would be available after eight years of service. Critical-skills holders could, at the discretion of the Secretary of Defense, be designated to receive extra entitlements.

Representative Montgomery's bill also provides for transferability of unused educational benefits to other family members, a provision the Air Force believes is key to retention and one that AFA strongly supports. On the Senate side, Sen. Alan Cranston (D-Calif.)—who in the last Congress included transferability in his veteran's educational proposal—has dropped it from S.8, the bill he has introduced this year. He believes that the expense of the transferability provision is not outweighed by an expected "significant" retention gain.

Hearings on the subject were scheduled at press time, and it is expected that animated discussions will take place. Almost all of the bills do call for the lifting of the current 1989 deadline for use of the Vietnam-era GI Bill. This is one provision that the Department of Defense supports although it is adamantly opposed to enactment of all other new GI Bill proposals. Dr. Lawrence J. Korb, Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics, has previously told Congress, "The Department supports the use of educational benefits only as part of a whole package of recruiting and retention tools. . . . Currently, all services are enjoying success in both recruiting and retention. What we are doing now is working; it should be allowed to continue. . . . The Administration believes it wise that the enactment of new education benefits legislation should be delayed until circumstances require such changes. . . . What we might decide is too expensive at this time may be the right price at a later date."

Meanwhile, the VA has released a report showing that a little more than half of the 9,900,000 Vietnam-era veterans have used their educational benefit. Of those who used it, ninety-three percent have used the maximum entitlement, usually thirty-six months.

In a related action, VA Administrator Harry N. Walters recently praised the author of the original draft of the post-World War II GI Bill. This gentleman, virtually unsung, was Harry Colmery, a Kansas City lawyer, statesman, and American Legion member. Walters was speaking at a dedication ceremony at Legion headquarters in Indianapolis where a memorial has been erected to Colmery. In his remarks, Walters highlighted the "tremendously positive impact" that the GI Bill has made "on all of America."

There certainly can be no question of that—and this fact is sure to be emphasized as hearings on today's GI Bill move along.

New Separate Operating Agency

The Air Reserve Personnel Center (ARPC) has been designated a Separate Operating Agency, effective May 1, 1983. ARPC, at Lowry AFB, Colo., provides a variety of personnel services to unit-assigned Reservists and Air National Guard members as well as Reservists in individual programs. In addition, the Center provides personnel services to inactive Reservists and other individuals with a Reserve obligation. All in all, it serves nearly a half-million Reservists.

The status change is basically aimed at assisting in better management in spite of an increased workload. It is expected that the new designation will enhance ARPC's ability to provide Reserve personnel functions at Hq. Air Force, major command, numbered air force, and base level. It will also contribute to the successful accomplishment of its ultimate mission—mobilization of Reserve personnel during a national crisis.

Vitamin E—How Effective?

Placing itself firmly in the midst of an ongoing controversy, the VA Medical Center at Minneapolis, Minn., has published results of a study that declares, "There is little scientific proof for most of the claimed benefits of vitamin E."

It is certainly true that, every day, all over America, people swallow large doses of the vitamin in the hope that it will delay aging, increase sexual potency, and combat any one of a score of ailments. However, Dr. Gerhard J. Johnson and his Minnesota coworkers report that in one disease for which the vitamin seemed an ideal treatment (hemolytic anemia), it had no effect at all.

Further, says Dr. Johnson, "the fact that vitamin therapy had no effect has implications far beyond the patients we studied. It challenges the concept that vitamin E is an effective antioxidant in situations other than those associated with vitamin E deficiency." Noting that there is a widespread perception of vitamin E as a panacea for a variety of complaints, the doctor added, "The fact is there is little scientific evidence to support the concept that vitamin E is effective in the treatment of human disease."

Supreme Court to Review Military Justice?

The US Senate has approved legislation to make a number of changes in trial and appellate procedures in the Uniform Code of Military Justice (UCMJ).

Sen. Roger Jepsen (R-Iowa), the bill's chief sponsor, notes that the bill, for the first time in history, allows the US Supreme Court to review decisions of the military courts. Right now, neither the government nor the defendant has the authority to appeal decisions beyond the Court of Military Appeals.

"The UCMJ has been a sound framework for the administration of justice and discipline in our armed forces," Senator Jepsen said. But, he continued, "there is always, as in any system of justice, the need for review and periodic adjustment."

A spokesman for the Senator told AIR FORCE Magazine that a similar bill passed the House some years ago, but died in the Senate. With that history, he is "confident it will pass the House again, maybe even by summer."

CHAMPUS Helps to Buy Durable Medical Equipment

Contrary to common belief, military families can, under certain conditions, buy durable medical equipment, such as wheelchairs or respirators, when it's cheaper than leasing or renting, and CHAMPUS will assist.

Most military members are not aware that this is possible—it is a relatively new change—and CHAMPUS officials are anxious that the word gets out, since the procedure can save money for both the member and the government.

CHAMPUS eligibles should check with their local CHAMPUS claims processor or Health Benefits Advisor before committing to buying or renting. Some conditions must be met; for example, the equipment must be prescribed by a physician. Also, it must be medically necessary for a specific illness or injury, and it must cost more than $100. Further, CHAMPUS can't help pay for durable medical equipment if the same item is available on loan from a military hospital.

When in doubt, check it out. Dollar savings are possible.

Explorer Scout Program at Hanscom

An unusual, and perhaps unique, Explorer Scout program is sponsored by Hanscom AFB, Mass.

While Hanscom is not the only Air Force base that cooperates with Explorer Scouts, base officials believe they might be the only one that sponsors a full-fledged Law Explorer Academy. In the Academy, held in cooperation with the nearby Bedford, Mass., community, Scouts learn such basic law enforcement skills as radio use and traffic control *(see photo)*. Each Sunday, for example, the Scouts work the base gates for a few hours under the watchful guidance of Air Force security policemen.

The Hanscom Academy was begun three years ago. Participation is open to all New England youngsters age fourteen to twenty-one, including Air Force dependents. About seventy-five have graduated from the ten-week course.

THE BULLETIN BOARD

VA Employees Garner Awards

At a recent VA ceremony in Washington, D. C., a VA clinical specialist in rehabilitation nursing won the Olin E. Teague Award. Mary Ann Mikulic, R. N., of Seattle was honored for her work in the rehabilitation of war-injured veterans.

She won for the overall excellence of her work at the Medical Center in Seattle, where she has worked since 1975. During this time, her research on patient-treatment issues that impede or promote rehabilitation has been published in national professional journals. She has also taught and participated in the development of the faculty for nine VA Regional Medical Education Center programs in rehabilitation-related issues.

In other news, the VA's highest honor for medical research, the William S. Middleton Award, was presented to Abba J. Kastin, M. D., Chief of the Endocrinology Department at the New Orleans VA Medical Center.

Dr. Kastin, an endocrinologist and professor of medicine at Tulane University School of Medicine, received the award for his "pioneering contributions in bringing about a better understanding of brain chemicals and their actions."

Dr. Kastin's twenty-year study has opened doors to new lines of research that could lead to improved diagnosis and treatment of a variety of central nervous system disorders, including Parkinson's disease, depression, and mental retardation.

Veterans Reemployment Rights Strengthened

The right of a returning veteran to get his old job back—or one even better—has received affirmation recently in several cases.

In Philadelphia, a disabled veteran was awarded more than $37,000 in back pay after the city of Philadelphia failed to reinstate him in his job after he returned from duty with the Marines.

Joseph F. Ryan, Jr., had been a corrections officer for the city prior to his Marine Corps stint. He was discharged for medical reasons in 1980 and applied for reemployment. The city said no.

After the Labor Department took up his case, the city conceded he was entitled to reemployment, but that his medical condition prevented him from returning to work as a corrections officer. Subsequently, they offered him three other jobs that were not similar in pay to his old one. Labor asked the Justice Department to sue, which it did.

The city lost and had to come up with the award. The judge noted that veterans are entitled to their pre-service job or, if they are incapable of performing that job because of a service-connected disability, to a job with comparable seniority, status, and pay that they can perform.

Meanwhile, and also in Philadelphia, it was announced that nearly 500 former railroad employees or their survivors will receive some $1.2 million stemming from a World War II case. Basically, it involves a government suit against Conrail—who inherited the problem when it took over the New York Central and other companies—for failure to include World War II service in computing pension benefits.

The government's suit contended that in not giving the employees pension credit for military service, the railroad violated the veterans' reemployment rights act. As in the case

A Hanscom AFB, Mass., Explorer Scout waves a vehicle into the base, under the watchful eye of the regular USAF security policeman. Every Sunday, Scouts from the area work the gates for a few hours, as part of their introduction to law-enforcement skills, side by side with Air Force professionals. (USAF photo by SSgt. Sue Rogenski)

noted above, this entitles veterans to reinstatement with the same pay, seniority, and benefits they would have had if they hadn't been away in the service. A 1977 Supreme Court ruling affirmed that pension benefits come under this act and that military service should be credited for pension purposes.

Under the terms of the settlement, the retired railroad workers or their survivors will receive lump-sum, back-pension payments ranging from a few dollars to more than $10,000. Future monthly benefits will also be increased.

Short Bursts

California provided almost eight percent of all Air Force recruits in 1982, according to recently released figures. **New York** ran a close second, furnishing 7.5 percent of new accessions. **Wyoming and Alaska**, each with 0.1 percent, were at the bottom of the recruiting totem pole.

Last May, the **ten millionth man** registered with Selective Service. This represents ninety-eight percent of the draft-eligible population.

Hq. Air Force has reminded the field that **reenlistment ceremonies** should be held **"in a dignified manner, without special gimmicks."** AIR FORCE Magazine frequently gets photos showing troops reenlisting while parachuting or flying as a crew member, or even on the golf course. It seems like a tough trend to halt.

In 1983, the Labor Department will pump some $2 million into **job training and placement programs** for unemployed veterans. Labor wants to try even harder to zero in on the disabled and Vietnam-era vet.

Retirees making **Survivor Benefit Plan premium payments** should notice a reduction this month. Rates are being changed to reflect up-to-date mortality and interest rates and should result in reduced premiums in the "vast majority" of cases.

VA has issued a new pamphlet, **"Veterans Benefits for Older Americans,"** which is aimed at the World War II vet, a growing number of whom are reaching age sixty-five.

The **Consumer Price Index** (CPI) plays an important role in the government's economic policy, including serving as the basis for adjusting military retired pay. Retirees will be comforted to know that the GAO, based on a recent audit, found reasonable assurance that the CPI is based on "good" data.

Fifty Ronald Reagans are listed in the VA computer. Also, more than 100 Harry Walters (one of whom is the VA Administrator), not to mention more than 304,000 Smiths, 202,000 Johnsons, 149,000 Williamses, and 144,000 Joneses. Moral of this tale—**always use your military serial number, Social Security number, or VA claim number** when writing to the VA.

Air Force members have been cautioned to get **passport and visa applications in within fifteen days** after they know where they're going. There is currently a sixty- to seventy-five-day backlog. Failure to apply for dependents' credentials in time could result in having to leave them behind even if concurrent travel was authorized.

In support of a presidential program, **ten Air Force sites have been made available to shelter homeless people.** Facilities offered are at Lackland AFB, Tex.; Duluth IAP, Minn.; Malmstrom AFB, Mont.; McConnell AFB, Kan.; Sheppard AFB, Tex.; Hill AFB, Utah; Elmendorf AFB, Alaska; Peterson AFB, Colo.; McClellan AFB, Calif.; and Chanute AFB, Ill. A small charge will be made since DoD is forbidden by law to spend money for nondefense purposes.

Senior Staff Changes

PROMOTIONS: To be **Lieutenant General:** Herman O. **Thomson.**

RETIREMENTS: B/G James T. **Boddie**, Jr.; L/G Arnold W. **Braswell.**

CHANGES: M/G Fred A. Haeffner, from Cmdr., 314th AD, PACAF, & Cmdr., Korean Air Defense Section, Osan AB, Korea, to Vice CINC, Hq. PACAF, Hickam AFB, Hawaii, replacing M/G (L/G selectee) Herman O. Thomson . . . **Col. (B/G selectee) Charles D. Metcalf**, from Dep. Dir. of Budget (Operations), Comptroller of the Air Force, Hq. USAF, Washington, D. C., to DCS/Comptroller, Hq. AFLC, Wright-Patterson AFB, Ohio, replacing retired B/G David M. Hall . . . **B/G (M/G selectee) Craven C. Rogers, Jr.**, from Mil. Ass't to Secretary of the Air Force, OSAF, Washington, D. C., to Cmdr., 314th AD, PACAF, & Cmdr., Korean Air Defense Section, Osan AB, Korea, replacing M/G Fred A. Haeffner.

L/G Robert D. Russ, from Vice Cmdr., Hq. TAC, Langley AFB, Va., to Spec. Ass't to Vice C/S, Hq. USAF, Washington, D. C. . . . **M/G (L/G selectee) Herman O. Thomson**, from Vice CINC, Hq. PACAF, Hickam AFB, Hawaii, to Dir., J-5, OJCS, Washington, D. C. . . . **B/G (M/G selectee) Russell L. Violett,** from Spec. Ass't to Dep. Cmdr. for Air Defense, Hq. TAC, Langley AFB, Va., to Dep. Cmdr. for Air Defense, Hq. TAC, Langley AFB, Va., replacing M/G (L/G selectee) John L. Pickitt. ■

Cost-effective

T-45 Hawk VTXTS, selected by the US Navy. The VTX training system has been developed by the US/UK team of McDonnell Douglas, Sperry Systems, British Aerospace and Rolls-Royce. The T-45 is the navalised version of the world's most professional advanced flying and weapons trainer. Hawk was designed for low cost of ownership and high operational productivity in its prime RAF training role. It has been further developed to meet worldwide advanced training and offensive support requirements and is in service in Scandinavia, Africa, Asia and the Middle East. In the Roya Force, in addition to its training task, Hawk is being modi to carry air-to-air missiles to enable it to undertake airf defence duties. Hawk is a deceptively simple aircraft.

Its versatility and effectiveness at low cost derive from ap cation of studied expertise in the latest technologies, toge with the unequalled experience gained by British Aerosp in meeting the needs of air arms at home and abroad si the dawn of military aviation.

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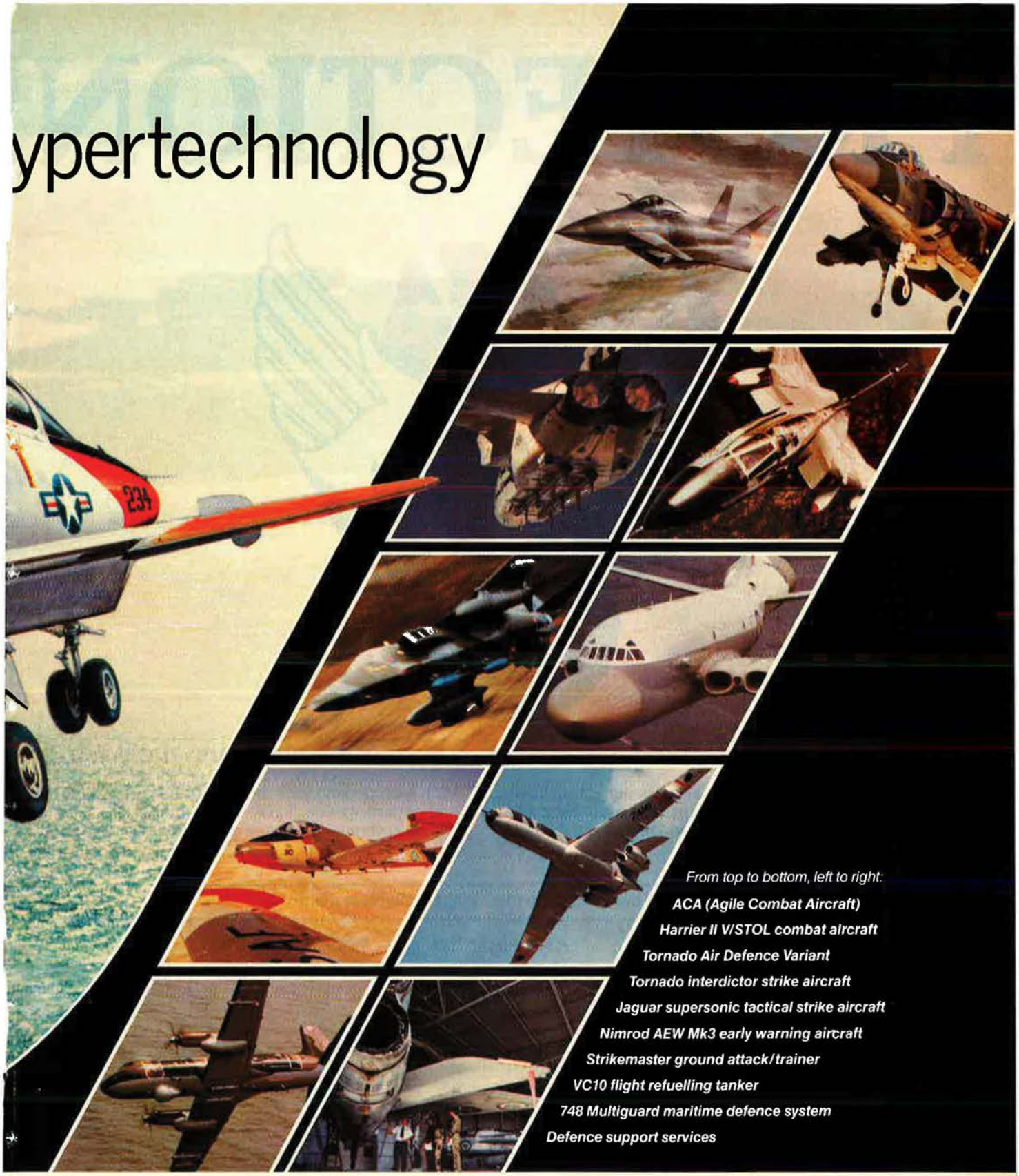

From top to bottom, left to right:

ACA (Agile Combat Aircraft)
Harrier II V/STOL combat aircraft
Tornado Air Defence Variant
Tornado interdictor strike aircraft
Jaguar supersonic tactical strike aircraft
Nimrod AEW Mk3 early warning aircraft
Strikemaster ground attack/trainer
VC10 flight refuelling tanker
748 Multiguard maritime defence system
Defence support services

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AFA Intercom

Ground Broken for First AFA National Headquarters Building

On Saturday morning, May 7, an excited group of AFA members and supporters, including national headquarters staffers, gathered at a small, dusty field in Rosslyn, Va., near the Pentagon, just across the Potomac River from Washington, D. C., to celebrate, in the words of AFA Chairman of the Board John G. Brosky, "the fulfillment of a thirty-seven-year-old Air Force Association dream." The occasion was the public groundbreaking for AFA's National Headquarters Building.

Brilliant blue skies provided the backdrop for the groundbreaking ceremony. AFA National Chaplain Maj. Gen. Richard Carr, USAF (Ret.), delivered the invocation, and AFA Executive Director Russell E. Dougherty served as master of ceremonies.

In his keynote address, Chairman Brosky echoed the sentiments of many of those in attendance with his wish "that every one of our more than 180,000 members . . . [were] here to join us in this celebration. Wouldn't it be wonderful if some of those marvelous people who got us on our way so many years ago also could be here this morning? Surely, this is their day!"

Among the special guests at the ceremony were AFA National Directors Earl D. Clark, Jr., Jon R. Donnelly, Jack B. Gross, George D. Hardy, John P. Henebry, Gen. David C. Jones, USAF (Ret.), Jess Larson, and James H. Straubel; Maj. Gen. James P. McCarthy, USAF, Air Force Director of Legislative Liaison; AFA's Man of the Year Thomas W. Anthony; Donald W. Steele Memorial Chapter President Charles Durazo; AFA's Civil Air Patrol Advisor Kenneth A. Rowe; and Maryland State AFA representative Col. John Sievertson, USAF, Commander of the 89th Military Airlift Wing at Andrews AFB, Md. Other guests included representatives from more than twenty military-related organizations and key Arlington County government officials.

It was during Chairman Brosky's tenure as AFA National President (1981–82) that the search for a location for a National Headquarters Building was initiated. That search was conducted by the Headquarters Location Committee (Jack B. Gross, George D. Hardy, and Earl D. Clark, Jr.); the Finance Committee (chaired by AFA National Treasurer George H. Chabbott); the Executive Committee (now chaired by AFA National President David L. Blankenship); national headquarters staff members Russ Dougherty, Andy Anderson, and Alfred Musi; and consultants John Gray, Justin Hinders, and Fred Simpich.

The architectural concept for the building was conceived by James Freehof, Senior Vice President of the interna-

TOP: As AFA's special guests look on from the stage, the groundbreakers dig in. Manning the shovels are (from left): AFA National Director Earl D. Clark, Jr.; James Freehof, Senior Vice President of the architectural firm of HTB, Inc.; AFA Executive Director Russell E. Dougherty; Marvin Weissberg, President of the Weissberg Development Corp.; AFA Chairman of the Board John G. Brosky; Walter Frankland, Jr., member of the Arlington County Board; and AFA National Directors Jack B. Gross and George D. Hardy. ABOVE LEFT: AFA Chairman of the Board John G. Brosky delivers keynote address at the groundbreaking ceremony. ABOVE RIGHT: Artist's concept of the first AFA National Headquarters Building. Excavation of the building site was begun this past May, and it is expected that the building will be ready for occupancy in the summer of 1984. See item.

Maj. Gen. (Lt. Gen. selectee) Robert E. Kelley, USAF, center, accepts an appreciation mug from AFA's Dallas Chapter President Bill Solemene, left, as Connie Sparks, Texas State AFA President, looks on. General Kelley, then Superintendent of the Air Force Academy, was the featured speaker during the recently held Texas State AFA Executive Meeting. The Dallas Chapter hosted a weekend of activities that included workshops and a golf tournament.

tionally known architectural firm of HTB, Inc. The concept has been reviewed and approved by the Headquarters Building Committee, the Executive Committee, the Board of Directors, and the Weissberg Development Corp., the building developer. Excavation of the 54,000-square-foot site was begun in May, and it is expected that the building will be ready for occupancy in the summer of 1984.

Improving the Scientific, Technological Literacy Of America's Youth

AFA's affiliate, the Aerospace Education Foundation, will sponsor a one-day symposium on September 15, 1983, in conjunction with AFA's National Convention. The symposium is designated the Third National Laboratory for the Advancement of Education. AEF has sponsored two other laboratories, the first in 1968 and the other in 1970.

What used to be recognized as the unique genius of America is slipping away from us and, in many areas, is now seen as only a "second-rate" capability. Unless action is taken *now*, this country is in danger of being unable to regain its supremacy in technological and economic development. First, all Americans must understand the serious implications of the problem; and, second, we must dedicate ourselves, on both the national and local levels, to actions that will ensure greater scientific and technological literacy in America.

The objectives of this symposium are:

- To determine how attendees can be a vital part of the educational agenda in the 1980s.
- To learn what is being done—and how much more must be done—to make America scientifically and technologically literate.
- To design feasible delivery systems that will bring state-of-the-art educational aids for the teaching of science and technology to America's schools at all levels.
- To develop a continuing, action-oriented awareness among Americans of the scientific and technical opportunities and challenges confronting our nation, and to develop an awareness of the implications of these challenges for our security and economic vitality.
- To encourage educators and parents to stimulate students to pursue careers in mathematics, science, and technology.
- To widen the range of curricula and provide quality instruction in mathematics, science, and technology at all grade levels.
- To create a partnership among industry, government, and academia to generate new ideas and cooperative programs that will address directly the scientific and technological needs of our nation.
- To design programs that will increase the scientific literacy of all citizens in order to enrich their lives, their work, and their full participation in our future.
- To spark a series of symposia with educational and community leaders as successors to this national symposium.
- To publish and circulate the proceedings of this Aerospace Education Foundation National Laboratory.

Symposium attendees will learn about solutions to the problem of inadequate scientific and technical course offerings in elementary and secondary schools and colleges. Ideas will be presented on how to encourage qualified people to teach the scientific and technical courses not currently offered in high schools and colleges. The symposium will also address the problem of obtaining better qualified instructors to teach those courses now being taught by instructors who lack specific skills in these areas. Included will be a review of methodologies that are currently operating effectively.

The agenda for the symposium will include a review of the draft of a "reference guide" that has been developed by some of the best minds in the nation for use in solving these chronic problems. This guide will include sug-

AFA's Wichita Falls Chapter recently presented its annual awards at Sheppard AFB, Tex. Pictured above are (from left): Gen. Thomas M. Ryan, Jr., then Commander of ATC and guest speaker at the ceremony; SrA. Henry L. Taylor, Outstanding Airman of the Year; 1st Lt. Kimberly Power, winner of a special AFA Membership Award; Jack Mathis, Wichita Falls Chapter member and winner of the award for the Organization of the Year; Eldon Shoffner, Civilian of the Year; SMSgt. Robert Holland, NCO of the Year; Capt. John DiPiero, Officer of the Year; and Maj. Gen. William M. Charles, Jr., Commander of Sheppard TTC. (USAF photo by Tim Park)

gestions and examples, and will be the subject of discussion and analysis by participants and attendees.

Other items on the agenda are discussions by panels of highly qualified individuals in the fields of education, industry, and the military, as well as briefings and exhibits highlighting the cutting edge of technology.

Finally, there will be an exhibit and material-sharing area that will include resource materials on programs that have proven effective in dealing with scientific and technological illiteracy. Attendees are encouraged to bring printed materials about their own successful programs for exhibit. A specific area will be reserved for such materials and associated exhibits.

For further information about the symposium, contact Michael Nisos, AEF Managing Director, 1750 Pennsylvania Ave., N. W., Washington, D. C. 20006. Phone: (202) 637-3370.

—By Michael Nisos

Two AFA Members Reach Milestones In Reserve Forces

Maj. Gen. Joseph L. Shosid, USAFR, received his second star during ceremonies held recently at Air Training Command Headquarters, Randolph AFB, Tex. General Shosid presently serves as Mobilization Assistant to the ATC Commander.

A longtime AFA member, General Shosid is a former National President (1973–74) and Chairman of the Board (1972 and 1975), and is a permanent member of the National Board of Directors. In addition, General Shosid was a co-winner of AFA's Man of the Year award in 1963.

An AFRES public affairs officer since 1958, General Shosid served as Mobilization Assistant to the USAF Director of Public Affairs before assuming his present position.

Gen. Thomas M. Ryan, Jr. (left), presents a second star to Maj. Gen. Joseph L. Shosid, USAFR. See item.

SMSgt. Edmund Gagliardi, PaANG, recently completed forty years of military service. Sergeant Gagliardi was Pennsylvania State AFA President in 1969 and Greater Pittsburgh Chapter President in 1970 and 1971.

Sergeant Gagliardi's military career began with enlistment in the Navy in 1943. Since 1965 he has served in a number of positions with the 911th Tactical Airlift Group (AFRES), headquartered at Pittsburgh IAP. Qualified in seven different career fields—from nuclear weapons handler to small-arms instructor—Sergeant Gagliardi serves currently as a life-support specialist.

Unit Reunions

Brooks Field
A reunion will be held on November 4–6, 1983, in San Antonio, Tex., for medical detachment and other AAF personnel who served at Brooks Field, Tex., from 1941–44. **Contact:** Mack Brushwood, 2512 Fleetwood Dr., Columbia, Mo. 65202. Phone: (314) 474-7108.

Confederate Air Force
The Confederate Air Force Southern Minnesota Wing's sixth annual air show will be held August 5–7, 1983, at St. Paul (downtown) Airport. **Contact:** John Schuck, Confederate Air Force, Fleming Field, Hangar No. 3, South St. Paul, Minn. 55075. Phone: (612) 455-6942.

Ellington and Victoria
Members of Class 42-A (Ellington and Victoria advanced flying schools) are invited to join Kelly AFB and Brooks AFB graduates for their first reunion, to be held on September 30–October 2, 1983, in San Antonio, Tex. **Contact:** M. M. Kovar, 3 Puddingstone Ct., Morristown, N. J. 07960.

Kelly Field Flying Class
There will be a reunion for members of the Kelly Field Flying School Class of 1930 at the Radisson South Hotel in Minneapolis, Minn., in October 1983. **Contact:** Gen. Edwin W. Rawlings, USAF (Ret.), 1914 1st National Bank West, Minneapolis, Minn. 55402.

Praise & Prayer Fly-In
The annual Praise & Prayer Fly-In will be held on September 24, 1983, at Richards-Gebaur Airport, Kansas City, Mo. **Contact:** George Meese, Sr., Praise & Prayer Fly-Ins, 194 Acton Rd., Annapolis, Md. 21403. Phone: (301) 263-4054.

Silver Wings Fraternity
The twenty-fifth anniversary convention and air show of the Silver Wings Fraternity of Senior Aviators will be held on July 14–17, 1983, at the Holiday Inn in Grand Island, N. Y., and at Niagara Falls IAP. **Contact:** Silver Wings, Box 1228, Harrisburg, Pa. 17108. Phone: (717) 232-9525.

Tachikawa Air Base Wing
Personnel assigned to Tachikawa Air Base Wing during the 1950s and '60s will hold a reunion in Colorado Springs, Colo., on October 28–30, 1983. **Contact:** Ed Bland, 2735 Foxgrove Ct., Colorado Springs, Colo. 80906. Phone: (303) 576-3883.

1st Strategic Air Depot
Veterans of the 1st Strategic Air Depot (1943–45), stationed at RAF Honington, England, will hold a reunion in England on September 18–25, 1983. **Contact:** Herbert Kaster, 416 Garden State Dr., Cherry Hill, N. J. 08002. Phone: (609) 779-1969.

8th Tactical Fighter Wing
The 8th Tactical Fighter Wing and 68th Fighter Interceptor Squadron (Itazuke, Japan) will hold their reunion on October 14–16, 1983, at the Sheraton Hotel in San Antonio, Tex. **Contact:** Lt. Col. Jamie Denard, USAF (Ret.), 924 Morningside Dr., San Antonio, Tex. 78209. Phone: (512) 826-1114.

10th Combat Cargo Sqdn.
The fifth reunion of the 10th Combat Cargo Squadron (3d Combat Cargo Group) and the 331st Troop Carrier Squadron (513th Troop Carrier Group) will be held on September 15–18, 1983, in conjunction with the Hump Pilots Association annual meeting, at the Town and Country Hotel in San Diego, Calif. **Contact:** Thornton W. Rose, 2614 Mirror Lake Dr., Fayetteville, N. C. 28303. Phone: (919) 323-9051 (day), or (919) 484-9060 (night).

27th Bomb Group
Veterans of the 27th Bomb Group will hold their reunion on October 13–15, 1983. **Contact:** Charles Cook, 3822 Cumberland Way, Lithonia, Ga. 30058. Phone: (404) 981-3945.

30th Bomb Group Ass'n
Members of the 30th Bomb Group, Seventh Air Force, Central Pacific, will hold a

Submissions to "Unit Reunions" should be sent to the attention of the "Unit Reunions" Editor, 1750 Pennsylvania Ave., N. W., Suite 400, Washington, D. C. 20006. Letters should be typed and should include the unit designation, the date and location of the reunion, and the name of the contact. For maximum response, please submit reunion notices *at least* three months in advance.

AFA's 1983 National Convention and Aerospace Development Briefings and Displays

September 11–15 • Washington, D.C.

Plan now to attend: AFA's 1983 National Convention and Aerospace Development Briefings and Displays at the new Sheraton Washington Hotel. Additional rooms available at the Shoreham Hotel across the street and the Dupont Plaza Hotel served by Metro, at substantially lower rates than the Sheraton Washington.

Hotel reservation requests: for the Sheraton Washington, send to: Sheraton Washington Hotel, 2660 Woodley Road, N. W., Washington, D.C. 20008; for the Shoreham Hotel, send to: 2500 Calvert St., N. W., Washington, D.C. 20008; and the Dupont Plaza Hotel, 1500 New Hampshire Ave., N. W., Washington, D.C. 20036. Make your reservations as soon as possible. *All three hotels have a cutoff date of August 19.* To assure acceptance of your reservation requests, please refer to the AFA National Convention. All reservation requests must be accompanied by one night's deposit or an American Express number and expiration date. Deposited reservations must be canceled by 4:00 p.m. on the date of arrival to avoid being charged for that night.

Convention activities include: Opening Ceremonies, Business Sessions, Symposia, luncheons honoring the Secretary of the Air Force and the Air Force Chief of Staff, Aerospace Education Foundation Awards Luncheon, the Annual Reception, and the black-tie 36th Air Force Anniversary Reception and Dinner Dance.

• A first this year will be an all-day symposium, Wednesday, September 14, highlighting the changes and challenges of Tactical Air Warfare. Also, on Thursday, September 15, the Aerospace Education Foundation will mount a major National Laboratory for the Advancement of Education. This one-day seminar with interested industrialists and educators will seek specific measures to stop our national drift toward scientific and technological illiteracy.

ADVANCE REGISTRATION FORM*

Air Force Association National Convention and Aerospace Development Briefings and Displays

September 11–15, 1983 • Sheraton Washington Hotel • Washington, D.C.

Type or Print

Name _____

Title _____

Affiliation _____

Address _____

City, State, ZIP _____

Note: Advance registration and/or ticket purchases must be accompanied by check made payable to AFA. Mail to AFA, 1750 Pennsylvania Ave., N.W., Suite 400, Washington, D.C. 20006.

Reserve the following for me:

___ Advance Registrations @ $115 per person (includes credentials and tickets to the following Convention functions: AF Chief of Staff Luncheon, Annual Reception, AF Secretary's Luncheon). $_____

Tickets may also be purchased separately for the following:

___ Aerospace Ed. Foundation Luncheon @ $35 $_____

___ AF Chief of Staff Luncheon @ $35 $_____

___ Annual Reception @ $35 $_____

___ AF Secretary's Luncheon @ $35 $_____

___ AF Anniversary Reception and Dinner Dance @ $75 $_____

Total for separate tickets $_____

Total Amount Enclosed $_____

Advance Registration Fee before September 2—$115 (After September 2—$125)

*Note: Official convention delegates, national directors, vice presidents, and committee members meeting at convention should *not* use this form. Your registration information has been mailed separately to you and you are eligible to register for "Red," "White," "Blue," or "Flag" convention packages.

reunion on October 7–8, 1983, at the Shangri-La in Afton, Okla. **Contact:** John S. Allison, 19 Lowndes, Charleston, S. C. 29401.

41st Bomb Group
The 41st Bomb Group invites all attached squadrons to its second reunion to be held on October 27–29, 1983, at the Desert Inn Hotel in Las Vegas, Nev. **Contact:** E. W. Olsen, 3949 Canyon Rd., Lafayette, Calif. 94549. Phone: (800) 227-2814, or (415) 825-8153.

45th Air Depot Group
The thirty-seventh annual reunion of the 45th Air Depot Group and all attached units will be held on September 7–11, 1983, at the Imperial House North Motel in Dayton, Ohio. **Contact:** Gene Bostwick, 10587 Valette Circle N., Miamisburg, Ohio 45342. Phone: (1-513) 866-5695. Chuck Guemelata, (1-419) 483-4371.

50th Troop Carrier Sqdn. Ass'n
Members of the 50th TCS, 314th Troop Carrier Group, will hold their reunion in Dayton, Ohio, on September 16–18, 1983. **Contact:** Robert J. De Maria, 50th Troop Carrier Squadron Association, 12896 Roadrunner Dr., Penn Valley, Calif. 95946. Phone: (916) 432-0356.

58th Fighter Control Sqdn.
The 58th Fighter Control Squadron, stationed in the Aleutian Islands from 1943–45, will hold its third reunion on September 8–11, 1983, in Colorado Springs, Colo. **Contact:** Albert H. Leonard, 4936 Determine Lane, Louisville, Ky. 40216.

68th Matériel Sqdn.
The 68th Matériel Squadron reunion will be held on July 30–August 2, 1983, at the Best Western Capri Motor Hotel in Denver, Colo. **Contact:** John P. McBride, P. O. Box 90, Amarillo, Tex. 79189.

Maj. Gen. Thomas M. Sadler, USAF, Commander of MAC's Twenty-first Air Force, briefs New Jersey State and national AFA visitors during this spring's AFA Day at McGuire AFB, N. J. The day's activities included a base tour, briefings, and the annual awards dinner. Listening in are (from left): Frank Kula, New Jersey State AFA President; Brig. Gen. Robert B. Patterson, USAF, Vice Commander of Twenty-first Air Force; Jim McDonnell, AFA Assistant Executive Director for Programs and Events; Jack Kruse (behind General Sadler), past president of New Jersey State AFA; and other AFA visitors. (USAF photo by Frank Gateward)

83d Bomb Sqdn.
Veterans of the 83d Bomb Squadron (12th Bomb Group) "Earthquakers" will hold their reunion on September 15–17, 1983, in Denver, Colo. **Contact**: Don McReynolds, 1025 Monaco St., Denver, Colo. 80220. Phone: (303) 377-0055.

304th Fighter Sqdn. Ass'n
The 304th Fighter Squadron will hold its reunion in Tampa, Fla., on August 4–6, 1983. **Contact:** Tracy P. Little, 3011 Westover St., Shreveport, La. 71108. Phone: (318) 635-2426.

312th Bomb Group
World War II veterans who served with the 312th Bomb Group plan to hold a reunion on August 5–7, 1983, at the Sheraton Jacksonville Beach Resort in Jacksonville Beach, Fla. **Contact**: Hollis A. Fowler, Jr., 8739 Ricardo Lane, Jacksonville, Fla. 32216. Phone: (904) 641-3993. Paul M. Stickel, 1136 Gray Ave., Greenville, Ohio 45331. Phone: (513) 548-5767.

321st Strategic Missile Wing
Former members of the 321st Bomb Group (1942–49), the 321st Bomb Wing (1953–61), and the 321st Strategic Missile Wing (1964 to present) will hold a reunion on September 6–8, 1983, in conjunction with the Grand Forks AFB Open House. **Contact:** Maj. James Boensch, USAF, 447th SMW/DO, Grand Forks AFB, N. D. 58205. Phone: (701) 594-6447.

325th Fighter Group
The 325th Fighter Group "Checkertail Clan" will hold its reunion on September 1–4, 1983, at The Cavalier Resort, Virginia Beach, Va. **Contact:** Bob or Barbara Burman, 705 Deer Lake Dr., Virginia Beach, Va. 23462.

351st Bomb Group
Members of the 351st Bomb Group, including the 508th, 509th, 510th, and 511th Bomb Squadrons, stationed in Polebrook, England, will hold their reunion in conjunction with the 8th AFHS in Houston, Tex., on October 12–16, 1983. **Contact:** Ben Schohan, 398 Catawba Ave., Westerville, Ohio 43081.

352d Fighter Group Ass'n
The 352d Fighter Group will rendezvous with other units of the Eighth Air Force at the ninth annual 8th AFHS reunion in Houston, Tex., on October 12–16, 1983.

AFA's new Eastern Maine Chapter recently received its charter during a ceremony in Bangor. Chapter President Harold "Sam" Hill accepted the charter from AFA Vice President for the New England Region Robert Devoucoux, left. Other guests at the ceremony included Maine State AFA President Arley McQueen, Jr., second from right, and Brig. Gen. Glenn W. Osgood, MeANG, right. (Photo by M. Gleason)

FBI Assistant Director Edward J. O'Malley (left), AFA's Tennessee Ernie Ford Chapter President Fred Hassett (center), and Bob Gast, Special Agent in charge of the FBI's San Francisco office, examine a copy of AIR FORCE *Magazine. Mr. O'Malley, a twenty-three-year FBI veteran, spoke on the Soviet intelligence threat during a recent meeting of the Tennessee Ernie Ford Chapter. (Photo by Tracy Lee Silveria)*

Contact: Robert H. Powell, Jr., 1545 Rainier Falls Dr., Northeast, Atlanta, Ga. 30329.

353d Fighter Group
The 353d Fighter Group (350th, 351st, and 352d Fighter Squadrons) minireunion will be held in conjunction with the 8th AFHS reunion on October 11–15, 1983, at the Shamrock Hilton Hotel in Houston, Tex. **Contact:** Charles Graham, Army and Navy Club, 1627 I St., N. W., Washington, D. C. 20006.

362d Fighter Group Ass'n
Veterans of the 362d Fighter Group, Ninth Air Force, will hold their reunion on August 1–6, 1983, in Green Bay, Wis. **Contact:** Bill Marles, 2838 Blue Brick Dr., Nashville, Tenn. 37214. Phone: (1-615) 883-1208. Cliff Saari, 430 N. Fisk St., Green Bay, Wis. 54303.

364th Fighter Group Ass'n
The first reunion for the 364th Fighter Group, including the 371st, 372d, and 373d Fighter Squadrons, Eighth Air Force, will be held on September 22–25, 1983, at the Ramada Inn in Colorado Springs, Colo. **Contact:** Col. John H. Lowell, USAF (Ret.), P. O. Box 27748, Denver, Colo. 80227. Phone: (303) 988-8283.

386th Bomb Group Ass'n
The 386th Bomb Group, including the 552d, 553d, 554th, and 555th Bomb Squadrons, will hold a reunion on September 29–October 2, 1983, in Philadelphia, Pa. **Contact:** Ed O'Neill, Jr., 2450 Somerset, Apt. 201, Troy, Mich. 48084. Phone: (313) 649-1062.

397th Bomb Group Ass'n
Members of the 397th Bomb Group, including the 596th, 597th, 598th, and 599th Bomb Squadrons, will hold their sixth reunion on September 30– October 2, 1983, at the Holiday Inn at Tampa IAP. **Contact:** Nevin F. Price, 397th Bomb Group Association, P. O. Box 1786, Rockville, Md. 20850. Phone: (301) 460-4488.

449th Bomb Group Ass'n
The first reunion of the 449th Bomb Group "Flying Horsemen" (including the 716th, 717th, 718th, and 719th Bomb Squadrons) will be held in November 1983 in Tucson, Ariz. **Contact:** Richard F. Downey, 4859 Stanhope Dr., St. Louis, Mo. 63128. Phone: (314) 892-4597.

457th Bomb Group Ass'n
Members of the 457th Bomb Group will hold their reunion in conjunction with the 8th Air Force Historical Society on October 12–16, 1983, in Houston, Tex. **Contact:** Homer Briggs, 811 Northwest B St., Bentonville, Ariz. 72712. Phone: (501) 273-3908.

463d Bomb Group
The 463d Bomb Group will hold its reunion on October 6–8, 1983, in Amarillo, Tex. **Contact:** John E. Boyett, 3500 E. 15th St., Amarillo, Tex. 79104. Phone: (806) 374-7397.

500th Bomb Sqdn.
Members of the 500th Bomb Squadron "Rough Raiders" will hold their reunion on October 13–18, 1983, in Washington, D. C. **Contact:** Bill Cavoli, 4314 Planters Ct., Annandale, Va. 22003. Phone: (703) 827-9100 or 978-3830.

USAF Air Police/Security Police
The first annual retired USAF Air Police/Security Police reunion is in the planning stages, with a tentative date of September 3–4, 1983. The reunion will be held in either Las Vegas, Nev., or San Antonio, Tex.

Interested personnel should send replies to the address below.

C. W. Gray
Mid-Valley Air Park
Los Lunas, N. M. 87031

Weather Reconnaissance Sqdns.
Attention, all former members of the 1st, 30th, and 53d Weather Reconnaissance

The best-kept secret at AFA's Fresno Chapter's 18th Annual Air Force Honors Night Banquet and Awards Ceremony was the naming of Fresno Chapter President Arnie Schweer as the unit's "Man of the Year." Pictured are (from left): Mrs. Schweer; Arnie Schweer; Maj. Gen. Jack Watkins, USAF, Commander of the 1st Strategic Aerospace Division and keynote speaker at the event; and Liston "Zack" Taylor, AFA National Director and master of ceremonies for the banquet.

AFA's Central Missouri Chapter recently held its Annual Membership Drive Kickoff Dinner at Whiteman AFB, Mo. More than 100 civilians and Air Force personnel attended the event. Maj. Gen. Harold E. Humfeld, USAF (Ret.), right, was the guest speaker at the dinner. Pictured with General Humfeld is Earl D. Uhler, President of the Central Missouri Chapter.

Squadrons "Hurricane Hunters," headquartered in Presque Isle and Grenier Fields, and flying B-25s in Iceland, the Azores, Bermuda, and West Palm Beach:

If interested in a reunion, please contact the address below.

Dennis A. Cassidy
Amberlands 20X
Croton-on-Hudson, N. Y. 10520
Phone: (914) 271-4561
(212) 980-7412

366th Security Police Sqdn.

I am trying to locate anyone who served with the 366th Security Police Squadron in Danang, Vietnam (1968–69).

Please contact the address below.

MSgt. Larry E. Crum, USAF
2003 Nottingham Dr.
Omaha, Neb. 68123

428th Fighter-Bomber Sqdn.

We are former Assistant Operations Officers of the 428th Fighter-Bomber Squadron, 474th Fighter-Bomber Group, who served in Korea in 1953. We are soliciting names and addresses of other former members of this F-84 outfit for the purpose of planning a reunion within the coming year.

We are both graduates of flying school Class 52-G, and would like to hear from former members of this class, regardless of later assignment.

Interested persons should contact one of the addresses below.

Randy Presley
Box 1238
Mt. Pleasant, Tex. 75455
or
Roy L. Henry
Box 279
Hearne, Tex. 77859

Coming Events

July 15–17, **Pennsylvania State Convention**, Philadelphia . . . July 16, **Michigan State Convention**, Southfield . . . July 22–24, **Georgia State Convention**, Athens . . . July 22–24, **Texas State Convention**, Bryan/College Station . . . July 29–31, **Florida State Convention**, Orlando . . . July 31, **Louisiana State Convention**, Barksdale AFB . . . August 11–13, **California State Convention**, Sunnyvale . . . August 12–13, **Missouri State Convention**, Whiteman AFB . . . August 12–14, **New York State Convention**, Rome . . . August 13–14, **North Dakota State Convention**, Minot . . . August 18–20, **Utah State Convention**, Ogden . . . August 19–20, **Wisconsin State Convention**, Milwaukee . . . August 26–28, **Oregon State Convention**, Portland . . . August 27, **Arizona State Convention**, Tucson . . . September 11–15, **AFA National Convention and Aerospace Development Briefings and Displays**, Washington, D. C. . . . October 20–22, **Aerospace Education Symposium**, Montgomery, Ala.

Bob Stevens'

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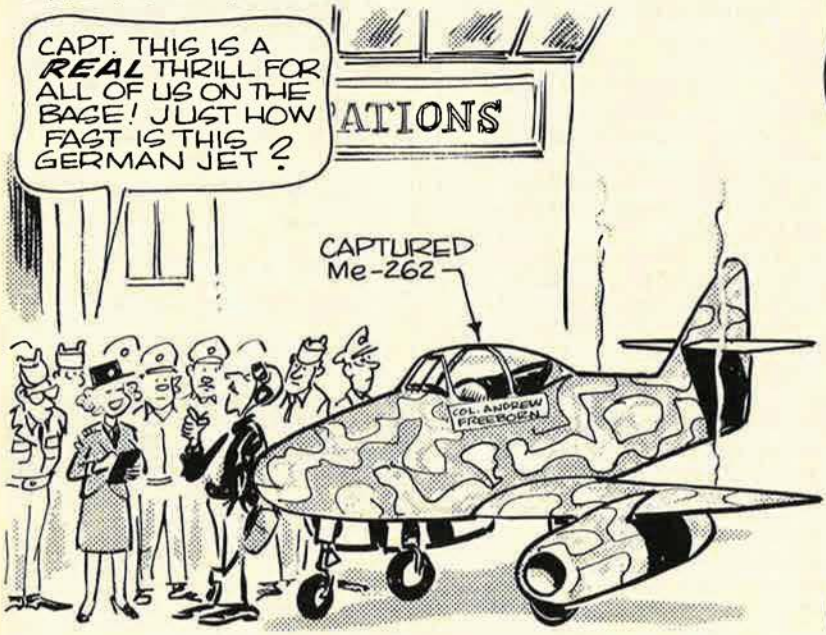
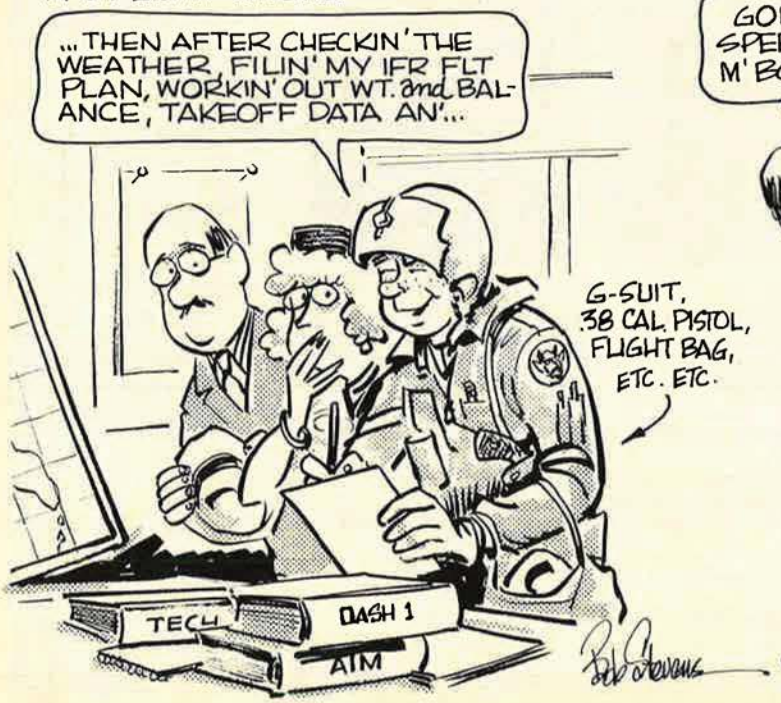
BACK IN WWII, W-P WAS A FLIGHT TEST FACILITY. LOTS OF PUBLICITY SURROUNDED FLIGHTS OF NEW OR STRANGE AIRCRAFT–



AND, MORE RECENTLY, A HOTSHOT FIGHTER JOCK PASSIN' THROUGH BROUGHT HIS FAMILY OUT FOR THE PREFLIGHT RITUAL –



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For the VTXTS Program, Sperry has been selected to develop the simulation and training systems for the Navy's new generation of jet training aircraft.

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F-15 Eagle

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