


JUNE 1993/\$3

# AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE

A dramatic, low-angle photograph showing the silhouette of a helicopter against a bright, cloudy sky. The helicopter is positioned vertically, with its main rotor blades extending upwards. A person is being hoisted by a rope from the helicopter's hook, appearing as a dark silhouette against the lighter sky. The overall mood is one of intense action and military operations.

**Special Operations  
No Time for Rambos**

# When "Close" is not good enough!

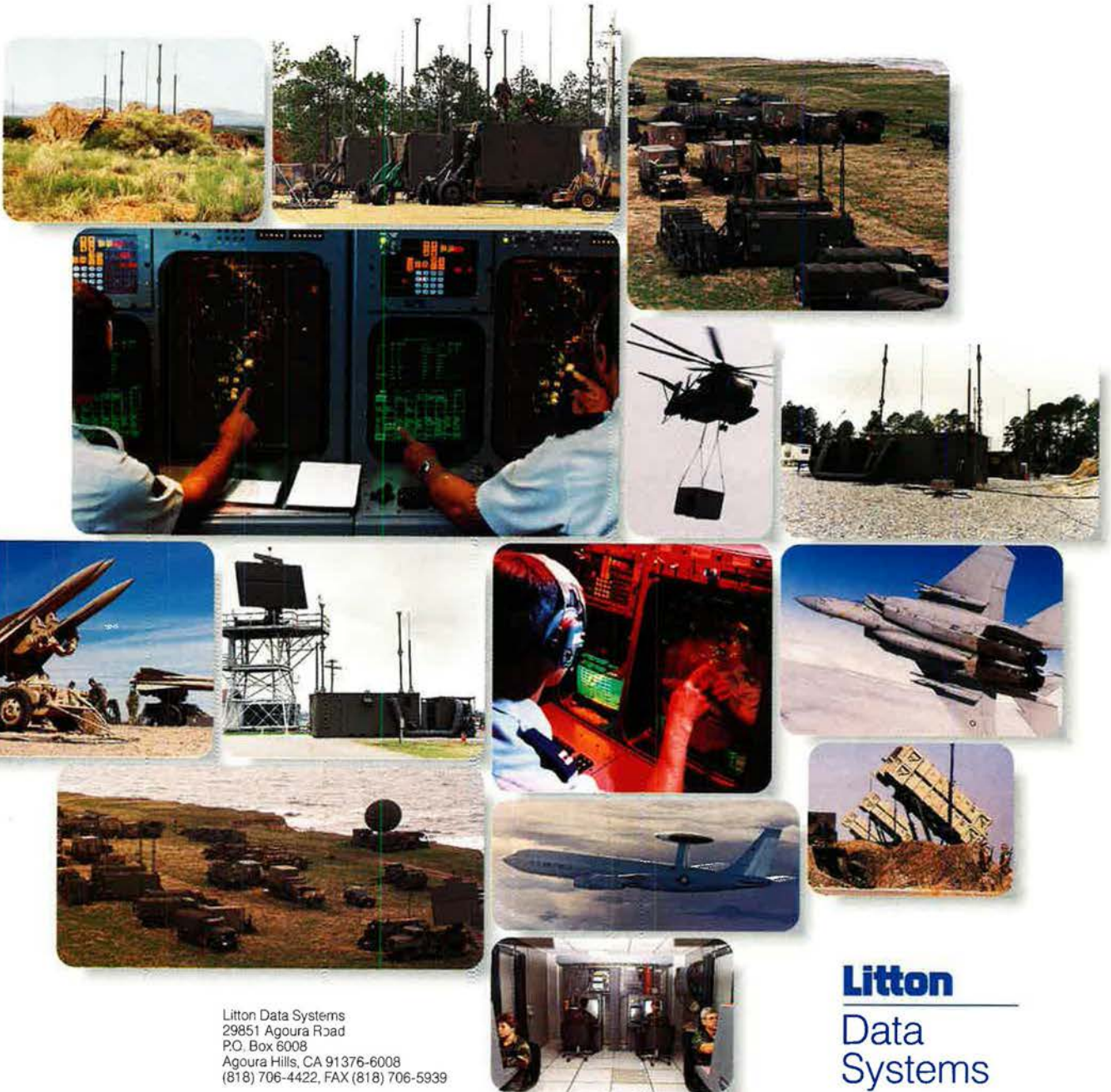
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# AIR FORCE

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**About the cover:** An MH-60G Pave Hawk special operations helicopter from the 55th SOS extracts an Army special forces team with the help of the SPIE (Special Procedures, Insertion/Extraction) rig. Staff photo by Guy Aceto.

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By John T. Correll, Editor in Chief

## The Chosen Few

**A**S THE new economic order takes shape, we hear much about "sacrifice." Secretary of Defense Les Aspin, for example, cited an "across-the-board need for everybody to sacrifice" when asked by a Senate subcommittee about the federal pay freeze proposed by the Clinton Administration. Meanwhile, believing that federal retirees should sacrifice, too, Congress has devised a selective cap on cost-of-living adjustments (COLAs) to retirement annuities.

As the Administration and Congress have it planned, though, there's nothing "across-the-board" about the sacrificing. The main weight of the caps and freezes would fall on members of the armed forces and military retirees. The pattern is definite, and difficult to miss.

Sen. Sam Nunn (D-Ga.), chairman of the Senate Armed Services Committee, points out that almost seventy percent of the people affected by the federal pay freeze—followed by truncated COLAs through 1997—will be members of the armed forces or civilians working for the Department of Defense. Active-duty military pay will fall 21.6 percent behind compensation in the private sector by 1998.

Congress originally considered imposing the retirement COLA cap on all federal retirees, but retreated from that position because of the political heat it generated. The revised plan applies only to those under age sixty-two. That targets the sacrifice on military retirees, who are not permitted to serve to that age. Fifty-eight percent of military retirees are under sixty-two. A limited number of civil servants and postal workers, represented by vocal unions, fall into that category.

The Congressional Budget Office wasted no sloppy sentiment in sizing up the reduction options. "If fewer people are needed in the future, military pay could be even lower than it is today and still be competitive," CBO reported in February. "Indeed, large-scale personnel reductions create the problem of how to encourage experienced personnel to leave the military rather than how to convince them to

stay." As for the retirement program, CBO pronounced it "expensive and generous."

People certainly are being shoved out of the military. When the drawdown is complete, at least 830,000 active-duty troops—thirty-six percent of the total—will have been forced out. Before it's over, the force-outs may exceed forty-five percent. That's a considerable amount of sacrificing by itself.

Even without a drawdown, military people reach their statutory service limits when they are in their forties or fifties. With the drawdown, many will leave sooner than planned. Those retiring this year absorb the fullest impact of the COLA cap because they have longest to go until age sixty-two, when they qualify for a "catch-up" adjustment. A typical master sergeant, for example, will lose \$63,448 over the years, counting the effects of inflation and compounding.

Social Security recipients and most other government beneficiaries will continue to receive full COLAs. The average worker in the private sector can also look ahead to modest gains. The Congressional Budget Office estimates that the Gross Domestic Product will run about 2.5 percent ahead of inflation through 1998.

So much for the myth of "across-the-board" sacrifices. Since government pay and regular military retirement COLAs are linked to wage increases in the private sector, there would be no reason for special caps or freezes if everybody were sacrificing. Do not, however, look for those pushing the caps to dwell on that point. When pressed, they justify the action by claiming that military benefits, especially retirement, were too generous anyway.

If the US population was put on the equivalent of military pay tomorrow, there would probably be a national strike going and recall referendums under way by the end of the week. The troops do not expect their earnings to measure all the way up to private-sector income (although they do expect the gap to be a little tighter than 21.6 percent).

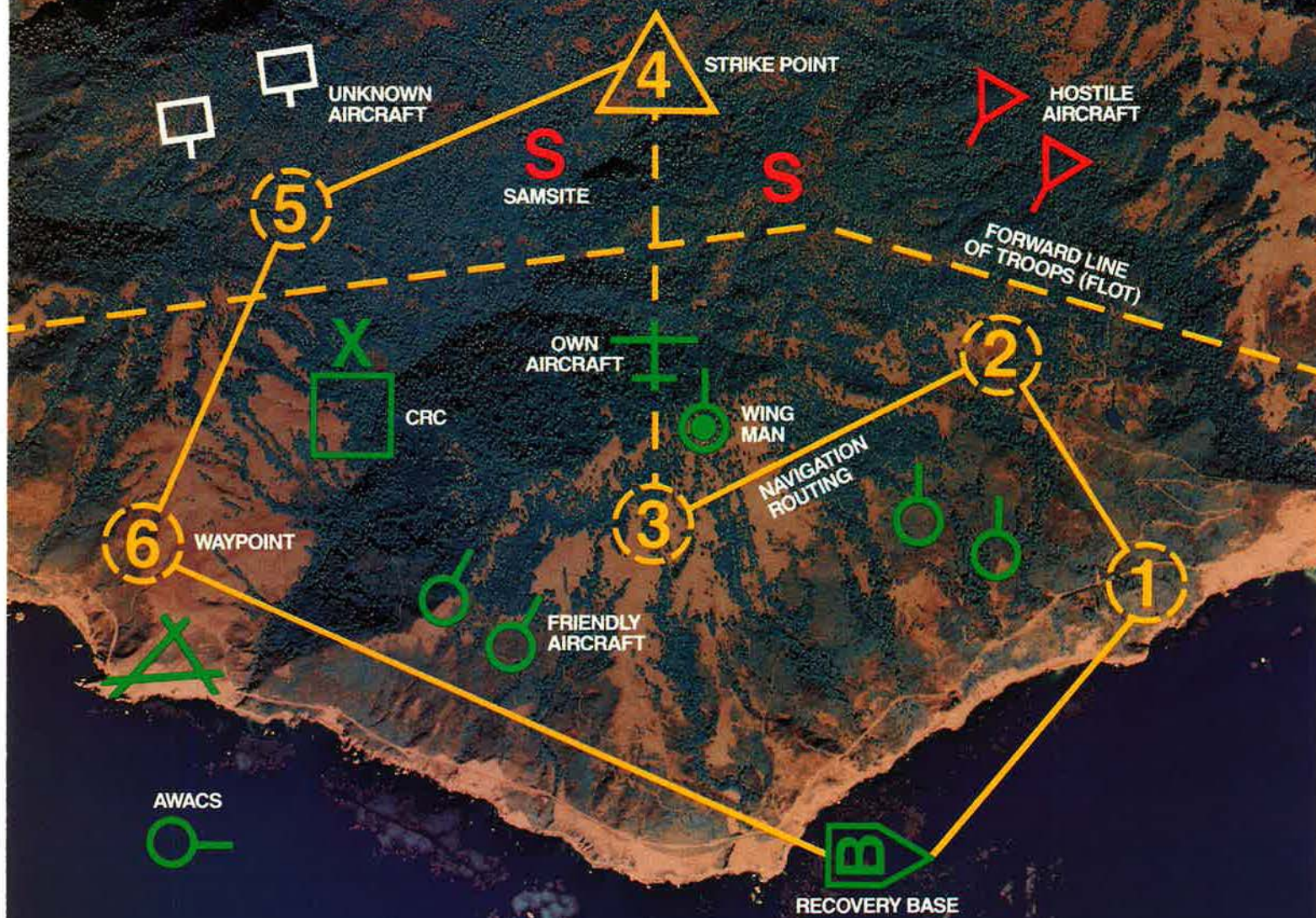
They understand that part of the compensation is deferred, retired pay that will be computed on part—not all—of their active-duty pay. They believe the government made a good-faith compact with them that adjustments to their compensation would be fair and equitable. In 1986, for example, an act of Congress guaranteed that federal retirement COLAs would be the same as those for Social Security annuitants.

It's hard to interpret recent developments as anything except a breach of that promise. It would also be easy to leap to the conclusion that the nation's leaders singled out military people and retirees as nondangerous politically and chose them to bear the brunt of the reductions. The Administration and Congress might reflect on that, in between speeches about shared sacrifice and wondering why Washington has a poor image with the military. ■



**The main weight of "sacrifice" falls on members of the armed forces and military retirees.**

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## Training's New Look

I just read "The New Look in Training" by Peter Grier [April 1993, p. 46], and I was amazed by how much I did not remember about my years in the Air Force training community. I am sure other former airmen involved in training for the past two decades were just as surprised. The article implies that the diffusion of training in the Air Force happened by accident, over time, and that senior Air Force leadership was unaware of the shift.

In fact, the diffusion was an approved policy to train people only for their first job and therefore limit their time in the training pipeline because of the expenses associated with training and the need to have people on the job as soon as possible. Training was seen as an investment, and the longer the individual spent in the training pipeline, the less time he or she was on the job during an enlistment.

The "first-job" policy was implemented with great fanfare in the early 1980s and was seen as a way to save training dollars that could be applied to the operational Air Force. The training budget was cut by reducing the amount of initial skills training time spent in the pipeline. The operational Majcoms were budgeted with both dollars and manpower to provide on-the-job and follow-on training. The result was a two-phased training program formalized and approved by Air Force senior leadership.

Tracking who was responsible for which training was provided by a little-known (but very important) process implemented by the Air Force in the 1960s called "Occupational Analysis."

Through this process, all Air Force specialties are surveyed periodically to determine which tasks are performed by people in the specialty and when those tasks are performed. From that information, training is directed at first-job tasks dependent on the resources available to conduct formal training. This description is oversimplified, but it makes the point that the planning of training is not, and has not been, an unfocused process. . . .

Giving a concrete example of the quality of training in the Air Force is

the best way to make my point. What better example is there than the performance of our trained people in the Persian Gulf War? That performance illustrates how effective Air Force training has been. There is always room for improvement, however, and I believe that training is moving in a positive direction. I hope that our retention rates are high, because the training program see described is long and expensive. If an individual spends only one enlistment in the Air Force and years are spent in the training pipeline, USAF won't get a very good return on its training investment.

Also, it is inconsistent to reduce the number of Majcoms and other higher-level staffs while creating numbered air forces to manage training programs. These programs are currently managed by small staffs at Hq. Air Training Command.

Contrary to the implications of General McPeak's statement, "When someone hears that Captain Smith or Sergeant Jones is Air Force-trained, they'll pay attention," the solid reputation of Air Force training is nothing new. I worked in interservice training for close to fifteen years, and Air Force training has always been respected as the leader. I feel confident the new direction will continue that tradition.

Col. Bob P. Tindell,  
USAF (Ret.)  
Maitland, Fla.

## Bashing the Navigators

The current climate of ill will toward navigators damages the Air Force mission and, hence, the nation's de-

fense. If "Career Paths in the New Air Force" [February 1993, p. 54] and Maj. Clarence J. Romero's letter, "The Optimal Force Mix" [April 1993, p. 4], are an indication of the current climate, then navigators should brace themselves for a historic onslaught.

Times change, and technology always forces reviews of manpower needs. The navigators' problem is that nearly every technological leap starts a new wave of navigator-bashing. Not surprisingly, it's normally the pilots who do the most slugging.

Technology has simplified elements of both the navigator's job and the pilot's job. Why don't such changes lead to a wave of pilot-bashing? Haven't modern autopilots, glass cockpits, improved communications, and navigation aids made the modern pilot's job much easier than that of his 1950s predecessor?

It's not surprising that a vast majority of pilots who depend on navigators to accomplish the mission hold the profession in high esteem. Try to find an MC-130 Combat Talon or HC-130 Combat Shadow driver who doesn't think highly of his radar navigator. (It would be a futile search; such pilots don't exist.)

The point is this: professions change. The 1950s-era navigator doesn't exist any more than the 1950s-era pilot does. Navigators have evolved into specialists while retaining all the basic skills of their 1950s forefathers. This evolution has produced a more valuable officer. Any attempt to libel his skills damages the Air Force mission.

Considering the disproportionate pain and damage the reduction in force and other personnel actions have caused navigators, we should salute those who remain. They are some of the most loyal and able professionals in the Air Force and receive precious little support and credit.

Capt. Kenneth W. Stallings II,  
USAF (Ret.)  
Jonesboro, Ga.

## Updated Intelligence

"Space Support for the Shooting Wars" [April 1993, p. 30] was interesting and highly readable—until I read

**Do you have a comment about a current issue? Write to "Letters," AIR FORCE Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Letters should be concise, timely, and preferably typed. We cannot acknowledge receipt of letters. We reserve the right to condense letters as necessary. Unsigned letters are not acceptable. Photographs cannot be used or returned.—THE EDITORS**



## FOX ONE ... SPLASH ONE!

On December 27, 1992, the first aerial combat victory by America's newest air-to-air missile, the Advanced Medium Range Air-To-Air Missile (AMRAAM), was achieved when a USAF F-16 downed an Iraqi MiG that was violating United Nations sanctions in the Iraq southern no-fly zone.

Three weeks later, on January 17, 1993, the second AMRAAM kill was achieved, again by a USAF F-16 which downed a second Iraqi MiG violating U.N. sanctions in the northern no-fly zone.

These USAF victories add to the F-16 worldwide total of 65 combat kills without a single loss.

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## Letters

that some intelligence "never got to the armed services. The Central Intelligence Agency and other intelligence outfits kept clamps on the data for their own purposes." That is an outrageous distortion and . . . only helps to feed misperceptions about the role and uses of intelligence. In the process, you insult the professional men and women in intelligence careers in all services who clearly understand the needs of the primary customers—the warplanner and warfighter.

It is obvious you haven't checked on the intelligence community in a number of years, so let me bring you up-to-date. We've come a long way from the bad old "green door" days when intelligence officers at many levels had, essentially, stamped *Time* Magazine "secret." Properly pressured by the operational forces, many of those "green doors" came crashing down. . . .

Since southeast Asia days, units at all levels have had access to the data they need to plan and execute their missions. True, some source material and the precise methodologies needed to extract intelligence from mere data remain sensitive, but the critical intelligence information is made available to the people who need it.

Don't be so quick to criticize the CIA. . . . Over the years, I have observed numerous occasions when exceptionally sensitive intelligence has been carefully inserted into the estimates that define the threat and, consequently, help refine the operational forces needed to defeat that threat. I assure you that, without the CIA's unique capabilities, critical intelligence information would never have been acquired. Many courageous CIA professionals have overcome daunting risks to acquire intelligence that the military eventually put to good use. . . .

Even during the so-called cold war, intelligence information fed the databases, updated the mission planning folders, kept the Single Integrated Operational Plan viable, gave the targeters the data needed for new weapons, and enabled the Red Flag/Green Flag folks to exercise against a realistic threat. In short, the intelligence community played a key role in keeping the cold war cold.

Rather than maintaining a 1960s mindset, why not take a current look at intelligence support today and where it is headed in the post-cold war era? Much remains to be accomplished, as General Horner pointed out, and the forces will never have enough intelligence, but the intelligence commu-

nity has heard the message from the operators—for decades.

Col. Evan H. Parrott,  
USAF  
Clifton, Va.

## Credit the Crusaders

It was a pleasure to read "The Aardvarks Gather at Cannon" [*April 1993, p. 36*]. As a former F-111 maintenance officer at Cannon AFB, N. M., I feel it is about time that the F-111, as well as the fine men and women at Cannon, received the recognition they so rightly deserve. However, you incorrectly identified the aircraft in three different captions as F-111Fs from the 423d Fighter Squadron. They belong to the 523d Fighter Squadron.

Maj. Mark C. Humphrey,  
USAF  
Springfield, Va.

■ *The 428th Fighter Squadron was also misidentified, and the right-seater in an EF-111 is known as an Electronic Warfare Officer, contrary to what the article stated.*—THE EDITORS

## The Stalwart Saudis

"The Stalwart Saudi Air Force" [*March 1993, p. 40*], by Michael Collins Dunn, makes me wonder if he is talking about the same place where I spent six years, helping to train the RSAF in command and control.

The first glaring error in the article is his statement that the two Iranian F-4 aircraft were headed for the coastal town of Dhahran. There is no town by the name of Dhahran. That is the name of the airport, and only the airport.

Next, he states that RSAF jets were scrambled to intercept the F-4s and downed at least one. Lieutenants Majid and Harthy were on combat air patrol, which was being flown almost constantly at that time. Each of them fired one missile, and both of the F-4s disappeared from all radar screens and were seen to splash. Lieutenant Harthy is probably as good a pilot as you will find in any air force. During my time at Taif, I also helped in the standardization division, and he was the only pilot who never missed a question or procedure when being flight checked.

I wonder if it ever entered Dr. Dunn's mind that the reason the RSAF has notched few kills is because they are strong enough that very few countries in the area would like to take them on. In plain English, they haven't had any enemy aircraft to "notch a kill" against.

I also take exception to his statement that the RSAF is not a truly modern force. I know of quite a few



USAF facilities that would love to have the aircraft and equipment that the RSAF has.

He mentions Taif as being on the Red Sea coast. During my three years at Taif, it was about 110 miles from the Red Sea.

Finally, the Saudi Ambassador to the US, Prince Bandar bin Sultan bin Abdul Aziz al Saud, is an F-15 pilot and a damned good one. He is not, however, a brother to King Fahd.

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

■ *Dr. Dunn replies:*

*I share Chief Maultsby's admiration for the Royal Saudi Air Force—some saw the article as being too full of praise—but I dispute some of his contentions. Several of the errors he points out were due to editorial changes, but others are not errors at all.*

*Dhahran is the headquarters town of the Arab/American Oil Company (ARAMCO) and the Saudi Petrochemical University.*

*My article states that "the RSAF is the best-trained air force in the Middle East (Israel excepted) and one of the best equipped." I do not see that as damning the RSAF with faint praise, as Chief Maultsby seems to.*

*He is correct about the location of Taif and Prince Bandar's relationship to King Fahd (he is the king's nephew). These errors occurred during editing. In addition, the article equates £5 million with \$10 billion. The correct figure is, of course, £5 billion.*

#### Other Pilots at Tonopah

"The Secret Doings at Tonopah" [January 1993, p. 72] falls short. The article leaves the impression that Al Whitley was the key player in the F-117 program. Not so. This is not a slam against Al, since he did make contributions, but a slam against the article.

The article does injustice to other people involved in the program: Col. Skip Anderson from Air Force Systems Command, who was the first Air Force pilot, and the other AFSC pilots who followed him in the early years—Lt. Col. Russ Easter (who didn't fly it, but made significant contributions), Roger Moseley, John Beesley, and Paul Tackabury. A large tip of the hat should go to the company pilots: Hal Farley, the first person to fly the airplane; Dave Ferguson (retired USAF/AFSC); Tom Morgenfeld (ex-Navy); and last, but certainly not least, Bob Riedenauer, who took the ride in the first production airplane and got permanently grounded for his efforts. The cause of his crash is correctly stated

as being a mixup in the controls. However, I remember it as being between the pitch and roll channels, not the pitch and yaw channels. . . .

Thorough development test and evaluation and initial operational test and evaluation programs contributed to the development of a training program for operational pilots. Compare this to Mr. Kitfield's implication that Al learned how the airplane was going to fly from the "Skunk Works" engineers.

The use of "off-the-shelf" equipment was mandated by the pace of the program, its concurrency, attempts to keep the costs down because stealth development was so expensive, and, finally, by a philosophy of, "If it works, use it." (Most of the systems were okay, but some had problems, such as the Gulfstream wheels and brakes, which have been replaced with F-15 wheels and Goodyear brakes.)

Day flying at Tonopah had taken place prior to the official public announcement in November 1988, contrary to what the article stated.

The statement, "The crews of KC-135Q tankers, which refueled the F-117As on the first stage of their journeys to the Persian Gulf in 1990, were not even given the airplane's refueling data," seems out of context, since either "inbriefed" crews weren't used for the deployment or the crews they did use were mistakenly not given the information.

My qualifications for writing this letter? I was associated with the F-117A program for more than eight and a half years (six years as a blue-suiter and two and a half years as a Lockheed employee).

Maj. Robert E. Drabant,  
USAF (Ret.)  
Las Vegas, Nev.

#### Timely Responsiveness

Please pass on warm regards and thanks to Lt. Col. Bob Duncan for his very well written article, "Responsive Air Support" [February 1993, p. 74], based on CENTAF's management of offensive air support in Operations Desert Shield and Desert Storm.

As part of the Marine air liaison team working with General Horner's staff during Desert Shield, I appreciate the well balanced description of the system that was planned and the joint process we all developed together.

The article is now being used among the joint services here in north Norway as a good example of the relevant issues in developing an air support system.

Lt. Col. (Col. selectee) Larry Groves,  
USMC  
Bodø, Norway



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development and a successful history of managing total programs from start to finish. The Vought Pampa 2000 is the low risk JPATS option — ready today — to handle the training requirements of the 21st century.



# The Chart Page

Edited by Tamar A. Mehuron, Associate Editor

## How the Defense Budget Dropped

The Drop in Budget Authority (in current \$ billions)

	1994	1995	1996	1997	1998	1994-98
July 1990 baseline	288.0	296.4	304.5	312.9	321.5	1,523.3
Bush final January 1993	275.5	278.0	278.3	284.6	293.4	1,409.8
Clinton February 1993	263.7	262.8	253.8	248.4	254.2	1,282.9
House budget resolution	263.2	262.0	253.1	247.6	253.4	1,279.3
Senate budget resolution	263.9	263.3	254.4	248.9	254.7	1,285.2
Final budget resolution	263.4	262.4	253.6	248.1	253.9	1,281.4
Clinton March 27	263.4	261.1	253.7	246.0	253.9	1,278.1

*In July 1990, President Bush and Congress agreed on a budget baseline for defense through 1998. This baseline has been the starting point for subsequent cuts.*

The Drop in Outlays (in current \$ billions)

	1994	1995	1996	1997	1998	1994-98
July 1990 baseline	289.6	293.8	299.8	306.5	313.8	1,503.5
Bush final January 1993	284.4	284.3	284.6	286.5	289.0	1,428.8
Clinton February 1993	277.7	272.6	264.9	249.1	252.7	1,317.0
House budget resolution	276.5	271.9	264.2	248.4	251.9	1,312.9
Senate budget resolution	277.8	273.0	265.4	249.6	253.2	1,319.0
Final budget resolution	277.0	272.1	264.7	248.9	252.4	1,315.1
Clinton March 27	276.9	270.9	264.7	246.9	252.5	1,311.9

**Sources:** "A Vision of Change for America," Clinton report to Congress, Feb. 17, 1993; House and Senate budget resolutions, 1993; Aspin-Clinton budget proposal, Department of Defense, March 27, 1993. All numbers refer to the total defense program.

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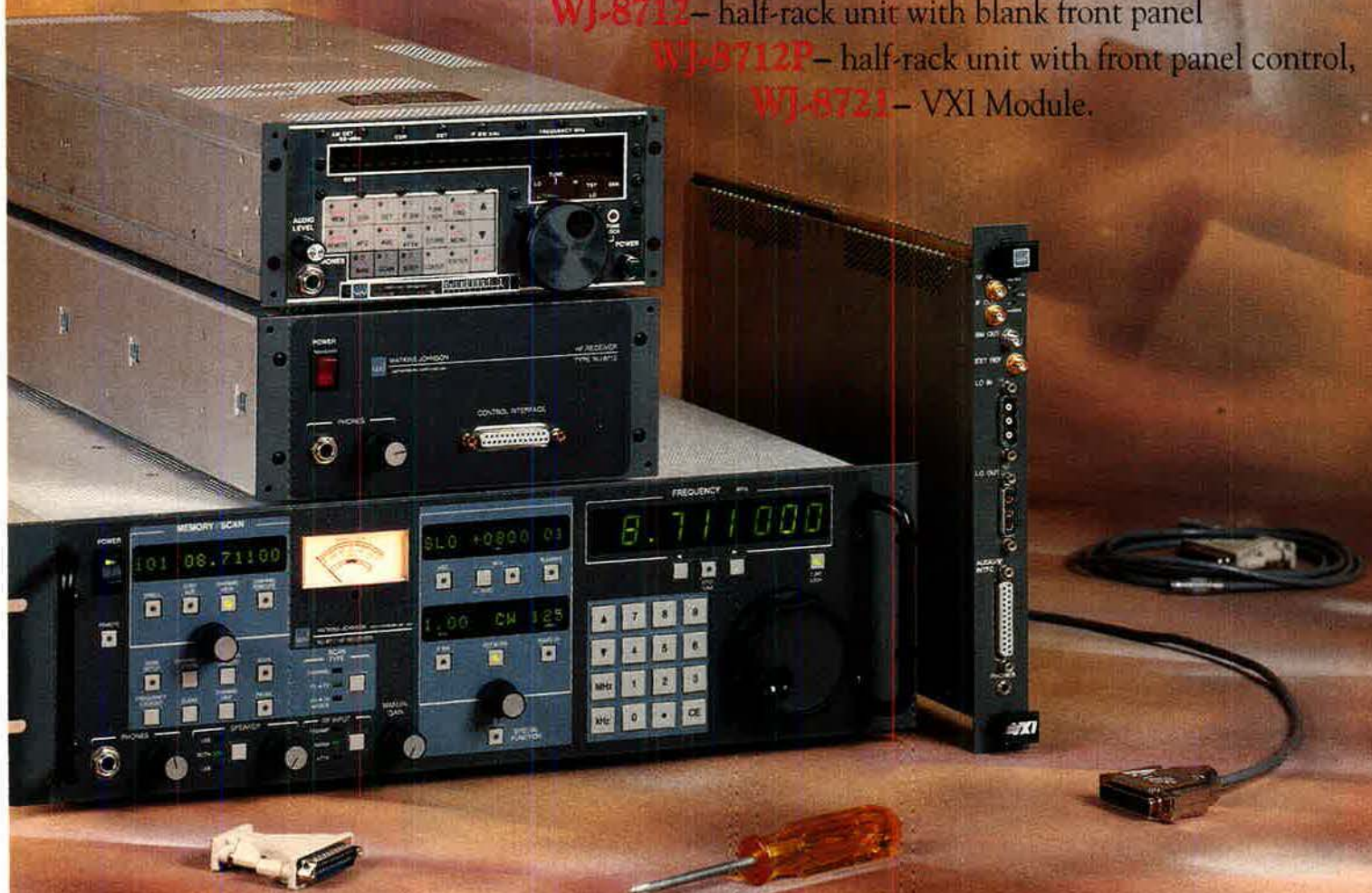
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EXCELLENCE IN ENGINEERING



# Aerospace World

By Frank Oliveri, Associate Editor

## Combat Aircraft Opened to Women

Defense Secretary Les Aspin lifted the long-standing ban on female pilots serving in US combat aircraft.

The Secretary's decision, which was expected, came as part of a sweeping effort to integrate women more thoroughly into the armed forces. It stands in direct conflict with the recent recommendation of a presidential commission.

The late April announcement means women can immediately compete for cockpit assignments in fighters, bombers, and other aircraft. Women not only will be allowed to serve in USAF, Navy, and Marine warplanes but also in Army and Marine attack helicopters, certain Navy warships, and selected other positions in the Army and Marines, including artillery and air-defense units.

For the moment, it appears that the armed services will be permitted to exclude women from front-line infantry and armor units. Even so, the Army and Marine Corps are under orders to justify continuation of this ban.

"The result of all this will be that the services will be able to call upon a much larger pool of talent to perform the vital tasks that our military forces must perform in the post-cold war world," Mr. Aspin said.

At present, there are 202,626 women officers and troops in the 1.74-million-strong US military. Women make up about fifteen percent of the total Air Force and fourteen percent of its officer corps. There are 295 women pilots and 115 women navigators in the Air Force.

## First Woman Air Force Combat Pilot

Gen. Merrill A. McPeak, Air Force Chief of Staff, said that the first woman combat pilot in the USAF will be 1st Lt. Jeannie Flynn.

Lieutenant Flynn, a distinguished ROTC graduate from the University of Texas, holds a master's degree in aeronautical and aerospace engineering from Stanford University.

The lieutenant graduated at the top of her pilot training class at Laughlin AFB, Tex., last December. She will enter lead-in fighter training at Hol-



REUTERS / BETTMANN

*An Air Force F-15 takes off from Aviano AB, Italy, to begin patrolling the skies over Bosnia. Fighter aircraft from the US, UK (note British E-3 AWACS in background), Italy, France, Turkey, and the Netherlands have been enforcing the United Nations' no-fly zone over the former Yugoslavia since April 12.*

loman AFB, N. M., and then enter the advanced F-15E course at Luke AFB, Ariz. From there, she will deploy with an operational F-15E unit.

Asked his view of Secretary Aspin's decision, General McPeak said, "I'm comfortable with it. I had a full opportunity to state my view. The Secretary made a decision, so I'm comfortable with it, and there's always a small chance that I was wrong."

The Air Force has a backlog of "banked" male pilots waiting for cockpits to open up. Many of these fear that women will squeeze men out of cockpits as the service gets smaller. When questioned about this, Mr. Aspin said, "I anticipate that none of the problems will be exacerbated because of this. I do think that they'll be able to handle this very successfully."

## McPeak on Chain of Command

Gen. Merrill A. McPeak, in what some viewed as an unusual expression of high-level concern, admonished Air Force officers and enlisted personnel to remember that the national chain of command "runs from

the President right down to our newest airman."

The Air Force Chief of Staff's pointed remark was seen as a caution about widespread military criticism of President Clinton. Many officers and troops in all services are unhappy with the President's campaign to further reduce defense spending and to permit homosexuals to serve openly.

In an April electronic message to commanders down to squadron level, General McPeak noted that the President recently visited "East Coast military installations"—an aircraft carrier and a naval base—and that "media coverage struck a somewhat negative tone that should cause concern to all of us in the chain of command." The stories to which he referred contained critical statements about the President, many of them attributed to naval officers quoted by name.

General McPeak declared, "We simply must not permit today's debates about a new national military strategy, or the resources commitment the nation will allocate to defense, or social issues, to divide us from the soci-

ety we serve or to undercut the strength and integrity of the chain of command."

#### Aspin Disciplines C-17 Officials

Defense Secretary Aspin took action in late April against four USAF acquisition officials. All had taken part in overseeing the C-17 airlifter program in recent years and were punished for alleged failings in the management of that project.

Mr. Aspin said he acted because "high-ranking acquisition professionals" did not acknowledge program difficulties, nor did they take decisive action to correct the problems. For those reasons, said the Secretary, he no longer has confidence that the four can perform up to his standards. Mr. Aspin took this step despite an extensive, official Air Force report that appeared to disprove each specific charge leveled against the four.

Maj. Gen. Michael J. Butchko, Jr., once the C-17 System Program Director, was relieved of duties as commander of the Air Force Development Test Center, Eglin AFB, Fla. The action, said the Pentagon, stemmed from General Butchko's performance in the airlifter program.

The other three—two officers and one civilian—were barred from further work in the field of acquisition. They are: Lt. Gen. Edward P. Barry, Jr., commander of AFMC's Space and Missile Systems Center, Los Angeles AFB, Calif.; Brig. Gen. John M. Nauseef, deputy chief of staff for Financial Management and Comptroller for

Air Force Materiel Command; and A. Allen Hixenbaugh, special assistant to the Director of Contracting, Aeronautical Systems Center, Wright-Patterson AFB, Ohio.

Despite his actions against the four, Mr. Aspin dismissed as unfounded the charges of Pentagon Deputy Inspector General Derek Vander Schaaf that criminal behavior was involved.

#### B-1Bs Complete Long-Range Mission

Two Air Force B-1B bombers in April flew to and hit targets on a practice range at Solenzara, Corsica, in the Mediterranean Sea.

The bombers, which had taken off from McConnell AFB, Kan., were the first B-1Bs to complete a delivery of conventional weapons over an intercontinental range. A pair of B-1Bs from the 384th Bomb Wing at McConnell flew a total of twenty-one hours as part of a joint-service, combined-nation attack package. The "cell" of B-1Bs took off, rendezvoused twice with Air Force KC-135 tankers en route to the target, and arrived on time and on target.

The 384th's B-1Bs have two roles: retaining nuclear capability and developing a worldwide conventional response capability.

#### ALOs Get Choice of Cockpits

The Air Force Military Personnel Center said in March that company-grade fighter pilots completing a liaison assignment with the Army get the

highest priority for available fighter training, meaning that former liaison pilots should get some very good flying assignments.

Air liaison officers (ALOs) are assigned to Army units and coordinate close air support for ground troops. Assignments range from one year in Korea to three years in Alaska or Hawaii. The standard tour length is two years in Europe and CONUS.

Of the last twenty-eight pilots serving as liaison officers, all received their first choice of cockpit assignments, and twenty-one of the twenty-eight got their top choice of location.

#### DoD Initiates Advanced Program

The Advanced Research Projects Agency (ARPA) selected Lockheed Advanced Development Co. and McDonnell Douglas Aerospace to head the critical technology validation phase of the advanced short takeoff, vertical landing (ASTOVL) technology demonstration program.

"Both contractors will refine the design of an operational aircraft concept using their lift technology and analyze and demonstrate affordability-enhancing technologies and processes," said a Pentagon statement in March. "They will also conduct large-scale wind tunnel model testing and develop a project plan for a full-scale technology demonstration aircraft."

The statement reports that the Air Force version of the aircraft might well turn out to be a single-engine, single-seat, conventional strike fighter powered by a derivative of the F-22 Advanced Tactical Fighter engine. The Navy and Marine Corps variant would use the same engine and avionics, it said.

The naval version would also include propulsive lift equipment enabling it to take off and land from warships and austere airfields without catapults and arresting gear. The Navy fighter would be called the short takeoff, vertical landing strike fighter (SSF).

This generic fighter, said the statement, could replace the F-16, F/A-18, and AV-8B.

Lockheed received \$32.8 million and McDonnell Douglas received \$27.6 million for the program, which is a three-year effort. Lockheed will team with Pratt & Whitney, Allison, Rolls-Royce, and Hercules. McDonnell Douglas will team with General Electric Aircraft Engines and British Aerospace.

#### USAF Controllers Help Save British Satellite

A flight-control team from Onizuka AFB, Calif., worked with the Royal Air



*In May, the X-31 Enhanced Fighter Maneuverability aircraft executed a minimum-radius, 180° turn, employing a post-stall technique known as the "Herbst maneuver." Using its full capability of 70° angle of attack, the X-31 can reduce turning time to about two-thirds that of conventional fighters.*

Force in April to save a UK military communications satellite tumbling out of control in space.

The satellite, SKYNET 4-B, was tumbling out of reach of RAF satellite controllers at Oakhanger, England. The British were sending commands in the blind to the troubled system with little success.

Controllers at Onizuka observed these attempts and noticed that the RAF controllers did not have a good line of sight to the vehicle from their station and that some of the RAF commands were not being accepted by the vehicle.

At 1:05 p.m., the RAF declared a vehicle emergency. Within five minutes, lead flight director 1st Lt. Christopher Coffelt and six members of the Onizuka flight-control team were backing up the RAF with two sites of the Air Force Satellite Network.

Two hours later, British Aerospace Corp., the spacecraft contractor, suggested that the 750th Space Group take control of the vehicle because they had better telemetry.

Capt. Bill Moriarity, chief of Current Operations, said, "At that time, the vehicle was tumbling at nine revolutions per minute, which is extremely fast for a vehicle that is not supposed to spin at all."

It took approximately five hours to gain control of the satellite. At 8:40 p.m., the vehicle was fully stabilized and the gyros were again turned on. Fifteen minutes later the RAF technicians resumed control of the vehicle.

#### **DoD to Cut Major Sites**

The Pentagon decided in March to end or reduce operations at twenty-nine new sites overseas under the current plan to reduce the number of US troops worldwide. Since January 1990, the US has reduced its overseas sites by forty-two percent, or 704 installations.

The tenth round of overseas site reductions hit a total of fourteen installations in Germany, eight in Greece, four in the Netherlands, two in the United Kingdom, and one in Okinawa.

The realignment will affect more than 2,200 service members, 150 US civilians, and 650 local nationals. Since 1990, the Department of Defense has eliminated 181,534 authorized overseas positions. It is considering closures or reductions at thirty-two additional sites.

#### **Early Retirement Program Begins**

The Pentagon said in March that the services began early retirement programs for selected active-duty members with more than fifteen but fewer than twenty years of service.



*Gen. Henry Viccellio, Jr., commander of Air Training Command, furls the 82d Flying Training Wing's flag during inactivation ceremonies at Williams AFB, Ariz., in March. Col. Roger Alexander, the wing's last commander, and SMSgt. Wanda Kennedy, Senior Enlisted Advisor, assist the General.*

The program is part of President Clinton's defense conversion initiative designed to help service members make the transition from military to civilian life.

The action helps prevent involuntary separations that would result from the military drawdown. The early retirement program is not an entitlement. Congress granted the authority in the Fiscal 1993 Defense Authorization Act. This authority will expire October 1, 1995.

Regulations and policies will be set by the service secretaries. Those members nearest twenty years of service will be offered the program first. Those members who take early retirement will be offered the same benefits available to twenty-year veterans.

#### **Airman Receives Belated DFC**

A veteran airman received the Distinguished Flying Cross in March for actions that took place nearly half a century ago.

TSgt. Charles E. Cowan, a member of the 1st Bombardment Division, flew on twenty-five missions over occupied Europe in World War II. On January 11, 1944, Sergeant Cowan and his unit led elements of Eighth Air Force on a bombing mission over Berlin to attack major aircraft factories.

*Little Brat*, the B-17 to which Sergeant Cowan was assigned as an engineer and top turret gunner, rendezvoused with elements of Eighth Air Force over Germany en route to Berlin. Bad weather settled in and kept a majority of the mission's P-38

and P-51 fighter escorts from providing support.

Taking advantage of the undefended bombers, German fighters attacked.

"One time—I'll never forget this—one came in fast and I opened fire on him," Sergeant Cowan recalled. "I'm sure I got him because smoke started streaming from out of the fuselage. But a split-second later, he smashed into our left wingman. There was an incredible explosion, and they both went down in flames."

The division claimed 210 enemy aircraft, the largest single-mission kill total ever claimed by a division of the Eighth. Another forty-three were reported to be probable kills and eighty-four damaged. The Americans lost 400 airmen.

The mission was successful and the unit's heroism was honored with the DFC in the summer of 1944. However, Sergeant Cowan wasn't there to receive it. He had just completed his twenty-five-mission tour of duty and was separated from Army Air Forces. At the time, USAAF had run out of the medals and couldn't provide him with one. He later tried several times to get the medal but to no avail.

However, in 1992, his son-in-law, Army Lt. Col. Erick R. Fabrizio, looked into how Mr. Cowan could receive his medal. Seven months later, Mr. Cowan finally received the honor he had earned nearly fifty years ago.

#### **Reserve Components Get Assistance**

The Pentagon initiated transition assistance for National Guardsmen

and Reservists. The following assistance is provided:

- Separation pay. From October 1992 through September 1995, a member of the Selected Reserve who is involuntarily discharged or transferred from the Reserve and who has between six and fifteen years of service will be eligible for separation pay.

- Early qualification for retired pay. From October 1992 through September 1995, any enlisted member of the Selected Reserve who has completed fifteen qualifying years of service but fewer than twenty and is involuntarily separated will be eligible for retired pay at age sixty.

- Special separation pay. Any enlisted member of the Selected Reserve who has qualified for retirement on reaching age sixty, but who is not yet sixty and is involuntarily separated, will qualify for special separation pay.

- Priority placement. Members of the Selected Reserve whose units or billets are inactivated will be given priority for affiliation in other Selected Reserve units or billets.

- Montgomery GI Bill benefits. A member of the Selected Reserve who has received a notice of eligibility for Montgomery GI Bill benefits and who is involuntarily separated from the Selected Reserve will remain eligible for educational assistance for ten years, beginning on the date of initial eligibility.

- Commissary and exchange privileges. A member of the Selected Re-

serve who is involuntarily discharged or transferred will be granted continued use of commissary and exchange stores under the Selected Reserve program for two years from the date of separation.

#### McPeak Sets Sights on Space

The United States should attempt to achieve the economies that would flow from consolidation of US space assets under Air Force control and to expand the Space Applications and Warfare Center into a joint agency that would include all services.

So declared General McPeak in an April speech to the Ninth Space Symposium at Colorado Springs, Colo.

"It can be argued that to put all the space business in the Air Force would mean that other services and combatant CINCs would lose touch with space and would subsequently be poorly positioned to work their own space requirements, training, and applications," General McPeak said. "But, if we set our mind to it, there is no reason to think we can't achieve the economies that would spring from consolidation and even stronger service and CINC participation in the process."

General McPeak said members of the joint agency could in crisis or war join joint and component staffs, bringing with them their expertise.

General McPeak also declared that many nations have or soon will have the capability to place remote sensing units in space, which will permit them

to discern US force movements and hinder US ability to act decisively in a crisis. This problem, he said, creates a need for further development of antisatellite systems.

"Suffice it to say that ASAT, the endgame interceptor, is only one of a much larger set of tools we need to develop to help control the space environment," General McPeak said. "We simply must find a way to get on with construction of capabilities aimed at ensuring that no nation can deny us our hard-won space superiority."

#### AETC Changes Instructor Policies

Air Education and Training Command (AETC) plans to change the source of its flight-training instructors. It is to rely more on pilots with operational experience than on first assignment instructor pilots (FAIPs) skimmed from the top of graduating classes.

So said Gen. Henry Viccellio, Jr., commander of Air Training Command, who is set to become AETC commander when it activates July 1. In the past, ATC sought pilots from the top of their graduating classes to teach the "ATC way."

"In contrast, today and tomorrow we'll want operational experience to teach students in a way that will help them excel once they leave training, and we'll help [future instructor pilots] apply their experience to do just that," General Viccellio said. "Our new specialized undergraduate pilot training syllabus projects the basis of an operational culture, and we need ops experience to translate our new programs into reality."

The command previously sought instructor pilots from operational units, staffs, professional military education, and undergraduate pilot training. Once qualified as instructor pilots, they did tours of three years at a UPT base. The service will no longer allow FAIPs.

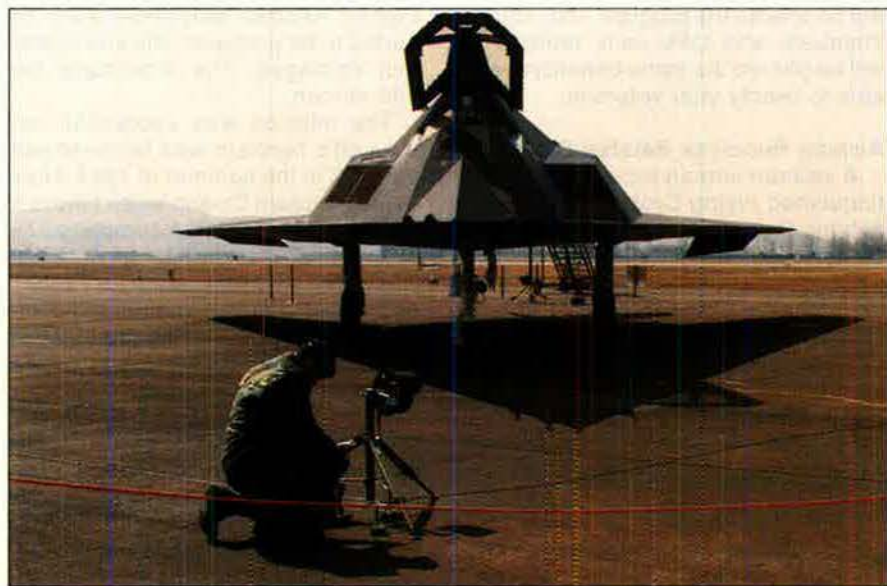
#### Sergeant Named Top Male ATC Athlete

A medical services specialist at Keesler Medical Center, Keesler AFB, Miss., was named Air Training Command's male athlete of the year in March.

Sgt. Robert Parham, a fourth-degree black belt in karate, is top-ranked nationally in adult middleweight sparring by Sport Karate International. The sergeant earned the ranking by winning the World Amateur Internationals in December in Atlantic City, N. J.

#### AFSCs to Change

All officer and enlisted Air Force Specialty Codes will change once the



**MSgt. Don Lowe deploys Tactical Automated Security Equipment around an F-117 Stealth fighter during the 1993 Team Spirit exercise in the Republic of Korea. This was the first major field test of the equipment, which can be deployed anywhere in the world and set up within hours.**



restructured classification system is implemented in late October.

The Air Force Military Personnel Center at Randolph AFB, Tex., said that the new classifications will better meet the needs of a restructured Air Force, while also realigning career fields that have become splintered over the years.

The center said that officer and enlisted specialty codes will share common first digits, depending on the function area. Those areas are:

- 1: Operations.
- 2: Logistics.
- 3: Support.
- 4: Medical.
- 5: Professional (chaplains and judge advocates).
- 6: Acquisition, financial management.
- 7: Office of special investigations.
- 8: Special duty identifiers.
- 9: Reporting identifiers.

Prefixes and suffixes will remain the same with the new system. However, new skill levels will be:

- 1: entry level.
- 2: intermediate level (copilots and missile launch officers only).
- 3: fully qualified.
- 4: staff Air Force Specialty Codes (above wing level).

Enlisted skill levels will remain the same.

#### McClellan Added to Closure List

The Defense Base Closure Commission has targeted a base that was not on the Pentagon's recent base-closure/realignment list.

In March the commission added McClellan AFB, Calif., to the tentative closing list, according to the Air Force. However, in mid-March, Defense Secretary Les Aspin recommended keeping McClellan open. The closure commission must accept or modify the Pentagon's plan by July 1 before forwarding its list to the President.

Closures originally recommended by Mr. Aspin avoided McClellan because of the negative economic impact of previously approved 1988 and 1991 closures and realignments on the area. As a result of the latest closures and realignments, California is the hardest-hit state. It could potentially lose ten bases and almost 32,000 military and civilian jobs.

The Pentagon has listed thirty-one major bases for closure and an additional twelve for realignment. At the time of the recent closure and realignment proposal, Mr. Aspin said, "I believe that the cumulative economic impact of the 1988, 1991, and 1993 actions on the Sacramento area would be too great if McClellan AFB and the



*The troops who served in Operation Restore Hope in Somalia received a presidential welcome from Bill Clinton when they returned to the US in May. President Clinton also presented the Defense Distinguished Service Medal to Task Force Commander Lt. Gen. Robert B. Johnston, USMC.*

related Defense Logistics Agency distribution depot were not removed from the list of recommendations proposed by the military departments and defense agencies."

The commission is fully within its rights to add to the current list of closures and realignments.

#### Funds Set Aside for Homestead

The Department of Defense set aside \$76 million for construction at Homestead AFB, Fla., to support future defense contingency requirements, the Pentagon said in March.

The action is consistent with the base-closure criteria and threat assessment. Homestead was gravely damaged by Hurricane Andrew, which almost razed the base last year. The base has been recommended for closure by the Pentagon.

The decision to provide construction money for the base was made following preliminary discussions with community representatives from the Homestead area. Secretary Aspin also directed the Department's Office of Economic Adjustment to initiate a program to assist the community in developing a base reuse-and-conversion plan.

#### Aspin Initiates Outreach Program

Defense Secretary Les Aspin initiated the private-sector outreach program, an effort to spur economic growth through technological innovation.

Mr. Aspin said, "The President's program builds on the past success of the Defense Advanced Research Projects Agency to make it a national

resource in the effort to revitalize our economy."

Under the Technology Reinvestment Program, about \$500 million in Fiscal 1993 funds are made available. Companies interested in participating in the effort are invited to call (800) 382-5873 to receive detailed information.

DoD said that the Technology Reinvestment Program is intended to stimulate the transition to a growing, integrated, national industrial capability that provides the most advanced, affordable military systems and competitive commercial products.

#### US Must Face Four Dangers

In a March speech to the National Defense University in Washington, D. C., Defense Secretary Aspin said the number one threat to US security would be regional, ethnic, or religious conflict. He said that this danger does not put the existence of the US at risk but could have an impact on America's vital interests.

What must be determined, said the Secretary, is how many regional threats the US can confront with its military force. This question, while still unanswered, according to Mr. Aspin, will ultimately decide the size of the US military establishment.

The second danger Mr. Aspin cited is the nuclear threat, which still exists in Russia while other nations gain the technology to make nuclear missiles.

The third major danger, as seen by the Department of Defense, arises from the possible failure of reform in the former Soviet Union, which could

bring a new era of dictatorship or totalitarianism.

The fourth lies in the US economy. If it fails to perform as it should, national security will be compromised. Secretary Aspin said the Pentagon has a specific role to play in defense industrial conversion and reinvestment.

### Space Station to be Redesigned

NASA outlined three budget options for the redesign of the Space Station program. The options will be used as guidelines by the Advisory Committee on the Redesign of the Space Station.

The options, introduced by John H. Gibbons, director of the Office of Science and Technology Policy, are based on top-line dollar figures. The low option is \$5 billion, the midrange option is \$7 billion, and the high option would be \$9 billion. All three will be considered by the committee.

Each option would cover the total expenditure for the space station from Fiscal 1994 through Fiscal 1998 and would include funds for development, operations, utilization, shuttle integration, facilities, research operations support, and transition cost and must include adequate program reserves to ensure program implementation within available funds.

Station options above \$7 billion must be accompanied by offsetting reductions in the rest of the NASA budget. "For example, a space station option of \$9 billion would require \$2 billion in offsets from the NASA budget over the next five years," NASA said.

### News Notes

■ Loral Corp. announced in March the formation of a new missiles group that includes Loral Vought Systems and Loral Aeronutronic. Dr. Felix Fenster, former president of Loral Vought Systems, has been promoted to group vice president of Loral Corp. and will run the new missiles group.

■ The Aerospace Industries Association said that aerospace manufacturers cut 130,000 jobs in 1992, or eleven percent of the total, dropping the overall count to 1.05 million. Employers predicted that job losses would continue in 1993, but at a slightly slower rate.

■ In March, the Navy established the Naval Doctrine Command, which will define the new direction of the Navy and Marine Corps. The organization will build doctrine for expeditionary warfare, in light of the Navy's new strategy paper, "From the Sea."

■ An improved version of the Navy Standoff Land-Attack Missile success-

fully completed operational testing and was made available to the fleet in March, McDonnell Douglas said. The new system allows the missile to be launched from higher altitudes. The system uses new software, which incorporates a feature called "energy management guidance." The system increases the allowable altitude and ambient temperature envelope for greater tactical flexibility in SLAM flights.

■ The US aerospace industry posted a positive trade balance of \$31.4 billion in 1992, marking a two percent increase over the record \$30.8 billion net surplus of 1991, according to the Aerospace Industries Association.

■ The Bell Eagle Eye unmanned aerial vehicle completed its first ground run in March. The tiltrotor aircraft completed numerous tests during the ground run, including conversion to and from vertical to horizontal nacelle angle at 100 percent RPMs. The system is expected to provide basic flight

performance, handling qualities, and supportability proof-of-concept data.

■ Air Combat Command on April 1 realigned three detachments: Det. 1, 458th Airlift Squadron from Offutt AFB, Neb.; Det. 1, 547th AS, Langley AFB, Va.; and Det. 3, 458th AS, Barksdale AFB, La. The units will become Det. 1, 1st Operations Group at Langley; Det. 1, 55th Operations Group at Offutt; and Det. 3, 2d Operations Group at Barksdale. The move will affect twenty C-21 aircraft and seventy personnel.

■ A final program review was completed on the Air Force's first Milstar military communications satellite in late March, the last hurdle before first launch. Lockheed is the prime contractor of the Milstar satellite, which is designed to provide worldwide, jam-resistant, survivable command-and-control communications.

■ The Air Force Junior ROTC is planning to activate 100 new units this fall and needs retired Air Force officers and NCOs to fill numerous

## Senior Staff Changes

**RETIREMENTS:** B/G Harold H. Rhoden, B/G Michael G. Vergamini.

**PROMOTIONS:** To be Lieutenant General: John S. Fairfield, Michael E. Ryan, Dale W. Thompson, Jr.

**CHANGES:** B/G Allen D. Bunker, from Dir., Budget Ops., OSAF, Washington, D. C., to Dep. Ass't Sec'y for Budget, OSAF, Washington, D. C., replacing M/G Robert F. Swarts . . . Col. (B/G selectee) Thomas R. Case, from IG, Hq. PACAF, Hickam AFB, Hawaii, to Cmdr., 3d Wing, PACAF, Elmendorf AFB, Alaska, replacing Col. Rodney P. Kelly . . . M/G (L/G selectee) John S. Fairfield, from Cmdr., AFCC, Scott AFB, Ill., to Vice CINC, Hq. PACAF, Hickam AFB, Hawaii, replacing L/G Malcolm B. Armstrong . . . B/G Dwight M. Kealoha, from Cmdr., 375th AW, AMC, Scott AFB, Ill., to Cmdr., 15th ABW, Hq. PACAF, Hickam AFB, Hawaii, replacing Col. William C. Van Meter . . . Col. (B/G selectee) Thomas J. Keck, from Dep. Dir., Plans and Policy, Hq. ACC, Langley AFB, Va., to Cmdr., 55th Wing, ACC, Offutt AFB, Neb., replacing Col. William G. Manire . . . B/G (M/G selectee) Lester L. Lyles, from Vice Cmdr., Ogden ALC, AFMC, Hill AFB, Utah, to Cmdr., Ogden ALC, AFMC, Hill AFB, Utah, replacing M/G (L/G selectee) Dale W. Thompson, Jr. . . . B/G John M. McBroom, from Dep. Dir., Ops., NMCC, J-3, Jt. Staff, Washington, D. C., to Cmdr., USAF Recruiting Service, ATC, and Dir., Recruiting Service and Commissioning Prgrams., Hq. ATC, Randolph AFB, Tex., replacing retired B/G Michael G. Vergamini . . . B/G George W. Norwood, from Dep. IG, Hq. USAF, Washington D. C., to Cmdr., 432d FW, PACAF, Misawa AB, Japan, replacing Col. Burr L. Crittenden.

Col. (B/G selectee) Charles H. Perez, from Dir., Commodities, Ogden ALC, AFMC, Hill AFB, Utah, to Vice Cmdr., Ogden ALC, AFMC, Hill AFB, Utah, replacing B/G (M/G selectee) Lester L. Lyles . . . M/G Everett H. Pratt, Jr., from Dir., P&R, Hq. ATC, Randolph AFB, Tex., to Cmdr., Provisional FTW, Hq. Air Education and Training Command, Randolph AFB, Tex. . . . M/G Glenn A. Proffitt II, from Dir., Manpower and Org., Hq. USAF, Washington, D. C., to Dir., P&R, Hq. ATC, Randolph AFB, Tex., replacing M/G Everett H. Pratt, Jr. . . . M/G (L/G selectee) Michael E. Ryan, from Vice Dir., Strategic Plans and Policy, J-5, Jt. Staff, Washington, D. C., to Ass't to the Chairman, JCS, Washington, D. C. . . . M/G Robert F. Swarts, from Dep. Ass't Sec'y for Budget, OSAF, Washington, D. C., to Cmdr., AAFES, Dallas, Tex. . . . M/G (L/G selectee) Dale W. Thompson, Jr., from Cmdr., Ogden ALC, AFMC, Hill AFB, Utah, to Vice Cmdr., Hq. AFMC, Wright-Patterson AFB, Ohio . . . Col. (B/G selectee) Buford R. Witt, from Asst. Dep. Dir., Unified and Specified Cmd. C<sup>4</sup> Support, J-6, Jt. Staff, Washington, D. C., to Dir., Plans and Policy, DCS/C<sup>4</sup>, Hq. USAF, Washington, D. C., replacing B/G Bruce J. Bonn.

**AFRES CHANGES:** M/G Robert A. McIntosh, from Vice Cmdr., Hq. AFRES, Robins AFB, Ga., to Cmdr., 14th Air Force, Dobbins ARB, Ga., replacing B/G Wallace W. Whaley . . . M/G James E. Sherrard III, from Cmdr., 4th Air Force, AFRES, McClellan AFB, Calif., to Vice Cmdr., Hq. AFRES, Robins AFB, Ga., replacing M/G Robert A. McIntosh . . . B/G Wallace W. Whaley, from Cmdr., 14th Air Force, AFRES, Dobbins ARB, Ga., to Cmdr., 4th Air Force, McClellan AFB, Calif., replacing M/G James E. Sherrard III.

**SENIOR EXECUTIVE SERVICE (SES) CHANGES:** Samuel L. Croucher, from Dep. Dir., Contracting, ASC, Hq. AFMC, Wright-Patterson AFB, Ohio, to Dir., Contracting, Warner Robins ALC, AFMC, Robins AFB, Ga., replacing Stephen L. Davis . . . Stephen L. Davis, from Dir., Contracting, Warner Robins ALC, AFMC, Robins AFB, Ga., to Dep. Dir., Contracting, Hq. AFMC, Wright-Patterson AFB, Ohio, replacing Richard F. Schomper. ■



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teaching positions nationwide, the Air Force said in March. Applicants must have completed twenty years of active duty and have been retired fewer than four years. For more information contact Headquarters AFROTC, Instructor Management Branch, 551 East Maxwell Blvd., Maxwell AFB, AL 36112-6106.

■ NASA's Langley Research Center, Hampton, Va., will lead a multiyear research program to develop technology for a future high-speed civil transport, NASA said in March. The effort would provide a foundation that aerospace companies can use to make business decisions about future supersonic transport aircraft and engine development programs.

■ The Air Force's AGM-130 stand-off weapon system successfully completed its third production verification flight test, Rockwell International Corp. said in March. The weapon was launched from an F-111F aircraft at 490 knots true air speed and 13.5 nautical miles from the simulated command-and-control center. After launch, the weapon's flight profile was controlled by an F-15E, which guided it via data link to a direct hit.

■ Saudi Arabia and the Air Force have signed an agreement to purchase 154 Pratt & Whitney F100-PW-229 engines to power that country's new fleet of seventy-two F-15 aircraft, Pratt said in March. The potential value of the contract is \$600 million.

■ Maj. Russ Hodgkins, 429th Electronic Combat Squadron, 366th Wing, at Mountain Home AFB, Idaho, became the first aircrew member to pass 2,000 flying hours in the EF-111 Raven,



*Col. Richard Meeboer preflights the first USAF F-111E to pass 6,000 hours of flying time. The RAF Upper Heyford, UK, fighter first flew in 1968 and passed the milestone last April. Colonel Meeboer has accumulated 2,000 hours in the F-111, unofficially known as the "Aardvark."*

the service said in March. Major Hodgkins began flying the EF-111 in September 1985.

■ Air Force Academy Cadets 2d Class John Carr and Dean Cook earned \$30,000 National Merit Scholarships from the Harry S. Truman Scholarship Foundation in March. They were recognized for outstanding leadership potential, academic achievement, and commitment to public service careers.

■ The 21st Space Wing became the first wing in Air Force Space Command to get an operational flying unit

when the 774th Airlift Flight was activated in April, the Air Force said. The flight has six C-21A Learjets, used primarily for training new pilots for transition to major weapon systems and providing operational support airlift to DoD military and civilian personnel.

■ Maj. Gen. Kenneth A. Minitan succeeded Maj. Gen. Gary W. O'Shaughnessy as commander of Air Force Intelligence Command in May when General O'Shaughnessy retired. General Minitan had been director of Plans and Requirements, assistant chief of staff for Intelligence, in the Pentagon.

**Purchases**

The Air Force awarded McDonnell Douglas a \$340 million face-value increase to a firm fixed-price contract that provides for definitization of a previously issued contract for procurement of nine F-15E aircraft and related support. Expected completion: November 1995.

The Air Force awarded General Electric Co. a \$50.8 million face-value increase to a firm fixed-price contract for twelve F110-GE-129 Increased Performance Engines for use in F-16 aircraft. Expected completion: July 1994.

The Air Force awarded McDonnell Douglas Aerospace Co. a \$9 million face-value increase to a firm fixed-price contract for advanced buy/long-lead funding of initial spares, components, parts, and materials to support the production of seventy-two F-15S (XP) aircraft. Expected completion: May 1993. ■

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**Air Combat Command is fast becoming the clutch hitter of the US global power lineup.**

# Expeditionary Force

By James W. Canan, Senior Editor

**T**HE AIR Force did something unusual with B-1s last March. It sent a pair of the bombers from Ellsworth AFB, S. D., via Guam, to the Republic of Korea, where they set down on an American air base within easy striking distance of a hostile neighboring nation.

The faraway, in-your-face deployment of the B-1s was part of Exercise Team Spirit, a muscular US/ROK combined-arms military exercise involving Air Force units from Pacific Air Forces (PACAF) and Air Combat Command (ACC). Among other things, it demonstrated to North Korea, now likely a nuclear threat, just how diverse and deadly US airpower has become.

By using B-1s in the exercise, including a third bomber from Ellsworth operating out of Guam, the Air Force underlined a message delivered with a bang in the Persian Gulf War—that bombers armed with nonnuclear bombs and based in the continental United States are now big guns in US global power.

Air Combat Command, which contributed five squadrons of combat aircraft to Team Spirit, owns and operates those bombers along with all other

types of Air Force CONUS-based fixed-wing combat aircraft. As the Air Force pulls back from overseas, its theater responsibilities rest ever more heavily with ACC. This makes ACC unique among major commands past and present, a CONUS composite strike force with integrated airpower and a mandate that covers the globe.

“We are a truly expeditionary force,” asserts Gen. John Michael Loh, ACC commander. “We are learning how to operate relatively independent of large in-place forces [overseas]. Those forces aren’t there any more.” Before long, he says, “nine-tenths of all [Air Force] combat power will be based in the United States. We don’t fully appreciate what that means. We’re just beginning to understand it.”

## Expeditionary in Nature

ACC’s abundant overseas and off-shore operations are evidence of the command’s expeditionary nature. ACC units are, or have been, engaged in a half-dozen or more contingency actions around the world. These “are making demands on our forces that were not anticipated” in the aftermath of the cold war, says General Loh. “We’re having to pick up more and

*ACC deployed B-1 bombers to South Korea in a muscular combined-arms exercise that showed how diverse and deadly US airpower has become. Nonnuclear bombers have starring roles in ACC’s preparations for operating overseas in “a truly expeditionary force.”*

Photo by Randy Jelly / Arms Communications





**Integrated airpower, exemplified by this formation of disparate fighters over the Persian Gulf, is the essence of ACC. SAC and TAC numbered air forces inherited by ACC are being reorganized to blend bombers and fighters in each.**

more of those commitments because USAFE [US Air Forces in Europe] is drawing down.”

A prime example is ACC’s increasing involvement in Operation Provide Comfort, the US deployment to Turkey and northern Iraq for relief of the Kurds. At one time, ACC provided only E-3 Airborne Warning and Control System (AWACS) planes. Now it also provides RC-135 Rivet Joint electronic intelligence aircraft, F-4G “Wild Weasels,” and F-111 deep-attack aircraft, with more likely to come.

ACC came into being at Langley AFB, Va., on June 1, 1992, as a merger of Tactical Air Command and almost all of Strategic Air Command, both of which went out of existence. It has come a long way—“it seems like ten years in one year,” says one ACC officer—in blending SAC’s global perspective with TAC’s theater perspective and in integrating strategic and tactical airpower to mold a highly flexible, versatile fighting force.

ACC quickly emerged as the clutch hitter in the US global power lineup. General Loh, who formerly commanded TAC, declares that “our whole concept of home-based forces is a lot different from what it used to be.” In the past, he says, CONUS commands, including TAC, “usually augmented the very large in-place forces of our [theater] unified commands.” Nowadays, he says, the CONUS commands, such as ACC, form “the backbone of

the force structures of *all* our overseas commands, including European Command and Pacific Command.”

As a result, says General Loh, ACC, unlike TAC before it, is “*the* [US] combat airpower command,” having “absorbed all the functions that TAC and SAC excelled at and taken them to higher levels of competence. . . . When a joint-force commander wants to perform those functions, he calls on us. They are our mission. . . . They represent the totality of what we do.”

The ACC commander notes that the Air Force “will have more airpower in the Pacific than in Europe within three years” and that “both [European and Pacific] theater air components will be small, very small.”

This year, ACC is expected to surpass USAFE and PACAF combined in numbers of fixed-wing combat aircraft of all sorts. By ACC’s reckoning, it will own 1,085 fighters, attack aircraft, and bombers, whereas USAFE and PACAF each will own about 270 fighters and attack planes. ACC will also own about 400 combat support aircraft, including about fifty helicopters, compared to almost none for USAFE and PACAF. In addition, Air National Guard and Air Force Reserve units assigned to ACC operate approximately 1,300 aircraft, giving the command a grand total approaching 3,000 planes.

The shift to a US power base is a drastic departure from the cold war era, during which the Air Force sta-

tioned more combat units in overseas theaters than in CONUS. The turn-about means, among other things, that ACC “ought to engage in all the joint-forces training we can get in order to support those [theater] CINCs, because they’re not going to have enough force structure,” says General Loh.

### Bombers “Everywhere”

Bombers loom large in such training; witness Exercise Team Spirit. “I want to see them everywhere,” General Loh declares. “I want B-1s and B-52s as conventional [weapons] platforms in every exercise we do overseas. Routinely.”

Resistance seemed to run higher in SAC than in TAC to Air Force plans, first announced in the autumn of 1991, to disband the two traditional commands and mix bombers with fighters, along with ICBMs, in a new command enfolding all “shooters” and supporting casts. SAC skeptics suspected that bombers slated to lose their signature strategic nuclear mission would take a back seat in ACC and that the new command would be run by and for fighter pilots.

It now appears that such misgivings were off the mark. Bomber outfits seem pleased with their lot in ACC. Relationships between bomber units and fighter units seem more mutually respectful than resentful.

General Loh acknowledges that many SAC and TAC loyalists “felt threatened” by their absorption in the new ACC. “Some of the former SAC folks and some of the former TAC folks are still upset,” he says. “That’s good. That means we’re making progress, we’re maturing. We’re getting better at developing our own style and culture out of the SAC and TAC styles and cultures.” On the whole, the bomber and fighter communities “have come together very well,” he claims.

ACC may be more to the liking of bomber partisans than of fighter partisans. “The bomber community is excited about its mission, about participating in the planning of composite-force exercises and operations. It’s a new dimension for bombers, and they’re doing very well at it,” the ACC commander says.

TAC holdovers, on the other hand, seem to have found it harder to adjust. ACC fighter units are forced to wrestle with complicated, relatively mundane logistical considerations that never much concerned such units in TAC.



"The former TAC folks have to change their mindset more than the former SAC folks," General Loh explains. "They were used to being sent into theaters where there was already an infrastructure—deploying F-15s and F-16s, for example, to places that already had F-15 and F-16 squadrons. They were accustomed to being dependent on in-place [theater] forces. Now they have to consider what they need to take with them to operate effectively when they arrive, because those forces won't be there."

"I've invested a lot of time and effort in trying to explain the difference [between past and present]—now having to deploy everything associated with operations and maintenance, and with having the bomber as the backbone of much of our capability."

### The Bomber Two-Ship

The manner in which ACC deployed B-1s to Exercise Team Spirit signifies the changing role of heavy bombers. The original plan was to send a single B-1 to Korea, in keeping with the long-standing practice of strategic bombers going it alone. General Loh had other ideas. He recalls telling his planners, "We won't go single-ship, we'll go two-ship."

Two-ship formation is how fighters, not bombers, normally fly. Indeed, the B-1 looks more and more like a fighter in the eyes of a growing number of ACC beholders, some of whom have begun referring to it as the "FB-1."



Staff photo by Guy Acelo

*Swift, highly maneuverable B-1s, such as these from the 319th Bomb Wing at Grand Forks AFB, N. D., look more and more like fighters in the eyes of a growing number of ACC beholders—some of whom have dubbed the plane the "FB-1."*

"That's fine with me," declares General Loh. "I don't mind calling it the FB-1. Why not?" He claims that the swingwing B-1 performs at least as much like a fighter as does the swingwing F-111, which was conceived a quarter-century ago as a dual-role fighter-bomber but was never used in the fighter role. "B-1s are a lot like F-111s except they go five times as far and can carry eight times more precision ordnance," says General Loh.

Given its speed and superior handling qualities, the B-1 can keep up

with fighters in composite-force strike packages. Referred to at ACC as a "deep interdictor," the B-1 can also "do lots of things at low altitude," notes an ACC operations officer. These are the big reasons why ACC plans to replace B-52Gs with B-1s in its composite 366th Wing—a prototype "air intervention wing" containing various types of aircraft—at Mountain Home AFB, Idaho, by 1995 [see "Gunfighter Country," *October 1992*, p. 24].

Not that the 366th's B-52Gs are slouches. They carry huge loads of gravity bombs, are armed with Have Nap precision standoff missiles, and coordinate effectively with the wing's fighter and attack aircraft. But they are old and headed for retirement.

Meanwhile, there are big plans to equip B-1s, notably those earmarked for the air intervention wing, with precision guided munitions. The Air Force, Navy, and Army are jointly developing three types of PGMs—the Joint Direct Attack Munition (JDAM), a missile with a 2,000-lb. warhead; the Joint Standoff Weapon (JSOW), a glide bomb with antiarmor cluster submunitions; and the Triservice Standoff Attack Missile (TSSAM), a stealthy cruise missile with a range of more than 100 nautical miles.

ACC's bombers, including the B-2 stealth aircraft, will carry combinations of all these PGMs on nonnuclear missions. Once the B-2s become operational, ACC will use them strictly as penetrating bombers. B-1s will be



Photo © Geoffrey Pearce

*At Pope AFB, N. C., the 23d Wing comprises former TAC A-10s and former MAC C-130s, including these on the ramp. It supports the Army's 82d Airborne Division at Fort Bragg, N. C., and would be ACC's lead element in an air-land operation.*

employed as penetrators or as standoff platforms. The Air Force plans to retain forty-seven B-52H bombers modified for both nuclear and conventional capability, together with forty-one B-52Gs with a nuclear-only mission.

### Buy More Bombers?

ACC has big plans for bomber modernization that go beyond B-1 upgrades already in the works. "We're coming up with a smart bomber acquisition strategy," says General Loh. "I don't want to quit buying bombers forever and stick with what we have now. We have to find a way to buy more bombers to replace our older B-52s."

The ACC commander contends that the Air Force may find it necessary to buy, and could well end up buying, "more B-2s" than the twenty the Pentagon and Congress settled on last year. He intends to unveil ACC's proposals for future bomber procurement at an Air Force leadership Corona meeting later this month. They will be part of ACC's "combat forces roadmap," in which the command will also set forth its plans for new fighters, including a joint-service and export multirole fighter, General Loh explains.

It is increasingly difficult to typecast aircraft in this new age of integrated airpower and multirole responsibilities, when bombers act like fighters and the other way around. Some ACC officers have taken to calling their stealthy F-117 the "B-117," and their dual-role F-15E the "B-

15E," given that the main mission of both planes is deep interdiction.

No matter what they are called, all ACC warplanes come under the control of the command's numbered air forces, its vital organs of operation. From SAC, ACC inherited 2d Air Force at Beale AFB, Calif., whose specialty is strategic reconnaissance; 8th Air Force at Barksdale AFB, La., with bombers; and 20th Air Force at Vandenberg AFB, Calif., with ICBMs. From TAC came 9th Air Force at Shaw AFB, S. C., and 12th Air Force at Bergstrom AFB, Tex., both with fighter, attack, and combat support aircraft. Also from TAC came 1st Air Force at Tyndall AFB, Fla., which would support NORAD with its air-defense units if the need arose.

ACC will soon lose 20th Air Force to Air Force Space Command, which launches satellites and knows its way around big booster rockets. AFSPACECOM is earmarked for inclusion, sooner or later, in US Strategic Command.

"We were doing well at integrating the ICBMs in Air Combat Command," says General Loh, "but if they belong better in Air Force Space Command, so be it, that's fine." He sees 20th Air Force as "a natural" in the role of USSTRATCOM's missile component command, should it come about. "20th Air Force is a good outfit," he says. "Maybe it will impart some of our [ACC] culture to Air Force Space Command. If it can do that, then we'll be a better Air Force because of it."

Fighter and bomber numbered air forces stay put but are changing character. ACC is reorganizing them to integrate their airpower more thoroughly. "I want to end up with three relatively homogeneous numbered air forces—the 8th, 9th, and 12th," General Loh explains. "Each will be a composite, general-purpose numbered air force with virtually all of the different kinds of aircraft we have in Air Combat Command."

They will not look exactly alike in the end. The "8th will have a preponderance of bombers, 9th and 12th a preponderance of fighters, and that's because of their locations," the ACC commander explains. The "8th will gain a lot of Air National Guard and Air Force Reserve squadrons and will be responsible for the oversight and evaluation of those units."

### New Atlantic Command

As in Operation Desert Storm, 9th Air Force will remain the air component of US Central Command. The 12th will remain the air component of US Southern Command but will no longer be the air component of US Atlantic Command (LANTCOM), which is slated for a new look and an expanded role.

LANTCOM has long been a Navy/Marine Corps maritime command with a multiservice joint task force headquartered at Norfolk, Va., and with a CINC drawn exclusively from the Navy. It is being transformed into a broader-gauged unified command on-call to the national command authorities for global deployment and operations. It enfoldes the Navy's Atlantic Fleet, the Marine Corps' Marine Forces Atlantic (MARFORLANT), and all CONUS-based combat forces now under the Army's Forces Command (FORSCOM) and the Air Force's Air Combat Command.

Those outfits will train together to fight together as an expeditionary force, which is right down ACC's alley. A new name was in store for the remodeled USLANTCOM at its creation last March, one that would reflect its CONUS character and unified makeup. General Loh had suggested "US Forces Command, because that's what it is; it contains all forces stationed in the United States."

ACC takes on added dimension in the remodeled Atlantic Command. Unlike TAC before it, ACC becomes the air component of a US unified

Photo by Randy Jolly / Arms Communications



*This F-15E (or "B-15E," as some would have it) belongs to ACC's 366th Wing—an "air intervention" wing of variegated aircraft that "would be our leading element to deploy in a crisis," says Gen. John Michael Loh, ACC commander.*

command with an open-ended combat mission, one that will draw its successive CINCs from all the services, not just from the Navy.

Twelfth Air Force is now the air component of USLANTCOM's Joint Task Force. General Loh planned to replace 12th Air Force with 8th Air Force as the air component of the new US unified command. When all is said and done, "the commander of Air Combat Command is the air commander for the unified command" and has at his disposal in that capacity all the planes of all the ACC numbered air forces.

Last February, in a preview of things to come, ACC joined other LANTCOM commands in Fleetex 93-1, a seagoing exercise centered on the aircraft carrier USS *Theodore Roosevelt* and conceived as preparation for CONUS joint-forces deployment to Europe. The Navy put into effect its new "From the Sea" strategy, shifting its focus from cold war, open-ocean, "blue water" types of operations to regional operations on and around littorals. It removed far-ranging F-14 counterair fighters from the carrier to make room for a Marine Corps air-ground task force with F/A-18 attack fighters and 600 amphibious troops.

ACC landbased fighters filled the void. "Our F-15Cs provided air cover that would have been provided by the F-14s," General Loh explains.

There was more. B-52s, F-15Es, F-16Cs, and A-10s from ACC CONUS bases also took part in all facets of the air operation.

### Revolutionary Exercise

General Loh calls Fleetex 93-1 "fairly revolutionary—a prototype of the adaptive joint force packages that Admiral [Paul David] Miller [CINCLANT] and I have been planning and will be putting together. [Air Combat Command] can't do it all. We have to go 'joint' to be fully effective."

ACC will join CONUS combat components of the other services later this summer in another expeditionary exercise, this one centered on the carrier USS *America*. "We'll embark twice as many Marine and Army troops and replace more displaced carrier air with landbased air," General Loh explains. The exercise may incorporate F-117s and B-1s.

Exercises involving ACC wings and squadrons—as part of the new CONUS unified command or in concert with air units of overseas com-



Staff photo by Guy Aceto

*Under this emblem, ACC is blending SAC's bombers and global perspective with TAC's fighters and theater perspective—"developing our own style and culture out of the SAC and TAC styles and cultures," says General Loh.*

mands—will take place at the rate of nearly one per week through 1993. Fifty-one are scheduled. In addition, frequent workouts are in store for ACC units through the spectrum of Air Force "flag" exercises.

General Loh points out that ACC is "making all of our large-scale ranges and training exercises, such as Red Flag, Blue Flag, and Green Flag, available for putting together and training adaptive joint force packages" with air units of the other services.

The 366th Wing, which reached full strength less than a year ago, has begun getting involved in such exercises. General Loh takes note of a Green Flag command-and-control exercise last March in which the wing was, he says, "the star."

"The work we did in Green Flag—putting together a composite force package using the composite intervention wing—was absolutely remarkable," he declares. "It validated the concept of having a composite wing for air intervention." He says the 366th Wing is "going great. We'll declare it to have operational capability this fall." The wing will then undertake its first overseas deployment, likely to the Pacific.

ACC's other prototype composite wing, the less diversified 23d Wing at Pope AFB, N. C., supports the Army's 82d Airborne Division at nearby Fort Bragg, N. C., with its mix of A-10s and C-130s and is "coming along very, very well," says General Loh. "The 23d would be our leading element,

first to go, in an air-land operation. The 366th would be our leading element to deploy in a crisis."

There is a danger of ACC becoming all things to all people and overly committed amid the US overseas draw-down. General Loh acknowledges this, noting that "we may have to draw the line" at some stage. He also makes the point that Air National Guard and Air Force Reserve units cannot be expected to assume much of the burden, because of civilian jobs and family considerations. Those who believe that the Air Force should be able to cut its active-duty forces ever more sharply and rely more on Reserve and Guard units should take heed of this, he says.

"I'm concerned about the heavy demands that our high operating tempo is making on our active-duty forces," General Loh asserts. "We have a huge commitment in several places. We need to keep reminding our leaders—the Secretary of Defense, the Chairman [of the Joint Chiefs of Staff], everybody—that our active force does almost all of what we do [overseas], except for some of the counternarcotics work.

"The Guard and Reserve are good. I want to integrate them more into our exercises, but they can't handle long durations away from home. Our extended commitments are a major limitation of our ability to put [more of] our force structure into the Guard and Reserve. All I want is recognition of this . . . to retain the force structure of the active-duty Air Combat Command." ■

## A survey of surveys on the public's view of defense issues.

# Opinions

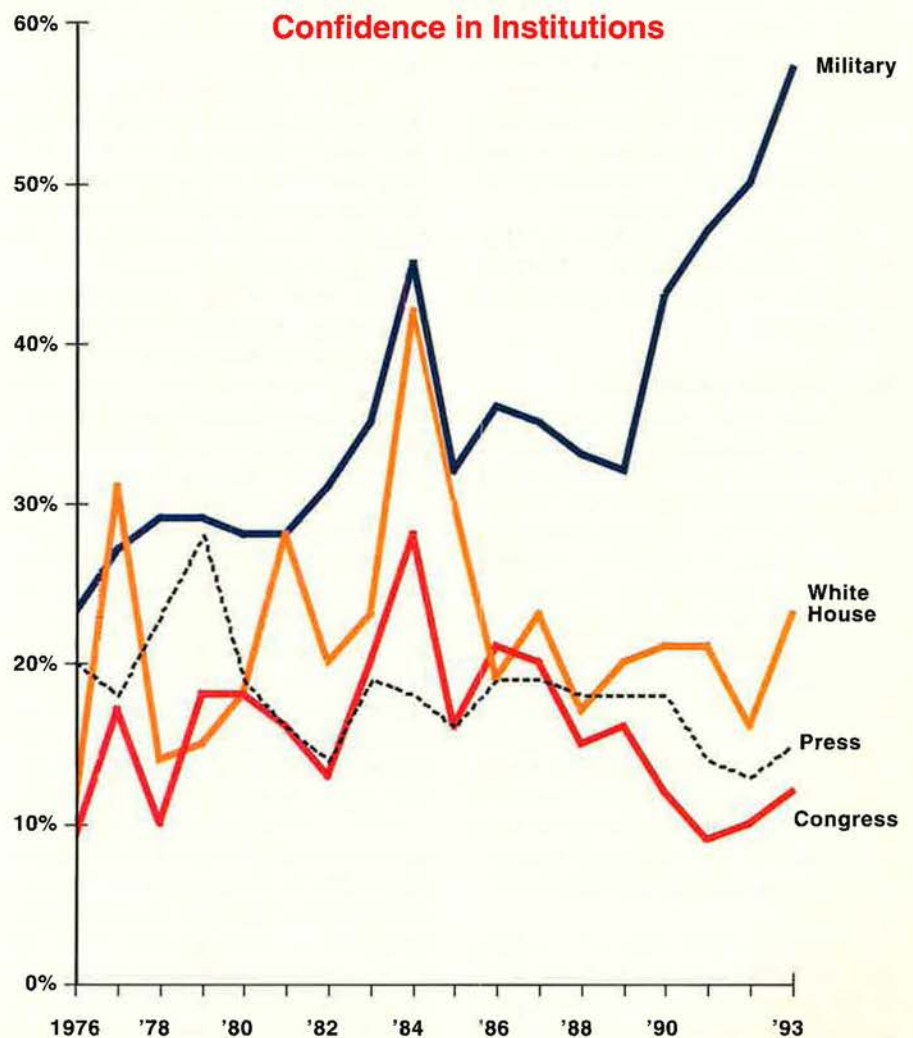
By John T. Correll, Editor in Chief

**P**UBLIC regard for the US armed forces stands at its highest in twenty-seven years, according to a nationwide Louis Harris poll released March 1. "Confidence in the military and the people who run it is up sharply since last year; it has risen every year since 1989," a Harris spokesman said. "No other major institution, profession, or interest group comes close."

Fifty-seven percent of those surveyed expressed high confidence in the armed forces. The institution held in lowest esteem was Congress, which got a "high confidence" vote of only twelve percent. (In a separate poll, eighty-two percent of adult Americans agreed that "the best way to ensure peace is through military strength.")

At the same time, however, a majority of the public says that Congress—in which it has virtually no confidence—should cut the defense budget. Such are the perplexities of the national mindset as measured by polls taken in the past six months or so.

Apparently, the public believes the US to be safe and strong enough. In a Gallup poll in January, eighty-seven percent said they were satisfied with the nation's military security. (Fifty-one percent of those polled in a different Gallup survey thought US forces could remove Iraqi dictator Saddam



Year	Military	Supreme Court	Educational Institutions	TV News	White House	Major Companies	Press	Congress
1976	23	22	31	28	11	16	20	9
1977	27	29	37	28	31	20	18	17
1978	29	29	41	35	14	22	23	10
1979	29	28	33	37	15	18	28	18
1980	28	27	36	29	18	16	19	18
1981	28	29	34	24	28	16	16	16
1982	31	25	30	24	20	18	14	13
1983	35	33	36	24	23	18	19	20
1984	45	35	40	28	42	19	18	28
1985	32	28	35	23	30	17	16	16
1986	36	32	34	27	19	16	19	21
1987	35	30	36	29	23	21	19	20
1988	33	32	34	28	17	19	18	15
1989	32	15	32	25	20	16	18	16
1990	43	32	35	27	21	14	18	12
1991	47	23	21	20	21	15	14	9
1992	50	30	25	22	16	11	13	10
1993	57	26	23	23	23	16	15	12

The Louis Harris poll has asked adult Americans annually since the 1960s whether they have "a great deal of confidence" in various institutions. The latest survey, released March 1, found confidence in the military to be at a twenty-seven-year high. As the chart at left shows, esteem for the armed forces exceeds that for the White House and the press—and public regard for Congress is embarrassingly low. Arrayed on the chart above are the percentages of the public expressing "a great deal of confidence" in eight American institutions over the past eighteen years.

Hussein without incurring substantial casualties in their own ranks.)

In eleven polls since October, only a fraction of the public—one to two percent—ranked defense among the leading issues facing the country. (The top three issues were health care, the federal deficit, and the economy.)

### Polls and Politics

Citizens complain that their opinions are ignored by the people who run the government. Nothing could be further from the truth. Political leaders follow the polls. So do bureaucrats and almost everybody else.

That doesn't mean that policy always follows public opinion, but the shift of a few points in the polls is often enough to make things happen. Polling and surveying have become massive enterprises, taking the public's pulse on everything from voting intentions to Elvis sightings and UFOs. (Forty-three percent of the populace believes Earth has been visited by extraterrestrial creatures, according to one survey.)

In addition to the big-name independents—Gallup, Louis Harris, and Roper—polls are conducted by the TV networks and metropolitan newspapers. Politicians and political parties maintain their own polling units. Academic, regional, and private business pollsters are also active.

Unfortunately, polls tell us what people believe, seldom what they know. Public opinion is not necessarily informed opinion (which doesn't mean it doesn't count).

Anecdotal evidence, for example, indicates that most people believe the defense share of the federal budget to be higher than it actually is (20.2 percent in 1993, headed for 13.7 percent in 1998). They may have gotten that idea from political charlatans who like to claim that defense consumes half of the budget.

People also tend to state bold opinions on issues before thinking them through. That often leads to contradictory findings. In December, for example, a Gallup survey for *News-*

*week* asked, "Under what conditions should American troops be employed?" The following responses were elicited, just three questions apart, in the same poll:

- The US should commit its troops only as part of a UN operation: eighty-seven percent.
- The US should be willing to commit its troops on its own in some cases: sixty-two percent.

Despite such anomalies and glitches, opinion polling remains a big influence on how the wheels of government go round. The national repository for polling data is the Roper Center for Public Opinion Research at the University of Connecticut. *AIR FORCE Magazine* drew on its resources for a sampling of what Americans have said recently on issues affecting national defense.

### The Use of Troops

The public seems to understand that US forces are likely to fight in foreign conflicts in the years ahead. By and large, those who object to such involvement are in the minority.

A CBS News–*New York Times* poll in October asked, "Does the United States have a responsibility to intervene militarily in trouble spots around the world?" and got the following response:

- Yes: forty-six percent.
- No: thirty-nine percent.
- Don't know/no answer: fifteen percent.

The more specific the conflict in question, the more inclined the public seems to be for US forces to take a hand in it. A Gallup poll for *Newsweek* in December found up to eighty percent in favor of deploying US forces in notional circumstances, depending on the provocation or offense. Americans believe US troops should be sent when:

- Another country's borders are threatened or crossed: thirty-two percent.
- There is mass killing: fifty-six percent.
- A leader we don't trust is developing nuclear weapons: sixty-two percent.
- Armed forces are causing mass starvation: seventy-one percent.
- Americans are attacked: eighty percent.

In the winter of 1992–93, US forces were engaged in contingencies in Somalia, Iraq, and the Balkans. All three operations had the potential to shift or escalate.

**Somalia.** Of these, the humanitarian relief effort in Somalia was the most popular. On average, seventy-

## Where to Cut?

	Major Cuts	Minor Cuts	No Cuts	Not Sure
Federal budget	36%	44%	18%	2%
Farm subsidies	26%	36%	35%	4%
Veterans' benefits	5%	31%	61%	3%
Defense	36%	44%	18%	2%
Welfare assistance to families with dependent children	24%	42%	30%	4%
Science (e.g. space station, supercollider)	43%	37%	16%	4%

**A Hart and Teeter poll conducted March 9, 1993, for NBC News and the Wall Street Journal asked, "Do you favor making major/minor/no spending cuts in these areas?" The results show strong support for defense cuts. An interesting variation in this poll was that it gave the public a choice between "major" and "minor" cuts. The response indicates a definite preference for minor cuts. Note also that the percentages for defense cuts track precisely with those for cuts to the federal budget as a whole.**

four percent of the public in thirteen polls in December and January favored US military involvement. A smaller majority (fifty-two percent in nine polls) supported more than relief action in Somalia, saying variously that US troops should disarm the warlords and warring factions, attempt to end the fighting, or stay until a stable government was in place.

**Bosnia-Herzegovina.** About forty-nine percent of the public (as measured by twenty-two polls) wanted the US military to act in the Balkan crisis. Substantial majorities favored not only relief operations (sixty-seven percent) but also the shooting down of violators in a no-fly zone (sixty-eight percent). Forty-nine percent backed the use of US airpower in Bosnia generally, and thirty-seven percent were ready to commit US ground troops.

**Iraq.** Twenty-one different polls, all taken in January, found a thumping average of seventy-two percent of the public in favor of US military action against Iraq and its recalcitrant leader, Saddam Hussein. Eighty-two percent agreed with the limited air strikes flown this winter against Iraq—and an even greater majority, eighty-four percent, wanted more strikes if Saddam's belligerency continued. Sixty percent called for removing Saddam from power, even at the risk of US casualties. Fifty-seven percent favored a ground invasion of Iraq.

### Defense Budget Cuts

The public supports the armed forces in peace and war but draws the line, apparently, at funding them. The polls find a consistent majority of about fifty-five percent of the nation believ-

ing that defense costs are excessive and should be reduced.

The majority is greater in some polls, and the answer depends on how the question is put. On February 17, for example, Gallup asked respondents if they agreed with President Clinton's plan for "reducing the defense budget by \$76 billion over the next four years." Sixty-six percent said they did agree.

Would the respondents have been equally supportive had they known that President Clinton's actual proposal for defense, disclosed in March, would be lower by \$131.7 billion in budget authority (\$116.9 lower in outlays) than the program as it stood in the last days of the Bush Administration? Or that defense reductions between 1994 and 1998, counting those already ordered by the Bush Administration, would total \$245.2 billion? Or that of all categories of federal spending, only defense had met reduction targets laid down by the 1990 budget summit agreement?

The polls generally reflect the fact that the public wants major cuts to the federal budget except in programs that affect them personally and directly. This is often laid to a desire to eliminate the federal deficit. That proposition, however, is not borne out by the polls.

In September, for example, fifty-five percent of public respondents told Gallup they favored "\$200 billion in new domestic spending for public works projects to be paid for by deeper cuts in defense and higher taxes on business and upper-income families." In October, a Los Angeles *Times* poll asked, "If the federal government spent less for defense, what should be done with the extra money?" The

deficit reduction people were in the minority:

- Reduce the deficit: thirty-eight percent.
- Lower taxes: twenty-three percent.
- Spend more on domestic programs: twenty-two percent.
- Spend on education, jobs, etc.: thirteen percent.
- Not sure/refused to answer: four percent.

A March 9 poll conducted for NBC News and the *Wall Street Journal* introduced an interesting variation in questions. (See box at left.) It gave respondents a choice of "major" cuts and "minor" cuts. The result was a higher-than-average percentage in favor of cutting defense, with the clarification that only thirty-six percent wanted truly deep reductions.

### Gays in the Military

No military issue has been more controversial than President Clinton's proposal, introduced in the election campaign and reaffirmed during his first week in the White House, to allow homosexuals to serve openly in the armed forces.

Public support for his position, never strong, seems to be deteriorating. According to Los Angeles *Times* pollsters, opinion has shifted from an earlier fifty-fifty split on the issue. Fifty-three percent of the public now believes the military should continue to exclude gays, with only forty percent in favor of lifting the ban.

As on other issues, the presentation of the question makes a big difference. When Gallup (June 1992) listed the armed forces as one occupation among numerous others, it found a majority of fifty-seven percent in favor of admitting homosexuals. When Gallup (January 1993) asked about the military alone, the response dropped to fifty percent in favor.

Gallup (November 1992) asked, "Do you think President-elect Bill Clinton should delay his promise to lift restrictions on gays in the military if there are strong arguments that this action will produce serious morale and readiness problems?" To this question, sixty-one percent said "delay" while only twenty-nine percent said "proceed."

The strongest action of all came in a Los Angeles *Times* poll—conducted without Pentagon cooperation—which found that seventy-four percent of enlisted members of the armed forces disapprove of the plan to remove the ban on homosexuals in the military, while eighteen percent favor lifting it. ■



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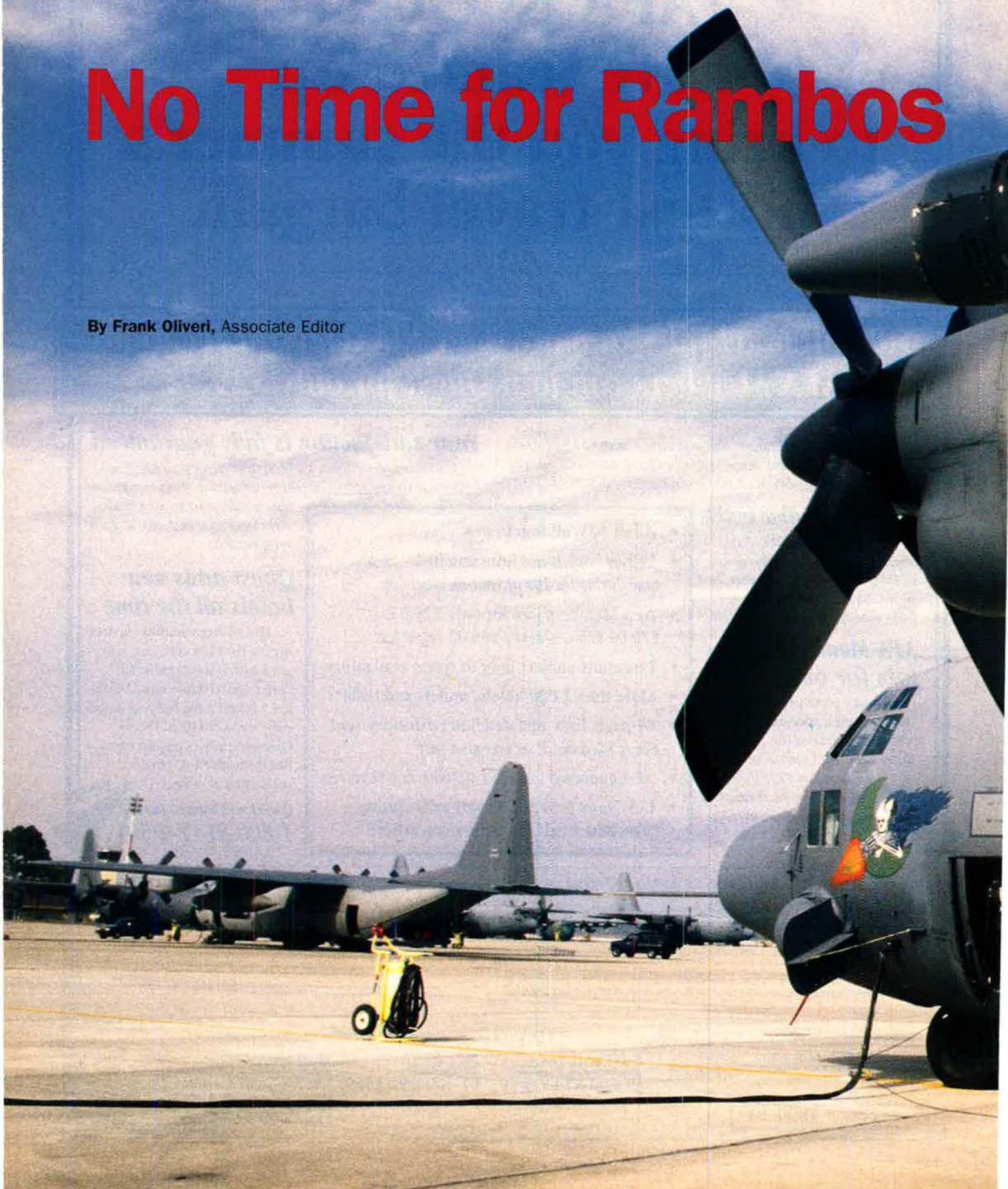
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**Special ops crews tend to be steady, careful veterans. The mission is hair-raising enough without thrill-seekers involved.**

# No Time for Rambos

By Frank Oliveri, Associate Editor







**E**ARLY in the 1989 invasion of Panama, Air Force AC-130 gunships blasted the headquarters of the Panamanian Defense Forces. The weight and accuracy of the gunfire evidently left a deep impression on PDF officers, because US forces soon learned the AC-130 made a potent psychological weapon.

This is how they used it: US soldiers, whenever they hit dug-in Panamanian resistance, would phone in the position. Next they would warn the PDF unit that it had been targeted and that AC-130s were en route. Everyone knew what had happened to the headquarters. Usually, enemy units threw down their weapons.

That probably was wise. In the quantity and quality of direct fire it produces, the AC-130 is in a class by itself. Its most accurate weapon is the 40-mm cannon, a converted World War II naval anti-aircraft gun. The big gun, a 105-mm howitzer, also is highly accurate. The 20-mm cannons are used on area targets.

Panama provided an ideal setting for use of the AC-130, according to the USAF special operations forces (SOF) pilots who took it into battle. Panama was a "low-threat" theater. The greatest danger to the slow-moving AC-130 came from small-arms fire. Far more risky are operations in medium- and high-threat conditions, such as those encountered night after night in the Persian Gulf region. Gunship crews had to fly there too.



**AC-130s often carry colorful and sometimes intimidating nose art. More intimidating are the 40-mm cannon, 105-mm howitzer, and 20-mm cannons it carries. The gunsight of this AC-130 is clearly visible to the left of the pilot's seat.**

"When the threat gets worse, other airplanes can just fly faster and lower," said Lt. Col. Jim Connors, commander of the 16th Special Operations Squadron at Hurlburt Field, Fla. "We can't fly faster and lower. We have to stand there and . . . well, 'slug it out' is not the best term, but it's a high-risk job."

The faint of heart should not fly into combat in an AC-130 or, for that matter, in any of the special aircraft that SOF outfits have used with telling effect in a half-dozen recent conflicts. Units of Air Force Special Op-

erations Command—the 1st Special Operations Wing—have been in the forefront of some difficult and desperate military actions over the past few years.

"Grenada, Panama, Desert Shield, Desert Storm . . . we're primary players," observed Col. Norty Schwartz, operations group commander of the 1st SOW. "We're up front. We're in there first. A guy in this unit has a high probability of participating" in a major combat event.

### Looking for Action

One need only talk to the crew members to see that expectations of combat are widespread at the 1st SOW, which has units based at Hurlburt Field and Eglin AFB, Fla. (Air Force Special Operations Command also has units in Europe and the Pacific.) The crews train every day to infiltrate and extract special operations units, resupply troops behind enemy lines, act as pathfinders for attacking aircraft, provide close fire support to small units on the ground, and conduct combat recovery missions, at night, in and under bad weather, and at altitudes that would give the average airman the willies.

The 1st SOW maintains and operates a fleet of more than sixty specialized aircraft. It comprises six flying squadrons and two maintenance squadrons. The flying squadrons are the 8th SOS, with MC-130 Combat Talon Is; the 9th SOS, with HC-130s;



**SSgt. Monty Hendrix of the 1st SOW's Weapons Branch fine-tunes a 7.62-mm minigun on a 20th SOS MH-53J Pave Low helicopter. The Pave Low can also carry a .50-caliber machine gun, favored by gunners because of its long range.**

the 15th SOS, with MC-130s; the 16th SOS, with AC-130s; the 20th SOS, with MH-53J Pave Low helicopters; and the 55th SOS, with MH-60G Pave Hawk helicopters. The combined military and civilian work force, now numbering more than 5,000 personnel, is set to expand to about 7,000 by 1995.

All aircraft in the SOF fleet are penetrators, which use various tactics to perform their mission. Each aircraft is suited to fly behind enemy lines undetected. Most of the SOF's fixed-wing planes are modified C-130s, which move slowly but have ample internal space for weapons or storage. All are air refuelable. Some can fly in all weather conditions, and some are used in unconventional ways.

The AC-130 has a curious way of operating. It goes into a left-hand bank-



*SOF activity begins to pick up at sundown. Above, AC-130s wait to upload ammunition for a live-fire mission. Below, gunners load a 40-mm gun with clips of four shells. The 40-mm is the most accurate gun in the AC-130's arsenal.*



Staff photos by Guy Aceto

ing orbit over the target area, allowing the pilot and the fire-control officer to acquire the target and lay down a virtually continuous stream of fire from the plane's side-mounted guns. If the pilot does the targeting, the guns are bolted into stationary positions. He maneuvers the aircraft and acquires the target through a head-up display on the cockpit's left side.

Because the gunship can loiter over a target and because the firing is more or less continuous, "we are very good at close air support of troops in contact with the enemy," said Colonel Connors. "We can come in, identify

the target, find out where the good guys are, and make sure they are protected."

The AC-130 is slow and not particularly maneuverable. It usually operates at night, when it is not vulnerable to optical sensors. It is also a heavy user of chaff and flares. "We have limited electronic warfare defensive capability on board," said Colonel Connors. "Our main defense is nighttime. We are not a great weapon system for all encounters in all areas, but we are very good at what we do in environments we can live in"—Panama, for instance.

The Persian Gulf area, however, was a different story.

### III-Fated Spirit 03

One night during Operation Desert Storm, SSgt. Ken Taylor went aloft as a loadmaster on an AC-130 gunship, call sign "Spirit 01." The aircraft was told to stop Iraqi columns approaching Khafji, a Saudi Arabian border town located just south of Iraqi-occupied Kuwait. Khafji had been overrun by Iraqi units.

"We were up there at about eleven o'clock at night, and we were hitting targets and doing pretty well right across the border," Sergeant Taylor said.

The crew was informed that Khafji had been overrun, and, "at that point, we got tasked to go ahead and start working on convoys," said Sergeant Taylor. "We took out eight APCs [armored personnel carriers]. The other APCs started turning around and heading back north and dispersing throughout the desert."

While attacking the convoy, Spirit 01 was getting AAA fire from troops on a road below. Sergeant Taylor said the road was filled with forty to fifty AAA pieces, including 23-mm, 37-mm, 57-mm, and 100-mm guns. As soon as the APC operation petered out, Spirit 01 went after the gun emplacements.

"They were just shooting optically at us," said Sergeant Taylor, "so they started to send up artillery flares, try-



*The 55th SOS demonstrates its expertise as it practices the SPIE (Special Procedures, Insertion/Extraction) technique. An Army Special Forces team is lifted by an MH-60G Pave Hawk after its members attach themselves to the SPIE rig.*

ing to silhouette us. [The flares] were looking like Strelas [Soviet-made SA-7 shoulder-fired heat-seeking SAMs]. Whenever they did bring it to our altitude, [the flare] would light right off our wingtip. They could see us then.”

When Spirit 01 ran out of ammunition at about 2:00 a.m., it left the scene. Soon Spirit 02 was heading into the area; this AC-130 did about twenty minutes of work before the fire grew too intense, and it withdrew.

After a lengthy delay, Spirit 03 went into the target area. Sergeant Taylor said that, initially, Spirit 03 did not run into as much fire as the two other flights had encountered. Then, at about 6:00 a.m., an Iraqi SAM hit the left wing of Spirit 03 and exploded just above a fuel tank, blowing off the wing. The crippled AC-130 did a barrel roll into the shallow water just off the Saudi coast, killing fourteen crew members.

Capt. D. G. Timpson, an aircraft commander on that mission, said Spirit 03 may have been vulnerable because it stayed in the area for about a half hour after dawn, the point at which it became visible to gunners below.



Staff photos by Guy Aceto

Flying in SOF aircraft is invariably hazardous. That holds true even in—especially in—SOF training flights.

#### **Down to 100 Feet**

Capt. Steve Cox of the 15th SOS is the pilot of an MC-130H Combat Talon II—the Air Force plane of choice for long-range infiltration of and pickup from areas that are either diplomati-

cally sensitive or politically denied. He described a recent joint training mission with an Army Special Forces team.

“We were in the Philippines, and we were going to do an insertion of a Special Forces team into Alaska,” said Captain Cox. “So we went and planned with these guys for two or three days to build up the routes. We did all the surveys, charts. Then we took off and did two air refuelings, high level. It took about fourteen hours to get to the place we were going to drop down to low level.

“We dropped down to 100 feet. We flew there for about a half hour, penetrating the coast at night in [foul] weather. Then we dropped these guys, about fifteen and a half hours into the flight. They parachuted out into the field within five seconds of the time they were supposed to get there.”

Such a mission could only be undertaken in the MC-130 Combat Talon, early models of which entered service in 1966. The Combat Talon II employs an advanced terrain-following and terrain-avoidance radar system,

which enables the aircraft to fly at night at extremely low levels in adverse weather conditions.

It can carry up to seventy-five special forces troops—twenty-five more than the Combat Talon I can carry. It also functions with a crew of seven rather than the nine found on a Combat Talon I. This stems from the use of new video display technology, com-

puter assistance and cuing, and cross-coupling of all crew position video displays. The aircraft also has outstanding night vision goggle (NVG) compatibility.

The MC-130s employ inertial navigation systems and are linked to the Navstar Global Positioning System (GPS). The special navigation and aerial delivery systems are used to locate small drop zones and deliver people or equipment with great accuracy and higher speed than is possible in conventional C-130s.

Combat Talon Is and IIs have been modified to allow for high-speed (250 knots), low-level drops. This enables the aircraft to drop at regular flying speeds, so the enemy no longer can deduce exactly when supplies or personnel have been dropped. Both types of MC-130 are air refuelable.

Such advances have made it possible for SOF transports to stay aloft for extremely long periods. Infiltration and exfiltration missions frequently run for many hours and require the augmentation of regular crews with backup members. Captain Cox said that the crew also works on adapting to the strange rhythms of the mission.

"If we fly all night, either on a real mission or for training, we'll take a day or two and put a team of users and a crew in isolation together, where they do their planning without interruption," said the captain. "You plan your mission and stay up all night and sleep during the day. You black out



*A maintenance crew checks the Fulton Recovery System on an MC-130E Combat Talon aircraft from the 8th SOS. Fourteen MC-130s have been modified with the system, which can pick up loads in midair or from the ground in midflight.*

the room and sleep." Once the adjustments have been made, he said, the crew can take off.

#### **No Time for Rambos**

USAF special operators are in a high-risk, high-payoff business. Contrary to popular belief, SOF members are not wild-eyed, thrill-seeking Rambos, though more than a few own up to "getting off on the adrenaline." Because of the high stakes, they usually are careful types, with a pronounced gift for planning and organization.

Before taking on a new member, the SOFs conduct a detailed analysis. They want to know if the individual possesses the right talent, skills, and psychological makeup for the tasks he must perform. "The basic thing is to make sure that we have people crewing the airplanes who are well suited to the mission, who can operate independently, who have large shoulders, and who can operate in stressful environments and keep clearheaded about it," Colonel Schwartz said.

Few first-term airmen are accepted in SOF units. The 1st SOW looks for people who have already proven themselves elsewhere in the use of basic weapon systems. Talented personnel are needed because "if the systems don't work, the mission still gets done," Colonel Schwartz said. "On a national mission, you're not going to turn around."

Nowhere was the truth of that statement more apparent than on the first night of the Persian Gulf War, when USAF MH-53J Pave Low special operations helicopters were tapped for a high-pressure mission.

Lt. Col. Russell E. Rakip, Jr., commander of the 20th SOS, said that several Pave Lows were used as pathfinders to lead two groups of Army AH-64 Apache attack helicopters into position to fire their Hellfire missiles at critical Iraqi air defense radars. These were the first shots of the war, and failure could not have been tolerated. As it turned out, the Apaches

Staff photos by Guy Acasio



*The 9th SOS operates the HC-130 Combat Shadow tanker. This aircraft can refuel SOF helicopters at night and behind enemy lines. HC-130 crews rely heavily on night vision goggles to carry out their missions.*



**The MH-53J *Pave Low* has been called the most sophisticated helicopter in the world, and SOF crews constantly put its capabilities to the test. At low level, at night, and through bad weather, the MH-53J can truly operate anytime, anyplace.**

reached their firing marks exactly on time.

The MH-53J provided combat recovery in western Iraq, Saudi Arabia, and coastal Kuwait. It also was used to infiltrate and exfiltrate special operations troops throughout Iraq and Kuwait.

The MH-53J *Pave Low* III "Enhanced" is the most sophisticated helicopter in the world, according to the Air Force. Its range is limited only by crew endurance and tanker availability. The aircraft is equipped with armor plating and a combination of 7.62-mm miniguns or .50-caliber machine guns. It also employs a sophisticated navigation and terrain-following radar package that permits it to fly over mountainous terrain in adverse weather.

*Pave Lows* use forward-looking infrared systems, GPS, Doppler navigation systems, and terrain-following and terrain-avoidance radar. An onboard computer and integrated avionics enable the crew to navigate precisely from liftoff to the target via designated waypoints while avoiding hostile areas. Flown by a crew of six, the helicopter can deliver thirty-seven troops.

#### **AWACS Called Us**

Because of its sophisticated communications and navigation systems, the *Pave Low* took part in another important Desert Storm mission: Scud hunting. Capt. Lou Caporicci, a pilot

in the 20th SOS, said that on a resupply mission he and his crew were tasked to hunt down a Scud launcher that had recently fired nearby.

"AWACS picked it up and called us," said Captain Caporicci. "They asked us if we could do something about it. I had two gunships escorting me, and they went in and took out the site."

The other SOF helicopter is the MH-60G *Pave Hawk*. Its mission is similar to that of the *Pave Low*, but the aircraft is less sophisticated and does not have the lift capability of the MH-53J. The *Pave Hawk* does not incorporate terrain-following radar, but relies on an infrared detection set and a mission computer. Capt. Greg Lynch of the 55th SOS, which flies the *Pave Hawk*, said its main mission is long-range insertion of a small force.

"Things that fit into that category would be reconnaissance and surveillance teams," Captain Lynch said. "We are able to put teams in with the [MH-60G], which has a smaller size and a smaller radar cross section and lower noise signature than the *Pave Low*."

The 1st SOW's fleet of HC-130 aerial refueler aircraft has an especially difficult and dangerous task—conducting midair refueling at night over hostile territory. Lt. Col. Robert Scott is the commander of the 9th SOS, currently located at Eglin AFB but moving to Hurlburt Field in the mid-1990s. He said his HC-130 squadron was tops in the Air Force in NVG

flying experience. Because the HC-130 is the least technically advanced aircraft in the SOF inventory, he said, its operators are extremely dependent on their NVGs at night.

Colonel Scott said the HC-130 does not have an electronic warfare officer and is not capable of operating in all weather conditions. It flies in two- or three-ship formations, so that if a problem occurs with one aircraft, no helicopter customer is left without fuel.

The SOF member has to be ready for extremely hazardous flying. Moreover, he will confront extraordinary demands on his time. Individuals in the 1st SOW, said Colonel Schwartz, average 100 to 120 days a year on temporary duty away from Hurlburt or Eglin. In some units, the rate runs as high as 200 days a year.

Last February, elements of the 9th SOS and the 20th SOS returned to Florida from the Persian Gulf. This was the first time since August 1990 that those units were intact and at their home installations. The 55th SOS recently ended a nine-month stint in Turkey, where it supported Operation Provide Comfort in northern Iraq.

In recent years, officers say, the Air Force's SOF units generally have enjoyed striking success in recruiting and retaining high-quality personnel, with overall retention rates exceeding ninety-five percent. The 1st SOW, like every other element of all the services' SOFs, has benefited from strong congressional support for budget increases. While the rest of the military budget has been declining, that of the SOFs has risen from \$500 million in 1981 to some \$3 billion this year.

Signs are, however, that this bright picture is changing. The 1st SOW is losing some of its most experienced members as the shrinking Air Force offers early-out incentives and conducts involuntary reductions in force. Several squadron commanders said they were unhappy about losing such talented personnel, though their younger replacements are talented enough.

The 1st SOW is also starting to feel a budget pinch. In order to save money, said Colonel Schwartz, the wing had to cut 500 flying hours in the second quarter of Fiscal 1993.

"It could hurt our readiness," Colonel Schwartz said. "We'll see. . . . You naturally wanted to defend your flying hour program. That is where your core readiness comes from." ■



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**Analysis of regional conflict scenarios points to heavy reliance on landbased airpower.**

# The Lion's Share of Power Projection

**By David Ochmanek and John Bordeaux**

**I**N FUTURE major regional conflicts, national political and military leaders are likely to place a premium on US forces that can deploy rapidly over long distances, swiftly destroy invading armored forces as well as fixed assets, and engage the enemy effectively while placing minimal numbers of American service personnel in harm's way.

A quantitative analysis taking these factors into consideration shows that landbased air forces—heavy bombers and fighter-bombers—are likely to provide the lion's share of US power projection capability in future conflicts, at least during the critical days or weeks of the war.

The analysis shows that US heavy bombers, with long range and large payloads of effective weapons, have the potential to project conventional firepower rapidly and effectively, providing critical capabilities early in a "short-warning" conflict. In the opening days of such a war, bombers are uniquely capable of delivering heavy firepower against fixed targets and, in the case of the stealthy B-2, invading armies.

The ability of bombers and fighters to realize the potential ascribed to

them in this analysis depends critically on the development and procurement of large numbers of modern munitions and on enhancements to the bombers' avionics. This capability is also dependent on the development of operational concepts that facilitate the survivability of bombers and on developing the planning tools necessary to employ standoff weapons.

Landbased tactical fighter-bombers can play the dominant role in US combat operations within a few days of the start of a deployment. These planes can deploy rapidly to distant theaters, requiring a modest amount of airlift relative to their combat power. In large numbers and equipped with modern munitions, landbased fighter-bombers can rapidly destroy large formations of enemy maneuver forces and fixed targets. The contribution of these forces to US military capabilities does not appear to be overly sensitive to access to forward bases in the theater of operations, given sufficient tanker support.

## **Changing Role for Naval Forces**

Without question, carriers and other naval assets play a number of impor-



## Munitions Loadouts and Sortie Rates

Force element	Destroy fixed target (tons/sortie)	Halt invading armies (TMDs/sortie)	Destroy dug-in forces (kills/sortie)	Average sortie rates
B-2A	19	32	—	.5
B-1B	6(S/O)21	33	—	.5
B-52H	6(S/O)13	30	—	.25
F-117	2	—	—	.85
F-111F	4	12	1.3	1.12
F-15E	4	12	1.3	1.08
F-16	2	4	.9	1.26
A-10	3	4	.9	1.4
F/A-18C/D	2	4	.9	1.16
A-6E	3	4	1.3	1.06
AV-8B	1.5	2	.5	1.2
TLAM-C	.5	—	—	.98 reliability

TMD = Tactical Munition Dispenser      S/O = standoff

tant roles in US military strategy. If properly located, carrier-based aircraft can play a useful role early in a short-warning war, helping to establish an air defense and conducting initial strikes on some surface targets.

In particular, the ability to project power ashore, suppress defenses, and establish an air defense over arriving forces in the first week of a campaign is very important. This capability can be enhanced by positioning naval forces in proximity to the theater of operations during the time of crisis preceding a major theater conflict.

However, a rationale for investment in these forces cannot be found in an examination of large-scale air-to-ground operations.

In theater warfare, US maritime power-projection forces—carrier aviation and Tomahawk land-attack cruise missiles—play a relatively minor role in destroying an enemy's fixed assets and ground forces, which are two important operational objectives assigned to air forces. The relatively slow deployment speed of warships, limited number of strike aircraft deployed on carriers, and comparatively modest payloads of these aircraft all limit the contribution that even a large, mod-

ernized carrier force can make to large-scale air operations. A major improvement in carrier arrival rates (which would require massive investment) would not appreciably change this assessment.

In this analysis, we examined air forces in the context of major theater conflicts. Theater warfare has been and is now the primary determinant of general-purpose force structure. Future regional conflicts will likely possess several characteristics that will shape our approach to fighting them. Few US forces will be deployed in the region at the outbreak of hostilities; history shows that the US usually fails to anticipate the outbreak of conflicts. US friends and allies may be badly outnumbered by hostile forces. The adversary—Iran, Iraq, North Korea—will possess large ground forces, including sizable armored formations and perhaps nuclear weapons. US decision-makers and the public will wish to minimize the risk of heavy US casualties.

The contributions of US airpower assets to future theater campaigns should be assessed in a “zero-warning” scenario—that is, an adversary attacks an ally or friend before the US

can deploy more forces into the region.

We assumed an attack of ten armored and mechanized divisions, supported by additional infantry divisions—a force that could be fielded by a number of regional powers. Our “baseline” case posited an attack by Iran or Iraq against Kuwait and Saudi Arabia; our second case postulated a North Korean attack on the Republic of Korea.

We assessed the capabilities of selected US airpower-projection assets—bombers, landbased and carrier-based fighter-bombers, and Tomahawks—in these scenarios set around the turn of the century. Several new types of air-delivered munitions will be available by then, and these were included in the analysis. No new aircraft types were considered, although existing types may undergo upgrades or life extensions. The study assumed that US and allied ground forces play a major role in halting the enemy invasion.

### High-Priority Objectives

In future theater wars, US and allied leaders are likely to have several high-priority objectives. Three to

which ground-attack aircraft would contribute directly are destroying enemy war-making capacity by destroying fixed assets; halting and destroying the invading force; and destroying dug-in ground forces. We compared the contribution of airpower assets to

sonnel carriers, and as many as 25,000 "thin-skinned" vehicles, such as trucks and mobile surface-to-air missile (SAM) units. Depending on the level of opposition, an attacking force of this size would likely be stopped when fifty to sixty percent of

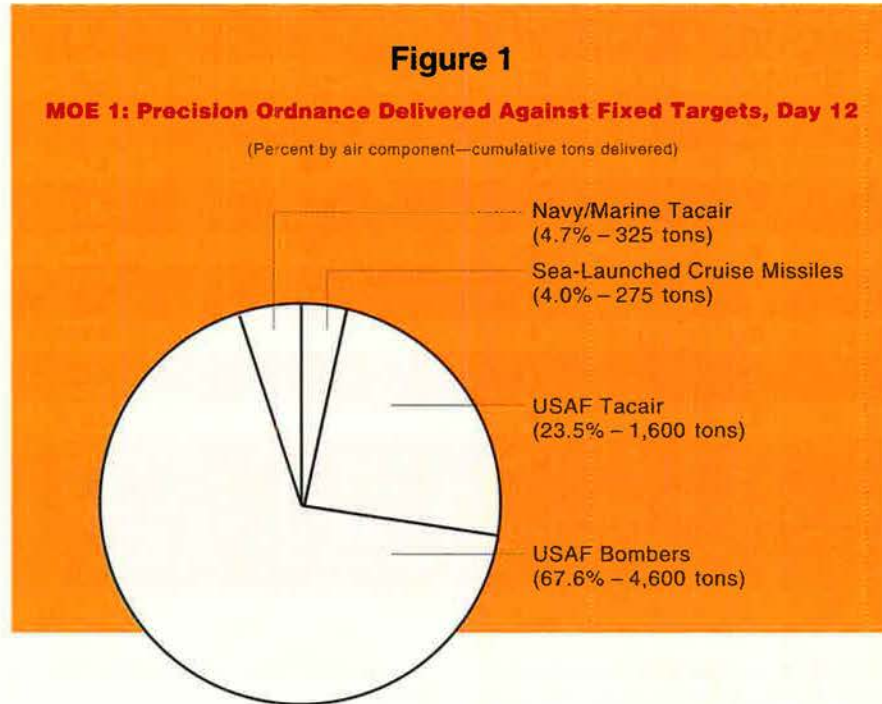
The rate at which US forces can deploy to the theater of war is an important determinant of their ability to contribute to the campaign. Obviously, this is particularly true in cases in which a conflict starts prior to or during large-scale US reinforcement. Our analysis incorporated the following basic assumptions about US force deployments:

- One carrier battle group (CVBG) is on station within range of the conflict at the outset. A second CVBG arrives seven days later, and a third on Day 14. Each CVBG is assumed to have forty embarked attack aircraft—twenty A-6Es and twenty F/A-18s.

- Brigade-sized Marine units with accompanying aircraft arrive on Days 7 and 14.

- Ninety percent of the Air Mobility Command's (AMC) transport aircraft are available for use by Day 4. Assets from the Civil Reserve Air Fleet (CRAF I and II) are available by Day 4 as well. We assumed that only forty percent of total airlift capacity goes to support USAF's deployment and combat operations.

- Munitions for USAF fighter and fighter-bomber units must be airlifted to the theater until Day 10, by which time munitions from prepositioned stocks will be available. Bomber munitions are predeployed at Guam, Diego Garcia, and RAF Fairford, UK.



each of these objectives, by translating them into quantifiable measures of evaluations (MOEs).

**MOE 1: Tons of precision ordnance deliverable against fixed targets.** These targets would include such assets as high-level command posts and communications facilities, military storage areas, oil refining and distribution facilities, airfields, and bridges. We estimated that a regional opponent might present approximately 500 such targets, which might be associated with approximately 4,000 aimpoints for attack with conventional weapons. Recognizing that the enemy will be able to repair some of these assets following attacks on them, we set an initial threshold of adequacy for such attacks at 6,000 tons of precision ordnance delivered, or approximately 1.5 tons per aimpoint.

**MOE 2: Tons of ordnance deliverable against moving vehicles.** An attack of ten armored and mechanized divisions would include 2,000 to 3,000 tanks, 6,000 to 7,000 armored per-

its vehicles (and their contents) had been destroyed or severely damaged. At this point, the combat power of the attacking force would be reduced to roughly four armored division equivalents—about the size of Kuwaiti, Saudi, and arriving US ground forces that might be opposing the attack. We estimated that it would require 3,500 tons of specialized munitions to inflict this level of attrition.

**MOE 3: Kill potential against revetted armor.** When an army stops and digs in, it presents a target different from an army on the move. Assuming that air forces inflict sixty percent attrition on the invading force before it stops, between 3,200 and 4,000 armored vehicles would remain. We set our benchmark at 3,500. Using a high-side benchmark is appropriate, given that the invading force might stop before sixty percent attrition, US ground-attack aircraft will be called on to do other tasks, and targeting uncertainties will prompt multiple "kills" on vehicles.

### Support Assets Needed

Of course, a host of support assets must be deployed if the shooters are to operate effectively. In estimating deployment rates for "bomb-droppers," we took account of this need. We deployed to our baseline major theater conflict thirty squadrons of USAF fighters and fighter-bombers, sixteen B-2 bombers, and forty B-1Bs. We also employed forty B-52Hs from bases in the US.

Assumptions used for weapon loads for MOEs 1 and 2 are shown in the chart on p. 39. Also shown is the assumed sortie effectiveness for MOE 3 and sortie rates for all aircraft types. Weapon loads reflect typical combat loadings; sortie rates are based on those achieved during the Gulf War. Vehicle kills per sortie are far less than the theoretical maximum for each type of aircraft. Only aircraft capable of delivering homing weapons, such as Maverick missiles and laser-guided bombs (LGBs), are counted.

We compared aircraft and muni-

tions that will be available around 2000. This implied the use of existing aircraft (with some upgrades) but several new, advanced munitions. Among them are inertially aided, GPS-guided (IGPS) unitary bombs, such conventional cruise missiles as the Triservice

viving armored vehicles, which were assumed to have dug into revetments (MOE 3). The exception to this rule is the F-117, which would continue attacking fixed targets.

■ Fifty percent of the F-15Es, F-16s, A-6Es, and F/A-18s (to a maxi-

It is, essentially, a “snapshot” of the cumulative effort against this MOE on Day 12 of the war—the point at which our threshold of 6,000 tons of precision ordnance was exceeded.

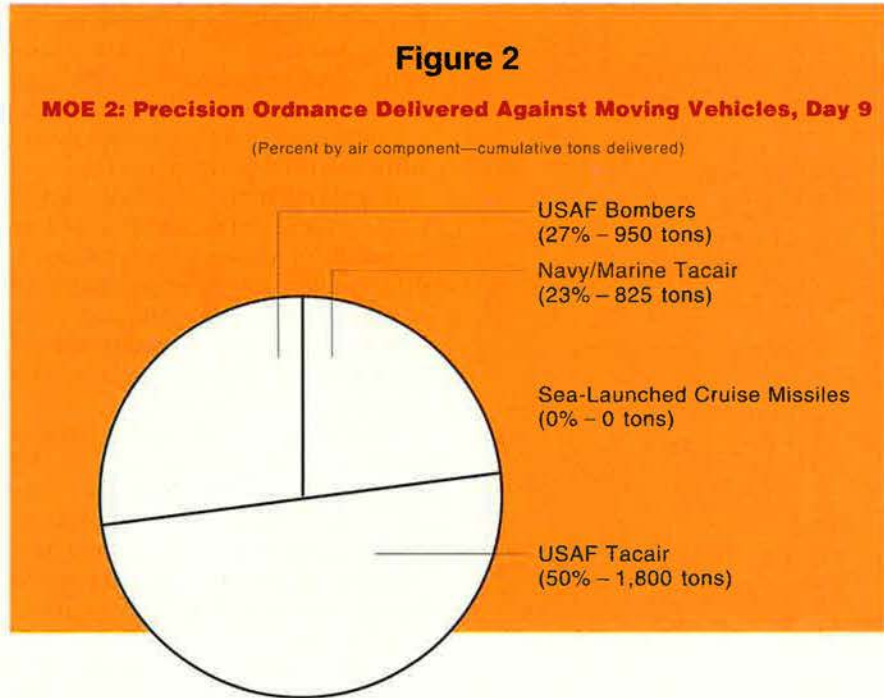
Figure 1 shows that the Air Force’s heavy bombers do the bulk of the work of attacking fixed targets. B-52s, B-1Bs, and the carrier battle group deliver cruise missiles for the first five days of the war, after which the B-1Bs are assumed to deliver IGPS bombs. The B-2 also delivers IGPS bombs, such as Joint Direct Attack Munitions (JDAMs). Tactical air assets contribute to MOE 1 after the threshold for MOE 2 is reached (Day 9) and deliver laser-guided and IGPS bombs. The F-15E provides most of the tactical air contribution. The effectiveness of standoff weapons is predicated on the functioning of timely intelligence and the development and fielding of a mission planning system.

Figure 2 at left provides an analogous picture for MOE 2—attacks on moving columns of vehicles. The B-2s are assumed to begin attacks on Day 1, launching from their bases in the US and recovering at Diego Garcia. They are responsible for the bulk of the ordnance delivered (e.g., guided CBU-97s) against the columns in the opening days of the war. By Day 9, however, when the threshold for MOE 2 (3,500 tons of ordnance delivered) is reached, landbased tacair begins to dominate, delivering more than 1,500 tons of ordnance per day, primarily CBU-97s.

Figure 3 on p. 42 provides a snapshot of the distribution of effort in MOE 3—attacks on revetted armor. The allocation of assets to this MOE commences on Day 9 (because we assume, for simplicity, that US air assets do not begin attacking revetted armor until the attacking force stops on all fronts). We assume that homing weapons, such as Maverick missiles or LGBs, are needed for effective attacks. F-15Es, F-16Cs, F-111Fs, and F/A-18C/Ds conduct these attacks. The F-15E and F-16, which deploy to the theater in large numbers and which have high sortie rates, score most of the kills. The threshold of 3,500 potential kills is reached on Day 16—seven days after these attacks commence.

### Basic Conclusions

We performed a host of comparisons similar to those shown above,



Standoff Attack Missile (TSSAM) and ALCM-C for the bombers, and such area antiarmor munitions as Skeet submunitions.

Finally, before comparing the various elements in terms of our three MOEs, it was necessary to specify some rules to allocate the force among the three MOEs over time. We assumed:

■ At the initiation of hostilities, US and allied commanders would give top priority to stopping the invading force as soon as possible (MOE 2). To the extent possible, aircraft capable of effectively attacking moving vehicles would be pressed into that role until the invasion was halted.

■ Aircraft not suitable for early attacks on moving armor (e.g., the F-117, which is not equipped with tactical munition dispensers; the B-1 and the B-52, which may be vulnerable to SAMs; and the TLAM) would be assigned to attack fixed targets (MOE 1).

■ Once the attacking forces were halted, aircraft capable of delivering LGBs or Mavericks would attack sur-

num of ninety-six) were assigned to suppression of enemy air defenses for the first five days of the war. Between Day 5 and Day 10, twenty-five percent performed SEAD. After that, the “SEAD tax” on these jets dropped to fifteen percent.

Having laid out these assumptions and constraints, we were ready to calculate the contributions of each type of aircraft to each of our three MOEs.

### Bombers to the Fore

The assumption that a carrier battle group is on station and within range of targets at the start of the conflict is an important one. While the carrier’s ground-attack capabilities are limited, they provide a supplement to the B-2 in the earliest days of the war and, over time, a significant portion of the overall capability for this MOE, if one assumes that carrier attacks can be sustained for two to three weeks.

Figure 1 on p. 40 shows the relative contributions of aircraft to MOE 1 in a single major regional war scenario.

varying key assumptions. Specifically, we examined cases in which landbased air forces and seabased forces individually and in combination were denied access to bases and operating areas within 1,000 kilometers of the enemy, US forces fought two simulta-

neous theater wars, and different force structures were posited. Our conclusions are as follows:

neous theater wars, and different force structures were posited. Our conclusions are as follows:

■ In most cases, changes in force structure (*i.e.*, number of aircraft) had only minor effects on the achievement of objectives, provided that a robust landbased component was main-

in US power-projection capability—recent breakthroughs in sensors, miniaturized guidance, computing, and stealth. Perhaps more than any other single factor, the capabilities offered by modern munitions are a critical determinant of the overall capabilities of US power-projection forces.

IGPS bombs, such as the JDAM, can permit aircraft such as the B-2 and B-1, which today cannot deliver precision weapons, to do so. This capability, combined with a bomber's large payload, can dramatically improve the capability of US forces to rapidly destroy an enemy's fixed assets.

In addition to their use from carrier battle groups, cruise missiles will be essential for nonstealthy bombers to play a significant role in the early days of a theater war. Thus equipped, these bombers can destroy a large portion of an enemy's fixed assets quickly, with very low risk of attrition.

Area antiarmor munitions, such as the Sensor-Fuzed Weapon (CBU-97 with Skeet submunitions), can give US air forces the capability to destroy columns of armored vehicles quickly. There is a guided version that can be used by bombers from high altitude.

It is essential to US strategy for theater warfare that the US retain the capability to airlift large quantities of military materiel over long distances. Given that the C-141 fleet is nearing the end of its useful life, the US must place a high priority on replacing the lift capacity of these aircraft.

Maritime prepositioning of munitions in southwest Asia and the western Pacific is absolutely essential for US power-projection capabilities. The munitions delivery capacity of two or three wings of USAF fighter-bombers is such that a substantial portion of AMC's airlift fleet would be needed to keep a deployed force of this size supplied with munitions.

Increasingly, force effectiveness is limited mainly by incomplete information on the location and disposition of enemy forces and other assets. Further improvements in surveillance and assessment will be needed in order to fully realize the growing potential of modern airpower. ■

tained. In extreme cases, relying solely on landbased assets resulted in only a one- or two-day delay in achieving objectives. Zeroing out the contribution of landbased bombers and fighter-bombers, however, added weeks—seventeen to eighteen days for MOE 1; nine to ten days for MOE 2; and forty to forty-two days for MOE 3.

■ Failing to develop and procure modern munitions led to serious reductions in capability for all forces in MOEs 1 and 2.

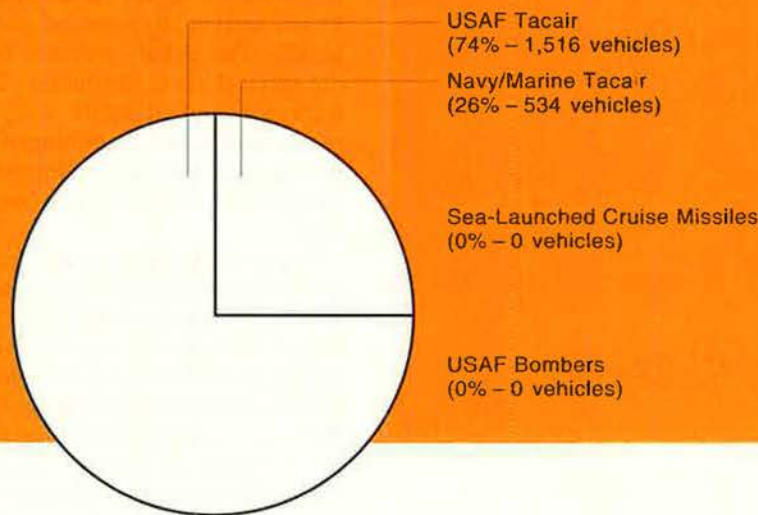
■ For the US to secure the capability implied by this work, it must have the use of mobile joint battle management systems and mobility forces in general.

A number of factors account for the dominant role of aviation in general, and landbased aviation in particular,

**Figure 3**

**MOE 3: Kill Potential Against Revetted Armor, Day 16**

(Percent by air component—cumulative kills delivered)



neous theater wars, and different force structures were posited. Our conclusions are as follows:

■ The contribution of landbased fighter-bombers to the theater campaign is not overly sensitive to assumptions about US access to bases close to the fight, provided sufficient tanker support is available. Heavy bombers, with inherent long range, are insensitive to variations in these assumptions.

■ When the need to fight two simultaneous theater wars is considered, the results are similar to those seen in our single-war case, in terms of both relative distribution of effort and time required to achieve our thresholds. The total capacity of the airlift fleet and the portion of that capacity available to USAF deployments are crucial determinants of capability.

■ In a Korean conflict, the presence of landbased fighters and fighter-bombers in Korea and Japan prior to the outbreak of war makes a substantial contribution to overall US combat

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**Some proposals for the US health-care system are being road-tested by the VA and the Defense Department.**

# Reforming Military Medical Care

By Bruce D. Callander

**I**T is a little-known fact that most of the high-octane proposals for reforming the US health-care system are being road-tested in the Defense Department and the Department of Veterans Affairs. Already, pilot military programs include such features as managed care, increased use of general practitioners, and fresh approaches to cost sharing.

The push for health-care reform in the military, like that across the US, is driven by soaring medical costs. In recent years, military medical costs have risen twice as fast as other military costs. One major reason: The armed forces and the VA are having to pay increasingly large amounts to private health-care providers now being used to supplement in-house military care.

Take last year, for example. The military services spent more than \$15 billion on health care for uniformed members, civilian employees, retirees, dependents, and survivors. Of this amount, some \$3.7 billion in Fiscal Year 1992 went to CHAMPUS (Civilian Health and Medical Program of the Uniformed Services)—the system that covers retirees and dependents using private practitioners.

Likewise, the VA spends a huge annual sum to care for disabled and indigent veterans. The tab in 1990 (the most recent year for which a full accounting is available) was more than \$11 billion, and expenditures have no doubt risen since. For the VA, too, the cost of contract civilian specialists has zoomed out of sight, rising from \$17 million in 1985 to some \$1 billion in 1991, with no letup in sight.

The services' health-care costs have continued to rise in absolute terms, despite major troop cuts in recent years. Future reductions are not expected to bring any relief. As active-duty strength drops, the number of veterans potentially eligible for VA care is certain to increase.

The only solution, say officials, is to improve the military health-care system in some fundamental way.

## **A Vast System**

That's a tall order. Combined, the military and veterans systems cover more than one-tenth of the US population. Figures for the most recent year show that the services alone served some two million active-duty members and 2.6 million dependents

plus 1.7 million military retirees and their 2.3 million dependents and survivors.

VA medical facilities, for their part, serve a potential population of about twenty-five million veterans. Although only a fraction of that number regularly use VA care, the percentage could grow as health insurance costs rise and both veterans and their employers find they can no longer afford it. The demand also is likely to rise as veterans of World War II and Korea grow older and require more care and long-term treatment. Neither deep military cuts nor a national health-care scheme will change this picture in any big way.

The medical assets of the military community are the most extensive of any in the nation. Worldwide, the services maintain 164 hospitals and more than 500 outpatient clinics. They employ 52,000 civilian and 157,000 military members in direct or support positions. They also pay thousands of civilian providers through CHAMPUS. They train medical professionals in-house and through scholarship programs, do medical research, and do much work in disease control and health maintenance.



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The VA operates another 171 hospitals, 126 nursing homes, and 240 outpatient clinics, sharing a number of these with the military system. It uses both its own staff and contract providers. In 1990, it logged more than a million inpatient stays and twenty-two million outpatient visits. The VA has extensive health-care programs for older people and the physically impaired.

President Bill Clinton, whose blue-ribbon task force on health care has helped launch a far-reaching overhaul of the US system, provided few early clues about his plan. However, he did make it known that the Administration wants to integrate military and veteran health programs into a national plan—not eliminate them.

Experts say it makes sense to keep the VA system in place, if only because it is one of the country's biggest providers of long-term care. There is even more reason to preserve the services' medical systems, both to keep present forces fit and to be ready for a shooting war. Even at bases marked for closing, medical resources are being maintained or shifted to other bases. President Clinton even pledged recently that some portions of hurricane-ravaged Homestead AFB, Fla., would be kept open to serve retirees. Presumably, medical facilities would be among them.

Both the active-duty and veterans systems have problems. Like most government operations, they stand accused by critics of being bureaucratic, top-heavy with administrative deadwood, and wasteful of resources. Some of the beneficiaries, particularly dependents and retirees, complain the system is characterized by impersonal providers, long waits, and endless paperwork.

For the most part, however, the gripes are no different from and no more intense than those of patients under other government programs or in most private health-care facilities. In reality, the military beneficiaries are far more concerned about losing access to their present providers. They warn that national health reforms may threaten their ability to use such services.

Some of the suggested Clinton reforms envision merging the military and VA systems, and opening both to low-income civilians not covered by other programs. Other proposals would cut back on the number of beneficia-

ries eligible for either military or VA care or sharply increase their share of the costs.

### **Big Enough for Wartime Needs**

On the active-duty side, the services must keep a substantial medical system in place to support not only the current forces but also to meet future war requirements. Therefore, it would be wasteful to limit care to a shrinking number of active-duty members and leave much of the potential unused. The services' ability to attract medical recruits depends in part on assuring them that they will see a broad cross section of patients, not just young, able-bodied members.

As the active-duty population drops, the services could, in fact, use more of their capacity to treat beneficiaries now cared for by civilian providers. Among these are retirees who make up what the services call the "ghost" population who now use CHAMPUS, Medicare, or private insurance but who would rather use less expensive military facilities. To offset the added burden on the military facilities, however, some propose that the beneficiaries pay more of the cost than they do at present.

The services do expect small cost savings as strength cuts lower the number of eligible dependents and as more retirees reach age sixty-five and become eligible for Medicare. This prospect has its down side for the nation as a whole, however. Unless some low-cost care system is put in place, many former CHAMPUS eligibles will cost the government as much or more when they turn to other programs for care. The same could hold true if the VA is forced to cut back on care for veterans.

Another proposed solution to the national health-care dilemma is to require more employers to furnish medical insurance to their workers. This could ease the demands on both the military and VA facilities since many dependents and veterans are employed. Studies in Hawaii, which has a mandated employer-insurance plan, show that many veterans use company insurance rather than VA care. A General Accounting Office report suggests that employer-mandated insurance would reduce the demand for inpatient VA care by about eighteen percent and for outpatient care by roughly nine percent.

However, most employer-insurance

plans require beneficiaries to share the cost of premiums. If these copayments and deductibles were too high, more dependents and veterans could turn to cheaper military and VA care. Again, alternatives might be either to bar them from the service and VA programs or to require them to share more of the costs.

Another problem with mandating employer insurance is that not everybody would be covered. Many military dependents do not work in jobs that would be covered, and many veterans are beyond the age of active employment.

### **In for the Long Haul**

One GAO study of veterans suggests that a national health program could wean many users from the VA, but not all. That's because such proposals focus on acute care rather than the long-term nursing-home care the VA provides to aged veterans, dependents, and survivors. Many active-duty dependents receive specialized care at military facilities or through CHAMPUS. Thus, whichever national plan evolves, military and VA health systems are likely to remain important providers.

The services began in 1988 to explore various ways of lowering costs without compromising service. One common element of the plans is to provide local managers more power to direct beneficiaries to appropriate medical resources with an eye toward keeping down costs. Another common approach is to make more use of "primary care givers." Acting in the role of the traditional family doctor, they refer patients to specialists only when the more specific and expensive treatment is clearly indicated.

One of the military's earliest demonstration projects was the CHAMPUS Reform Initiative (CRI) tested in California and Hawaii. It allows beneficiaries a choice of three types of coverage:

- CHAMPUS Prime, which requires low copayments, no deductibles, and no claim forms but with only a limited choice of care providers.

- CHAMPUS Extra, which allows more choice of providers but requires deductible payments and higher copayments.

- CHAMPUS Standard, which allows the widest choice of providers and coverage but also costs the most in copayments.



Under all three options, beneficiaries remain eligible for care in military treatment facilities when space is available, but the services juggle the use of on-base and off-base resources to save money. Most eligible patients have chosen CHAMPUS Prime, and studies show that the program has slowed cost growth.

A second project, called Catchment Area Management, begun in 1989, is designed to draw together health-care resources in a geographic area. CAM has been tested at five sites, including Carswell AFB, Tex. It gives local managers control over most local resources, including operations and maintenance funds and CHAMPUS. It challenges them to hold down costs by negotiating discounts with civilian providers and making greater use of military facilities.

CAM managers have negotiated discounts of ten to thirty percent in prevailing CHAMPUS charges and hired civilian doctors to work on-base, which is even cheaper. Some sites require primary-care physicians to refer patients to military rather than civilian specialists. The plan also uses health-promotion programs to increase fitness and reduce the need for care. One aim of the Texas test has been to extend coverage to beneficiaries left stranded by the closure of Carswell AFB.

A variation on the CAM approach combines resources of the three services in the Tidewater area of Virginia. Included in the grouping are Portsmouth Naval Hospital, Fort Eustis Army Community Hospital, and the 1st Medical Group at Langley AFB. A TRICARE Service Center enrolls beneficiaries, advises them on benefits, and directs them to appropriate providers.

### The Long-Term Answer?

The Tidewater program is a pilot project for the planned transition to what the Defense Department hopes will be the long-term answer to the health-care problem: the Coordinated Care Program (CCP).

CCP, scheduled to cover all continental US military treatment facilities by 1994, would use a "gatekeeper" to direct beneficiaries to specific providers. Those sent to civilian facilities would pay standard CHAMPUS rates (currently, deductibles of \$150 per person and \$300 per family plus copayments of twenty to twenty-five

percent). Those sent to military hospitals or clinics would continue to pay nothing for outpatient care and only minimal fees for inpatient care.

The CCP proposal drew fire from military groups because it would have barred nonenrollees from military facilities and forced them to use CHAMPUS. Congress quashed that objection by ruling that only positive enrollment incentives could be used.

Military groups still prefer many features of the CHAMPUS Reform Initiative, however, particularly the low-cost option, CHAMPUS Prime. A recent GAO report also said that CCP's cost-sharing feature is out of line with other managed-care programs. Most civilian health-maintenance organizations (HMOs) charge about five dollars per office visit and only modest fixed fees for hospital care, GAO said. Few charge a percentage of the cost.

GAO said the Pentagon should follow the HMO practice of charging fixed fees for enrollees, but that it might consider charging more for non-enrollees at both military and civilian facilities. Another option, GAO said, would be to charge nominal premiums for coverage—a common practice with other government programs, such as Medicare, and with most private programs.

GAO's most serious reservation, however, was that the services lack the administrative machinery to carry out CCP. As recently as last summer, GAO said, DoD did not have information systems able to verify eligibility, process pay claims, allocate resources, or evaluate the program's performance.

The services' efforts continue to draw fire from several directions. The Congressional Budget Office charged that the military and VA programs will continue to cost too much and suggested that Congress should consider broader restructuring. The CBO questioned whether older retirees and dependents should be allowed any military care after they have become eligible for Medicare. It also suggested that CHAMPUS beneficiaries and in-house patients should share more of

the costs. The GAO saw similar flaws in the VA health-care system.

All this raises deep concern in the military community. Many service and veterans associations dislike even the current, relatively modest reforms. Last year, for example, the Senate Appropriations Committee's Subcommittee on Defense heard the views of the Military Coalition, a confederation of twenty-two military and veterans groups. A spokesman gave tentative support for managed care but insisted that priority should be given to treatment at military facilities. When beneficiaries have to use other options, he said, cost-sharing should be limited. He also said that CHAMPUS should be used as a second payer to Medicare for older patients. He called for broader dental coverage, continued health coverage for those in base-closure areas, and better programs for the disabled.

The coalition also favored extending the CRI beyond California and Hawaii and said the CCP should not go beyond the test stage until other options were explored. The Air Force Association, a member of the coalition, echoed this position, charging that the "untested" CCP approach would offer beneficiaries fewer choices and cost them more.

The military community's larger fear is that its facilities may be swallowed in the general overhaul of national health care. The Retired Officer Association said that "the military health service system and VA must be protected and never absorbed into a national health-insurance-styled program." Military Coalition spokesmen said service and veterans groups view military medical care as "an earned entitlement," one that "must be retained."

It seems clear that change is coming. However, there is little danger that the military and VA systems will disappear. The current system falls within the framework of the two most-discussed approaches to reform: mandated employer-provided insurance and full national health care. In a sense, the military community already is covered by a combination of the two. ■

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**The Clinton team takes its shot at a system that has been reformed several times already.**

**Service Acquisition Executive**

**Requirements developer**

**Service headquarters lead for requirements**

**Materiel commands**

**Development tester**

**Operational tester**

**Headquarters action officers**

# Another Run at the A

**F**OR decades, the Pentagon's procurement process functioned like a production line, rolling out a stream of updated weapons. Sometimes, design glitches or budget problems brought the line to a halt, but the general approach was clear. While one aircraft, tank, or warship was in service, a newer model would enter the assembly pipeline. A third model, newer still, would already be on the drawing board in research and development.

In coming years, officials warn, there won't be enough money to sustain such a steady, predictable flow of modernized weapons. As a consequence, the nation's acquisition system faces redesign for greater efficiency and effectiveness in the post-cold war environment. The basic structure likely will remain, but the way it is used will change.

For one thing, say Clinton Administration officials, weapons upgrades will probably increase in importance. Moreover, some weapons may be produced in extremely small quantities. Others might never enter production

but serve instead as research and development test-beds. At his Senate confirmation hearing last March, John M. Deutch, the new under secretary of defense for Acquisition, declared he will pursue at least three specific acquisition reform goals:

- Making the requirements-setting process thorough and realistic, so that targets for weapon system performance, budget, and schedule can be reliably set and ultimately met.

- Easing the paperwork burden for firms doing business with the Pentagon, principally by changing contract management, auditing, and testing practices and regulations.

- Inducing the Pentagon to increase use of off-the-shelf commercial products.

"If we are to have the forces and industrial base needed at a time of declining budgets," said Mr. Deutch, "I believe the DoD must reshape the way it develops and procures systems."

The procurement process that Mr. Deutch wants to tinker with is not a

## Key Players—Acquisition Management

Army	Navy	USMC	Air Force
Assistant Secretary of the Army for Research, Development, and Acquisition	Assistant Secretary of the Navy for Research, Development, and Acquisition	Assistant Secretary of the Navy for Research, Development, and Acquisition	Assistant Secretary of the Air Force for Acquisition
Training and Doctrine Command	Fleet CINCs/Office of CNO	Fleet Marine Force/Doctrine Command	Operating commands
DCS for Operations and Plans	Office of CNO (platform sponsor)	DCS for Requirements and Programs	DCS for Plans and Operations
Army Materiel Command	Systems Commands	Marine Corps Systems Command	Air Force Materiel Command
Test and Evaluation Command	Systems Commands	Marine Corps Systems Command	Air Force Materiel Command
Operational Test and Evaluation Command	Operational Test and Evaluation Force	Marine Corps Operational Test and Evaluation Agency	Air Force Operational Test and Evaluation Center
Staff officers and Program Executive Office liaison	Staff officers, Office of Assistant Secretary of the Navy	Staff officers, Office of Assistant Secretary of the Navy	Program element monitors OASAF

# Acquisition Process

By Peter Grier

simple one. It has already been reformed a number of times—most recently as a result of the 1986 Packard Commission recommendations on management reform.

### New Chain of Command

The Packard recommendations led to many changes, among them the creation of the position of under secretary of defense for Acquisition—the “procurement czar” post now held by Mr. Deutch. It simplified the weapons-development chain of command, which now leads from the Pentagon under secretary position to armed service acquisition under secretaries to midlevel managers called “Program Executive Officers” who oversee a number of systems and down to individual Program Managers.

Within the Pentagon, the Secretary of Defense, of course, retains the ultimate procurement decision-making power. However, a number of committees with interlocking memberships wield considerable authority. The most important of these panels:

**Defense Acquisition Board (DAB).** The DAB functions as a board of directors for the acquisition system, exercising general oversight by conducting formal reviews of new weapons development at critical decision points along the road.

Under Secretary of Defense for Acquisition Deutch is the DAB chairman, and Vice Chairman of the Joint Chiefs of Staff Adm. David Jeremiah is vice chairman. Other important members include the three service acquisition executives and the Pentagon’s director of Defense Research and Engineering.

**Joint Requirements Oversight Council (JROC).** The JROC judges whether the military really needs the weapons that it proposes to build and buy, in light of likely threats. It sets priorities among competing systems. Its chairman is Admiral Jeremiah. Vice chiefs of staff from the services fill out the membership.

**Defense Planning and Resources Board (DPRB).** The DPRB is the financial planning arm for the acqui-

sition system. Members of the board meet periodically to ensure that defense budgets and weapons procurement plans are in sync. Its chair is Deputy Secretary of Defense William Perry. Board members include the service secretaries and JCS Chairman Gen. Colin L. Powell.

As the shapes of these committees illustrate, the defense procurement process consists of three interlocking systems, with three major functions. First, defense officials have to figure out what they want and need. Then they have to figure out how to pay for it. Finally, they have to manage its development and deployment. DoD Directive 5000.1, which lays out the procurement system in bureaucratic terms, dryly notes that, given the multiplicity of decision points, “effective interaction is necessary for success.”

### Harder Than It Looks

The process of building and buying a weapon begins when the armed services determine they need it. That

sounds obvious, but the requirements process is a bit more complex.

First comes a "Mission Need Statement." This originates as a broadly expressed assessment, such as: "The US needs to be able to hit enemy forces 200 kilometers behind front lines to slow large armored formations," or "The US has to counter advances other nations have made in submarine quieting."

Usually, these broad-gauged statements of need come from warfighting commands, though they don't have to. Each year, each service shuffles through its need statements, sets priorities keeping likely budgets in mind, and sends them through Defense Department channels.

These end up at the Joint Requirements Oversight Council, which makes sure that the purported threats are valid.

factory, recommends that the program proceed.

There are now four milestones that a weapons program must pass to reach deployment. The JROC and the DAB are supposed to keep an eye on a weapon's progress and continue to judge whether the Mission Need Statement that began the whole thing remains valid.

Milestone 0 marks the formal beginning of the system development process, the door to a weapon's concept exploration and definition (CE&D) phase. This phase is a relatively short, intense period in which a small group works to answer the basic question of whether the new development program is justified or not.

During this post-Milestone 0 activity, the question of which weapon design is best suited to meeting mis-

weapon testing and evaluation and logistics support.

If all goes well, the DAB gives the program permission to pass Milestone 1. When it does so, the program enters the concept demonstration/validation (CD/V) phase. Typically, an official program office is formed and Program Manager appointed within six months.

Early in the CD/V phase, the number of people working on the project expands. Their job is to select the most technically feasible design or designs for development. They identify the most important cost, schedule, and performance trade-offs. The basic issue in this phase: Is this what we really want to do to carry out this mission?

Construction and testing of prototypes occur in the latter stages of the



Then, it decides which threats require production of a new weapon, rather than a change in doctrine or training.

After all of these "needs" have been scrubbed, the lucky few enter the acquisition system in earnest. They are forwarded to the DAB as formal Mission Need Statements.

The DAB functions as the gatekeeper of the defense procurement process. The board reviews the programs at key decision points called "milestones" and, if progress is satis-

sion need is still an open one. The pros and cons of different concepts are weighed as officials develop information on cost, performance, and operational requirements.

During this period, officials are also supposed to lay the foundation of the strategy for the weapon's acquisition. That means officials have to figure out the feasibility of actually building what they want and whether they can find contractors able and willing to do the job. Work begins on plans for

CD/V phase. If all continues to go well with the DAB and if the JROC continues to affirm the mission need, the fledgling program gets permission to pass Milestone 2 and enter the engineering and manufacturing development (EMD) phase.

### A System Shapes Up

EMD is the point at which experimentation tapers off and the final weapon system truly begins to take shape. Difficult and intense work re-

solves cost/performance trade-offs and sets the stage for the manufacture of a mature design. The pace of test and evaluation increases as program officials work to find out whether the system is really ready for production.

The projections of life-cycle costs are updated and checked against projections of annual funding. At the end of the EMD phase, the program moves into low-rate production as it prepares for the crucial Milestone 3 review.

If the program gets the final go-ahead from the DAB and JROC, it gets permission to pass Milestone 3 and enter the production and deployment phase. Follow-up testing continues, but the main emphasis is on meeting production and budget targets en route to initial operational capability.

essary, whether to correct a design deficiency, to counter an increased threat, or to take advantage of newly developed technology.

If a major upgrade is deemed appropriate, the recommendation goes to the DAB. If the DAB gives approval, the program passes Milestone 4 and enters a new phase. Cost/performance trade-offs are particularly important in such decisions. The chosen upgrade is weighed against not only other types of upgrades but also against the possibility of building new weapons.

To help plan and pay for this weapons development process, a resource management system runs alongside it—the Planning, Programming, and Budgeting System (PPBS), introduced into the Pentagon in 1962 by Defense Secretary Robert S. McNamara.

The foundation of them all is the Defense Planning Guidance, a secret document prepared in the fall of even-numbered years. The DPG lays out national objectives and military strategy in broad terms. This document, in turn, guides development of the Future Years Defense Program.

The FYDP translates defense strategy into dollar figures. It includes six-year acquisition outlooks for each service and the Defense Department as a whole. The FYDP (which used to stand for “Five-Year Defense Program,” because it covered five, rather than six, years) comes out biennially, in July.

During this process, each service (as well as the joint-service US Special Operations Command) produces a Program Objective Memorandum. A service POM lays out the details of

## Acquisition Process



The acquisition process does not end here, however. Following Packard Commission recommendations, formal procurement oversight continues into the useful service life of the system.

After a weapon has been in the field long enough for operators to have acquired a base of experience, the production and deployment phase segues into the operations support phase. The program office begins to weigh whether major modifications are nec-

### Interlocking Documents

PPBS is the forum Pentagon planners use to weigh national strategy against expected funds to produce the figures for the annual defense budget exercise. (Technically, the military budget has been biennial since 1987, but Congress still goes through the process every year.) The body that oversees the PPBS is the Defense Planning and Resources Board. The DPRB functions on the basis of several interlocking documents.

how the service is meeting the DPG with production of specific forces and acquisition programs, among other things. It lays out how the service is budgeting for its specific weapons and other needs. The draft service POMs come out biennially, usually in April, and undergo months of revisions before they are approved in final form in the fall.

On paper, the Department of Defense acquisition process looks like a smoothly running machine of inter-

locking parts. In practice, however, things often go awry. Witness the cancellation of the Navy's A-12 attack plane in January 1991.

Recent years have seen a more or less continuous attempt at reform of the process, with the 1989 Defense Management Review following up on the 1986 Packard Commission recommendations. Yet persistent problems have led many to believe the system is still broken and in need of further fixing.

Critics frequently charge that the system does not do a good job of setting requirements and assigning priorities before the onset of Milestone 0. They further claim that rigor in milestone reviews has been missing, with troubled systems sometimes being waved through. They say that the process has trouble dealing well with technical failure, particularly in the EMD phase, and that appointees to the under secretary of defense for Acquisition post have rarely had sweeping authority over procurement matters, as Congress intended when it created the new post.

"There is widespread frustration and cynicism in industry, Congress, and the DoD about efforts to streamline and reform the process," said Mr. Deutch.

On top of this are the changes being forced by the dramatic decrease in the conventional military threat to the US and its allies. Defense-procurement-as-assembly-line is a thing of the past. In the future, weapons will likely pass their milestone markers in fits and starts—if at all.

### The Bush White Paper

In mid-1992, the Bush Administration's Pentagon issued a sketchy white paper laying out a new defense acquisition strategy. New programs were to face tougher reviews before they could reach Milestone 0. Much greater emphasis was to be placed on research and development, particularly in major basic technology areas such as surveillance and communications. The plan also called for greater use of available funding for prototypes and technology demonstrators at the expense of production programs.

The election made this program moot. Now the Clinton team is proceeding with an acquisition reform package that differs greatly in emphasis. "We will have to have a radical

reform of our acquisition process," Deputy Secretary Perry told Congress. Specifics will have to await the results of the Clinton Pentagon's comprehensive review of defense programs, which has become known as the "Bottom-Up Review." Defense Secretary Les Aspin has said the Bottom-Up Review may be finished by late summer or early fall. Even now, however, defense insiders are expecting the new acquisition system to contain the following features:

- Low-rate production, to keep the industrial base intact during longer intervals between big new weapon programs. Defense Secretary Aspin promotes building a small number of selected weapons every year. The F-16 could be a candidate for this approach until the F-22 fighter comes on-line.

- System upgrades, to keep weapon platforms around longer, keep the force more effective, and keep some contractors in business. M1 tanks are one system Secretary Aspin has mentioned as eminently upgradable.

- "Silver bullets"—small, focused purchases of true breakthrough weapons. The F-117 Stealth fighter, of which only sixty were produced, is seen as the classic successful silver-bullet procurement. The Defense Secretary has also mentioned the V-22 Osprey as a possible "silver bullet" program.

- "Rollover Plus," a strategy of technology development. It means that, after a new weapon system is developed, it does not automatically go into production. Instead, the new technology is sent back to Milestone 0 and "rolled over" into an even newer generation system. "You will produce . . . maybe every third generation of planes," said Secretary Aspin earlier this year.

As an example of the seriousness with which the Pentagon leadership now takes these issues, Mr. Deutch says he wants to create new deputy under secretary positions for Acquisition Policy Reform and Advanced Technology Demonstration.

### Shrinking Industrial Base

The prospect of surviving on R&D

contracts, low-rate production, technology demonstrators, and occasional production runs does not make major defense contractors happy about their future. They point out that this strategy will inevitably lead to a contraction of the industrial base, particularly in second- and third-tier contractors. Fixed-price R&D contracts are being eliminated, so firms can show greater profit on development work. However, the unit cost of prototypes and advanced technology demonstrators will surely be very high, exposing them to severe political criticism.

Still, the defense industrial base inevitably will shrink. This issue is intimately linked to the procurement process. Those who have studied the problem say that government and industry will have to forge new relationships if acquisition reform is to succeed.

Thomas Culligan, vice president of McDonnell Douglas, called for what he terms an "all-volunteer defense industry," in which the Pentagon treats its contractors with the same kind of respect it accords members of the all-volunteer force. Too often, he said, firms are treated like "raw conscripts" in need of constant supervision. He noted that McDonnell Douglas has 600 government representatives working full-time at its facilities. Its commercial aviation business is two-thirds the size, yet has only thirty-five customer representatives at its facilities.

Clinton officials do put relief from micromanagement at the top of their list of acquisition reforms. Overly stringent military specifications and security restrictions deserve particular attention, Deputy Secretary Perry told Congress.

"That does not mean we are going to support defense companies that are going out of business," said Mr. Perry. "That does not mean we're going to intervene in the consolidation process. But it does mean we are very much concerned with the residual capability and will work to try to maintain that capability so that it has a minimum essential production capacity needed by the Defense Department." ■

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By John L. Frisbee, Contributing Editor

## Ordeal for the Record

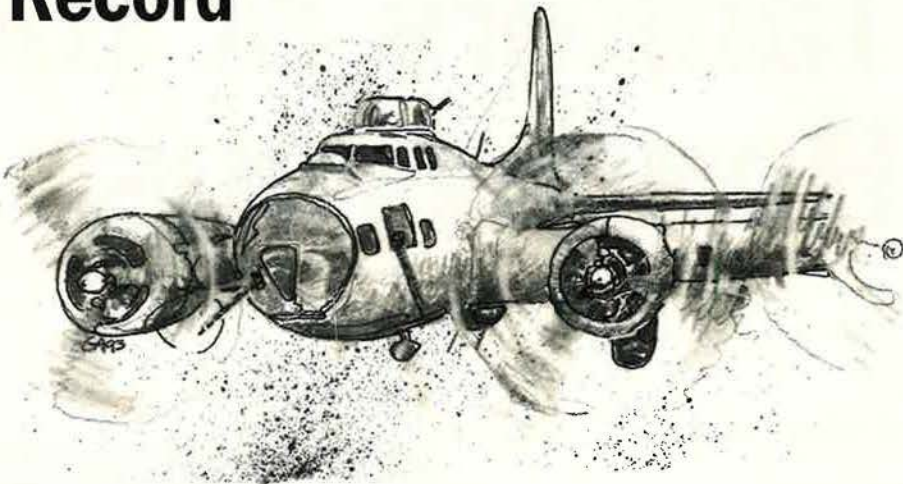
All but two of Lt. Bill Whitson's crew were wounded or dead. Crew integrity got them home.

**O**N MAY 15, 1943, the 305th Bomb Group was dispatched from its base at Chelveston, UK, as part of a strike force against military installations near Wilhelmshaven on Germany's northwest coast. The 305th was one of the earliest B-17 groups to arrive in England, flying its first combat mission on November 17, 1942. Under the leadership of Col. Curtis LeMay, the group had risen from the status of combat novices to one of the premier veteran outfits. It had been a costly, often painful learning process.

*Old Bill*, a B-17 from the group's 365th Squadron, was piloted by Lt. Bill Whitson on the Wilhelmshaven mission. Whitson knew that neither the AAF nor the RAF had fighters with enough range for escort into Germany. Enemy fighter attacks were inevitable as the squadron approached the target. Some distance short of Wilhelmshaven, bombardier Lt. Robert Barrall reported that the target area was blanketed with clouds. The group would proceed north to the island of Heligoland, an alternative that would not be uncontested. Already there were contrails several thousand feet above them. Seconds later, a swarm of FW-190s launched a head-on attack.

Closing at nearly 600 miles an hour, the -190s raked *Old Bill* with 20-mm cannon fire. Shell fragments cut deep into Whitson's legs and severed oxygen lines to the flight deck. Dragging himself painfully from his seat, Whitson staggered to the rear of the aircraft to assess damage and gather walkaround oxygen bottles. When he returned to the cockpit, copilot Lt. Harry Holt was suffering from severe anoxia. A revived Holt took over while Whitson's wounds were being cared for.

Returning to the left seat, Lieutenant Whitson was able, with difficulty, to hold formation as fighter attacks continued. The FW-190s concentrated on Whitson's bomber, which clearly was in trouble. Another 20-mm shell



exploded in the cockpit, fragments hitting the injured pilot and wounding Lieutenant Holt so seriously he could no longer help control the B-17 and had to be carried from his seat.

Almost immediately, 20-mm shells tore the Plexiglas nose completely away, killing navigator Lt. Douglas Venable and wounding bombardier Barrall. The top turret was shattered, leaving Sgt. Albert Haymon bleeding from head and arm injuries. Haymon stayed in the useless turret, hand-cranking the silent guns to a forward position that might discourage Luftwaffe fighter pilots. He then climbed down to help wounded radio operator Sgt. Fred Bewak.

With one engine out, a wing buckled, and hydraulics gone, Whitson could no longer stay with the formation. Checking with the crew, he found only two of his men uninjured. Those gunners whose weapons were still operating continued firing at enemy fighters as Whitson dove for cloud cover 5,000 feet below. The gunners claimed seven fighters destroyed during that screaming descent.

Exhausted from loss of blood and the strain of evasive maneuvers, Whitson was barely conscious. Seeing the pilot's condition, Sergeant Haymon slid into the copilot's seat and flew the plane while Whitson regained some strength.

When the bomber broke out of the clouds, Haymon saw an Me-210 peeling off to attack *Old Bill* and alerted the crew. Twice-wounded Lieutenant Barrall climbed into the shattered nose

section and manned the cheek gun, buffeted by a 150-mile-an-hour wind that blasted in through the open nose. Barrall kept firing until one of the -210's engines exploded and the enemy plane plunged into the sea. He then climbed up to the flight deck and relieved Whitson, who would have to land the plane if they made it to Chelveston. Tailgunner Sgt. Kenneth Meyer, one of the two uninjured crew members, replaced Sergeant Haymon in the copilot's seat. He and Barrall managed to maneuver the stricken bomber into the protection of a formation of B-17s returning to England.

Once they reached the coast they were on their own. With a dead navigator, a copilot out of action, a wounded radio operator, and a barely conscious pilot, finding Chelveston among the welter of airfields dotting the Midlands was no small achievement. As they approached the field, Whitson took over the controls, shaking his head to clear his brain and retain consciousness. Because the plane lacked flaps and brakes, he flew the B-17 onto the runway far above normal landing speed and ground-looped when it ran out of runway. He then collapsed over the control column. No 305th B-17 had ever survived such a beating. It had been an ordeal for the record.

Lieutenants Whitson and Barrall were awarded the Distinguished Service Cross, all other crew members the Silver Star, and eight of the ten the Purple Heart to become the most decorated crew of the 305th Bomb Group. ■

**They've got to be there—every time.  
Without them, you're flying on fumes.**

# Tankers at the Rendezvous

By David J. Lynch

**I**N THE Persian Gulf War, Air Force KC-135 and KC-10 tankers performed more than 51,000 in-flight refuelings. These giant filling stations in the sky transferred some 125 million gallons of fuel to other planes. Moreover, the tanker force missed not a single wartime refueling rendezvous.

For a public mesmerized by the war images that flashed across its TV screens, Tomahawk cruise missiles and smart bombs may have been the stars of the conflict. Many professional war planners, however, give top billing to the tanker fleet.

The dependability of USAF's aerial refueling aircraft was also the key to the success of Operation Restore Hope, the recent US humanitarian effort in Somalia. In nearly three months of operations through February, for example, the Tanker Task Force from Morón AB, Spain, posted a 100 percent effectiveness rate, meaning it never failed to deliver the fuel on time.

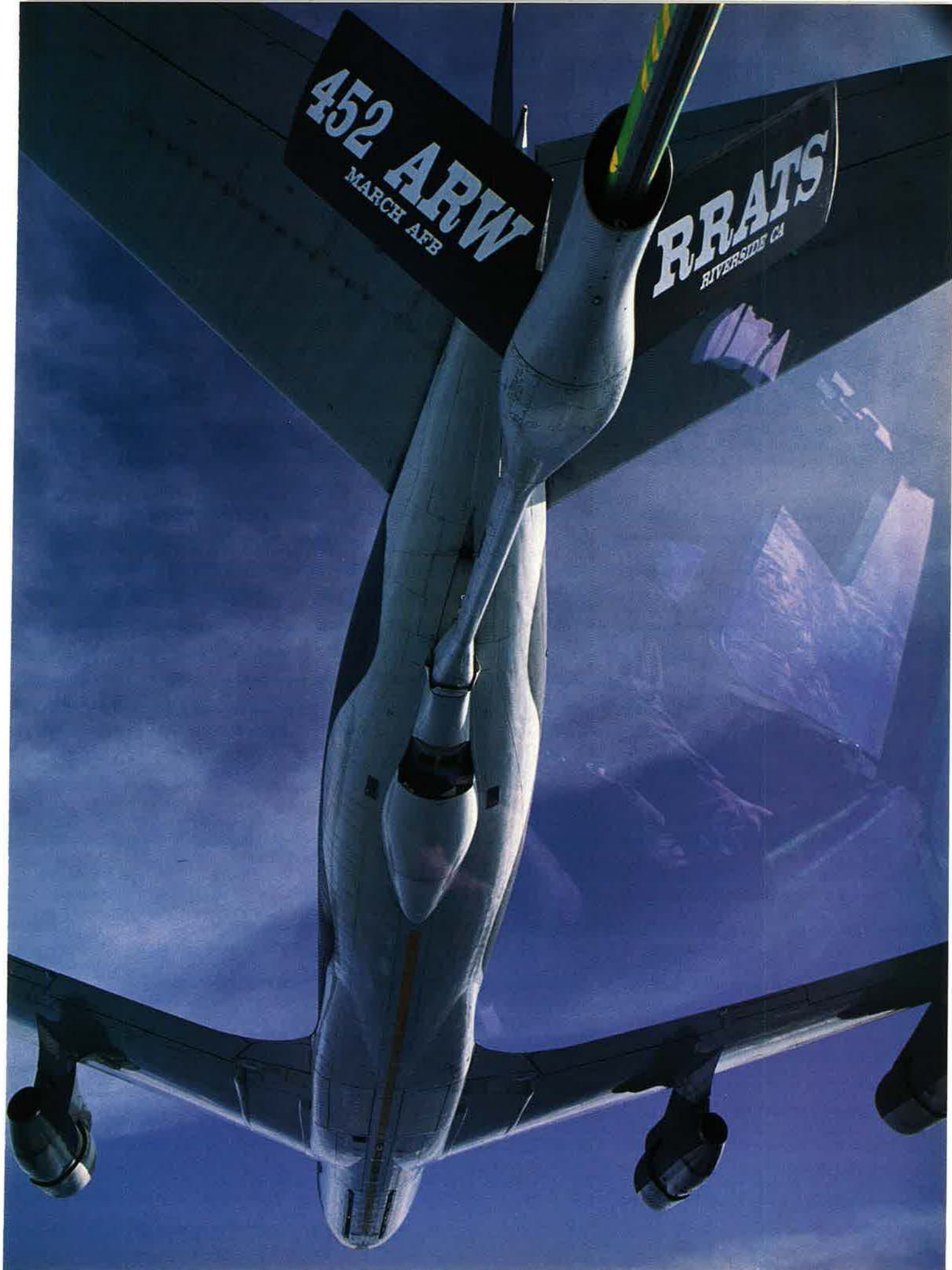
The Somali effort was choreographed. "Everything, including refueling the C-5s and C-141s on their way to Africa, was tightly scheduled," said Col. James Dickensheets, the task force commander. "If we missed a refueling



Photo © Joe Towers

*A total force mission if there ever was one, air refueling was an unsung force-multiplier during Operation Desert Storm. Opposite, an Air Force Reserve KC-135 Stratotanker from the 452d Air Refueling Wing, March AFB, Calif., extends its boom to a customer. Above, the Air National Guard is represented by a Stratotanker from the 151st Air Refueling Group, Utah ANG.*





452 ARW  
MARCH AFB

RRATS  
RIVERSIDE CA



**The active-duty Air Force also performs air refueling. Here, a 22d ARW KC-10 from March approaches a KC-135 of the 398th Operations Group, Castle AFB, Calif. During Operation Restore Hope, USAF tankers posted a 100 percent effectiveness rate.**

over the Atlantic Ocean or Mediterranean Sea, those planes would have to stop somewhere in Europe, throwing off the entire schedule” for delivering desperately needed supplies.

Air Force leaders have long recognized but are now reemphasizing that a key to projecting worldwide airpower resides in one of the less publicized elements of the force: the more than 3,000 men and women who fly aboard tankers. Each tanker pilot can tell a story of the moment when the dangers—and significance—of the refueling mission were brought home in dramatic fashion. For Capt. David Horton, it came in the Gulf War when an Air Force fighter pilot, flying on fumes, sent out a desperate radio call for help.

Captain Horton was at the controls of a KC-135R on the night of January 17, 1991, according to an official Air Force account of the incident. It was the opening phase of the war with Iraq. The young captain, who was based at Grissom AFB, Ind., was flying a lazy oval near the Iraqi border when his radio crackled to life. “Mayday, Mayday,” called an unknown pilot. “I want to declare an in-flight fuel emergency.”

### Running on Empty

The message came from the pilot of an F-117 Stealth fighter. The plane, returning to base after making an attack on Baghdad, was flying in extremely foul weather and had missed

its planned postattack refueling action. The stealth jet’s fuel tank was dangerously close to empty.

The F-117 had asked an E-3 Airborne Warning and Control System (AWACS) plane for directions to an alternate landing area. Captain Horton, listening in, realized the fighter’s new course came directly past his KC-135. The tanker pilot alerted the E-3 and began flying to a higher altitude, seeking to break out of heavy cloud cover. Finally, at 27,000 feet, he popped into clear air.

When the F-117 showed up, however, its pilot had trouble maintaining the proper altitude for refueling. Holding position was made difficult by the presence in the weapons bay of a heavy, unused smart bomb. As time slipped away, the F-117 pilot warned the refueling boom operator, “We’ve got one shot at this.”

The F-117 rose from the clouds, seeking the KC-135. As he eased in behind it, the fighter pilot throttled back to match the tanker’s speed. The boom was lowered into the tanker’s wake, and the operator maneuvered it into position as the fighter struggled to hold its place. Finally the connection was made, and the precious fuel began pouring into the F-117.

Because it was carrying the extra weapon, however, the fighter was still struggling to hold a position. Captain Horton executed a so-called “toboggan” maneuver. With the two planes joined by the refueling boom, the

tanker pilot dropped the KC-135 into a descent. The F-117 pilot tucked in behind, picking up the speed he needed to hold the fighter in place.

The refueling was completed and the F-117 roared away, but not before its pilot called out a thank-you. “You guys really saved my bacon,” said the fighter jock.

The process of conducting in-flight fillups has changed a great deal since 1918, when a Navy Reserve pilot snagged a bag of sand from a barge in an early test of a primitive air refueling concept. The path has been one of steadily increasing skill and sophistication.

Many of the earliest refueling attempts were nothing more than aerial stunts, as in 1921 when wing-walker Wesley May in Long Beach, Calif., hopped from one biplane to another with a five-pound can of gas strapped to his back.

In World War II, the US Army Air Forces did not conduct aerial refueling operations, though it seriously considered doing so, especially in the Pacific theater. One plan developed in 1942 called for launching B-17 bombers from Midway Island to hit targets in Tokyo, refueling the bombers before or after the raids. The role of refueler would have been played by modified B-24 bombers.

### Nothing Automatic

After the war, the Air Force got serious, but progress was slowed by the technological immaturity of the refueling devices. The receiver aircraft would have to snare a contact line trailing from the tanker and winch in the refueling hose to make the connection. There was nothing automatic about it.

In the Korean War, refueling during combat operations took place for the first time, with promising results. In 1954, the Air Force bought its first KC-135A Stratotankers from the Boeing Co., and, a decade later, the service had taken delivery of 732 KC-135s. Many of these are still flying; some are expected to continue flying well beyond the turn of the century.

The Air Force continued to develop its expertise through the late 1950s and early 1960s. The war in Vietnam sparked a dramatic expansion of the use of in-flight refueling. After the war, the Air Force sought to bolster its capabilities with an advanced tanker aircraft, a concept fulfilled by the KC-10. McDonnell Douglas began work



**The KC-10 Extender can also double as a transport, making it one of the most versatile airplanes in AMC's inventory. It can refuel both boom and probe-and-drogue aircraft and has a maximum cargo payload of 169,409 pounds.**

on this aircraft in 1978, and the first plane entered service three years later. The KC-10 was a significant advance in USAF's refueling capabilities. Each KC-135R holds around 200,000 pounds of fuel; the KC-10, which itself is air refuelable, carries up to 350,000 pounds.

In-flight refueling, though all but taken for granted in today's Air Force, can be a risky proposition even in peacetime. When the receiver is a large aircraft like a C-5, the tanker pilot has to worry about the aerodynamics of two large bodies coming so close together in midair. If he or she isn't careful, the flight of the two aircraft can form a powerful vacuum that can suck the two air vehicles together. In addition, the flight of the cargo plane can create a huge "bow wave" of air that can sweep over the tanker's elevators, giving the tanker pilot a nasty in-flight surprise.

When it comes to aerial refueling, fighters are easier to service. "You don't even feel them behind you," said Maj. Rick Antaya, a KC-135 pilot. He noted, however, that the experience level of the pilot flying the receiving aircraft makes a big difference. "Even in the worst of turbulence," said Major Antaya, a veteran pilot can hold position. That is not always the case with a rookie, said the major. "It doesn't take much to scare them off the boom."

The receiver also has a major task on his hands. The rule of thumb, say

operators, is that for every time the tanker pilot touches his throttles the receiver has to make three power adjustments.

#### **AWACS Helps Out**

There are three principal types of refueling operations. One is the "point-parallel" type, in which two aircraft come toward each other. At the tanker's direction, the receiver aircraft executes a 180° turn, reversing direction and ending up just three miles in front of the tanker. This tactic is most

commonly used in refueling large aircraft.

Second is the "en route" approach, which can be used by any type of aircraft. Here, the tanker and his customer are given refueling coordinates and a specific time to rendezvous. "You've got to be there on time," noted Capt. Al Self, a ten-year veteran of tanker operations. "Otherwise, it's a big blue sky."

Finally, in congested airspace, tankers can do their work under an AWACS-directed operation called "fighter turn-on." The giant airborne warning and control aircraft communicates with a tanker and a receiver. It gives the tanker heading and airspeed commands. It vectors the fighter toward the tanker until the combat jet acquires the tanker visually or on radar. Then the receiver moves into position.

There is a common thread to all three techniques: Once the receiver is within a half-mile of the tanker, the boom operator becomes the key figure. He or she is lying on his or her belly in the tanker's rear area, watching the operation unfold.

In the KC-10 tanker, the boom operator's station is pressurized and air-conditioned and includes a rear window and wide-angle periscope system. By blinking commands with the lights on the tanker's underside and speaking with the fighter pilot over a radio, the "air refueling operator" steers the receiver into a rectangle of airspace below and behind the tanker.



**Deployment of the KC-10 marked a great advance in tanker technology. It can carry almost twice as much fuel as the KC-135 and is itself air refuelable. Also, the boom operator's station is pressurized and air-conditioned.**

Once the receiver is in place, everything depends on the boom operator, who mechanically flies the boom into the receiver aircraft's refueling receptacle, using a digital fly-by-wire system. "That's probably the trickiest part of the operation," said Captain Self.

The Gulf War marked a significant departure for Air Force tanker crews. In peacetime and in small-scale conflicts, tankers had typically remained well away from the danger zone. The war with Iraq, however, found tankers deliberately flying much closer to hostilities. When flying missions north of the border, tanker pilots frequently saw hapless Iraqi antiaircraft batteries firing wildly into the air. "I remember the first time that I copied down the coordinates and plotted the [refueling] track," stated Maj. Diane Byrne. "I didn't think tankers were supposed to go that close to the action."

On her deepest penetration into Iraq, Major Byrne came within 400 miles of Baghdad—not unusual for tanker crews. There was no great philosophical change, according to Maj. Gen. Frank Willis, deputy chief of staff for Requirements for Air Mobility Command (AMC) at Scott AFB, Ill. Rather, it was a function of the geography of the war theater.

With the war barely one week old, Major Byrne was assigned to pilot a KC-10 over Iraqi territory. Once there, she was told to drop to 12,000 feet from the safety of her 25,000-foot cruising altitude to find a C-130 in



**High-performance fighters must slow to the tanker's speed in order to refuel. This AC-130, however, has to accelerate to keep up with the KC-135. With aircraft this large, there is a danger of creating a vacuum between them, causing a collision.**

need of fuel. The danger from Iraqi antiaircraft fire forced the Air Force to carry out refueling operations in virtual radio silence.

### Bumps in the Night

When Major Byrne arrived at 12,000 feet, she found bad weather and no C-130. She began descending by increments of 1,000 feet, searching for the fuel-hungry cargo plane. Eventually, she brought up a single emitter to check for her target. Successful at last, Major Byrne began pumping

30,000 pounds of fuel into the C-130. "My biggest concern was hitting another airplane," she said. "You just hope you don't hit anything."

Often, several different tankers could be scattered along different points—though at different altitudes—on the same oval. For safety reasons, the Air Force rarely refuels below 10,000 feet, but Major Byrne said that she and her AWACS controllers were prepared to drop as low as 3,500 feet to make the connection.

Bad weather was a constant hazard. There were sandstorms, dense sea fog, and scorching heat. All posed major challenges to tanker aircrews. One day in late January 1991, a sea fog blew in off the water. With visibility at zero/zero, Major Byrne's KC-10 was led into position on the runway, where it sat, waiting for the required 1,000 feet of visibility. After a long wait, the fog lifted far enough for the runway supervisor to give the go-ahead, but as the KC-10 sped down the runway, the fog suddenly closed in again. Major Byrne pressed ahead, however, and, after a few anxious moments, the tanker broke into the clear.

For Air Force leaders, the Gulf War highlighted the vulnerability of the tankers. KC-10s and KC-135s are basically defenseless, little more than flying fuel tanks. Tanker pilots rely on the accuracy of preflight intelligence assessments, orbiting fighter escorts, and nearby AWACS to alert them to any threats. During a mission,



**A Marine Corps Reserve RH-53 Sea Stallion chases the "basket" (drogue) of an Air Force HC-130 Combat Shadow from California ANG's 129th Rescue Group. The Combat Shadows do much of their refueling at night.**

tanker commanders wouldn't know unless told that they were being "painted" by an enemy acquisition radar.

"For a good number of years, there's been concern about our exposure to any possible threat," said General Willis. He added that, until they went into action in Desert Storm, tankers tended to operate at high altitude and well behind the forward edge of battle area.

The now-defunct Strategic Air Command, located at Offutt AFB, Neb., developed a "tanker defensive concept of operations." It called for tankers to guard against infrared and radar-guided weapons by using a combination of passive detection, threat avoidance, and situational awareness. Now, as a result of the war's lessons, AMC (for tankers, the successor to SAC) is eyeing refinements to that stance.

The Air Force Electronic Combat



Photo © Hans Halberstadt

*Experienced boom operators, such as MSgt. Dallas Stevens (a "boomer" for thirty-five years) of the Utah ANG, and proven performers, such as the KC-135, make an unbeatable team. USAF plans to fly its KC-135s well into the next century.*



Office at Wright-Patterson AFB, Ohio, began a tanker defense survivability analysis late last year. The office has already reached some conclusions.

### What's the Threat?

General Willis said initial results suggested that it would be too expensive to outfit tankers with self-defense capability. The emphasis, he said, will remain on giving the pilot the tools to know what's happening. "The aircrew is interested in knowing the threat out there," said General Willis.

Ideas on the table include satellite data links as well as possible tie-ins to the Joint Tactical Information Distri-

bution System (JTIDS), a data terminal that would help numerous friendly aircraft in an area share various types of information to provide all aircraft pilots a more complete picture of the air battle scene. The Air Force conducted a feasibility demonstration of JTIDS on a KC-135 during a recent Red Flag exercise.

A key requirement for tanker jockeys is flexibility. For Captain Self,

that premium on flexibility was illustrated by a dicey situation that came up during Desert Storm. One night, early in the war, he was commanding the middle KC-10 in a three-tanker operation. Trailing behind in formation were eighteen Marine Corps AV-8B Harrier jump-jets.

Suddenly, a fireball lit the sky. A Harrier had ripped the drogue receptacle off the lead KC-10. Sparks shot about as the basket-like drogue and twenty feet of hose slapped against the jet's side. "It scared us half to death," said Captain Self, who was now the lead tanker and had to make a quick decision: Should he continue, hoping to pick up enough fuel somewhere for all of the warplanes in his wake? Or divert to a nearby island base?

Gambling that another tanker would materialize to top him off, Captain Self pressed on. With the need to fuel ten Harriers rather than his original six, the KC-10 boss needed more gas—and fast. He got it. He quickly arranged a short-notice linkup with another tanker, which dumped tons of fuel into his aircraft. Topped off, Captain Self passed the fuel to the Harriers, which proceeded about their business as if nothing unusual had occurred. ■

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**For thirty years, even the name was covert. Now its story—at least some of it—can be told.**

# The Secret Mission of NRO

By Bill Gertz

**F**OR more than three decades, the work of the National Reconnaissance Office was one of the best-kept secrets of the US military and intelligence establishment. Then came the partial declassification of the NRO in September, and the stories have been pouring out ever since.

By now, it is evident that the builder and operator of ultrasophisticated spy satellites scored quite a few triumphs.

The NRO's satellites exploded the myth of the US-Soviet "missile gap" in 1961, showing that the USSR had fewer ICBMs than Washington had feared. They photographed the first Soviet SSX-18 ICBM canister, a discovery that reverberated through superpower arms talks for years. NRO "birds" saw the construction of a Soviet phased-array radar in violation of the ABM Treaty. They exposed a purported *Yankee*-class submarine for what it was—a huge, inflatable rubber boat, left as a decoy whenever the real sub departed on secret patrols.

NRO overhead surveillance detected Soviet construction of a huge network of underground command bunkers useful for protecting leaders in a nuclear war. They revealed the spe-

cific deception techniques used by North Korea to mask a nuclear weapons facility near Yongbyon. In 1988, they spotted Chinese CSS-2 intermediate-range ballistic missiles deployed in the Saudi Arabian desert, marking the first time Beijing had exported such arms.

In at least one case, NRO pictures were too good, leading analysts to the wrong conclusion. When the US first discovered a chemical weapons plant near Rabta in Libya, Libyan agents staged a fire at the plant. It was a deception, complete with burn marks painted on buildings. NRO's high-flying space cameras saw it all, and officials concluded the plant was burned out.

When President Bush decided to order US troops to deploy in Somalia last December, the first question went to the NRO: "How long are the runways in Mogadishu where troops would be landing?" It was the key to the early phase of the operation, and everyone knew the NRO had the answer or could get it—fast.

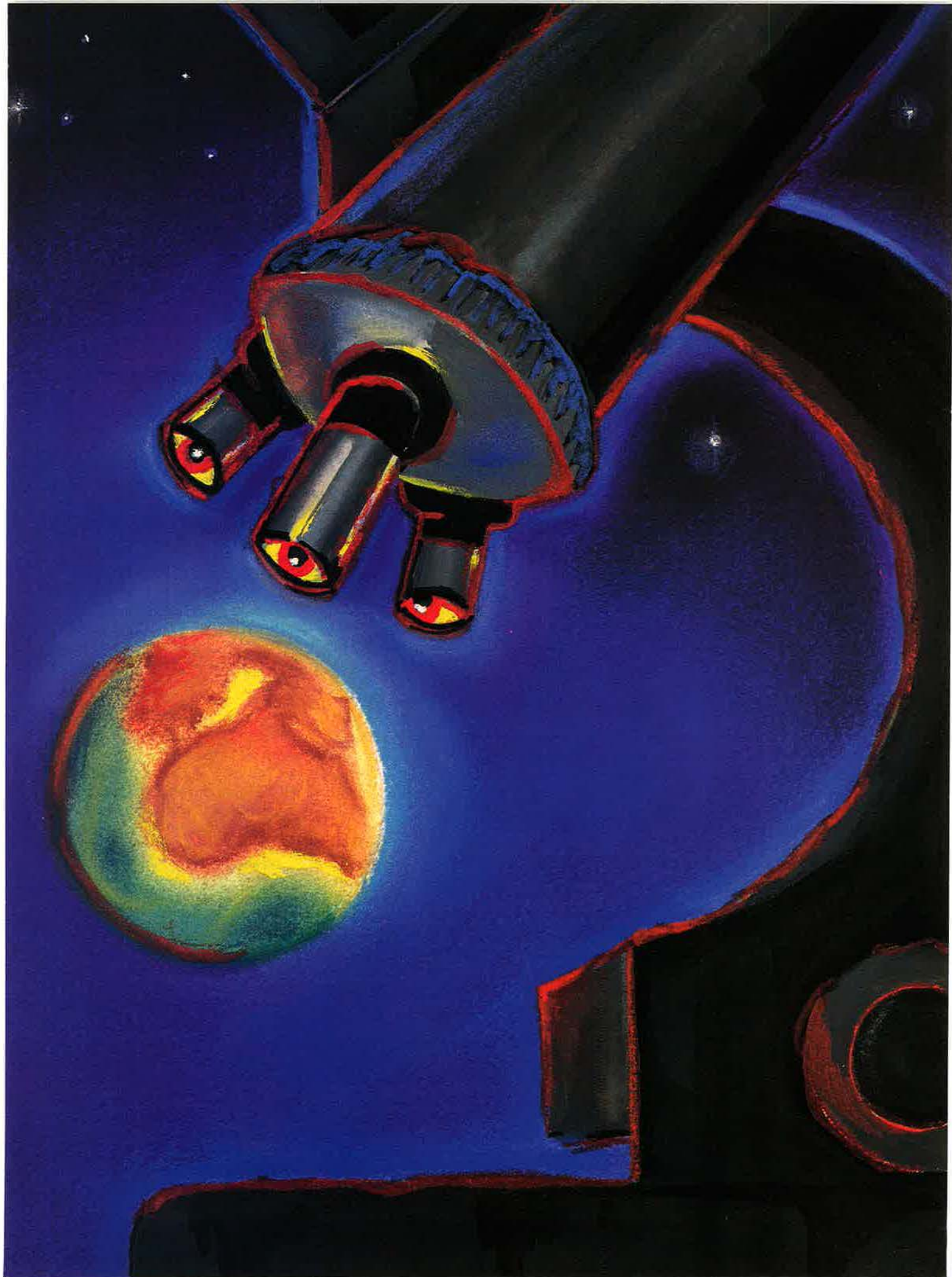
That's nothing new. Hans Mark, former Air Force Secretary and NRO director during the late 1970s and early 1980s, considered the NRO national

security role in the cold war to be "absolutely crucial" to world peace. "NRO made it possible to make arms-control agreements with the Russians because [NRO was] able to monitor them," says Dr. Mark. "It was very important in providing policymakers with timely and important information."

## Still Watching the Missile Fields

In the worst years of the cold war, the NRO supported US national security by producing high-quality imagery from space. Today, the NRO's spacecraft still watch strategic missile fields within the borders of the old Soviet empire. The NRO, however, is seeking new missions, including environmental monitoring, economic intelligence, spying on regional conflicts, and keeping close tabs on the spread of nuclear, biological, and chemical weapons and ballistic missiles.

The NRO is a major component of the US intelligence community, one directed jointly by the Department of Defense and the Central Intelligence Agency. Its personnel are drawn from offices throughout the Pentagon, but especially the Air Force. Always di-



rected by a senior Air Force civilian official, the NRO by some estimates is responsible for ninety percent of all US intelligence collection.

Until early this year, Martin C. Faga was assistant secretary of the Air Force for Space. He also was the last person to direct the NRO at a time when its very name and his position in it still were considered state secrets. He believes that the effect of the NRO on US national security has been pervasive.

"It's fair to say that satellite reconnaissance has been a part of every security event of the last thirty years," said Mr. Faga, "whether it's preparing SAC [the old Strategic Air Command] for its bombing and missile missions, or assisting tactical units in the field, or keeping the President, Secretary of Defense, National Security Advisor, and others informed of the whole raft of issues."

The National Security Council formed the NRO on August 25, 1960, in a secret procedure that combined several American space-related components, primarily from the Air Force, Pentagon, and CIA. Despite the declassification of its name, NRO is still a top-secret intelligence-gathering agency and wants to remain that way to maintain its unique spying capabilities, according to Mr. Faga, who nevertheless agreed to discuss how it does its job.

In addition to operating the nation's photographic satellites, NRO also operates signals intelligence satellites, special "ferret" satellites that monitor foreign radar, numerous weather satellites that check the skies over target areas, and special communications-relay satellites that get information from space to the ground securely. Very little of NRO's work ever involved aircraft.

Little-noticed but important and difficult NRO missions have included providing accurate data to USAF strategic nuclear forces for their targeting library—a key resource for US strategic bombers and missiles. Map data collected by NRO also helps in the complex process of programming the on-board computers used to guide ground-hugging cruise missiles.

### Technological Marvels

Those with access to the NRO's stunning photographic intelligence—classified at the highest levels—and other products it broadly categorizes

as imagery marvel at its technical achievements. It has long been part of the folklore that NRO birds as high as 150 miles above Earth could clearly photograph the five o'clock shadow on a man's face or the numbers on license plates of limousines traversing Red Square. Asked, for example, whether NRO satellites could distinguish men from women, Mr. Faga replied: "With high-resolution imagery, you could. I'm not saying whether we've got it or not."

What is not in doubt is that the NRO has been providing a vast array of extremely detailed pictures from space, whether on the movement of mobile ICBMs in Russia, Scud missiles in Iraq, or the activities of a group of international terrorists at a training camp in Libya. US presidential knowledge of the real situation in a military or diplomatic face-off was deemed to be of immense value.

Senate Intelligence Committee Chairman Sen. Dennis DeConcini (D-Ariz.) sees US satellite reconnaissance as the most sophisticated system of systems in existence. "Billions have been spent on these systems, and most of that money has been spent well."

"During the whole period of the cold war, a tremendous amount of the stability in the world was due to NRO's contribution," said Edward C. Aldridge, Jr., the former Air Force Secretary who secretly served as NRO director during the Reagan Administration. Mr. Aldridge points out that NRO imagery played a major role in the shape of US arms-control positions.

Mr. Aldridge said he made certain that the satellites being designed and built were as flexible as possible. "When you think about satellite systems, it takes about five to eight years from the time you design it to the time you launch," he says. "We're very fortunate now that satellites today have two or three times as much product lifetime and are very flexible."

NRO has evolved over the past three decades to take into account technologies that have changed communications, computers, and optics. "What that has meant is that the productivity of any satellite is far greater today than it was twenty years ago," Mr. Faga says. "Some of them are smaller today because things have become more miniature, or in many cases they

have much more capacity. They are much more flexible, and they are much faster in terms of the response of data or ability to task them and retask them quickly."

NRO's satellite cameras are designed for two purposes: reconnaissance and surveillance. Reconnaissance entails looking for specific information. Surveillance is a search of a general area for interesting items. NRO participates in both general types of spy functions, but specializes in close-look, real-time intelligence, producing high-quality images for policy-makers.

### "Spot" and "Search" Concepts

NRO birds can take "spot" pictures of specific geographic sites or "search" images that cover broad areas of the Earth, defense experts say. The satellites circle the Earth every twenty-four hours in elliptical, polar orbits. Satellite closeups allow NRO to capture many external characteristics of objects and places.

In the 1990s, the NRO will continue to discharge some traditional duties, such as verifying compliance with the START I and START II arms treaties and the treaty to reduce conventional forces in Europe. There will, however, be new missions.

One is environmental monitoring. In 1991, Sen. Al Gore (now Vice President) met with NRO experts to set up the Director of Central Intelligence (DCI) Environmental Task Force. The group of about fifty scientists includes specialists from both the government and the private sector who are cleared to examine NRO products, as well as other global intelligence, for use in environmental research. Space cameras already provide data on such environmental events as huge fires in Amazon rain forests, volcanic eruptions, floods, earthquakes, and other natural disasters.

The demand for political information is growing. Among the specific demands might be images of prison camps in Bosnia or the photos accurate enough to measure airstrips in Somalia. Other important new priorities will be watching the world for the spread of nuclear, biological, and chemical weapons and missiles and monitoring the numerous regional conflicts that could threaten US interests.



The NRO has been given new orders to support rapid overseas deployment of US troops, which increasingly will be based in the US. When contingencies arise, intelligence will have to be produced at what Mr. Faga calls "airplane speeds" over large distances while troops are either en route to their destination or in the process of landing.

"The need for information—What's there? What's going on on the ground? Who's there? How are we doing getting communications?—there's just an enormous information load, and there is really no other way to deal with that other than from satellites," Mr. Faga says.

The NRO itself does not set up tasking and requirements for the constellation of satellites that skim above the atmosphere taking pictures of Earth. That job is done by a DCI special committee known as COMIREX—Committee on Imagery Requirements and Exploitation. Last year, COMIREX became part of the new Central Imagery Office, an interagency center created in an intelligence reorganization. Through COMIREX, NRO is tasked daily to collect information from a range of locations around the globe.

### Latest Images in Demand

COMIREX gives NRO its marching orders, which can be extensive indeed. Requests come from CIA analysts at the Non-Proliferation Center—experts who want the latest imagery on the soon-to-be-tested North Korean ballistic missile, a 1,000-kilometer-range system. Or the commander in chief of US Central Command at MacDill AFB, Fla., near Tampa, seeks photographs of the nuclear facility near Baghdad that was hit by nearly forty US cruise missiles earlier this year.

According to Mr. Faga, the NRO is in charge of the intelligence satellites as well as the complex network of ground stations and equipment required to run them. Currently, thirty-eight military satellite control sites around the world are run by the Air Force, Navy, and Army. Many of the fifteen Air Force sites, including three on the West Coast, one in Colorado, and two on the East

Coast, are used to support NRO operations.

The number of NRO personnel is classified. Those who work with the agency say its people include highly trained civilian technicians and engineers, assisted in large part by Air Force personnel, who work in places with nondescript names, such as the Defense Communications, Electronics, and Evaluation and Testing Activity at Fort Belvoir, Va. Many NRO facilities are hidden within USAF units, including various space operations centers in California and Colorado.

The NRO spacecraft operations personnel send messages via computer to the spacecraft to keep them in orbit, help them maneuver into position for pictures, or move them farther from Earth to keep their orbits from deteriorating.

Unlike the nation's signals intelligence giant, the National Security Agency, the NRO does no analysis of its own intelligence "take." The analysis of NRO images is limited to the users of NRO products, such as the Central Intelligence Agency, Defense Intelligence Agency, State Department, and the military intelligence agencies.

Some experts who have worked with NRO say its personnel operate with a certain panache that comes from running the most advanced and sophisticated spying devices in the world. "I think the people in NRO are very enthusiastic about doing a well-focused mission," Mr. Faga says.

Most of the work involves operating very complex machines with thousands of parts over great distances and in situations where the slightest keyboard miscalculation can have disastrous consequences. "It's certainly a first-rate technical challenge to build and launch and operate these systems," says Mr. Faga. "It requires enormous diligence to detail. Every satellite of any kind has thousands of parts, so you have to be sure it is built properly, tested thoroughly. And any satellite, when it's in orbit, must be handled correctly."

Without constant care and attention to detail, satellites can stray, begin to tumble, or end up aiming in

directions other than toward their targets. Some are equipped with small thrusters that enable them to maneuver. Maintaining control in the vacuum of space is the most difficult job for NRO satellite jockeys. Operating NRO's satellites requires much experience and attention to detail. All activities are rehearsed two or three times before the actual operations.

Basic control of satellites involves computers talking to computers, and "if you tell a computer something that is wrong by one bit, it just says, 'I don't know what you're talking about—bleep,' [and] something comes up on the computer screen. . . . It can get pretty exciting," says Mr. Faga.

With Pentagon budgets falling for eight straight years, the NRO also has taken cuts in its annual budget—between \$5 billion and \$6 billion annually, by some estimates. R. James Woolsey, the new DCI, says that reorientation and restructuring of the satellite reconnaissance program in the coming years will produce substantial savings.

Cutbacks in NRO spending have been made every year since 1989, according to Mr. Faga, and such cuts translate into "less service" for policymakers and other intelligence consumers. "The budget is where you decide how much you're going to have. It isn't the requirements. The requirements are infinite." He adds, "If you need a lot more data, one way or another it's going to take more satellites, either more of them or bigger, and that's going to translate into more costs."

The number of reconnaissance satellites is expected to drop by up to twenty-five percent over the next several years, Mr. Faga says. The decrease will be offset somewhat by the newer, more advanced satellites' longer lives. Mr. Woolsey, however, states bluntly that budget cuts will mean intelligence consumers will not have all the intelligence they want and will be forced to pick and choose from the menu of sources.

"The range of specific information that every kind of government official wants today is enormous," says Mr. Faga, the former NRO director. "It's a choice government will constantly have to make—How much information does it want? The demands are infinite. There is no limit to what people ask for." ■

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*Bill Gertz covers national security for the Washington Times. This is his first article for AIR FORCE Magazine.*

# Checklist of Major Electronic Systems

Edited by Tamar A. Mehuron, Associate Editor

Electronics work in progress at the Air Force's Major Program Offices, Electronic Systems Center, Hanscom AFB, Mass., and Rome Laboratory, Griffiss AFB, N. Y.

## Air Base Decision System Program Office

### Air Force Electronic Security Equipment Program

Procurement of physical security equipment for deployment to 70 USAF bases and 210 sites overseas. **Contractor:** None. **Status:** Deployment.

### Air Force Shelter Technology Office

Program to provide program management and engineering support for shelter programs throughout the Air Force and to improve design, manufacturing techniques, and materials. **Contractors:** Spectrum 39, Advanced Composite Tech. **Status:** Engineering and manufacturing development (EMD).

### Air Force Worldwide Military Command and Control System ADP Modernization

Program to implement WAM system capabilities at designated Air Force sites. Objectives are to integrate workstations, implement a file transfer protocol capability, install a high-speed local area network, and connect various processors. **Contractors:** CEA, I-Net. **Status:** Deployment, production.

### Automated Weather Distribution System

Program to enhance the Air Weather Service's meteorological support for the Army and Air Force by using advanced computer technology and graphic presentation software. **Contractors:** GTE, Contel Government Corp. **Status:** Production.

### Automated Weather Distribution System P<sup>3</sup>

Preplanned Product Improvement to AWDS, focused on improved graphics, interoperability, and communications. **Contractors:** GTE, Contel Government Corp. **Status:** Production.

### Avionics Intermediate Shop Mobile Facility

Program provides for developing shelter systems for F-15, F-16, A-10, and F/EF-111 avionics maintenance. **Contractor:** American Development Corp. **Status:** Production.

### Base Recovery Attack Communications System

System to integrate communications equipment and computer hardware and software that will provide effective command and control of recovery efforts after attack. **Contractor:** Sumaria Systems. **Status:** EMD.

### Battlefield Weather Observation and Forecast System/Electro-Optical Tactical Decision Aids

Program to provide decision aids in assessing weather effects on various weapon systems in specific battle situations. **Contractor:** None. **Status:** Conceptual.

### Central Archive for Reusable Defense Software

Program to develop documented knowledge for establishing software reuse processes that support specific applications. Included will be the establishment of one or more domain-specific libraries. **Contractor:** Paramax. **Status:** Conceptual.

### Computer Resource Technology Transition

Program to integrate advanced computer software technology into operational commands and system program offices. **Contractors:** Many. **Status:** EMD.

### Deployable Strategic Mission Data Preparation Shelter

Program to provide USAF capability to transport a computer system able

to create Mission Planning Data Transfer Unit Cartridges for B-52s, B-1s, B-2s, ALCMs, and ACMs. **Contractor:** Sacramento ALC. **Status:** EMD, production.

### DoD Base and Installation Security System

RD&E program to develop physical security equipment for DoD sites worldwide. **Contractor:** None. **Status:** EMD.

### DoD Software Engineering Institute

Program to develop and disperse technology and means to improve quality of software in mission-critical computer systems. **Contractor:** Carnegie-Mellon Univ. **Status:** EMD.

### F-15 Avionics Intermediate Shop Mobile Facility

Program to develop and acquire AIS Facilities in support of the F-15E aircraft and its weapon systems. Activity includes the engineering and acquisition of mobile shelters to house test equipment. **Contractor:** American Development Corp. **Status:** Conceptual.

### Information Processing System

Provides automated support for command-and-control functions at top AMC command echelons. **Contractor:** Computer Science Corp. **Status:** EMD, production.

### Portable, Reusable, Integrated Software Modules

Program to develop a generic command center architecture incorporating Multilevel Security capabilities, using prototyping techniques with emphasis on reusable components. **Contractors:** Raytheon, Hughes. **Status:** EMD.

### Scope Shield Phase II

Program to improve communications for USAF Security Police and other forces. **Contractor:** Racal. **Status:** Production.

### Solar Electro-Optical Network Phase II

Program to increase the spatial resolution of the present Radio Solar Telescope Network, a subsystem comprising four antennas and other components that monitor solar activity. **Contractor:** To be determined (TBD). **Status:** Development.

### STARS

Software Technology for Adaptable, Reliable Systems pursues DoD goal of dramatic improvements in weapon software quality while reducing costs. **Contractors:** Boeing, IBM, Unisys. **Status:** Deployment.

### Survivable Base Communications System

Program to dramatically reduce the time required to assess damage and direct efforts of air base recovery teams. Combines communications equipment and computers for effective command of recovery personnel. **Contractor:** Sumaria. **Status:** EMD.

### Tactical Forecast System/Tactical Weather Observing System

Program to provide automated access to near real-time battlefield weather observations, climatology, satellite data, tactical decision aids, and model forecast databases for direct weather support to theater command-and-control systems. **Contractor:** TBD. **Status:** Development.

### UHF Satellite Terminal System

Development of a deployable, multiple-access communications system based on a single UHF satellite channel for Air Force and DoD users. **Contractor:** Titan Linkabit. **Status:** EMD.

#### **Wargaming & Simulation**

Program to present a coordinated approach for joint wargaming and simulation efforts. Projects include: Distributed Wargaming System II, Future Air Model, Video Teleconferencing Command and Control System, Defense Simulation Internet, Warrior Preparation Center Improvement Program, and Blue Flag Improvement Program. **Contractors:** Various. **Status:** Various.

#### **Weapons Storage and Security System**

Research effort to determine new ways to provide dispersed, unattended tactical weapons storage using hardened vaults beneath the floors of aircraft shelters. **Contractor:** Bechtel. **Status:** Production.

#### **Airborne Warning and Control System Program Office**

##### **Airborne Battlefield Command and Control Center III**

A C-130-based, automated, airborne command-and-control system for ACC use in forward battle areas and with special operations forces. **Contractor:** Unisys. **Status:** Production.

##### **Airborne Warning and Control System**

A major upgrade program for the AWACS surveillance and battle management aircraft. Includes additional sensors, antijam communications, and radar systems upgrades to keep the plane in service into the next century. **Contractors:** Boeing, Westinghouse. **Status:** EMD, production.

##### **NATO AWACS Program**

Development, production, and enhancement of NATO's 18 AWACS E-3 Sentry planes. Installation of a major upgrade, Electronic Support Measures, to provide a passive sensor system as a complement to active radar sensors. **Contractor:** Boeing. **Status:** EMD, production.

##### **Republic of France Have Quick A Nets**

Foreign military sales program to provide line replaceable units for installation into four French commercially procured AWACS E-3s. Plans call for four radios per aircraft. **Contractor:** Boeing. **Status:** Production.

##### **Saudi Arabian AWACS**

Program to acquire and outfit five US-built AWACS E-3s for the Royal Saudi Air Force. **Contractor:** Boeing. **Status:** Deployment.

#### **Airspace Management System Program Office**

##### **Adaptive Array Processor**

Program to improve tactical air forces air-to-air and air-to-ground UHF voice jam-resistant communications. The AAP will provide the TAF with an electronic nullification of the interfering/jamming signal. **Contractors:** Hazeltine, MITRE. **Status:** Conceptual.

##### **Air Force Airborne SINGARS**

Program to develop and procure airborne Single Channel Ground and Airborne Radio Subsystems for jam-resistant secure voice tactical VHF/FM/AM communications. **Contractor:** TBD. **Status:** EMD.

##### **Deployable Communications—Circuit Switches**

Family of automatic central office telephone switches providing analog and digital voice and data traffic. Part of the TRI-TAC joint program. **Contractors:** GTE, ITT. **Status:** Deployment.

##### **Digital European Backbone**

Program to upgrade portions of the European Defense Communications system from insecure analog systems to secure digital systems. **Contractors:** TRW, GTE, Signatron. **Status:** Production, deployment.

##### **FAA/Air Force Radar Replacement**

Joint effort to replace 1950s-vintage surveillance and height-finding radars with modern three-dimensional radars. **Contractor:** Westinghouse. **Status:** Production.

##### **Ground Mobile Forces SATCOM Terminals**

Program to produce highly mobile satellite communications terminals for the tactical air forces and others. **Contractors:** GE, Harris. **Status:** Deployment.

##### **Have Quick II/IIA**

Program to upgrade the Have Quick antijam UHF voice communications radio. **Contractors:** Many. **Status:** Production.

##### **Microwave Landing System**

A five-part program to replace the current Instrument Landing System with

a precision approach and landing system. **Contractors:** Many. **Status:** EMD, production.

#### **National Airspace Systems**

Upgrade program to ensure compatibility of the DoD Air Traffic Control System with the FAA Capital Investment Plan through 2017. Replacement of analog systems with digital systems. **Contractor:** TBD. **Status:** Conceptual.

#### **NATO Air Base SATCOM Terminal Program**

Program to enhance survivability of wartime communications between NATO Air Operations Centers and allied airfields. **Contractors:** Harris, Loral, Western Development Labs. **Status:** Production.

#### **New Mobile Rapcon**

Program to acquire new approach-control radar systems to replace aging mobile AN/MPN-14 systems. **Contractors:** Unisys, Aydin Computer System. **Status:** Production, validation.

#### **Tower Restoral Vehicle/Surveillance Restoral Vehicle**

Program to provide highly mobile, rapid restoral equipment for air traffic control towers and radar approach controls. **Contractor:** Airspace Technology Corp. **Status:** EMD.

#### **Mission Planning System Program Director**

##### **Air Force Mission Support System**

Program to broaden automated support to mission planning and execution and permit upgrades to aircraft, weapon, and electronic systems. Mission planning systems are to connect with C<sup>3</sup>I at unit, wing, and theater levels. **Contractors:** Lockheed Sanders, McDonnell Douglas. **Status:** EMD.

##### **Air Situation Display System**

Procurement of system composed of six operator display positions used at Allied Tactical Operations Center, Sembach AB, Germany. **Contractor:** COMPTeK Research. **Status:** Production.

##### **Common Mapping Standard**

Program to provide standardized, USAF-validated cartographic database of mapping, charting, geodesy, and imagery products used in mission planning systems. **Contractor:** TBD. **Status:** EMD.

##### **Computer-Aided Mission Planning at Air Base Level**

Program to provide automated mission planning through the use of digital mapping data, weather information, threat data, and aircraft performance data. Program is an Engineering Change Proposal to an F-16 contract between US government and the European Participating Forces of the Netherlands, Norway, and Belgium. Program will deliver 48 production models, three full-scale engineering development models, and four engineering models. The Netherlands will get 30 production models, Belgium 13, and Norway five. ASC has contracting responsibility, but ESC manages the program. **Contractor:** General Dynamics. **Status:** EMD.

##### **Conventional Mission Planning Preparation Software**

Program to provide software for conventional mission planning for B-52 weapons. **Contractors:** Boeing Military Airplane, McDonnell Douglas Missile Systems Co. **Status:** EMD.

##### **EIFEL**

Program to develop follow-on telecommunications and automated data-processing capabilities to the EIFEL I system at the ATOC, Sembach AB, Germany, and at associated bases. Common undertaking of the US, Germany, Belgium, the Netherlands, and the UK. **Contractor:** Dornier Systems. **Status:** EMD.

##### **Foreign Comparative Testing Program**

Program to evaluate and assess overall imagery aspects in relation to mission planning requirements, incorporating SPOT Digital Satellite Imagery Project and other projects. **Contractor:** TBD. **Status:** EMD.

##### **JTIDS-MACC Integration**

Program to integrate Joint Tactical Information Distribution System and a Joint Surveillance Targeting Attack Radar System ground display into the TAF Integrated Situation Display subsystem of the Modular Air Control Center. **Contractor:** COMPTeK Research. **Status:** EMD.

##### **Mission Support Systems II Upgrade and Modification**

Program to provide near-term upgrade to keep pace with steadily growing requirements demanding greater processing speed and storage capacity. **Contractor:** Lockheed Sanders. **Status:** EMD, production.

### Special Operations Forces Planning and Rehearsal System

Development, procurement, and deployment of a third-generation AMPS to replace minicamp hardware and enhance existing minicamps. **Contractor:** TBD. **Status:** EMD.

## Intelligence, C<sup>3</sup>CM System Program Office

### Automated Message Handling System

Program to provide intelligence analysts with capabilities for local electronic message handling and access to databases. **Contractor:** McDonnell Douglas Electronic Systems Co. **Status:** Production.

### Baseband Processor/Nonstop Receiver

Program to develop improved equipment that will more effectively determine the existence or nonexistence of Tempest threats. **Contractor:** TBD. **Status:** EMD.

### Cobra Dane System Modernization

Upgrade to replace aging computers and software and improve processing of landbased, phased-array radar at Shemya AFB, Alaska. **Contractor:** Raytheon. **Status:** Production.

### Commercial Input Segment

Program to create another source of sensor input to the Joint Services Imagery Processing System. CIS will receive down links of multispectral sensor data for processing into imagery for exploitation and dissemination through the JSIPS. **Contractor:** TBD. **Status:** Concept development.

### Constant Source

Development of means to correlate and display intelligence information to unit-level forces. **Contractors:** Assurance Technology Corp., BTG, Inc. **Status:** Production.

### Firestarter

Initiative to provide computer and communications security to Air Force systems independent of the funding for the development or operation of the systems. **Contractor:** None. **Status:** EMD.

### Intelligence Communications Architecture

Program to support development of an intelligence communications architecture and to monitor related efforts. **Contractors:** Many. **Status:** Concept, delivery.

### Joint Intelligence Center

Program to develop and implement a wartime protected theater intelligence system to support unified and specified commands. **Contractor:** None. **Status:** Concept definition.

### Joint Services Imagery Processing System

Development of a ground station to receive, process, and disseminate national, strategic, or tactical imagery to combat commanders. **Contractor:** E-Systems. **Status:** EMD.

### Joint Worldwide Intelligence Communications System

Program to engineer, procure, fabricate, and deploy systems to provide a high-capacity communications network linking the unified and specified command joint intelligence centers, service intelligence chiefs, scientific and technical intelligence centers, and other key intelligence nodes worldwide. **Contractor:** TBD. **Status:** EMD.

### Mission Verification System

Program to provide each squadron the capability to validate mission results, provide feedback to pilots, and assess airborne sensor performance. **Contractor:** TBD. **Status:** Concept exploration and definition.

### Networking Capabilities

Program to provide wide-ranging support to various local area networks and network-associated systems. **Contractor:** Infotec Development, Inc. **Status:** Production.

### Receive-Only Terminal

Joint-service program to develop a portable, tactical, S-Band secondary imagery receive system. **Contractor:** Harris Corp. **Status:** Demonstration/validation.

### Sentinel II

Program to modernize cryptologic and general intelligence training for Goodfellow Training Center, Goodfellow AFB, Tex. Program has three separate contracts. The first contract will provide an upgrade to computer-based training capabilities already at Goodfellow. **Contractor:**

Global Information Systems Technology. Second contract to provide an instructor monitoring capability. Third contract to integrate developed software on Sentinel Bright II and Sentinel Aspen II workstations. **Contractors:** TBD. **Status:** EMD/production for all three contracts.

### Sentinel Aspen Phase II

Program to modernize the Air Intelligence, Targeting Indications, and Warning and Fusion Training conducted by Goodfellow Training Center. **Contractor:** Network Solutions, Inc. **Status:** Production.

### Sentinel Byte

Program to provide unit-level intelligence support system focused on automated use of data in TAF units. **Contractors:** Many. **Status:** Production, deployment.

### Soft-Copy Exploitation System

Development of a common family of workstations for exploitation of digital imagery; a DoD program managed by ESC. **Contractor:** Classified. **Status:** Production.

### Tactical Air Forces Linked Ops/Intel Centers, Europe

Program to develop intelligence software application linked to other Contingency Tactical Air Control System Automated Planning System units. **Contractors:** Infotec Development, BTG, Planning Research Corp. **Status:** EMD.

## International System Program Office

### AWACS Interface System

Program to provide Royal Saudi Air Force with interface to its E-3 Sentry AWACS aircraft. **Contractor:** Whittaker Electronic Systems. **Status:** Deployment.

### Base Air Defense Ground Environment

Program to provide engineering technical support to the Japan ASDF for a BADGE upgrade. **Contractor:** MITRE. **Status:** Operational deployment.

### Canadian Patrol Frigate

Program to provide software analysis and technical support to Canada in its development of software for a new warship. **Contractor:** MITRE. **Status:** EMD.

### Egyptian E-2C/776 Interoperability

Technical assistance to Egypt for methods to coordinate the E-2C Hawkeye aircraft and the 776 Ground System. **Contractor:** Hughes. **Status:** Deployment.

### Peace Panorama

Program to provide Colombia an air surveillance system to establish and maintain control of Colombian airspace, control military operations, and identify radar targets. **Contractor:** BDM. **Status:** EMD.

### Peace Shield

Development and acquisition of a ground-based C<sup>3</sup> system for the Royal Saudi Air Force. Includes equipment, facilities, and support units that will link up with existing Saudi tactical radars, Saudi AWACS planes, and other elements of Saudi military forces. **Contractor:** Hughes. **Status:** EMD, deployment.

### Royal Thai Air Defense System

Program aimed at upgrading and automating existing Royal Thai Air Defense System and expanding its long-haul communications network. **Contractors:** Unisys, Paramax. **Status:** Deployment.

### Tribal Class Upgrade & Modernization Program

Program to help Canadian Navy acquire command-and-control system for four Tribal-class destroyers. **Contractor:** MITRE. **Status:** TBD.

### United Arab Emirates Modified AN/TRC-170

Program to modify and develop an AN/TRC-170 troposcatter radio set with support equipment for the UAE Hawk missile program. **Contractor:** Raytheon. **Status:** Production.

## Joint STARS System Program Office

### Joint Surveillance and Target Attack Radar System

A joint USAF-Army program to develop the primary sensor needed to carry out the AirLand Battle Doctrine; integrates a sensitive, side-looking multimode radar into an E-8A platform to create a targeting system able to detect ground-based objects, whether stationary or moving. **Contractor:** Grumman. **Status:** EMD.

## JTIDS System Program Office

### Air Force JINTACCS

USAF input to a program for joint interoperability of tactical command-and-control systems, designed to ensure that Air Force standards are included in the program. **Contractors:** JTC<sup>3</sup>A, Martin Marietta. **Status:** EMD.

### Joint Tactical Information Distribution System

A program to develop a high-capacity, jam-resistant, secure digital information system that will permit the distribution of intelligence data among fighter aircraft, surveillance aircraft, ground air defense units, and naval vessels. **Contractors:** GEC, Rockwell Collins. **Status:** EMD, low-rate initial production.

## Milstar Terminals System Program Office

### Low-Cost Terminal

Program to develop full Milstar Low Data Rate communication capabilities at minimum cost. The terminal will be small and inexpensive enough to be used in both airborne and ground-based platforms. Current platforms include B-1, B-2, VC-25, VC-137, and EC-135A/G aircraft, and Weapon System Launch Control Facilities. **Contractors:** Raytheon, E-Systems, Stanford Telecommunications. **Status:** Demonstration.

### Milstar Satellite Terminals

Development of reliable, antijam, and survivable EHF satellite communications terminals for strategic and tactical use among all services. **Contractor:** Raytheon. **Status:** EMD.

## North Warning & North Atlantic Defense System Program Office

### Caribbean Basin Radar Network

Program to upgrade US air surveillance in the Caribbean via transmission of radar data via satellite and land links to US C<sup>3</sup> centers. **Contractor:** Westinghouse. **Status:** Production.

### Joint Surveillance System-Connectivity

Program to modify the Region and Sector Operations Control Centers to task, monitor, accept, and employ data from new sensor systems via the Advanced Interface Control Unit. **Contractor:** TRW. **Status:** Production.

### Mount Kojee Radar

Program to transport, install, check, and test an AN/FPS-70 radar originally procured for Wallace AFS, the Philippines. Site surveys will determine the need for a new antenna tower. **Contractor:** Westinghouse. **Status:** Production.

### North Atlantic Defense System

Program to provide four long-range radars to enhance ability of Air Forces Iceland to perform NATO missions. **Contractors:** GE, TechDyn Systems, Hughes Aircraft, Whittaker Electronic Systems. **Status:** Deployment, USS-C production.

### North Warning System

A program to develop new long- and short-range radars to replace the aging Distant Early Warning Line and provide continuous coverage from the northern slopes of Alaska across Canada and down the east coast of Labrador. **Contractors:** Unisys, GE. **Status:** EMD, production.

### Over-the-Horizon Backscatter Radar

Program to develop and deploy a series of four radar systems for long-range detection, early warning, and attack assessment of bomber and cruise-missile threats. **Contractor:** GE. **Status:** EMD, production.

### Puerto Rico Operations Center

Program to establish performance, integration, and verification requirements for Puerto Rico Operations Center, to be procured by the Puerto Rico ANG. **Contractor:** Litton Data Systems. **Status:** Production.

## Space & Missile Warning System Program Office

### Acquisition Integration Office

Program to provide a "system of systems" quality assurance function. Responsibilities include engineering analysis for 800-series programs in Missile Warning, Atmospheric Warning, and Space Warning. **Contractor:** None. **Status:** Ongoing.

### Antisatellite Battle Management/C<sup>3</sup>

Program to develop a battle management/C<sup>3</sup> system to control all ASAT

capability, provide a surveillance support network, and integrate these elements with current and future ASAT weapons. **Contractor:** TRW. **Status:** Conceptual, demonstration, and validation.

### BMEWS Modernization Program

Program to upgrade the Ballistic Missile Early Warning System radars in Greenland and the UK, plus modernization of BMEWS radar in Alaska. **Contractor:** Raytheon. **Status:** EMD.

### Cheyenne Mountain Upgrade Programs

Integrated management of five existing upgrades to Integrated Tactical Warning and Attack Assessment system of systems. **Contractors:** Many. **Status:** EMD, production.

### Command Center Processing and Display System Replacement

A replacement system, part of the ballistic missile warning network, to receive warning information from sensors and produce integrated warning and attack assessment displays for Cheyenne Mountain AFB, Colo., and STRATCOM headquarters. **Contractor:** TRW. **Status:** EMD.

### Communications System Segment Replacement

A replacement system to improve the reliability, capacity, and flexibility of Cheyenne Mountain communications processing. **Contractor:** GTE. **Status:** EMD.

### Granite Sentry

Program to replace the current NORAD computer system and modular display system and to upgrade command post, air defense operations center, battle staff support center, and weather support unit in Cheyenne Mountain. **Contractors:** AFSPACECOM, DEC. **Status:** EMD.

### Integrated Tactical Warning and Attack Assessment System

Acquisition of new systems and upgrade of existing systems of the Integrated Tactical Warning and Attack Assessment System. **Contractors:** Many. **Status:** Ongoing.

### Pave Paws

A program to develop and deploy advanced, large-scale, phased-array radar systems to provide precise early warning and attack characterization of enemy sea-launched ballistic missiles from all directions. **Contractor:** Raytheon. **Status:** EMD.

### Space Defense Operations Center

Program to develop new SPADOC at Cheyenne Mountain AFB; central C<sup>3</sup> element of the Space Defense Command and Control System to be used to collect and distribute information on space status and warning. **Contractor:** Loral Command & Control. **Status:** EMD.

### Space Surveillance Network Improvement Program

SSNIP will evaluate Air Force Space Command's spacetrack capabilities for detecting and cataloging space objects. Recommendations for future upgrades to improve this global network of sensor sites, which detect, track, and identify satellites in Earth's orbit, will be planned. **Contractor:** TRW. **Status:** EMD.

### Survivable Communications Integration System

Development of a multimedia management and control system for sending missile warning data between sensor sites and command authorities. **Contractor:** E-Systems. **Status:** EMD.

## Strategic C<sup>3</sup> System Program Office

### Advanced VLF/LF Receiver

Program to provide B-2 bomber force with highly survivable capability to receive NCA directives. **Contractor:** Rockwell. **Status:** EMD.

### Dual-Frequency MEECN Receiver

Program to build receiver that will allow C<sup>3</sup> reception in VLF/LF band to strategic launch-control centers, despite high-altitude nuclear detonations. **Contractor:** Westinghouse. **Status:** EMD.

### Ground Wave Emergency Network

C<sup>3</sup> program to provide US strategic forces with long-range communications that can continue to function in the presence of electromagnetic pulse. **Contractors:** GE, Contel. **Status:** On hold.

### High-Power Transmitter Set

Program to provide the national command authorities a very-low-frequency, survivable, and reliable capability to transmit emergency Action Messages worldwide to nuclear forces. **Contractor:** Rockwell International. **Status:** EMD.

#### **Miniature Receive Terminal**

A program to develop survivable, low-frequency terminals to upgrade communications among NCA, STRATCOM, and ACC bombers; terminals will be designed to work even in a nuclear environment. **Contractor:** Rockwell. **Status:** Production.

#### **Modular Control Equipment**

Development of a transportable, modular, automated air command-and-control system. **Contractor:** Litton Data Systems. **Status:** Production.

#### **Modular Control Equipment P<sup>3</sup>**

Design development, fabrication, integration, and test of improvements to MCE components. **Contractor:** Litton Data Systems. **Status:** EMD.

#### **Primary Simulation Trainer**

Program to enable ATC (AETC as of July 1, 1993) to prepare and conduct training exercises for USAF and ANG introductory courses in Air Weapons Control. **Contractor:** TBD. **Status:** Production.

#### **Rapid Execution and Combat Targeting**

Program to modify Minuteman and Peacekeeper launch-control centers. **Contractor:** GTE. **Status:** EMD.

#### **Seek Screen AN/TPS-75 Radar**

Development of modification kit to provide enhanced ECCM and performance for the AN/TPS-43E tactical radar. Kit will improve resistance to enemy aircraft's jamming, increase radar's range and sensitivity, and improve its survivability. **Contractor:** Westinghouse. **Status:** Production.

#### **Seek Screen Arm Decoy**

Program to build a decoy protecting the AN/TPS-75 radar from destruction by incoming antiradiation missiles. **Contractor:** ITT Corp., Gilfillan Division. **Status:** EMD.

#### **Theater Missile Defense**

Program to provide theater air commanders an improved ability to carry out the Air Force TMD mission and maintain mission effectiveness against air-breathing threats. **Contractors:** Westinghouse Electronic Systems Group, Litton Data Systems. **Status:** HIGH GEAR Prototyping.

#### **Undergraduate Controller Training**

Program provides ATC with twelve Modular Control Equipment operator consoles and hardware for Undergraduate Air Weapons Controller School at Tyndall AFB, Fla. **Contractor:** Litton Data Systems. **Status:** Production/deployment.

### **Rome Laboratory**

#### **Advanced Terminal Technology**

Program to reduce the weight, size, and power requirements of airborne terminal systems and to increase survivability of satellite communications. **Contractor:** None. **Status:** Ongoing.

#### **Analog Fiber-Optic Links for RF Waveguide Replacement**

Program to demonstrate a cost-effective, optical method to replace conventional RF antenna waveguide with analog fiber-optic links. **Contractors:** Many. **Status:** Ongoing.

#### **B-52 Infrared Camera**

Program to provide the bomber with the capability to detect, track, and identify advanced atmospheric and space-based threats passively, with sufficient fidelity to provide positive threat assessment. **Contractor:** None. **Status:** Ongoing.

#### **Conformal Array Radar Demonstration**

Development and integration of sensors operating at multiple frequencies to provide high-confidence detection, tracking, classification, and identification of low-observable threats. **Contractor:** Raytheon. **Status:** Ongoing.

#### **Digital Beam-Forming**

Program to develop sensor systems with sufficient stability, adaptability, and sensitivity to handle small targets in a severe ECM environment. **Contractor:** GE. **Status:** Ongoing.

#### **Enhanced Software Life-Cycle Support Environment**

Joint ESC/Rome Laboratory project to produce and deploy a robust software engineering environment for use by the Air Force and DoD. **Contractor:** International Software Systems Inc. **Status:** EMD.

#### **HIL Multisensor Fusion**

Development of techniques to detect, store, and process unusual signals

across wide bandwidths at higher frequencies and under new transmission schemes. **Contractor:** None. **Status:** Conceptual.

#### **Integral C<sup>3</sup>I Optical Processor**

Effort to develop a hybrid optoelectronic processor capable of achieving processing speeds of one tera-operation ( $10^{12}$  single operations) per second. **Contractor:** None. **Status:** Ongoing.

#### **Integrated C<sup>3</sup>I Optical Processor**

Program to design and demonstrate a hybrid optoelectronic processor that integrates multiple C<sup>3</sup>I functions to achieve a Multifunction Airborne Surveillance System with synergistic advantage. **Contractors:** Many. **Status:** Ongoing.

#### **Knowledge-Based System Architecture Concept**

Program to develop systems to support decision and analysis tasks in planning, intelligence, battle management, training, and logistics and to assist in the maintenance of these various AI-based systems. **Contractors:** Many. **Status:** Ongoing.

#### **Natural Language**

Program to investigate and develop advanced technology that will assist in the functional processes of an intelligence center and emulate the cooperation and interaction that occur between expert, intelligent analysts. **Contractor:** None. **Status:** Ongoing.

#### **Optical Control of Phased Arrays for Multifrequency/Multibeam Systems**

Program to demonstrate a cost-effective, optical method to implement and control large, high-density, multibeam/multifrequency, shared-aperture, phased-array antennas. **Contractors:** Many. **Status:** Ongoing.

#### **Optical Memory**

Program to develop an integrated optical processor, with special emphasis on optical memory and optical interconnections that will help achieve high processing speeds. **Contractors:** Many. **Status:** Ongoing.

#### **Optical Processor for Jammer Cancellation**

Effort to develop an optically based signal processor for evaluation as a multiple parallel correlation canceler for radar multislidlobe multiscatter jammer rejection. **Contractors:** GE, Rockwell. **Status:** Ongoing.

#### **Requirements Engineering Workstation**

Program to integrate a suite of requirements analysis, specification, and validation tools on a Sun4/UNIX platform providing a uniform user interface style (Open Look) and common object manager database system. Initially, tools will support requirements analysis, user interface prototyping, performance modeling, executable specifications, and reusable components library. **Contractor:** International Software Systems Inc. **Status:** EMD.

#### **Secure Communications**

Program to design and develop interoperable, multiservice, survivable, and secure communications among geographically separate functional units. **Contractors:** Many. **Status:** Ongoing.

#### **Software Engineering Cooperative Research and Development Agreement**

Program to develop and provide advanced software engineering technology to identify and exploit parallelism for both current and future high-performance computers. **Contractors:** Many. **Status:** Ongoing.

#### **Software Life-Cycle Support Environment**

Program to develop software engineering tools, methods, and integrated software development/support capabilities that will replace or reduce today's labor-intensive techniques. **Contractor:** None. **Status:** Ongoing.

#### **Software Quality Technology Transfer Consortium**

CRDA effort between Rome Laboratory and defense industry to apply and validate Rome Laboratory Software Quality Technology on major defense system development projects. **Contractors:** Many. **Status:** Ongoing.

#### **Speakeasy**

Program to develop a joint-service, multiband, programmable radio with the capability to be backward-compatible with existing fielded systems in addition to the capability of adding new functionality through software. **Contractors:** Hazeltine, TRW, TI, Hughes, Sciteq, IBM. **Status:** Ongoing.

#### **Strategic Defense System Communications**

Program to develop lightweight/low-power EHF and laser communica-

tions technology for SDS space segment mission payloads, mission communications network technology, and ground terminal elements technology. **Contractors:** Many. **Status:** Ongoing.

#### **Survivable Tactical Communications**

Program to develop a single communications network that can integrate all multilevel-secure functions (voice, data, message) and reduce equipment requirements by fifty percent. **Contractor:** None. **Status:** Conceptual.

#### **System Engineering Concept Demonstration**

Program to demonstrate concepts and technology that can increase the productivity and effectiveness of systems and specialty engineers involved in the development, maintenance, and enhancement of military computer-based systems. **Contractor:** Software Productivity Solutions Inc. **Status:** Conceptual.

#### **TACS Force Level Execution**

Program to provide Combat Operations Division personnel of the Tactical Air Program and Tactical Air Control Center the automated capability to monitor, assess, and replan deviations that occur in the execution of the Air Tasking Order. **Contractor:** Advanced Decisions System. **Status:** Ongoing.

### **Deputate for Engineering and Program Management**

#### **Industrial Base Initiative**

Program to reduce cost and improve quality of Air Force C<sup>3</sup>I systems by encouraging contractor capital investment in design and production processes and computer support technologies. **Contractors:** Many. **Status:** Ongoing.

#### **Program to Revitalize Industrial Defense Efficiency**

Effort to ensure the strength and competitiveness of US sources of defense critical components and materials. **Contractor:** TBD. **Status:** EMD.

### **Deputate for Plans and Advanced Programs**

#### **Air Defense Initiative**

Definition, development, and demonstration of new technologies required for future construction of comprehensive active air defense system. Emphasis is on technologies for surveillance, battle management, and C<sup>3</sup>I against advanced air vehicles. **Contractors:** Many. **Status:** Concept definition.

#### **Airspace Command and Control**

Program to develop air traffic control systems sufficient to meet demands of post-2000 tactical environment. **Contractors:** Many. **Status:** Conceptual.

#### **Airspace Management Planning**

Program to provide an informational and strategy network to analyze evolving air traffic control and management systems, and related emerging technologies. **Contractor:** DoT Transportation System Center. **Status:** Conceptual.

#### **First Order Cost Estimating Model for Radars**

Project to develop model able to predict acquisition costs of radars quickly during the conceptual phase, when little or no engineering design data are available. **Contractor:** Tecolote. **Status:** Conceptual.

#### **Global Reach Airlift Planning**

Study to develop and define C<sup>3</sup> concepts, technology roadmaps, and architecture for USAF Global Reach Airlift assets in 2015. **Contractor:** Dynamics Research Corp. **Status:** Conceptual.

#### **Hostile Target Identification**

Program to provide Air Force a strategy for employing various technology options to identify air-to-air targets. Goals of HTI Technical Application Team include identifying and assessing technology solutions in the areas of surveillance sensors, communications, real-time intelligence, and data fusion. **Contractor:** TBD. **Status:** Conceptual.

#### **International Cooperative Research & Development**

Focal-point office for processing information on ESC activities that might be of broader international interest and for identifying emerging technologies in the US. **Contractor:** None. **Status:** Ongoing.

#### **Military Airlift Command C<sup>4</sup> Information Flow Analysis**

Program to develop analysis of Air Mobility Command missions, how mission functions are distributed, and how the existing/planned C<sup>4</sup> system ties everything together. The use of an automated Computer-Aided Systems Engineering tool and a Database Management System will result in

a functional and technical blueprint that will help systems interoperability and provide one baseline for future planned upgrades. **Contractor:** Dynamics Research Corp. **Status:** Conceptual.

#### **Military Satellite Communications**

Program to examine users' MILSATCOM requirements and allocations against current and future systems. Program includes analysis of ground system improvements that can increase communications capacity of current satellite systems. Program also examines system capabilities vs. user costs. **Contractor:** MITRE. **Status:** Concept exploration.

#### **Multirole Fighter C<sup>3</sup>I**

Program to identify C<sup>3</sup>I technology and provide C<sup>3</sup>I options in the planning of a future Multirole Fighter development program. ESC supports ASC in this effort. **Contractor:** TBD. **Status:** Conceptual.

#### **NATO ACCS/MCE Compatibility Study**

Program that supports USAF in its evaluation of the Modular Control Element for application in the NATO Air Command and Control System and to conduct engineering evaluation of the MCE. **Contractor:** MITRE. **Status:** Conceptual.

#### **Project Model**

Program to support the operational user and system developer with C<sup>3</sup>I analysis capability. The program provides cost-effective system options via simulation modeling and rapid prototyping. **Contractor:** TBD. **Status:** Conceptual.

#### **Region Operations Control Center/Sector Operations Control Center**

Joint ESC/ACC/NORAD program to upgrade the ROCC/SOCC computer systems. Program aims to satisfy mid- to long-term mission needs, define alternative concepts, and develop the supporting analyses and documentation approval. **Contractor:** TBD. **Status:** Conceptual.

#### **Small Business Innovative Research**

Program to stimulate technological innovation in private research and technological firms. **Contractors:** Many. **Status:** Ongoing.

#### **SOF Aircraft Concept Definition Study**

Joint program (with ASC and Wright Laboratory) to assess the C<sup>3</sup> requirements for a new Special Operations Forces Transport Aircraft. Initiation of project work deferred pending release of funding. **Contractor:** TBD. **Status:** Conceptual.

#### **Strategic Defense Initiative Planning**

Analysis of and experimentation with promising concepts and technologies for C<sup>3</sup> and battle management of a future strategic defense system. An experimental version of Strategic Battle Manager will be used. **Contractor:** TBD. **Status:** Validation.

#### **Tactical Weather Systems Technical Alternatives Analysis**

Study to determine the weather observing and forecasting data requirements for the battlefield, evaluating satellite data and its role in meeting battlefield requirements. **Contractor:** TBD. **Status:** Conceptual.

#### **Theater Battle Management**

Program to support theater operations on all levels, from command battle management to mission planning and execution. **Contractor:** TBD. **Status:** Conceptual.

#### **Theater Missile Defense**

Program is part of SDI effort to deploy a ballistic missile defense capability within a given theater of operations. Work includes development of C<sup>3</sup>I architecture for each level of TMD capability. Many theater sensor, intelligence, and communications systems will require upgrades and modifications to support TMD architecture. **Contractor:** TBD. **Status:** Concept definition.

#### **Unmanned Vehicle**

Program to support DoD UAV Joint Program Office with data links, data distribution capability, mission planning, and ground stations. **Contractor:** MITRE. **Status:** Concept definition.

#### **USTRANSCOM Business Process Analysis**

Study aims to identify areas for potential change in structures, processes, and technology within command. Study will examine how information technology can improve ways of doing business, and identify the cost and risk of change. **Contractor:** Dynamics Research Corp. **Status:** Conceptual. ■

**The new control center keeps close track of every tanker and airlifter in the fleet and coordinates 400 missions a day.**

# Mobility Central

**I**N THE summer of 1991, the Persian Gulf War had been over for several months. Gen. H. T. Johnson, head of Military Airlift Command, figuratively sat back, relaxed, and took a long look at how MAC had performed, paying special attention to its command and control of airlifters and how it had served its clients.

Things looked good. MAC had just staged a mammoth movement of troops and equipment in a seven-month period, from August 1990 through February 1991. General Johnson was impressed with MAC's statistical achievements. He knew that no organization anywhere had done anything quite like it—ever.

To the surprise of many, however, General Johnson concluded it was not good enough. The command could do better, and would, although the results would only become manifest under MAC's successor, Air Mobility Command, and would encompass tankers as well as airlift.

General Johnson's action was the genesis of the Tanker Airlift Control Center, which has brought about what many consider the most significant change in Air Force mobility operations in a decade. The TACC, manned by 600 controllers, schedulers, and forecasters, maintains constant contact with all 1,600 AMC planes and their crews. It stays abreast of AMC's 400 daily missions down to the finest detail.

The truly significant result, however, is the TACC's impact on operations. With the formation of the TACC, the Air Force cut about 125 headquarters billets at a stroke and removed several layers of bureaucracy that had bogged down the commanding and

controlling of the service's tanker and airlifter force.

"In the past, if a C-141 pilot in upstate New York needed to be air refueled, he would go to the command validator who had to approve the requirement," explained one senior Air Force officer. "Then the command validator would ask Strategic Air Command for air refueling support. SAC would then task a specific base, aircraft, and crew." Long delays and much confusion were common.

Now, say officers, there is one central source for mobility information, advice, and decisions—the TACC. The scheduler receiving a request for airlift makes arrangements with the refueling officer working in the next office or at the next desk. The TACC controls movements of all transports and refuelers and serves as a one-stop shop for defense officials who need to move men or supplies in a hurry.

## Fix It Anyway

General Johnson had correctly sensed that MAC needed something more than it had during the Persian Gulf War, but he didn't know exactly what. No one did, but the task of rapidly fixing an organization that wasn't broken fell to Col. (now Brig. Gen.) John W. Handy, a command pilot with more than 4,500 flying hours. He was philosophical about the assignment.

"General Johnson had a unique perspective because he was also commander of the US Transportation Command," General Handy said. "He was at the top of a massive bureaucracy. . . . He was extremely proud of MAC's role in airlift, but there's always a better way to do things, and it

**By Dan Allsup**

*Opposite, a KC-135 tanker from the 452d Air Refueling Wing (AFRES), March AFB, Calif., tops off a thirsty customer. Such meetings are now arranged through the Tanker Airlift Control Center, the new central source for mobility information, advice, and decisions.*







**Creation of the TACC simplified the coordination of massive airlift missions. C-141s (above), C-5s, and KC-10s moved more than 27,000 troops and 26,000 tons of supplies to Somalia, aided by the detailed scheduling provided by the TACC.**

was my job to find it. . . . With no hidden agenda, he wiped the slate clean and said, 'Tell me if there's a better way.'

The late Col. Daryl L. Bottjer, the key staff member of General Handy's team, recorded the marching orders this way in an oral history: "When the CINC gave me the project, he said, 'The only rule is that I want whatever you create to be much more efficient than what we have now. Other than that, you can create it the way you think it should be.'" When they had something for him to look at, said General Johnson, "we'll talk about it."

Given those open-ended orders, Colonels Handy and Bottjer began a detailed review of MAC. Colonel Bottjer examined everything about the MAC operation, "not only whether a position needed a telephone, but whether the telephone required six buttons or twelve buttons or forty-eight buttons and what those buttons should be connected to."

Colonel Handy soon produced the outline of a new type of organization whose purpose would be to help pool the Air Force's airlifters and refueling aircraft (then under control of Strategic Air Command) to enhance global mobility operations, reduce bureaucratic interference and delays, and clarify lines of command to the operational units.

In August 1991, Colonel Handy gave General Johnson his first briefing on the yet-to-be-named organization. The

team was urged to continue working on the concept.

#### Together at Last

In October, the team of analysts received some startling news: MAC and SAC (plus Tactical Air Command) would be disbanded, and a new organization—Air Mobility Command—would combine many of their functions. Air divisions would disappear, and the numbered air forces would be dramatically reduced in size and significance. Most important, control of most of USAF's air refueling planes would pass to the same command that would be in charge of long-range airlifters. "The reorganization really played into our hands," said General Handy.

Even with the Air Force's organizational turmoil, formation of the new mobility control system continued. By April 1992, Air Mobility Command was ready to unveil the TACC, located at Scott AFB, Ill., whose basic mission would be to centrally locate the planning and execution of air mobility operations.

Simply finding space at AMC headquarters was no easy task, but communications was the primary problem in making the TACC concept work.

"Automated communications is really a key element," explained Col. Charles Henry, head of the TACC's contingency operations and exercise branch. "Without it, we couldn't move. We wouldn't be able to manipulate the

massive amounts of data and keep track of things." In mobility matters, he said, this is the key because "you have to keep as many people as possible informed of the decisions being made and the situations as they unfold."

The TACC's controllers, schedulers, and forecasters work in three "cells," which correspond to the eastern hemisphere, western hemisphere, and the Americas. Wherever an air refueling or airlift mission is required, the request comes to the TACC and is routed to the proper cell for action.

The creation of the TACC was, and in some quarters still is, controversial. The basic theory behind the TACC—centralization—could not have been less popular, given the military's traditional aversion to it. One serious skeptic was Gen. Ronald Fogleman, now commander of Air Mobility Command, who said he had always viewed those pushing centralization as "the forces of darkness." General Fogleman initially thought the idea a big mistake.

Some AMC officials were concerned about the rise of an "imperial TACC," a very strong and centralized organization impervious to outside influence.

"It was a matter of selling an idea where there [were] no buyers," remarked General Handy, who now heads the TACC that he helped create. "Some people failed to recognize that we needed to centralize operations. Our customers were the easiest sell because they didn't have to worry anymore about who to call for airlift or passenger support."

Now that the mobility community has seen the TACC in action, most fears seem to have been allayed.

"We simply bring together customers and their suppliers [mobility forces], and we work that linkage very effectively," said General Handy. In every other aspect of mobility operations, "we aggressively try to push out authority and responsibility to the lowest possible level. That's where the expertise is."

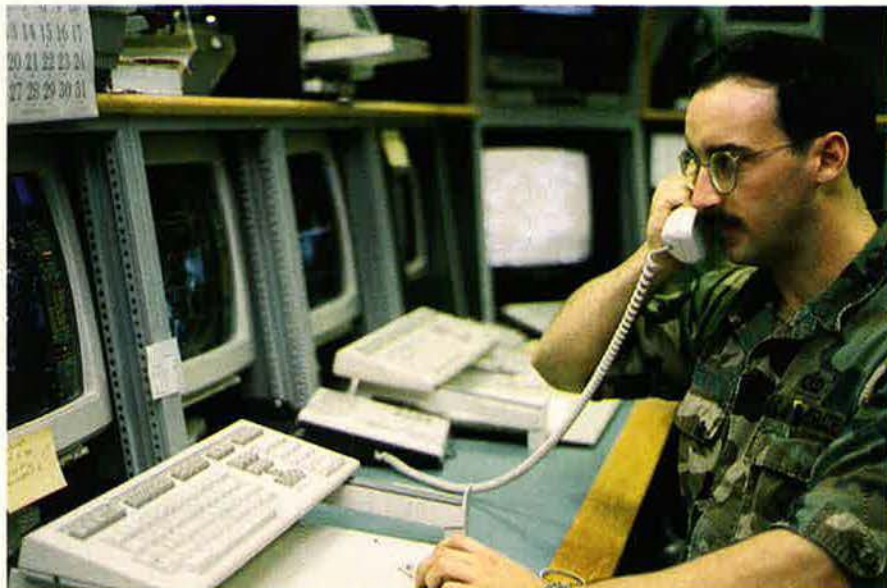
#### A Radical Departure

The once-doubting General Fogleman also has become a believer. "The TACC is a radical departure," he said. "It operates twenty-four hours a day, 365 days a year . . . in the same room, with the same computers and same procedures. Other than the pace of activity, there is no difference between peace or war. The people, the

systems, and the procedures will not change. We operate in peace the way we fight in war.

"Historically, our operations were spread around the globe between numbered air forces and [air] divisions. Crossfeed was difficult. At the headquarters, the [operations] center worked in a sleepy peacetime mode, content to let subordinates run the business. During a crisis or contingency, the staff size in the ops center expanded five times, from five to twenty-five or thirty on duty. That Crisis Action Team would switch to different computer systems and use different procedures and take over the show." It was, said the General, "not much of a way to run a business."

"I don't know what the old MAC was like, but I think the TACC works great," said Col. George Mazzeo, AMC's director of Operations and a



*Desperately needed goods, such as the supplies below being prepared for delivery to Bosnia, reach their destination more efficiently, thanks to schedulers at the TACC (above), who have helped make a good system better.*



USAF photo by S/A, Janel Schroeder

self-described "old tanker guy." For the first time, said Colonel Mazzeo, "we have the entire picture in one core area. If I have a question, all I have to do is get out of my chair and walk to the person responsible and ask what the problem is. The proof is the way we handled the Somalia crisis. It validates the entire concept."

Operation Restore Hope, the relief

effort to Somalia, required the US to form an air bridge to move as many troops and as much cargo as possible from the United States to Somalia as quickly as possible. By strategically orbiting USAF refuelers from Lajes Field in the Azores and Morón AB, Spain, the nation's military aircraft refueled and flew nonstop from the California coast to Cairo West Air-

port in Egypt, from which they made a final short hop to Somalia.

### Pinpoint Timing

As of mid-March, AMC had completed 1,019 airlift missions into Somalia with 1,156 air refueling missions. The command's C-5 Galaxies and C-141 StarLifters had moved more than 27,000 troops and 26,500 tons of supplies. No other country could post those numbers, General Handy pointed out. "Nobody in the world has the capability to do what the Air Force does."

The operation was carried out with pinpoint timing that commercial airlines would envy. "Once, the commander of the US Joint Task Force in Somalia wanted to take off from Camp Pendleton, Calif., and land in Mogadishu on the afternoon of December 6," recalled General Handy. "We planned a mission that would land him there at exactly 1300 hours—with three air refuelings en route. As it turned out, he changed his plans, but we could have done it.

"We would never have conceived of that idea before the TACC. MAC would have had to go to SAC to coordinate tankers, and then we'd have to deploy them to various points around the world. It wouldn't have worked operationally. It's New Think vs. Old Think; the synergy of two professions coming together. Now we control our own world. As good as our transportation system was before, it's much better now." ■

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*Dan Allsup is a former senior staff writer for Airman Magazine and was once selected Air Force Journalist of the Year. He retired from active duty in 1989 and is now a director of communications for a major corporation in Belleville, Ill. This is his first article for AIR FORCE Magazine.*

**Surprisingly, today's anti-G suits differ little from those P-51 pilots wore in World War II.**

# Suited for Gs

By Robert E. van Patten

**I**T IS not the resistance of materials which limits the aerobatic performance of the artificial bird, but the physiologic resistance of man, who is the brain of the artificial bird."

So said Louis Blériot, the pioneering French aviator, in 1922. Unfortunately, Blériot's words are no less true today than they were seventy years ago. Crucial among man's limitations is his low tolerance of acceleration (Gs), which led directly to development of the anti-G suit.

*Capt. Eric Thyre of the Florida ANG's 125th Fighter Group stands in front of his F-16 with thumbs hooked into his anti-G suit. The leg and belly bladders inflate with compressed air to prevent the pooling of blood in the lower extremities.*



Photo by Lans Slout

To understand how and why the modern anti-G suit came into existence, it is useful to study a capsule history [see p. 77] of major, in-flight, G-induced problems, which sets the stage for the rest of the story.

Flight surgeons' concern about G forces was driven by two developments. The first was the steadily improving performance of fighters and racing aircraft, which led to more cases of blackout and G-induced loss of consciousness (G-LOC). The second was the emergence of a new weapon pioneered by the US Navy: the dive-bomber. When dive-bombers came into widespread use, crouching was the only defense tactic against Gs available to pilots.

Posture can do much to increase G tolerance. Placing the pilot in a supine or prone position improves tolerance by moving the column of blood be-

tween the heart and the eyes and brain out of the G vector. To a lesser degree, the same effect can be gained by crouching.

### Pooling Blood

Under Gs, inertial forces drain blood from the brain and cause it to pool in the gut and lower extremities. Anything short of strangulation that impedes this pooling will help increase tolerance to Gs.

The G suit—or, more properly, the anti-G suit—is a garment worn by fighter pilots to help them withstand Gs developed when a fighter performs tight, high-speed turning maneuvers. The modern G suit inflates leg and belly bladders with compressed air. The bladders compress the calves and thighs as well as the abdomen, thus increasing resistance to the pooling of blood.

Since the conventional anti-G suit can provide only about one G of protection, pilots augment it by the anti-G straining maneuver (AGSM), which consists of tensing all of the major skeletal muscles combined with cyclic inhalations with repeated straining against a closed or partially closed windpipe.

A well-trained pilot can raise his blood pressure with the AGSM enough to provide an additional four Gs of protection. The AGSM, when added to the basic tolerance of about four Gs and the additional one G provided by the anti-G suit, brings a pilot's tolerance up to around nine Gs. This is, however, exhausting work.

It was not until 1934 that military pilots were provided with the first pneumatic garment for G protection. This device, the "acceleration belt," was developed by Navy flight sur-

*The advent of the dive-bomber prompted scientists to find ways to help pilots resist G forces. First came Dr. Poppen's acceleration belt (right), useful mostly as a platform against which to perform the anti-G straining maneuver. It was followed by the Franks Flying Suit (far right), which was filled with liquid to counter the effects of Gs.*



geon Lt. Cmdr. J. R. Poppen, who was responding to complaints from dive-bomber pilots of "twilighting" (grayout) during dive recovery.

Poppen was assigned to the Naval Aircraft Factory in Philadelphia, Pa., and performed experiments on dogs using a small centrifuge. The acceleration belt he developed was a pneumatic bladder positioned over the abdomen and inflated prior to a dive-bombing run.

The belt was only marginally effective and probably was most valuable as a platform against which the pilot could do his AGSM. Nevertheless, it was the forerunner of the anti-G suit. (For history buffs, the 1941 motion picture "Dive Bomber," starring Errol Flynn and Fred MacMurray, provides a remarkably good, if fictionalized, chronicle of Poppen's work.)

Throughout the 1930s, the philo-

sophical approaches to acceleration studies in Europe and the US diverged. The German aeromedical community was closely focused on the G-LOC problem as a result of the Luftwaffe's remarkable exploitation of dive-bombing as a ground-attack weapon for close air support of infantry and armor. Luftwaffe scientists had a well-instrumented human centrifuge. They also conducted in-flight research in a Heinkel aircraft equipped with an X-ray machine to investigate the distortion of the heart and lungs under G forces.

Curiously, the Germans appear to have never considered developing a G-suit. Instead, they concentrated on body position and the AGSM as protective measures.

#### Dr. Franks's Flying Suit

Meanwhile, British and Canadian

researchers were building their own theories on the foundation provided by Commander Poppen. The descendant of Poppen's acceleration belt was the liquid-filled Franks Flying Suit (FFS). It was developed by Dr. W. R. Franks in the early 1940s using the Royal Canadian Air Force's new centrifuge in Toronto, Canada, as well as a centrifuge at the Royal Aircraft Establishment at Farnborough, England. The design was based on the physical principles that the inertial effects on the water in the suit were the same as those on blood and that the counterpressure of the water-filled suit would exactly balance the G effects on the cardiovascular system.

This suit was effective, providing about one G of protection. Some additional protection was gained by placing an accordion-like bladder full of air beneath a Spitfire's battery, which



*The next advance in the fight against Gs was the Cotton Aerodynamic Suit (far left), which integrated rubberized fabric bladders for compressed air into the garment. After years of official indifference, anti-G suits are receiving higher priority, spawning such experimental designs as the McDonnell Douglas Atlantis Warrior suit (left).*

was mounted on a hinged plate. As the aircraft pulled Gs, the weight of the battery squeezed the bladder, which was connected to the top of the FFS, further pressurizing the suit.

Though the FFS was effective, it was bulky and hot and could not be worn over anything other than underwear. In those days it was still possible to put a fighter down in a plowed field and walk away from it. If the pilot were wearing an FFS, he would have to get rid of it in order to have a reasonable chance at escape and evasion. Doing so, however, would leave him with the unenviable prospect of scampering around hostile territory in his underwear.

An Australian physician, Dr. Frank S. Cotton, responded to this drawback with the Cotton Aerodynamic Suit, which was made with rubberized fabric bladders for compressed air inte-

grated into the garment. It is from Cotton's basic design that most subsequent anti-G suits have evolved.

In the early 1940s, the Army Air Forces was heavily involved in anti-G suit research using centrifuges at both the Mayo Clinic and Wright-Patterson AFB, Ohio. The mighty engine of American technology and know-how was revved up for the development and production of the early G suits. Since the whole idea of the G suit involves squeezing on body surfaces, rubberized fabrics, and things like eyelets and laces, it was natural to mobilize the girdle and corset industry, which immediately went to war by applying its crucial knowledge of fabrics and elastomers.

By 1944, the new anti-G suits were operational in combat. The anti-G suits worn by today's USAF fighter pilots differ little from those used by P-51 pilots over Europe in 1944.

Until 1990, the US produced no noteworthy operational improvements to the World War II anti-G suit. The tactical view in the 1950s and 1960s held that jets, air-to-air missiles, and nuclear weapons had put an end to the dogfight forever. Despite official indifference, some extremely effective anti-G suits were developed by Air Force and civilian scientists during this period (including one nearly three times as effective as the standard suit). None has ever been operationally exploited.

### No Solution Yet

The operational advent of the F-16 and the subsequent high toll of pilots disabled by G-LOC revived the development of anti-G suit technology. However, not even the best of the new designs, including new liquid-filled suits and the use of balanced positive pressure breathing with more conventional suits (Combat Edge), has yet provided an operational solution to the G-LOC problem. Some of the most effective experimental designs may, in fact, be dangerous to pilots. This is an old problem first discovered in the 1940s and rediscovered in the 1950s

during centrifuge studies of G-suits with extensive body coverage.

Those first observations involved dogs protected by immersion in water up to the neck. In one series of tests, all of the animals died during exposure to high Gs. In later experiments with full-coverage suits, it was noted that men wearing them at high Gs developed dangerous heart rhythms. The cause was not fully understood, but the issue was never pursued since development of high-G suits was not a high priority.

It is now theorized that full-coverage suit designs produce this problem because they maintain a very high level of blood pressure at the heart, while the pressure at the level of the eyes, though sufficient, is much lower. This abnormal disparity causes a conflict in the body's cardiovascular reflex loop signals, which can result in life-threatening irregular heart rhythms.

With ever-higher levels of fighter performance and the advent of super-agile and supermaneuverable aircraft, solving the G-LOC problem will not be simple. More effective G suits may need to be supplemented by a prone or supine position for the pilot and artificial intelligence-based systems able to intervene in aircraft control if the pilot becomes unconscious or disoriented.

It is ironic that both of these ideas date from the work of German scientists in World War II research. The Luftwaffe experimented briefly with a spring-loaded "flop back" seat for dive-bomber pilots, the idea being to flop the pilot onto his back during dive recovery. One of the many variants of the twin-engine Junkers Ju-88 light bomber was a dive-bomber equipped with a barometric recovery system. Prior to commencing the dive, the pilot could dial in his desired pull-out altitude, and thereafter the system took care of the pullout even if the pilot suffered G-LOC. Neither idea was ever advanced to operational use, although articulating seats and artificial intelligence-based recovery systems are currently being studied. ■

## Milestones on the Way to the Anti-G Suit

**1918** A Royal Flying Corps pilot in a Sopwith triplane reports G-LOC of twenty seconds' duration. Only the inherent stability of his aircraft saves him.

**1922** Winner of Pulitzer races reports blacking out in turns and nearly crashing a number of times.

**1923** Concerned about the blackout threat, the Navy recommends widening the turns for the 1923 Pulitzer races. The Royal Air Force advises that four Gs is the limit of man's tolerance. Despite this precaution, one pilot is so disoriented by Gs that he flies an extra lap at the end of the race.

**1924** Jimmy Doolittle defines the physiological causes of grayout, blackout, and G-LOC. The medical community ridicules Doolittle, claiming that the effects are all neurological, not cardiovascular.

**1930** Racing pilot Jimmy Haizlip comments on the superior G tolerance of short pilots and the value of "doubling up" (crouching over) against Gs.

**1932** A Navy flight surgeon publishes a scientific paper vindicating Doolittle's work and stating that G effects are a "fainting reaction" attributable to cerebral anemia produced by centrifugal action.

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*Robert E. van Patten is an assistant clinical professor at Wright State University School of Medicine, Dayton, Ohio. Until 1989, he was chief of the acceleration effects branch of the Biodynamics and Bioengineering Division of Armstrong Aerospace Medical Research Laboratory. He is a consultant in aerospace medicine, life sciences, information sciences, and accident reconstruction. His most recent article for AIR FORCE Magazine, "Legacy of the Air Racers," appeared in the December 1992 issue.*

**AFA President James M. McCoy has appointed these advisors and councils for 1993.**

# AFA Advisors and Councils

By Laura Ann Campbell

## AFA Presidential Advisors

H. J. "Jerry" Dalton, Communications Advisor; Dr. Ken Daly, Junior AFROTC Advisor; Col. Earl Donnell, Senior AFROTC Advisor; P. L. Schittulli, Civilian Personnel Advisor; Donna L. Tinsley, Medical Advisor; Maj. Paul A. Willard II, Civil Air Patrol Advisor.



Dalton



Daly



Donnell



Schittulli



Tinsley



Willard

## Air National Guard Council

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Matera



Barnhart



Garofola



Knauff



Kornreich



Nelson



Priddle



Shepperd



Tuxill

## Reserve Council

Brig. Gen. John A. Bradley (Chairman); Maj. Catherine Chilton; CMSgt. Rudolph A. DeTiege; Col. John Kittelson, USAF (Ret.); Maj. Joseph W. Patterson (Liaison); Col. Donald R. Perrin; Brig. Gen. Michael J. Peters; Brig. Gen. (selectee) Keith T. Reiling; SSgt. Deborah J. Whitfield; Capt. M. Kathleen Williams.



Bradley



Chilton



DeTiege



Kittelson



Patterson



Perrin



Peters



Reiling



Whitfield



Williams





Olsen Cantu Colemere Coltrin Cummings Frank



Gorden Keller Kuechler Mann McCard Ponder



Scott Wallin Welch Schittulli

**Civilian Personnel Council**

Alan K. Olsen (Chairman); Robert J. Cantu; Mary M. Colemere; Robert Coltrin; Donald Cummings; Joyce K. Frank (Liaison); Suzanne H. Gorden; Christian H. Keller; Gregory P. Kuechler; Mary B. Mann; Sidney McCard; Lori Ponder; John Scott; James C. Wallin. Dr. Billy E. Welch. P. L. Schittulli, Advisor.



G. Thomas Batta Carpenter Cloutier Curry Dupin



Forgey Handy Hatcher Holmes Lassiter Myers



Ohrn Ospina Page Rudy Szalasny R. Thomas



Thompson Wood Pflingston

**Enlisted Council**

CMSgt. Gary Thomas, USAF Academy (Chairman); TSgt. Christopher Batta, USAFE; SSgt. (selectee) Kimberlie S. Carpenter, ACC; SMSgt. Michael E. Cloutier, PACAF (Vice Chairman); MSgt. Duane P. Curry, AFMPC; MSgt. George F. Dupin II, AFMC; SrA. Suzanne Forgey, ATC (Recorder); TSgt. Dean P. Handy, AFRES; SMSgt. Donald W. Hatcher, AFDW; SSgt. Robin L. Holmes, PACAF; TSgt. Michael G. Lassiter, AMC; SMSgt. (selectee) Kenneth L. Myers, AFIC; SSgt. Karl R. Ohrn, AU; SrA. Jorge A. Ospina, AMC; MSgt. Sharon B. Page, ANG; SSgt. Martin F. Rudy, AFCC; CMSgt. Jack Szalasny, Hq. USAF (Liaison); SrA. Ronald S. Thomas, AFMC; TSgt. John H. Thompson, AFSOC; TSgt. Lawrence P. Wood, AFSPACECOM. CMSAF Gary R. Pflingston, Advisor.



### Junior Officer Advisory Council

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Day



Anderson



Chumley



A. Cox



S. Cox



Devoe



Forsyth



Hansen



Herbert



Hunt



Johnson



Mauldin



Ptak



Rowburrey



Smith



Tri



Vander Linden



Vognild



Robertson



Cummock



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Brown



Carr



Harlow



Laitos



McAuliffe



Puglisi



Ray



Shellhammer



Smith



Weinbrenner



Wilkins



Day

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By Daniel M. Sheehan, Assistant Managing Editor

## Simulation Symposium

The **Paul Revere (Mass.) Chapter** sponsored a modeling and simulation symposium at the Stouffer Bedford Glen Hotel near Hanscom AFB, Mass., in Bedford. About 200 industry, government, and military people took part in one or more of the symposium's events. Keynote speaker Electronic Systems Center Commander Lt. Gen. Gordon E. Fornell praised both ESC and MITRE, a national industry leader in research and engineering.

"Holding the symposium here . . . reflects the leadership roles that ESC and MITRE have established in the modeling and simulation business," General Fornell said. "ESC recognized the growing importance of modeling and simulation long before it became such a high-visibility topic. . . . MITRE has made major investments in strengthening our collective expertise, and ESC has made parallel investments," he continued.

Other speakers at the symposium included former USAF Chief of Staff Gen. Larry Welch, Assistant Vice Chief of Staff Lt. Gen. Thomas G. McNerney, Air Force Materiel Command Director of Requirements Maj. Gen. James A. Fain, Jr., AFMC Director of Science and Technology Brig. Gen. Richard Paul, and retired Army Gen. Maxwell Thurman.

Modeling, simulation, and war-gaming technologies were on display, including demonstrations of 3-D virtual reality simulators. Speakers discussed modeling and simulation policy perspectives, initiatives, tools, and techniques.

Chapter Project Officer Jim Anderson presented tokens of appreciation from the chapter to the speakers, including a Paul Revere silver bowl to General McNerney for his speech. Chapter President Mike Salis termed the symposium "one of the best we have ever held. The quality of the speakers and the relevance of the topic drew great interest from industry and government participants."

## Texas AFA Honors Wing Commanders

Perhaps the most painful part of the current defense drawdown is the closure of military bases that have long



*Former Chief of Staff Gen. Larry Welch, USAF (Ret.), addresses a symposium sponsored by the Paul Revere Chapter at Hanscom AFB, Mass., home of Air Force Materiel Command's Electronic Systems Center.*

been integral parts of their neighboring communities. Texas AFA recently honored two officers who have done their best to make their base closures as painless as possible. Col. Richard Szafranski, commander of the 7th Bomb Wing at Carswell AFB, Tex., and Col. Scott Madole, commander of the 67th Reconnaissance Wing at Bergstrom AFB, Tex., have worked tirelessly to ease the impact of impending base closures on their communities—Fort Worth and Austin, respectively.

The two commanders successfully accomplished the huge task of reassigning thousands of military personnel, working with city leaders to develop reuse plans and lessen the impact of the base closures. For their efforts the two were honored with Special Citations from AFA, presented by State President L. B. "Buck" Webber and national Chairman of the Board C. R. Crawford.

## Chapter News

AFMC Vice Commander Lt. Gen. Charles J. Searock, Jr., addressed this year's Wright Brothers Heritage Benefit Awards Luncheon at the Wright-Patterson AFB Officers Club, sponsored by

the **Wright Memorial (Ohio) Chapter**. The luncheon is the culmination of a base-wide fund-raising drive sponsored by the chapter, which netted \$50,000 for worthy causes in the Dayton area.

Chapter President Ron Goerges was happy to present a check for \$1,000 to Col. Nathan R. "Rosie" Rosengarten, USAF (Ret.), of the Wright-Patterson AFB Education Foundation. Other worthy recipients included the Wright State AFROTC Scholarship Fund (\$2,500) and the Air Force Museum (\$3,500). The balance of the donations went to various community organizations.

The **Golden Triangle (Miss.) Chapter** joined forces with the Columbus AFB Community Council and the local chapter of The Retired Officers Association to host a combined dinner meeting at the Columbus AFB Officers Club. Mississippi State President Gene Smith was on hand to welcome national Executive Director Monroe W. Hatch, Jr., and 14th Flying Training Wing Commander Col. Nick P. Ardillo, Jr., to the meeting, at which upcoming changes to Air Training Command, including its transition to Air Education and Training Command, were discussed.

USAF photo by SrA James Vanheygi

The **Sal Capriglione (N. J.) Chapter** continues its support for young people's activities, hosting a strong contingent of AFROTC students at a recent dinner dance, which attracted more than 300 participants. Chapter President Joseph M. Capriglione greeted northern New Jersey AFROTC detachments from William Paterson College, Seton Hall University, New Jersey Institute of Technology, and Stevens Institute of Technology. Honored guests at the dance included National Vice President (Northeast Region) Eugene Goldenberg, New Jersey State Chairman of the Board Dolores Vallone, and Commandant of AFROTC Det. 490 Lt. Col. Steven Jensen.

Christmas is a long way off, but the **Guam-Arc Light Chapter** is gearing up to help fund a unique project in keeping with the Christmas spirit. This year begins a fifth decade of helping bring Christmas to the isolated people of the western Pacific archipelagoes.



*Jane LeMay Lodge, who chairs the Widow Search Committee for The General and Mrs. Curtis LeMay Foundation, described the work of the foundation at a meeting of the Orange County/Gen. Curtis E. LeMay (Calif.) Chapter. She is flanked by (from left) National Vice President (Far West Region) H. A. Strack, Col. Thomas Banning III, and Chapter President Carl G. Bureman.*

### Coming Events

June 4-5, **Alabama State Convention**, Montgomery, Ala.; June 4-6, **Arizona/Nevada State Convention**, Tucson, Ariz.; June 8, **Utah State Convention**, Ogden, Utah; June 11-13, **Louisiana State Convention**, New Orleans, La.; June 12, **Massachusetts State Convention**, Boston, Mass.; June 18-20, **New York State Convention**, Griffiss AFB, N. Y.; June 18-20, **Ohio State Convention**, Mansfield, Ohio; June 25-27, **Oklahoma State Convention**, Oklahoma City, Okla.; July 9-10, **Illinois State Convention**, Quad Cities, Ill.; July 9-11, **Georgia State Convention**, Columbus, Ga.; July 9-11, **Missouri State Convention**, Whiteman AFB, Mo.; July 9-11, **Virginia State Convention**, Charlottesville, Va.; July 16-17, **Arkansas State Convention**, Jacksonville, Ark.; July 16-18, **Pennsylvania State Convention**, Trevoise, Pa.; July 16-18, **Texas State Convention**, College Station, Tex.; July 23-24, **Kansas State Convention**, Wichita, Kan.; July 30-August 1, **Florida State Convention**, Cypress Gardens, Fla.; August 5-7, **California State Convention**, Sacramento, Calif.; August 6-7, **Montana State Convention**, Three Forks, Mont.; August 13-14, **Air Force Ball of Mid-America**, St. Louis, Mo.; August 13-14, **Colorado State Convention**, Colorado Springs, Colo.; August 20-21, **Mississippi State Convention**, Jackson, Miss.; September 13-15, **AFA National Convention and aerospace exhibition**, Washington, D. C.

The airdrop has grown from a spontaneous gesture of generosity by a WB-50 crew to the people of Kapingamarangi Atoll in 1952 to the collection of some \$35,000 worth of gifts, which in 1992 translated into an eight-mission, eighty-box drop to forty islands in Micronesia. Last year, Chapter President Bill Dippel and Vice President Capt. Pete Camit presented a check for \$6,000 to 633d Maintenance Squadron Commander Col. John Drury to be used for the annual Christmas Drop. The check represented the proceeds from the chapter's annual golf

tournament at Andersen AFB, Guam, which were combined with contributions from local businesses and individuals to fund the airdrop. The crews who made the drop were from the 374th Airlift Wing, Yokota AB, Japan. Chapter President Dippel expressed hopes that this year's drop will be even more successful.

### Have AFA/AEF News?

Contributions to "AFA/AEF Report" should be sent to Dave Noerr, AFA National Headquarters, 1501 Lee Highway, Arlington, VA 22209-1198. ■



*"Operation Community Partner" gave Kokomo business leaders and members of the Grissom Memorial (Ind.) Chapter a firsthand look at the total force in action by allowing them to accompany a crew from the 305th ARW (AFRES) on a training mission, escorted by Chapter President Lt. Col. Mike Moran.*

# Unit Reunions

## Air Rescue Ass'n

The Air Rescue Association will hold a reunion October 13-17, 1993, in Hot Springs, Ark. **Contact:** Roy E. Jacobsen, P. O. Box 14225, Scottsdale, AZ 85267-4225. Phone: (602) 948-6660.

## Burtonwood Ass'n

Military and civilian personnel who were stationed in Burtonwood, England, will hold a reunion October 20-23, 1993, in San Bernardino, Calif. **Contact:** Sam Pastucha, 26576 14th St., Highland, CA 92346-2915. Phone: (909) 862-2887.

## C-7A Caribou Ass'n

The C-7A Caribou Association will hold a reunion August 19-22, 1993, in Colorado Springs, Colo. **Contact:** Nick Evanish, 210 48th St., Gulfport, MS 39507-4317. Phone: (601) 863-8688.

## Kingman Field

Military and civilian personnel who were stationed at Kingman Field, Ariz., between 1942 and 1948 will hold a reunion October 1-3, 1993. **Contact:** Kingman AAF Reunions, Inc., 6000 Flightline Dr., Box 3, Kingman, AZ 86401. Phone: (602) 757-1892.

## USAF Honor Guard

Members of the USAF Honor Guard will hold a reunion September 3-5, 1993, at Bolling AFB, D. C. **Contact:** SrA. Mary Ellen Bradley, USAF Honor Guard, Bolling AFB, DC 20332. Phone: (202) 767-4418 or 767-4795.

## 4th Fighter Squadron

Members of the 4th Fighter Squadron will hold a reunion August 12-15, 1993, in Grand Rapids, Mich. **Contacts:** Neil Topper or Bud Katz, 2829 Bridgeside Dr., S. E., Caledonia, MI 49316-9075. Phone: (616) 554-3292.

## 21st Weather Squadron

Veterans of the 21st Weather Squadron and 40th Mobile Communications Squadron will hold a reunion September 17-18, 1993, in New Orleans, La. **Contact:** Irvin J. Kirch, 34 Hoss Rd., Indianapolis, IN 46217. Phone: (317) 786-6858.

## 24th Combat Mapping Squadron

Veterans of the 24th Combat Mapping Squadron (World War II) will hold a reunion September 15-18, 1993, at the Sea Point Hotel in San Diego, Calif. **Contact:** John G. Wolfshorn, 11791 Ave. 22, Chowchilla, CA 93610-8925. Phone: (209) 665-3502.

## 26th Air Division

Veterans of the 26th Air Division who were stationed at Roslyn AFS, N. Y., in the 1950s will hold a reunion September 24-26, 1993, in Cape Cod, Mass. **Contact:** Virginia S. Taylor, 903 Sandwich Rd., E. Falmouth, MA 02536. Phone: (508) 540-2279.

## 27th Troop Carrier Squadron

Veterans of the 27th Troop Carrier Squadron will hold a reunion September 9-12, 1993, in Oshkosh, Wis. **Contact:** Robert L. Major, P. O. Box 1042, Murphy, NC 28906-1042. Phone: (704) 644-5376.

## 34th Bomb Group

Veterans of the 34th Bomb Group will hold a reunion September 23-26, 1993, in Little Rock, Ark. **Contact:** Robert H. Wright, 411 Parkovash Ave., South Bend, IN 46617-1029. Phone: (219) 232-4287.

## 40th Bomb Wing

Veterans of the 40th Bomb Wing who were sta-

tioned at Smoky Hill or Schilling AFBs, Kan., will hold a reunion October 4-6, 1993, at the Holiday Inn in Salina, Kan. **Contact:** Paul Dunaway, 3705 S. W. 37th St., Topeka, KS 66614-2813. Phone: (913) 273-5880.

## Class 44-C

Members of Aviation Cadet Class 44-C who trained at Spartan School of Aeronautics, Tulsa, Okla., between September and November 1943 will hold a reunion September 24-25, 1993, in Tulsa. **Contacts:** Milo Balhorn, 223 Letsch Rd., Waterloo, IA 50701. Phone: (319) 233-8645. Oscar Bushwar, 1122 W. Northgate Dr., Irving, TX 75062. Phone: (214) 255-1742.

## Class 45-C

Members of Class 45-C (Marfa, Tex.) will hold a reunion October 27-30, 1993, at the Camelview Resort Hotel in Scottsdale, Ariz. Class 45-C graduates of Douglas AAB, Ariz., and Luke AFB, Ariz., are invited. **Contact:** S. J. Wigley, 3212 Center St., Oklahoma City, OK 73120-2406. Phone: (405) 751-0187.

## Class 48-B

Members of Flight Class 48-B will hold a reunion October 10-13, 1993, in Scottsdale, Ariz. **Contacts:** James E. Ahl, 14613 Whitewood Dr., Sun City West, AZ 85375. Phone: (602) 546-6875. Maj. Gen. Carl Schneider, USAF (Ret.). Phone: (602) 998-4697.

**Readers wishing to submit reunion notices to "Unit Reunions" should mail their notices well in advance of the event to "Unit Reunions," Air Force Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Please designate the unit holding the reunion, time, location, and a contact for more information.**

## Class 48-C

Members of Pilot Class 48-C will hold a reunion September 30-October 3, 1993, in San Antonio, Tex. **Contacts:** Maj. Michael Loyd, 62 Lakeview Dr., Daly City, CA 94015. George Lutz. Phone: (703) 256-7873.

## 49th Fighter Group Ass'n

Veterans of the 49th Fighter Group and 49th Fighter Wing who served in World War II, Korea, or Vietnam will hold a reunion August 26-29, 1993, in Dayton, Ohio. **Contact:** John Roth, 1017 Adams S. E., Albuquerque, NM 87108. Phone: (505) 268-2903.

## Class 50-G

Members of Pilot Class 50-G will hold a reunion October 7-10, 1993, in Montgomery, Ala. **Contacts:** Ralph Petz, 1635 Edgewood Dr., Winona, MN 55989. Phone: (507) 452-9297. Fred Toerge, 464 W. Elk Ave., Glendale, CA 91204. Phone: (818) 507-7019.

## Class 51-F

Members of Pilot Class 51-F will hold a reunion September 4-6, 1993, at the Hyatt Regency Hotel in San Antonio, Tex. **Contact:** Charles F. Watson, 143 Brightwood, San Antonio, TX 78209. Phone: (210) 349-4511.

## Class 52-B

Members of Pilot Class 52-B will hold a reunion September 17-20, 1993, at the Sheraton Hotel in Colorado Springs, Colo. **Contact:** Bill McIntosh, P. O. Box 268, Breckenridge, CO 80424. Phone: (303) 453-6666.

## 61st Fighter Squadron

Veterans of the 61st Fighter Squadron will hold a reunion September 16-19, 1993, in Biloxi, Miss. **Contact:** Dewitt Allred, P. O. Box 967, Collins, MS 39428. Phone: (601) 765-8870.

## 64th Bomb Squadron

Veterans of the 64th Bomb Squadron, 43d Bomb Wing, who were stationed at Davis-Monthan AFB, Ariz., in the early 1950s will hold a reunion September 23-26, 1993, in Tucson, Ariz. **Contact:** John Earl Sullivan, 5411 S. Hildreth Ave., Tucson, AZ 85746-2212. Phone: (602) 883-1893.

## 312th Bomb Group

Veterans of the 312th Bomb Group ("The Roarin' 20s") will hold a reunion September 23-26, 1993, at the Harley Hotel in Grand Rapids, Mich. **Contact:** Paul M. Stichel, 1136 Gray Ave., Greenville, OH 45331. Phone: (513) 548-5767.

## 320th Bomb Group Ass'n

Veterans of the 320th Bomb Group will hold a reunion September 23-25, 1993, in Orlando, Fla. **Contact:** Stu Rowan, 108 Aspen, Hereford, TX 79045. Phone: (806) 364-4015.

## 325th Fighter Group

Veterans of the 325th Fighter Group "Checkertail Clan" will hold a reunion September 23-26, 1993, at the Grandview-Holiday Inn in Lake Placid, N. Y. **Contacts:** Dan Penrod, 69 Keswick Ave., Pittsburgh, PA 15202. Phone: (412) 766-6190. John L. Gaston, 1402 Mears Dr., Colorado Springs, CO 80915. Phone: (719) 596-5556.

## 339th Fighter Group Ass'n

Veterans of the 339th Fighter Group, 8th Air Force (World War II), will hold a reunion October 17-22, 1993, in Las Vegas, Nev. **Contact:** Chet Malarz, 2405 Kings Point Dr., Atlanta, GA 30338.

## 340th/341st Fighter Squadrons

Veterans of the 340th and 341st Fighter Squadrons, 348th Fighter Group, 5th Air Force (World War II), will hold a reunion September 23-26, 1993, in Atlanta, Ga. **Contacts:** Charles Allen, 2406 Mount Vernon Rd., Suite 100, Atlanta, GA 30338. Phone: (404) 396-5492. Guy McGarity, 2559 Comanche Dr., Birmingham, AL 35244. Phone: (205) 988-0975.

## 356th Fighter Group

Veterans of the 356th Fighter Group will hold a reunion October 21-24, 1993, in Orlando, Fla. **Contact:** Harold Ogden, 19014 Armington, El Paso, TX 79927. Phone: (915) 852-3252.

## 376th Heavy Bomb Group Ass'n

Veterans of the 376th Heavy Bomb Group will hold a reunion September 1-6, 1993, in Nashville, Tenn. **Contact:** Bill McDonald, 319 Yacht Club Dr., Fort Walton Beach, FL 32548. Phone: (904) 243-8090.

## 390th Bomb Group Ass'n

Veterans of the 390th Bomb Group, 8th Air Force (World War II), will hold a reunion October 12-23, 1993, at the Clarion Hotel in St. Louis, Mo. **Contact:** Norman Coats, 9 Forest Glen Ln., Kirkwood, MO 63122. Phone: (314) 822-8577.

## 442d Tactical Fighter Wing

Members of the 442d Tactical Fighter Wing will

## Unit Reunions

hold a reunion July 16-17, 1993, at Richards-Gebaur AFB, Mo. **Contact:** Joe C. Blair, 3214 E. 104th St., Kansas City, MO 64137-1501. Phone: (816) 761-5001 (home) or (816) 348-2273 (work).

### 442d Troop Carrier Group

Veterans of the 442d Troop Carrier Group (World War II) will hold a fiftieth-anniversary reunion September 30-October 2, 1993, in Kansas City, Mo. **Contact:** Marvin A. Ledbetter, P. O. Box 1100, Skyland, NC 28776. Phone: (704) 628-4394.

### 450th Bomb Group Ass'n

Veterans of the 450th Bomb Group (World War II) will hold a reunion September 9-12, 1993, at the Radisson Inn, Cincinnati/Northern Kentucky International Airport. **Contact:** Doid K. Raab, 5695 Ireland Rd., N. E., Lancaster, OH 43130-9436. Phone: (614) 536-7635.

### 452d Bomb Wing

Veterans of the 452d Bomb Wing who served in Korea between 1950 and 1952 will hold a reunion August 7, 1993, at the Allen Center, US Naval Station, Long Beach, Calif. **Contact:** Gene Hoffman, P. O. Box 3785, Long Beach, CA 90803. Phone: (310) 438-7138.

### 455th Strategic Missile Wing

Members of the 455th Strategic Missile Wing, including the 740th, 741st, and 742d Strategic Missile Squadrons, will hold a reunion June 24-26, 1993, at the Sheraton Riverside Inn in Minot, N. D. **Contact:** Lt. Col. Raymond T. Cwikowski, 4014 Azure Way, Pensacola, FL 32507. Phone: (904) 492-4982.

### 461st Bomb Group

Veterans of the 461st Bomb Group who served

between 1943 and 1945 will hold a fiftieth-anniversary reunion September 29-October 3, 1993, in Fresno, Calif. **Contact:** Frank C. O'Bannon, P. O. Box 36600, Tucson, AZ 84740-6600.

### 485th Bomb Group

Veterans of the 485th Bomb Group, 15th Air Force, will hold a reunion September 15-19, 1993, in Albuquerque, N. M. **Contact:** Earl L. Bundy, 5773 Middlefield Dr., Columbus, OH 43235.

### 485th Tactical Missile Wing

Members of the 485th Tactical Missile Wing (Florennes AB, Belgium) will hold a reunion August 13-15, 1993, at Malmstrom AFB, Mont. **Contacts:** Maj. Les Cooper, USAF, 4645B Ironwood St., Great Falls, MT 59402-5000. Phone: (406) 731-6920. John Rudzianski, RR4 Box 189, P. O. Box 1, Montrose, PA 18801-0106.

### 530th Fighter Squadron

Members of the 530th Fighter Squadron, 311th Fighter Group (World War II), will hold a reunion September 16-19, 1993, at the Hilton Hotel in Savannah, Ga. **Contact:** F. H. Wilbourne, 4118 Keagy Rd., Salem, VA 24153. Phone: (703) 387-0562.

### 815th Troop Carrier Squadron

Members of the 815th Troop Carrier Squadron who served in Japan in the 1950s will hold a reunion October 15-17, 1993, in Laguna Beach, Calif. **Contact:** James L. McNally, 25201 York Cir., Laguna Hills, CA 92653. Phone: (714) 581-2073.

### 3558th Combat Crew Training Squadron

Instructors and permanent party personnel of the

3558th Combat Crew Training Squadron who were stationed at Perrin AFB, Tex., between 1955 and 1957 will hold a reunion October 5-7, 1993, in Reno, Nev. **Contact:** Lt. Col. Gus Sonderman, USAF (Ret.), 8520 Crestwood Dr., Boise, ID 83704. Phone: (208) 323-9568.

### Class 43-A

Seeking contact with Class 43-A (Stockton Field, Calif.) for a possible fiftieth-anniversary reunion. **Contact:** Robert E. Dinwiddie, 801 E. Miracle Strip Pkwy., Mary Esther, FL 32569-2036. Phone: (904) 243-2494.

### Class 43-K

Seeking contact with members of Pilot Class 43-K (Moody Field, Ga.) who are interested in a fiftieth-anniversary reunion. **Contact:** Lt. Col. Robert Dubowsky, USAF (Ret.), 650 Grant Ct., Satellite Beach, FL 32937. Phone: (407) 773-6604.

### 460th Tactical Recon Wing

For the purpose of holding a reunion, I am seeking contact with members of the 460th Tactical Reconnaissance Wing or personnel who were based at Tan Son Nhut AB, Vietnam. **Contact:** John Peele, 6203 57th Ave., Riverdale, MD 20737. Phone: (301) 277-0072 (home) or (301) 277-7474 (work).

### 623d AC&W Squadron

For the purpose of organizing a reunion, I am seeking contact with members of the 623d Aircraft Control and Warning Squadron and the 2152d Communications Squadron who were stationed on Okinawa. **Contact:** Larry E. Henry, 51628 Old Mill Rd., South Bend, IN 46637. ■

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## Bulletin Board

Seeking contact with **Walter H. Rees** and **TSgt. John B. Murphy, Jr.**, of the 95th Bomb Group, 8th Air Force (World War II). **Contact:** Roy E. Squires, 4117 Twilight Dr. S., Fort Worth, TX 76116.

Collector seeking contact with individuals who were in the **9th Strategic Reconnaissance Wing** or **4200th SRW** when the SR-71 was in use. Also want to contact members of the refueling units. **Contact:** Ron Girouard, P. O. Box 92153, Lafayette, LA 70509-2153.

Author seeking photos, drawings, and documents on the evolution of the **Mach 3 B-70 Valkyrie** (WS-110A). Interested in early North American and Boeing concepts, the proposed third XB-70, projected variants (RS-70, launch vehicle, SST, nuclear-powered), and related F-108 Rapier (WS-202) interceptor program. **Contact:** Terry Panopalis, 30 D'Auvergne, Candiac, Quebec J5R 5R2, Canada.

Seeking pictures of **RAF nose art** on Tornado fighter-bombers. **Contact:** SSgt. Paul J. Perron, USAF, 2604 Benton Rd., #605, Bossier City, LA 71111.

Seeking contact with former members of the **485th Tactical Missile Wing** (GLCM), Florennes AB, Belgium, for a reunion address database. **Contact:** Lester D. Cooper, 4645B Ironwood St., Great Falls, MT 59402-5000.

Seeking information on **Harry Dunn** and other personnel stationed at Ankara AS, Turkey, Unit 7217 SPS, between 1983 and 1987. **Contact:**

Charles Dickinson, 6523 Aires Dr., Arlington, TX 76017.

Seeking squadron patches, hats, and jackets from the **437th Fighter-Interceptor Squadron** (Flying Tigers), Otis AFB, Mass. **Contact:** Byron Lefebvre, 2908 N. W. 28th St., Fort Lauderdale, FL 33311.

Seeking information on the following individuals: **Robert G. Allison, Bernard J. Anderko, Donald R. Andrews, Caleb N. Bariteau, Wayne L. Barnett, and Earl E. Bartlett.** They served at RAF Sculthorpe, UK, in the 1950s. **Contact:** MSgt. E. Glenn Musser, Jr., USAF (Ret.), 3 Salem Square, Worcester, MA 01608.

Seeking contact with former members of 499th/649th Bomb Squadrons, 345th Bomb Group, 5th Air Force, who knew **1st Lt. Harold E. Warvel, B-25 pilot.** **Contact:** Dave Lorey, 402 Richwood Ct., Somerset, KY 42501.

Seeking contact with **F-16 pilots and crew chiefs** interested in joining the F-16 Viper Association. **Contact:** Richard E. Mitchell, 428 Madingley Rd., Linthicum, MD 21090.

Seeking contact with any USAF personnel who served in the UK during the **Cuban Missile Crisis**, particularly anyone who served with Thor missile squadrons. **Contact:** Dr. Stephen Twigg, Aberystwyth, Dyfed SY23 3DA, UK.

Seeking information from missileers or others

associated with **Atlas D and E missiles** at F. E. Warren AFB, Wyo. **Contact:** Rich Nolan, 832 Silver Sage Ave., Cheyenne, WY 82009-1027.

Seeking contact with **Sgt. James Michael Martin**. He married Pauline Sandra Metzner (Logan), and they had two children, Damien and Shaun. He was last stationed in Thailand. **Contact:** D. F. Martin, 368 Laird St., Birkenhead, Merseyside L41 7AL, UK.

Seeking information on **Fred G. Dehart**, who served with the 83d Fighter Squadron, 78th Fighter Group, in Duxford, England, from 1943 to 1945. His last known address was 1206 Hudson, Hoboken, N. J. **Contact:** William L. Carter, 8452 Desert Ave., Boise, ID 83709.

Seeking **USAF uniforms and field equipment** from 1945 to 1975 to be donated to museums. No dealers please. **Contact:** Elwood Paradowski, 2530 Droxford Dr., Houston, TX 77008.

Seeking photocopies of the following **patches** if they exist: 4th/13th/17th Strategic Missile Divisions, 556th/644th/848th/849th/865th/866th Strategic Missile Squadrons, 389th/706th Strategic Missile Wings, 4062d/4320th Strategic Wings. The photocopies are needed for a publication on strategic missile operations patches. Also looking for a 100-mission patch from the 570th/571st SMS (Titan II), 390th SMW, at Davis-Monthan AFB, Ariz. **Contact:** Capt. Greg Ogletree, 3419 Cornstock Ave., Omaha, NE 68123-1394.

Seeking contact with USAF airmen stationed in the **Galapagos Islands** between 1946 and 1948 or other times. **Contact:** Marvin A. Ledbetter, 88 Lytle Rd., Fletcher, NC 28732.

Seeking contact with **combat pilots** of 528th Fighter Squadron, 311th Fighter Group, who served in the CBI theater during 1943-45. **Contact:** Malcolm Rountree, P. O. 8414, Incline Village, NV 89452.

Seeking **wing and squadron flagship** photographs or sketches from all units. I am interested in the tail markings with the proper color schemes and lettering. **Contact:** Mark P. Navin, 2000 Debra St., Clovis, NM 88101.

Seeking **B-52 squadron and wing patches**. Most interested in units closed before the mid-1970s. Also patches from B-52-related weapons, systems, and events. **Contact:** Capt. Jon Drieling, AFRES, 437 Highland Ave., Zellenople, PA 16063.

Seeking contact with anyone who knew my father, **Stanford Nall**, especially **Capt. R. L. Koles** and **1st Lt. Robert A. Claybrook** who served with him. They were with the 431st Fighter-Interceptor Squadron at Wheelus Field, Libya, at the time of my father's fatal training flight accident in January 1955. **Contact:** Sherill Pociucha, P. O. Box 1817, 50-385 Wroclaw 46, Poland.

**If you need information on an individual, unit, or aircraft, or if you want to collect, donate, or trade USAF-related items, write to "Bulletin Board," AIR FORCE Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Letters should be brief and typewritten; we reserve the right to condense them as necessary. We cannot acknowledge receipt of letters. Unsigned letters, items or services for sale or otherwise intended to bring in money, and photographs will not be used or returned.—THE EDITORS**

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Seeking information on **SSgt. Irwin G. Sewell**, a waist gunner or tailgunner on the B-17F *Bad Penny*, 333d Bomb Squadron, that went down July 26, 1943. The aircraft was on a mission from Bury St. Edmunds, UK, to Hanover, Germany. Information and details are needed for family history. **Contact:** Laurence W. Rich, 10830 S. W. Fairhaven Way, Tigard, CR 97223-3820.

Seeking contact with **SSgt. Robert Warren Cole**, now forty-eight, from Seattle, Wash., who served in Detachment 40, 29th Weather Squadron, High Wycombe, England, from 1965 to 1968. He was a weather observer and ended his service December 30, 1970, in Texas. **Contact:** Michael Mangion, 82B Brixton Hill, London SW2 1QN, UK.

Collector seeking **patches, stickers and unit insignia.** **Contact:** Alan Domagala, 979 Chilver Rd., Windsor, Ontario N8Y 2K6, Canada.

Seeking contact with **MSgt. Larry Crawford** and family. He was stationed at RAF Bentwaters/Woodbridge, England, from December 1983 to 1986. He was last stationed in New Mexico. **Contact:** Terri Piggott, 206 Northlake Dr., Apt. 1207, Warner Robins, GA 31093.

Seeking contact with instructors of the 1943-46 **Single Engine Advanced Central Instructors School.** **Contact:** Lt. Col. Phillip Coady, USAF (Ret.), 12935 Rio Oso Rd., Auburn, CA 94602.

Seeking photos of **B-52C/D aircraft** from McCoy AFB, Fla., 1966-73. Also seeking 306th Bomb Wing patch and contact with B-52 and KC-135 aircrews. **Contact:** Robert J. Egluff, PSC Box 495, Charleston AFB, SC 29404-5365.

Seeking information on **Lura Lee Dunn**, who married pilot **Eugene Hoy Barksdale** in De-

ember 1921 while he was stationed at Mitchel Field, N. Y. She remarried several years after his death in August 1926. Also seeking copies of the Barksdales' correspondence for use in a biography of the flyer. **Contact:** John Andrew Prime, 745 Rutherford St., Shreveport, LA 71104-4335.

Seeking photos of B-29 and B-36 aircraft assigned to the **92d Bomb Group**, Fairchild AFB, Wash., 1950-55. Also seeking VHS tape of air show open house, any year, at the base. Also seeking copies of *Air Force Magazine* from 1941 to 1955. **Contact:** SSgt. J. M. Joyner, 917 Ritters Lake Rd., Greensboro, NC 27406-7809.

Seeking contact with graduates of **Itazuke High School, Itazuke AB, Japan.** **Contact:** Cheryl Cronney Lewis, 11935 Appling Valley Rd., Fairfax, VA 22030.

Seeking information and photos of the **Texas ANG F-101F "Voodoo,"** winner of the 1978 and 1980 William Tell competitions. The aircraft is being restored. **Contact:** Florida Military Aviation Museum, P. O. Box 17332, Clearwater, FL 34622.

Seeking information on **TSgt. Manuel Vasquez**, who belonged to the **97th, 305th, or 306th Bomb Group**. He was shot down over southern Germany in March 1943 while flying the *Ruptured Goose* for 8th Air Force. **Contact:** Lt. Col. William Garrison, USAF (Ret.), 1841 E. Alpine Ave., Tulare, CA 93274-6006.

Seeking information on a **USAF B-17** that flew from the Philippines to Biak and was almost fired on by Dutch AAA crews between January 15 and March 20, 1962. The B-17 landed safely at Beroekoe or Mokmer AB, Biak. **Contact:** G. A. F. Zwakenberg, Europastraat 27, 4641 CJ Ossendrecht, the Netherlands.



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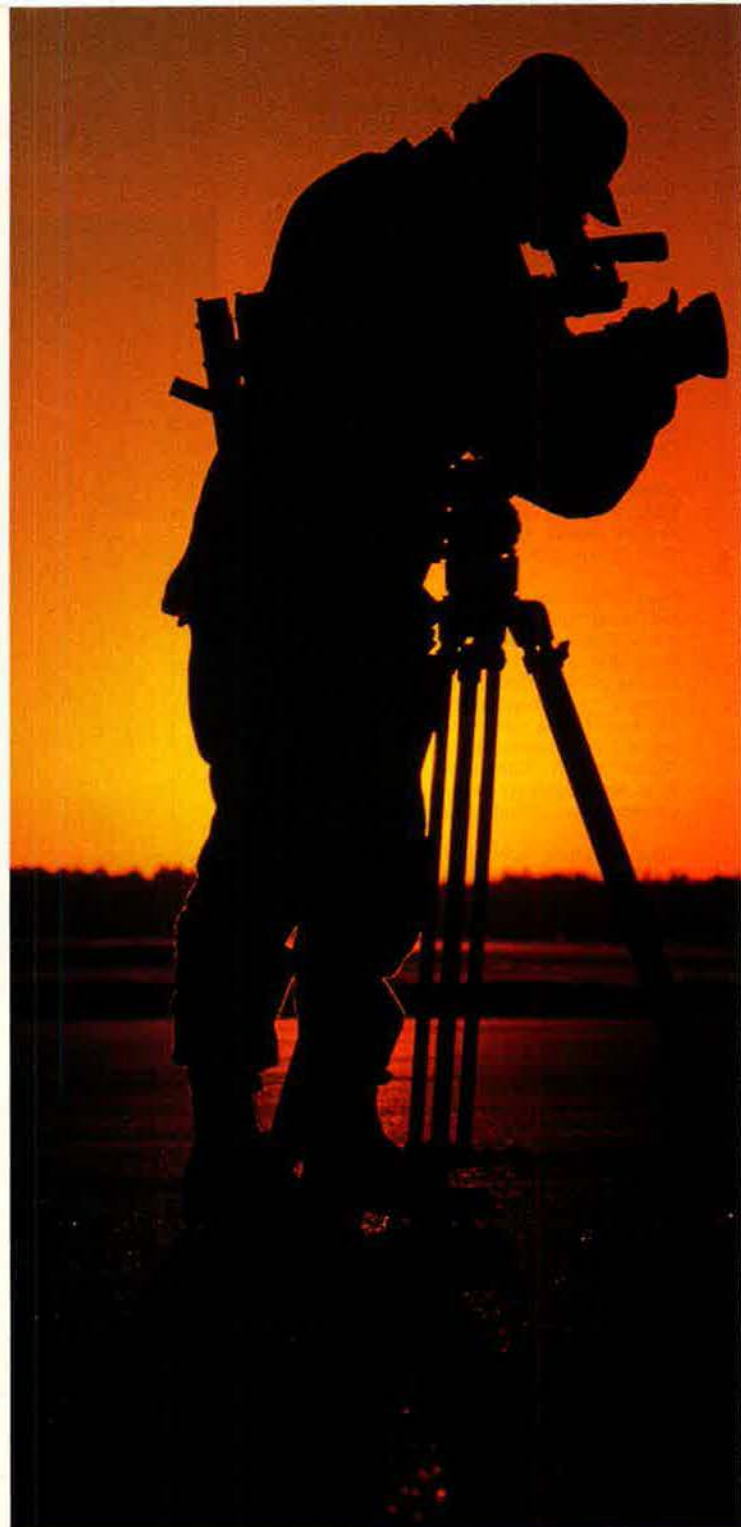
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## AFA Level Term life insurance rates

**Note:** Rates for members are for each \$20,000 unit of coverage.  
**Family Plan:** Spouse benefit is 50% of the member benefit (rates shown are for \$10,000 units). Coverage for each eligible child who is between the ages of 6 months and 21 years is \$5,000. Children under 6 months of age are provided with \$250 coverage once they are 15 days old and have been discharged from the hospital.

Attained Age	Non-Smoker Rates		Smoker Rates	
	Member Only Quarterly	Family Plan* Quarterly	Member Only Quarterly	Family Plan* Quarterly
20-24	\$3.12	\$4.62	\$3.78	\$5.28
25-29	3.50	5.10	4.38	5.88
30-34	4.38	6.86	6.12	8.00
35-39	6.78	9.28	8.28	10.78
40-44	10.30	14.55	13.26	17.01
45-49	18.06	25.56	22.20	29.70
50-54	27.00	37.00	33.18	43.18
55-59	38.70	53.70	47.58	62.58
60-64	59.32	84.82	73.56	98.56
65-69	135.00	172.50	166.02	203.52
70-74	216.00	291.00	265.68	320.68
75-79	270.00	345.00	332.10	407.10
80-84	369.48	444.48	454.44	529.44

\* Family Plan rate includes coverage for insured member.



# Application for AFA Level Term Life insurance

Your name: \_\_\_\_\_  Male  Female

Last/First/Middle \_\_\_\_\_

Address: \_\_\_\_\_

Number and Street/City/State/Zip \_\_\_\_\_

Daytime Phone: \_\_\_\_\_

Social Security #: \_\_\_\_\_

Area code/Number \_\_\_\_\_

Date of birth: \_\_\_\_\_

Age: \_\_\_\_\_

Height: \_\_\_\_\_

Weight: \_\_\_\_\_

Flying Status:  Yes  No

Month/Day/Year \_\_\_\_\_

Primary beneficiary: \_\_\_\_\_

Name/Relationship \_\_\_\_\_

Contingent beneficiary: \_\_\_\_\_

Name/Relationship \_\_\_\_\_

I am currently insured under this program in the amount of \$ \_\_\_\_\_. My certificate number is \_\_\_\_\_. Please increase my coverage to \$ \_\_\_\_\_ ( \_\_\_\_\_ units of coverage x \$20,000).

I am not currently insured under this program. Please issue me \_\_\_\_\_ units of coverage x \$20,000 = \_\_\_\_\_. In the past twelve months, I  have  have not used any tobacco products.

I am also requesting coverage for my eligible dependents:

Names of Dependents to be insured, Relationship, DOB, Height, Weight. Use additional sheets of paper if necessary.

Please select your preferred payment frequency and indicate the correct premium amount.

\_\_\_\_\_ Monthly government allotment (please submit a quarterly payment with your application; instructions for initiating an allotment will be sent with your certificate of coverage).

\_\_\_\_\_ AFA Visa or AFA MasterCard account no. \_\_\_\_\_ Expiration date \_\_\_\_\_

Direct billing:  \_\_\_\_\_ Quarterly  \_\_\_\_\_ Semi-annually  \_\_\_\_\_ Annually

The following questions should be answered for you and any dependents for whom you are requesting coverage:

1) Have you been hospitalized during the preceding 90 days?  Yes  No

2) In the past three years, have you received treatment or been told you had

a. Cancer, leukemia, Hodgkins Disease, or other associated malignancies?  Yes  No

b. Heart disease, stroke, or other cardiovascular disease?  Yes  No

3) Within the past two years, have you had persistent cough, pneumonia, chest discomfort, muscle weakness, unexplained weight loss of ten pounds or more, swollen glands, patches in mouth, visual disturbance, recurring diarrhea, fever, or infection?  Yes  No

4) Has any application made by you for life or health insurance been declined, postponed or issued other than as applied for?  Yes  No

5) Are you receiving, entitled to receive or would be entitled to receive upon timely application any benefits due to sickness or injury (other than medical expense benefits) under any private policy or plan or government program, whether insured or non-insured?  Yes  No

If you answered "Yes" to any of the above questions, please give the name of the person to whom your answer applies and provide details, dates, diagnosis, treatment and the names and address of the health care provider(s) and hospital(s). Use additional sheets of paper if necessary.

Information in this application, a copy of which shall be attached to and made a part of my certificate when issued, is given to obtain the plan requested and is true and complete to the best of my knowledge and belief. I agree that no insurance will be effective until a certificate has been issued and the initial premium paid. I understand that the coverage will not become effective until approved by MetLife.

I understand that if on the Effective Date I am not eligible for such insurance by reasons of (i) age or (ii) membership status, insurance will not become effective on my life. "Hospitalized" means inpatient confinement for: hospital care, hospice care, or care in an intermediate or long-term care facility. It also includes outpatient hospital care for chemotherapy, radiation therapy, or dialysis treatment.

## Authorization to furnish medical information

For underwriting and claims purposes, I hereby authorize any physician or other medical practitioner, hospital, clinic or other medically related facility, insurance company or other organization to furnish MetLife, on my behalf, with information in his or its possession, including the findings, related to medical, psychiatric or psychological care or examination, or surgical treatment given to the undersigned. The authorization shall be valid for two years. A photocopy of this authorization shall be considered as effective and valid as the original.

Member's Signature \_\_\_\_\_ Date \_\_\_\_\_ 19 \_\_\_\_\_

Send application with remittance to: Insurance Division, AFA, 1501 Lee Highway, Arlington, VA 22209-1198.

4571-G1-MetLife

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## Please retain this information for your records

### MetLife's Consumer Privacy Notice - Information Practices

**The Underwriting Process:** MetLife (hereinafter "we") will evaluate the information given by you on this enrollment form and tell you if we cannot give you the coverage you asked for. We will also tell you in general terms the reason for our decision. Upon written request, more specific reasons will be given to you.

**Information Collection:** This enrollment form is our main source of information. To properly evaluate your request for coverage, we obtain additional medical data from third parties about any person to be insured. For instance, we may ask physicians, hospitals, or medical care providers to confirm or add to the medical data you have given us.

**Information Disclosure:** In most cases, the information we have about you will be sent to third parties only if you authorize us to do so. In some cases where disclosure is required by law or necessary to conduct our business, we may send the information to third parties without your consent.

**Access and correct information:** Upon written request, we will make information we have about you available to you. You have certain access and correction rights with respect to the information about you in our files.

**Further information about our practices:** Upon written request, we will send you more information about our underwriting process and your access and correction rights. Also, upon your written request, we will give you more information about the circumstances under which we will disclose the information about you to third parties without your authorization. Please write MetLife at the following address about these matters:

Metropolitan Life Insurance Company, One Madison Avenue, New York, NY 10010-3650

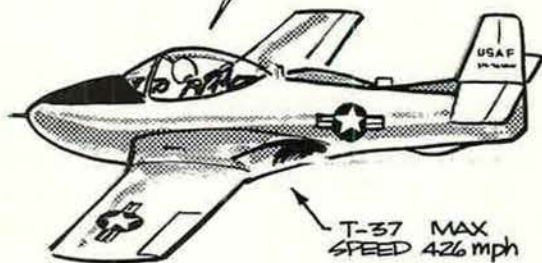
Bob Stevens'

# "There I was..."

THE FRUSTRATION OF BEING A PRIMARY STUDENT WHILE SHARING A BASE WITH YOUR ADVANCED BROTHERS CAN BE OVERPOWERING AT TIMES-

SUPERSONIC  
T-38

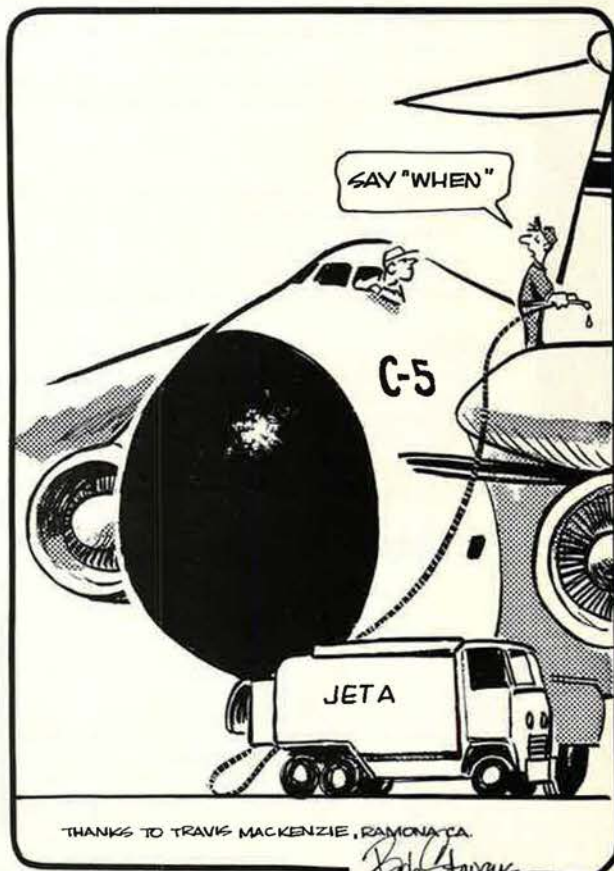
LAUGHLIN TOWER,  
THIS IS TWEET 44,  
REQUEST PERMISSION  
TO GO SUPERSONIC!

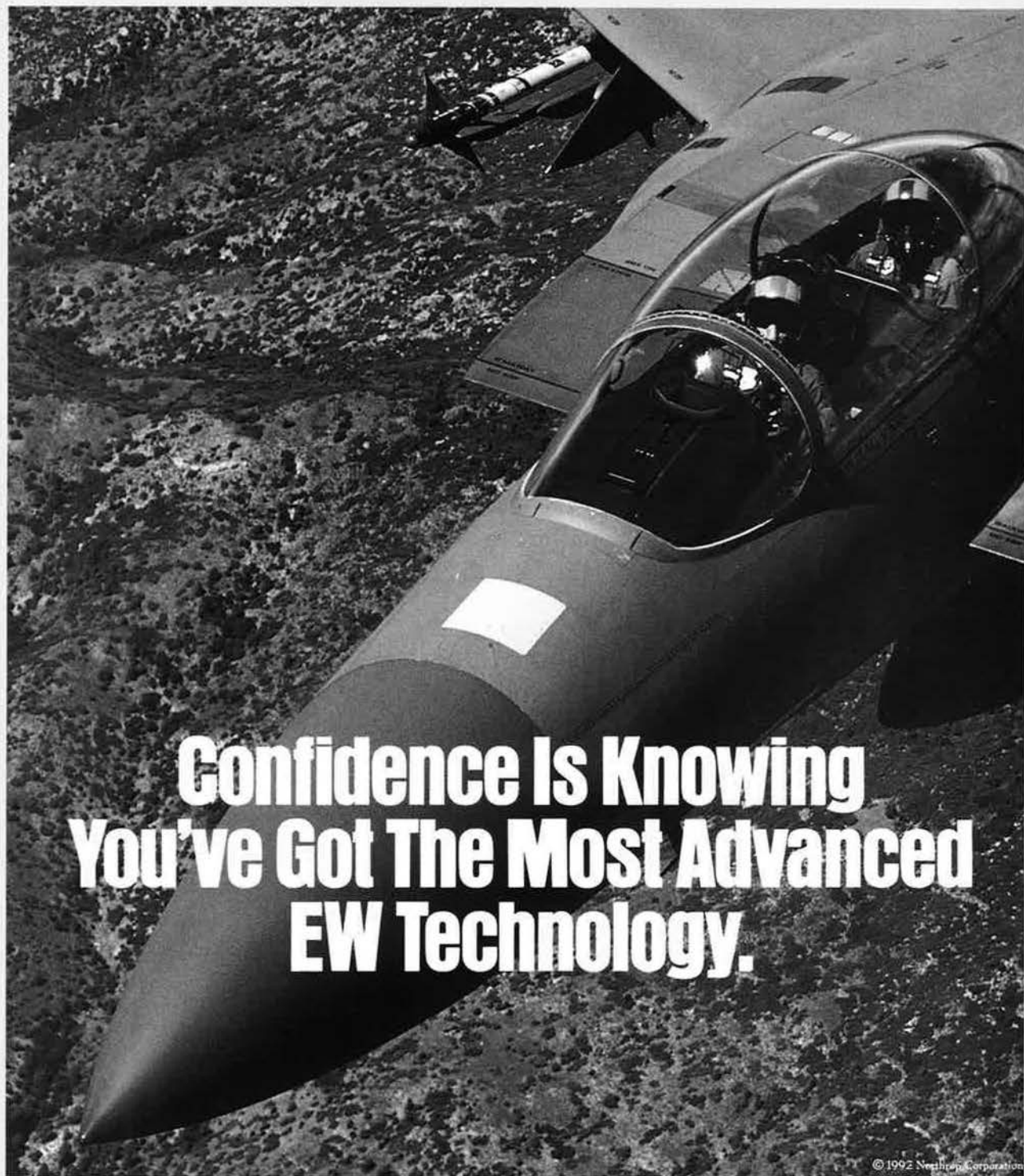


IT'S GRAB BAG TIME. NO BIG MESSAGE... JUST SOME FLOTSAM and JETSAM THAT DRIFTED UP FROM THE OL' FILE DRAWER. ENJOY...



HERE'S A CLASSIC FROM A COPY OF WWII'S YANK-COURTESY OF THE LIBERATOR CLUB:





# Confidence Is Knowing You've Got The Most Advanced EW Technology.

It's no secret the F-15E Eagle is the most effective fighter in the world. No secret to anyone who's flown it. Or against it.

Equipped with AN/ALQ-135 radar jamming system, it's proven how tough it is to beat. The F-15E operates in the most hostile environments—where Northrop's AN/ALQ-135 is unparalleled

**THE AN/ALQ-135**

**NORTHROP**  
*We're Setting Our Sights Higher.*

for its capability and reliability.

The AN/ALQ-135 system is software reprogrammable so it can be upgraded quickly to meet new threats as they evolve. It's also fully integrated and adaptable to a wide variety of aircraft.

The AN/ALQ-135: proven, and ready to take on whatever threats the future may bring.



# GLOBAL REACH.

The C-17 Globemaster III provides a new dimension in airlift. Our nation's newest airlifter combines into one aircraft the best qualities of today's military transport fleet.

What used to be done with three different aircraft can now be done with one—moving outside cargo swiftly across intercontinental distances into small, austere airfields.

Only the C-17 can provide quick, global direct delivery—bypassing large congested airfields to deliver what is needed, where it is needed, when it is needed.

In times of humanitarian need or regional conflict, the C-17 Globemaster III is the complete solution to the U.S. Air Force's strategy of global reach.

**MCDONNELL DOUGLAS**  
Performance Above and Beyond.