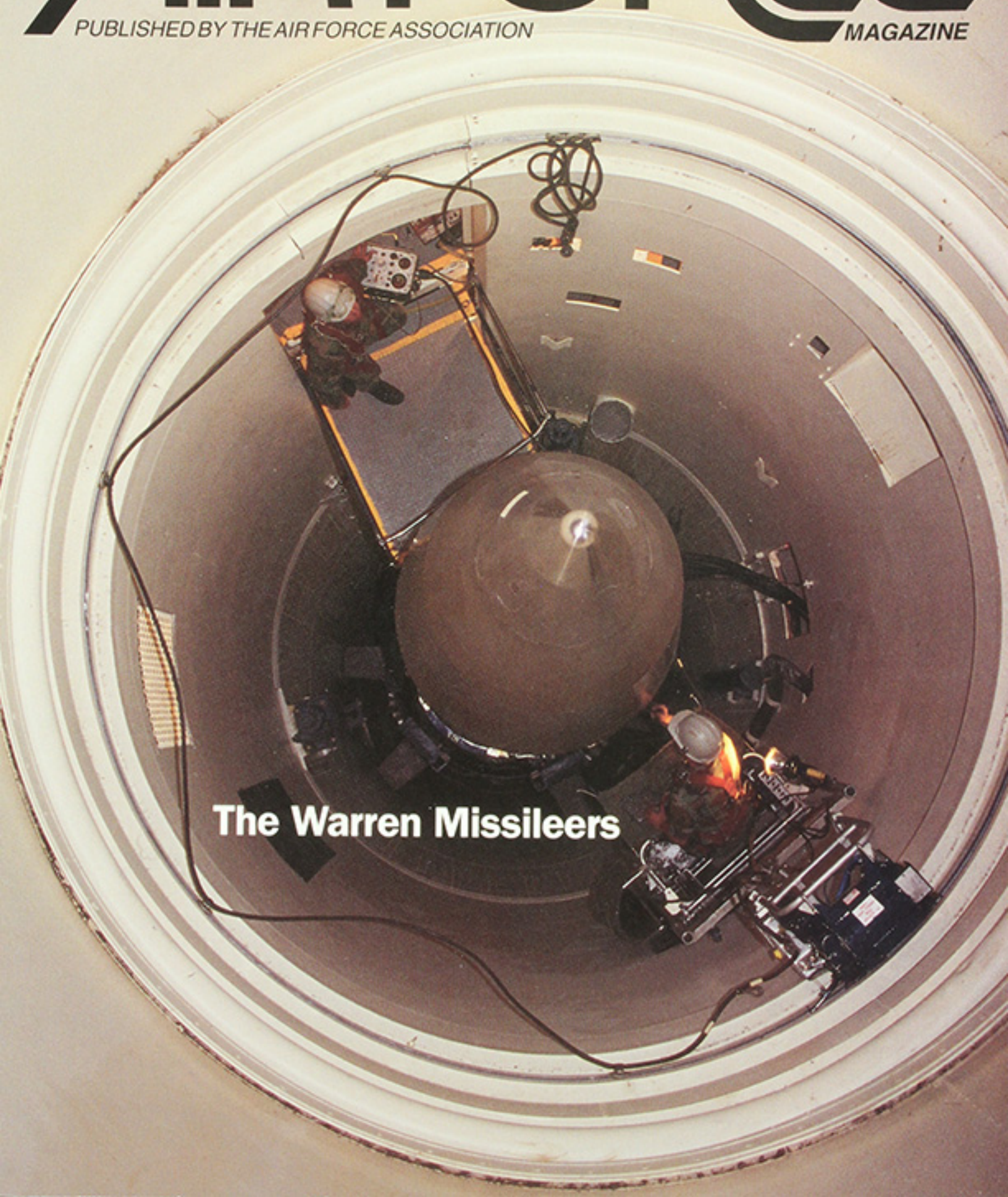


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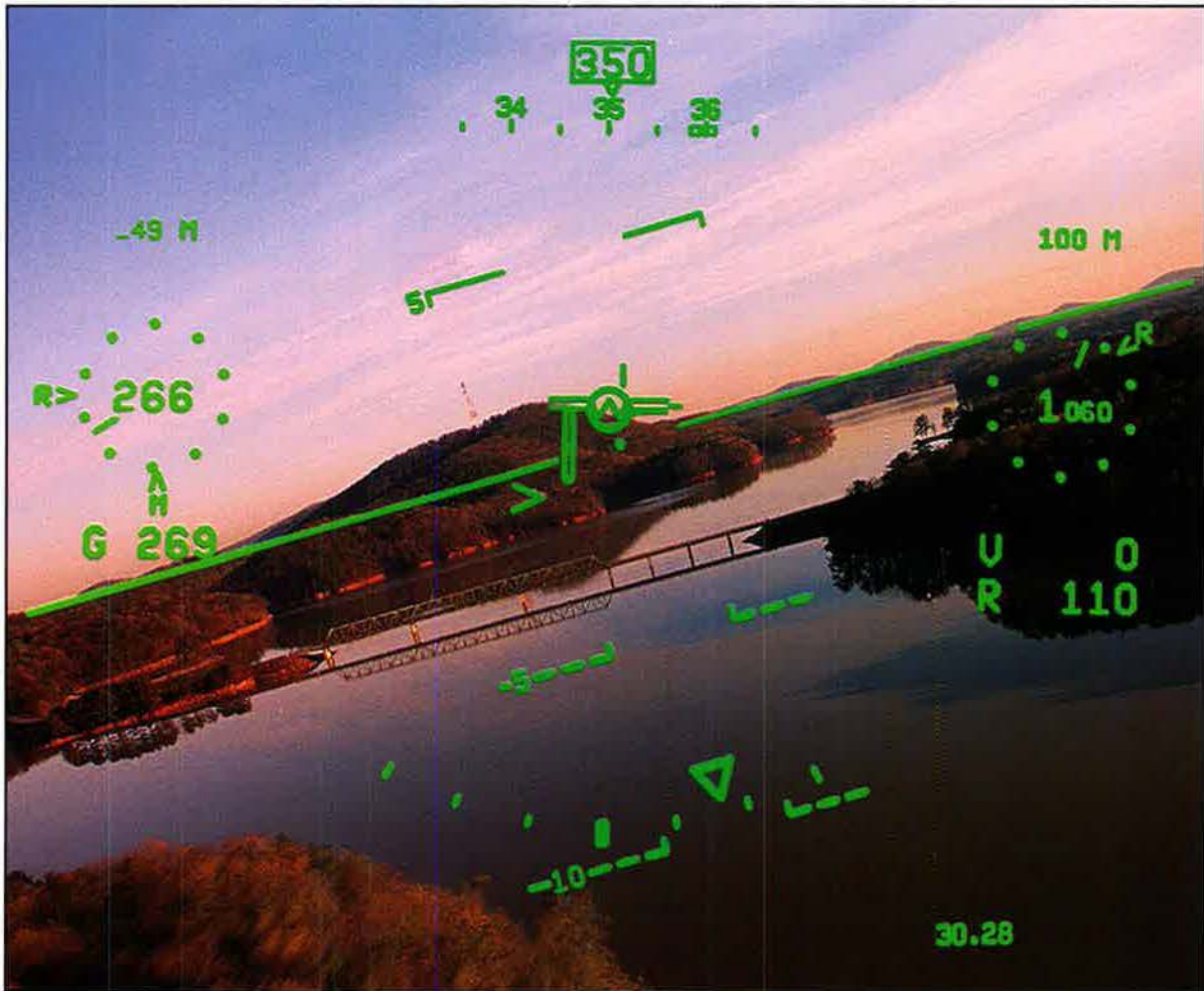
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MAGAZINE



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MAGAZINE

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About the cover:

SrA. Dennis Sasser (top left) and SrA. Christopher Pierson of the 90th Missile Wing, F. E. Warren AFB, Wyo., get up close to a key element of the nation's nuclear deterrent to perform maintenance on a Minuteman III. See "The Warren Missileers," p. 30. Staff photo by Guy Aceto.

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BOEING

By John T. Correll, Editor in Chief

Flak Ahead for the F-22

THE United States has not introduced an air-superiority fighter since 1974, when the F-15 entered service with the Air Force. Much has changed since then. The biggest innovation has been stealth, which makes an airplane far less detectable by radar.

The only stealth aircraft in the world, however, are the US Air Force's B-2 bombers and F-117A deep-attack fighters. The F-15 still dominates the realm of aerial combat. Even so, its edge is diminishing. The Russian-made Su-27 "Flanker" is on a par with the F-15 in some respects, and it may even have the advantage in certain matchups.

Other Russian and West European aircraft now in development will further challenge the US advantage early in the next century. The Air Force warns that by 2010, air superiority can no longer be guaranteed with the F-15. Fortunately, a timely solution is available in the stealthy F-22 fighter, which the Air Force plans to be operating in 2005. It will combine stealth with such other features as supercruise—sustained cruise at supersonic speeds—to set up another long run of US domination of the air. For good reason, it is the Air Force's top force modernization priority.

Air superiority is a precondition for all other combat operations. As General Eisenhower said after the D-Day invasion, "If I didn't have air supremacy, I wouldn't be here." It has been more than 40 years since US forces on the ground had to worry about enemy air attack.

Air superiority means not only freedom *from* attack but also freedom *to* attack. The most recent example was the Persian Gulf War, where Iraqi air forces and air defenses were unable to protect critical targets or stop coalition forces from operating at will.

The F-22 program has gotten a generally favorable reception as it moved through Congress in engineering and manufacturing development status. This may be the year it gets controversial. A big budget showdown is expected in 1997 as part of

the Quadrennial Defense Review. As always, aircraft programs will be among the big targets.

There is already some sentiment among the budget cutters that the three fighter programs currently under way—the F-22, the Joint Strike Fighter, and the Navy's F/A-18E/F—are excessive and that one or more

"Bolt-on stealth" is not a real alternative. It provides a third of the capability for 90 percent of the cost.

of them should be eliminated or scaled back. The Joint Strike Fighter, a program to replace attack aircraft, is not out of the concept phase. The competition, if it comes to that, will likely pit the F/A-18E/F Super Hornet, now in flight testing, against the F-22, for which initial production funding will be requested this year.

The Navy is acutely aware of this and has been sniping at the F-22 for months. After two unsuccessful attempts to acquire stealth, the Navy is reconciled to flying conventional aircraft until the Joint Strike Fighter is ready. The Navy's short-term hopes ride with a "reduced radar signature" variant of the F/A-18C attack aircraft that the fleet has operated since 1985. The Navy claims the F/A-18E/F will be able to beat the Russian Su-35, the Eurofighter 2000, and the French Rafale in "overall combat effectiveness" and will not be bested before a Russian "fifth-generation fighter" appears around 2015.

That is an extravagant claim. Air Force sources say it was based on the opinion of naval aviators assembled to help the Navy make its case. The General Accounting

Office was probably closer to the mark last June when it reported that the F/A-18E/F "will provide marginal operational improvement at high cost."

The Super Hornet's "bolt-on stealth" treatment does reduce the radar signature somewhat in the frontal quarter, but other aspects of the signature are not reduced at all. The structural gains, such as they are, are diminished when the Super Hornet is loaded with weapons and fuel, which it must carry externally.

The Air Force investigated a "bolt-on stealth" variant of the F-15. The amount of "stealth" achieved was modest, and the cost for a third of the relative combat effectiveness of the F-22 amounted to 90 percent of the cost of the F-22 itself.

It is obvious that the Navy believes in the Super Hornet, so perhaps it is just what naval aviators need. But they should not pitch it as the dominant air-to-air fighter of the next 15 years. It is not up to that.

If we want air superiority in 2010, we had better get on with the F-22. The goal is not parity or slight advantage. It is overwhelming advantage. We must defeat opposing fighters, air-defense radars, and surface-to-air missiles by a decisive margin. The mission requires an airplane that will not only fly undetected and see the enemy first but also outfly and outmaneuver the enemy in combat engagements.

The Defense Science Board notes that the F-22 is "very ambitious technically." The inherent difficulty in keeping such a program on track establishes another point of vulnerability. The Air Force, closely watched by Congress, will have to work the cost and performance problems relentlessly when they arise. Program managers have been there before on other systems that pushed the state of the art.

If the F-15 holds air superiority for 30 years, let us marvel and give thanks but realize that this cannot go on forever. The time has come for a new air-superiority fighter, and the F-22 is it. ■

The Cost of Strategic Airpower

"The Rediscovery of Strategic Airpower" [November 1996, p. 26] is rich in ideas and issues—more than an interested observer could reasonably address in the space allowed for editorial comment, but I would like to address the following.

On p. 30 is a photo of an F-15E accompanied by a caption offering economics that seems to favor F-15 delivery of 2,000-pound laser-guided bombs over cruise missiles by a ratio of 20 to one. The figures quoted appear to have included only the weapons and avoided the single-mission cost of the F-15, which includes Airborne Warning and Control System support, advance electronic countermeasures and ground-fire suppression, and the very high cost of a pilot. The article allows for "some operating costs," and the F-15 may be a good choice for certain targets, but not by 20 to one.

Cruise missiles are (almost) self-delivering weapons, and a seabased cruise missile platform would normally perform many other tasks unrelated to the missiles. Nonetheless, some portion of a cruise missile platform needs to be allocated to the weapon delivery cost, and a platform cost/risk assessment will always show an aircraft-over-target to be at greater risk than a platform hundreds of miles from the target.

The cost of delivering weapons is a complex figure, embodying layers of platform and risk assessment. Realistic comparisons are difficult at best, and poorly formulated comparisons can be extremely misleading. Asset-depletion costs not directly associated with the mission must be considered, and the mission planners must remember that Congress does not always replace what is consumed.

As is the case with cruise missile platforms, F-15s have many critical missions in combat. Laser-guided weapons aside, well-delivered plain iron bombs are very cheap and have the advantage that they can be countered only by immediate relocation of the target. On balance, justifying F-

15s as cost-effective bomb-delivery platforms needs to be done with great care: It could be a sure way to send all the F-15s to the scrap heap.

Ernest C. Guerri
Melbourne, Fla.

In "The Rediscovery of Strategic Airpower," the Center for Naval Analyses and RAND Corp. study quoted a cost of \$1,250,000 for conventional cruise missiles. It is time to set the record straight.

There are different definitions of "cruise missiles." The Navy Tomahawk is a cruise missile and has a cost in the ball park of those quoted by CNA/RAND. The Air Force has a missile called the Conventional Air-Launched Cruise Missile (CALCM), the cost of which (approximately \$150,000) is nowhere near the costs quoted by RAND. People, namely Tomahawk advocates, attempt to lump all cruise missiles into the same cost category in order to justify the costs of Navy involvement in deep strike.

There is no comparison between Navy cruise missile costs and Air Force cruise missile costs. When the cost of ships and personnel vs. B-52s and their personnel are factored in, the difference becomes even more obvious. The naysayers try to show that the CALCM cost must include the cost of the original ALCM. I say this is nuts.

We keep talking about the wonderful peace dividends from winning the Cold War; let's start claiming some. All the retired ALCMs were going to

be destroyed, and some innovative Air Force personnel had the vision to convert these into useful tools for conventional applications. Let's claim that the ALCMs did their job, and a damn good one at that, in helping to end the Cold War and not double-charge the country for this faithful warrior. We in the Air Force should stand up for what is one of the cheapest, most capable projectors of global power in the US arsenal and set the record straight.

All cruise missiles are not equal and should not be lumped into one cost figure. The Air Force has the cheapest, most responsive, most effective cruise missile in the world. Let's get the word out.

Lt. Col. Robert M. Kuhns,
USAF (Ret.)
Yorktown, Va.

I enjoyed "The Rediscovery of Strategic Airpower." I was glad to see one of the Air Force's most important deep-attack weapons mentioned, the Northrop Grumman B-2 Spirit.

It is sad to see President Clinton's and his Administration's inability to recognize the value of the B-2 and the need for more of these very capable aircraft. If the US is to have the advantage in the opening stages of any future conflict, we will need more than just 21 B-2s in order to strike a greater number of targets on the first night.

We can't always depend on a massive and expensive cruise missile attack to take on so many targets efficiently. Nor can we count on the possibility of using foreign air bases in the theater of operations for our medium- and short-range strike aircraft. In the end, the B-2 would be the most capable and cost-effective aircraft to use in any future conflict.

Cadet TSgt. Shaun Gonzales
Victorville, Calif.

Air Campaigns, JTIDS, and UCAVs

In "The Rediscovery of Strategic Airpower," retired Army Gen. Frederick J. Kroesen comments that "the recent air campaign against Iraqi forces gained not a single one of the

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US or UN objectives in the Persian Gulf War" and that "four days of land combat—aided immeasurably by the air campaign—achieved every goal and victory."

If the air campaign did not achieve any of the US or UN objectives, then why did the ground campaign last only four days? The land campaign did not achieve its primary objective, which was the annihilation of the six divisions of the Republican Guards. The objective was not a slap on the wrist or a spanking but a complete obliteration of everyone and everything in the Republican Guards.

The Republican Guards escaped because VII Corps, commanded by Lt. Gen. Frederick Franks, stopped three nights in a row to "synchronize" its forces and thereby allowed 4.5 Republican Guards divisions to get out "the back door at Basra." Therefore, I can't see that the four days of land combat achieved any goal or victory except, as some authors have noted, a "hollow victory."

Also in the November issue, "Technology and Air War" [p. 50] discussed the use of UCAVs (uninhabited combat aerial vehicles). Pulling all the Gs in the world in these vehicles will not do any good unless the remote pilot has 100 percent situational awareness—that is, input from a sensor suite that covers 360° of spherical space so that the remote pilot "knows" when his UCAV is threatened and can properly apply those 20 Gs. However, the good side to this is if his UCAV does get shot down, at least the "pilot" won't be stranded on enemy ground and can just go to the fridge for a beer since he will be "finished flying for the day."

Second, the author talks about the Joint Tactical Information Distribution System display and how much it helps the effort. Although this is true, only one unit—the F-15Cs at Mountain Home AFB, Idaho—has this capability and only because this unit was assigned to do an operational utility evaluation in 1994. (The OUE has never been closed out because this would entail the removal of the equipment from the aircraft and hence a very serious loss in capability.)

The Air Force was prepared to buy an inexpensive version of JTIDS, called JTIDS-R, for all of its F-15Cs until the Navy and Secretary of Defense usurped this capability by buying into a Multifunctional Information Distribution System, which only existed on the drawing boards, because it smacked of international cooperation. Therefore, neither the Air Force nor the Navy will have a MIDS in their jets until 2004, if then.

Finally, all of this talk about technology is great, but it seems to ignore one of the fundamentals of air-to-air and air-to-surface combat—the rules of engagement (ROE). F-15Cs could have taken several more shots during Operation Desert Storm and possibly achieved even more air-to-air kills, except for the ROE. All the stealthiness of the F-22 won't do one bit of good unless someone solves the combat identification problem. . . .

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

"Don't Trust Your Instruments"

The September "Aerospace World" reports on the disciplinary action taken against 16 ranking officers for the crash of the CT-43A near Dubrovnik, Croatia, on April 3, 1996 [see "USAF Disciplines 16," p. 19]. This action leaves many of us old-time pilots with a feeling of disbelief and dismay.

When a careless driver on the highway goes to sleep and crosses the centerline, crashing into oncoming traffic, do we fire the sheriff, the mayor, the councilmen, the county supervisors, and the governor of the jurisdiction? I think not.

Since the early days when the US Army Air Corps taught us "Don't Trust Your Instruments," pilots have been consistently and successfully making more difficult instrument approaches with much less—and sometimes really skimpy—data than the US flyers had in Croatia.

A comprehensive civilian report on the accident reveals that the crew failed to follow procedures taught before a pilot graduates from flying school. When I was on active duty, these procedures were checked annually. There is a limit to how much "hand-holding" one should expect, particularly after the fact.

Yes, we grieved and despaired when we lost bunkmates, be it on the Hump from India to China, over Africa, during the Berlin Airlift, in Korea, or wherever. Our ranking officers grieved right along with us. It is appalling and shocking that this same caliber of men have had their careers sacrificed. Their much-needed experience and abilities will no longer be available to our country—a terrible waste!

Lt. Col. Lawrence L. Caskey,
USAF (Ret.)
Paso Robles, Calif.

Enlisted Combat Pilots

In your "Stripes and Wings" [October 1996 "Pieces of History," p. 88], you state that "the military was reluctant to give enlisted flyers the kinds



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1501 Lee Highway

Arlington, Va. 22209-1198

Tel: 703/247-5800

Telefax: 703/247-5855

Industry Relations Manager

Jennifer Krause • 703/247-5800

US and European Sales Manager

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Letters

of duties handled by commissioned pilots. The sergeant pilots served in such roles as test pilot, courier, flight instructor, or mechanic." Wrong!

There were 3,000 of us, and many flew combat in 1942 as staff sergeant pilots ("pilot" was included in our designated rank) in the Aleutian, Pacific, and North African theaters in fighter and troop carrier aircraft. These men flew with competence and valor, and many lost their lives in combat.

Col. Roy A. Miller, USAF (Ret.)
Staff Sergeant Pilot, Class 42-G
Shreveport, La.

Air Forces in Korea

The letter from Robert D. Swartz, Sr. [*"Other Air Forces," November 1996 "Letters," p. 8*], objecting to one of Gen. Ronald R. Fogleman's statements about the Korean War, reminds me of the warning to be leery of any statement beginning with "History shows . . ."

Task Force Smith's air support at the opening of the war was admittedly far short of what was desired, but not for the reasons Mr. Swartz implies. Until June 25, 1950, 5th Air Force in Japan had been trained and equipped solely to provide air defense for those islands.

Requests by 5th Air Force for joint air-ground training exercises had gone largely unheeded by the Far East commander and his staff, perhaps because, with the removal of the army of occupation from Korea to Japan in 1948, Gen. Douglas MacArthur had been charged only with providing logistic support for the small Korea Military Advisory Group left behind there under the charge of the US ambassador.

To say that Task Force Smith was a regular Army force is equally disingenuous. Maj. Gen. William F. Dean picked up a group of occupation soldiers from various units scattered around Kyushu, Japan, after MacArthur received permission to send a regimental combat team for an "arrogant show of force" against the North Koreans, then still north of the Han River. Confusion and a mix-up in communications between Maj. Gen. John H. Church of MacArthur's Advanced Echelon at Suwon and MacArthur's chief of staff in Tokyo resulted in Task Force Smith's landing at Pusan, not Suwon where MacArthur had anticipated.

At that time, the North Koreans still were being held north of the Han and the Suwon airfield was being used by USAF transport planes, with 5th Air Force clearing South Korean skies of

North Korean fighters and fighter-bombers. This seems to be what Mr. Swartz calls "[practicing] duels in the firmament."

The landing at Inchon (which MacArthur insisted on against almost universal advice to the contrary from his Army and Navy colleagues) and the drop of the 187th Airborne Regimental Combat Team did in fact "relieve the pressure" as stated. By that time, however, the Communists had been building up both air and ground forces north of the Yalu in Manchuria.

If history is to show anything about that era in warfare, it will show that the Communist air forces were kept north of the Yalu by Far East Air Forces, Navy Task Force fighters, and, more important, the threat of nuclear retaliation by the Air Force's young Strategic Air Command, which Mr. Swartz either chose to ignore or knew nothing about.

John S. Boeman
Bratenahl, Ohio

Risner's Push

I have just finished "Pardo's Push" [*October 1996 "Valor," p. 8*], in which you mentioned Robbie Risner pushing his wingman out of North Korea. I invite you to sit in the seat of the radar controller for that caper. I'm sure I handled that mission, although I have never been able to verify it.

I never had the slightest clue who was flying that F-86 until a few years ago when a friend who had read Colonel Risner's book related the incident to me. The more he told me, the more familiar it sounded.

I thought I had checked everyone out that afternoon when a Mayday squawked. I responded, "Give Kodak a call." No answer. I quickly said, "Aircraft squawking, 'Mayday,' pick up 220 for Kodak." The next two or three sweeps told me I had him. I sent the P-51s flying rescue combat air patrol to meet the Mayday. The chopper was launched, and we waited for the gang.

In due time, the chopper called, "The pilot has bailed out," followed soon by, "We have him; he's OK."

Immediately, the call came, "Kodak, I'm [call sign of somebody I had no idea even existed]. I'm over your station. Where can I bail out?" That would wake up the dead. Bear in mind, all this time I was painting only one return. I have never been able to visit with Risner to clear this up, but it sure gels.

Maj. Lester A. Smith,
USAF (Ret.)
Amarillo, Tex.

By Brian Green, Congressional Editor

The 105th Congress

The Senate looks to be more conservative, the House about the same, but the real wild card is the line-item veto.

WASHINGTON, D. C., DEC. 11

REPUBLICAN lawmakers, a group that raised the last two Clinton Administration defense spending proposals by billions of dollars, will retain control of both houses of Congress for at least another two years.

In the 1996 elections, the Republicans gained a net of two seats in the Senate, where they now hold a 55 to 45 edge over the Democrats. The final count in the House of Representatives is 227 Republicans, 207 Democrats, and one Independent—a net Republican loss of nine seats.

The Republican leadership in the key defense policy and spending committees is unchanged. Sen. Strom Thurmond (R-S. C.) will remain chairman of the Senate Armed Services Committee, and Sen. Ted Stevens (R-Alaska) will continue to chair the Defense Subcommittee of the Senate Appropriations Committee. On the other side of Capitol Hill, Rep. Floyd Spence (R-S. C.) again will serve as chairman of the House National Security Committee, and Rep. C. W. "Bill" Young (R-Fla.) will keep the chairmanship of House Appropriations Committee's National Security Subcommittee.

The Democrats will experience some leadership turbulence. The Senate Armed Services Committee's new ranking Democrat, Sen. Carl Levin, is a Michigan liberal. He takes over for Sen. Sam Nunn of Georgia, a conservative and one of the foremost defense authorities in Washington. Sen. Daniel K. Inouye of Hawaii will continue as senior Democrat on the Appropriations defense panel. On the House side, ranking Democrats are Rep. Ronald V. Dellums (D-Calif.) on the National Security Committee and Rep. John P. Murtha (D-Pa.) on the Appropriations defense panel.

The Senate Veterans' Affairs Committee will get a new chairman, Sen. Arlen Specter (R-Pa.), who replaces the recently retired Sen. Alan K. Simpson of Wyoming. The House Veterans' Affairs Committee will continue to be chaired by Rep. Bob Stump (R-Ariz.). The ranking minority members are Sen. Jay Rockefeller (D-W. Va.) and Rep. Lane Evans (D-Ill.), who replaces longtime veterans' advocate Rep. G. V. "Sonny" Montgomery (D-Miss.).

The Senate will have a somewhat more conservative ideological cast in the 105th Congress, and the prospects for the armed forces may improve. Retirement claimed several Senators who consistently opposed DoD requests, and they will be replaced by members who appear more likely to support those requests. The Senate, moreover, will have a bloc of nine or 10 Democrats who support the Department of Defense more often than the mainstream of the Democratic Party does.

Some perceive a contrary trend in the House. A seat-by-seat comparison of newcomers and those leaving the chamber suggests a modest decline in Pentagon support. The national security views of the new members, however, are not very well defined.

Members of the 105th Congress will be facing a range of difficult defense and national security issues:

The Quadrennial Defense Review. The last Congress mandated a thorough DoD review of defense strategy, force structure, and budgets. It also required the creation of a National Review Panel to examine the results of the new study and offer alternatives to the optimal force structure recommended by the QDR. These reviews are certain to be subject to intense Congressional scrutiny.

Modernization funding. Last year, senior leaders of the services and the Defense Department noted a shortage of funds to modernize aging weapon inventories. Since overall defense funding is not expected

to rise over the next several years, Congress and DoD must figure out how to fund the modernization while sustaining readiness and required force structure.

Tactical air modernization. Modernization of Air Force, Navy, and Marine fighter forces depends on the outcome of debates over the Air Force's F-22 next-generation air-superiority fighter; the multirole, multi-service Joint Strike Fighter; and the Navy F/A-18E/F. Affordability is a key issue.

Missile defense. Congressional Republicans have pushed for early deployment of a national missile defense, while the Administration remains on a "go slower" track. Under Secretary of Defense for Acquisition and Technology Paul G. Kaminski recently argued for a balance among counterproliferation, deterrence, and active and passive defense.

Depot maintenance. A cadre of Congressional supporters has fought Defense Department efforts to increase the private-sector share of depot maintenance at the expense of military depots.

One wild card for the defense budget this year will be the line-item veto. Congress passed and the President signed into law last spring the authority for the President to veto "any item of new direct spending." The new law took effect this January.

There is no consensus yet on the impact this measure will have on the defense budget. Political experts note that in states with the line-item veto, governors use it as a bargaining tool to ensure spending on their favored programs but not as an ax to cut spending deeply. Furthermore, Congress has its own sources of leverage in the battle over budget priorities.

Others contend that the line-item veto shifts tremendous power to the President. They point out that in a constrained budget, increases to President Clinton's favored domestic programs could equate to downward pressure on the defense budget. ■

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Aerospace World

By Suzann Chapman, Associate Editor

JSF Competition Narrows

The Department of Defense selected two industrial teams, led by Boeing and Lockheed Martin, to develop Joint Strike Fighter (JSF) flying demonstrators. The November 16 announcement eliminated the McDonnell Douglas/Northrop Grumman/British Aerospace contractor team from the high-stakes fighter competition.

The JSF program is expected to produce a family of aircraft that will replace, at a minimum, USAF's F-16 and A-10, the Navy's A-6E, the Marine Corps's AV-8B and F/A-18C/D, and the British Royal Navy's Sea Harrier. The new aircraft might also be chosen to replace the Air Force's F-111, F-117, and F-15E fighters.

This phase of the JSF program is valued at \$2.2 billion and includes propulsion efforts. Boeing received nearly \$662 million and Lockheed Martin about \$719 million. Each contractor team will build two concept demonstrators, expected to fly in 2001. After that, DoD will select a winner.

The winner ultimately could reap as much as \$170 billion from the next-generation fighter program. Plans now call for the contractor to build some 3,000 of the jets for the US Air Force, Navy, and Marine Corps and Britain's Royal Navy. With additional export sales, that number could go even higher.

Teams Offer "Best Value"

In the wake of the long-awaited JSF decision, DoD officials declined to provide specifics of the source selection process but did state that the Boeing and Lockheed Martin teams offered "best value."

Best value, they said, included affordability, management, and technical approach.

Although Boeing has not built a production fighter aircraft since the 1930s, a senior Air Force official cited the Washington aerospace giant's expertise in building the wings and rear fuselage for USAF's F-22 and the company's significant contribution to Lockheed Martin's win of the F-22 contract.

Republican Tapped for Pentagon

With the Republicans firmly in control of Capitol Hill, President Clinton has reached out to a GOP veteran, Sen. William S. Cohen, to be his third Secretary of Defense in a bid to forge Congressional acceptance of his policies in a second term.

The President announced the nomination December 5, days before the Maine lawmaker was to retire from the Senate. He said the nominee would help secure "bipartisan support" for defense. The Senator said his nomination sends "a very strong signal" that the President wants "a bipartisan approach" to defense.

If confirmed, Senator Cohen would replace Secretary of Defense William J. Perry, who in 1994 stepped into the post vacated by Les Aspin, the Administration's first Pentagon chief. (Secretary Perry tendered his resignation in November.) The 56-year-old nominee, a 24-year veteran of Congress, served three terms in the House and then three terms in the Senate, where he served on the armed services and intelligence committees. He chose not to seek reelection in 1996.

Senator Cohen has left an extensive defense record. He generally is conservative on national security. He supported the Bush Administration's prosecution of the Persian Gulf War, opposed major cuts in the defense and intelligence budgets, and supported the Peacekeeper missile and ballistic missile defense programs. However, he also has been a leading Congressional opponent of the B-2 stealth bomber, arguing that it is too costly and should be halted after production of 21 of the aircraft.

"We saw . . . a lot of confidence [that Boeing] could, indeed, provide all of the services with the products we need to meet our operational requirements," the USAF official said.

However, defense officials also encouraged possible collaboration by McDonnell Douglas or other US and UK firms who might want to work with the two winners on what they termed an "extremely challenging" JSF program.

Not Your Father's Joint Aircraft

The Joint Strike Fighter will trim normal aircraft development costs by about \$18 billion and 20-year life-cycle costs by about \$60 billion, estimated DoD's top acquisition official, Dr. Paul G. Kaminski. He compared the cost savings on the triservice program to separate-service stand-alone aircraft efforts.

The savings will come from a flexible manufacturing approach and the use of common subsystems to gain economies of scale, as well as procurement of commercial high-end parts. Dr. Kaminski declared this to be a truly new way of doing business,

emphasizing that the Pentagon would not stage a repeat of its last "common" aircraft program. The Tactical Fighter, Experimental, led to the Air Force F-111 but failed to produce an aircraft acceptable to the Navy.

"It's nothing like the approach that we took on the old TFX program way back in the 1960s," he said. "We will be building three different designs here, not a single design."

Produced in common will be the key high-cost components—engines, avionics, and many high-cost structural components. Advances in the requirements process—using modeling and simulation to conduct trade studies—and advances in design tools and manufacturing have facilitated considerable progress in the way that the Pentagon now designs and builds aircraft.

"Rather than force-fitting a common aircraft designed to different requirements, the JSF concept . . . is to build three highly common aircraft variants on the same production line using flexible manufacturing technology," Dr. Kaminski told reporters on November 16.

Boeing Team Nets Laser Craft

The Air Force awarded a \$1.1 billion contract on November 12 to Boeing, which is teamed with Lockheed Martin and TRW to produce a prototype Airborne Laser (ABL) attack aircraft, now designated the YAL-1A.

The ABL system, installed on a commercial 747-400F airframe, will employ a high-energy laser to destroy theater ballistic missiles while they are in their boost phase, still over enemy territory. The Boeing team has until the fall of 2002 to deliver the ABL prototype and prove its capability by destroying a boosting theater ballistic missile.

This award culminates a two-year concept-definition phase, which included the Boeing team and a team led by Rockwell International. Despite earlier skepticism, DoD now classifies the revolutionary laser weapon system as a major defense acquisition program.

TRW, which built the world's first high-energy chemical laser in 1973 for DoD, will develop the chemical oxygen-iodine laser. Lockheed Martin is in charge of target acquisition and laser-beam adaptive optics. Boeing will manage systems integration, aircraft modifications, and the development of battle-management systems.

Following successful completion of this phase, USAF plans to award a follow-on contract for about \$4.5 billion for a fleet of seven ABL aircraft. The first three would be due by 2006.

During a conflict, two ABL aircraft would circle at about 40,000 feet over friendly territory around the clock. They would detect, acquire, then shoot any enemy-launched theater ballistic missiles while the missiles are still over enemy territory.

Col. Richard D. Tebay, system program director at Phillips Laboratory, Kirtland AFB, N. M., said that each ABL would be capable of firing about 30 "shots" at a cost of about \$1,000 per shot. He said the range will be several hundred kilometers, depending on weather conditions. The ABL needs only five seconds to "kill" its target and has a 40- to 100-second window of opportunity.

In praising the ABL program, the head of the Ballistic Missile Defense Organization, Lt. Gen. Lester L. Lyles, called it the "missing link in the joint architecture" for theater missile defense.

HARM Shots Validated

Air Force F-16s patrolling the airspace over southern Iraq on Novem-

ber 2 and November 4 launched AGM-88C High-Speed Antiradiation Missiles at Iraqi radar sites, the Pentagon said.

According to a statement issued by the Pentagon on November 8, DoD's review of the two November HARM launches confirmed that both F-16CJ aircraft had been illuminated by the Iraqi radars.

"The [Joint Staff] assessment team also found the performance of the pilots to be highly professional and that they operated properly under the rules of engagement," stated the Pentagon.

Pilots flying missions under Operation Southern Watch's ROE may attack any radar site illuminating their aircraft in a threatening way. Both aircraft, assigned to the 4404th Composite Wing (Provisional) at Prince Sultan AB, Saudi Arabia, returned to base safely following the incidents.

Pentagon officials stated on November 3 that early analysis of the first incident "did not support initial indications of radar activity."

The next day, Defense Secretary William J. Perry ordered the Joint Staff to investigate both incidents to find out if Iraqi radar did, in fact, target the USAF aircraft or if the F-16 on-board instruments gave a faulty reading.

Sexual Harassment Stopping

On November 14, the Air Force training commander at Lackland AFB, Tex., told reporters that the service had disciplined eight male instructors during the past three years in sexual harassment cases involving new recruits.

The announcement came a day after Defense Secretary Perry asked each service secretary to report on their programs for preventing sexual harassment in light of allegations made by the Army against several of its trainers at Aberdeen Proving Ground, Md.

Brig. Gen. Robert J. Courter, Jr., 37th Training Wing commander, said the offenses at Lackland had ranged from making unwanted sexual advances to having consensual sex with trainees. He stated that all the instructors had been removed from training posts. Two were removed from the service—one after serving time in prison. The other six were given Article 15s and reduced in rank.

General Courter said such incidents will occur, despite USAF prevention programs, but added that the service takes immediate action whenever they take place.

Secretary Perry asked for reports by the middle of this month on "how each service communicates the department's resolve not to tolerate sexual harassment or unprofessional relationships," according to a Pentagon spokesman.

The Air Force issued a statement on November 14 reminding military and civilian members that it has established a toll-free number for reporting sexual harassment or other improper behavior: (800) 558-1404. This Air Force Personnel Center line at Randolph AFB, Tex., is manned during normal duty hours in the Central Standard Time zone.

The service stressed its "zero tolerance" standard for sexual harassment and discrimination. The statement also suggested using local chains of command and social action offices to report misconduct.

USAF Sets Up in Africa

Even in the midst of daily planning changes for multinational relief efforts to Rwanda and Zaire, Air Mobility Command forces were among the first on the scene. Two C-17s, one C-5, one C-141, and one KC-10 headed to Europe on November 14 prior to heading for Africa.

The aircraft carried Tanker Airlift Control Elements (TALCEs) to set up self-supporting airlift operations in Africa, as well as additional aircrews to sustain around-the-clock operations.

In response to questions on November 19, Secretary Perry stated that current thinking put the US contribution for the effort at fewer than 1,000 troops, mainly support and logistics, rather than combat personnel. Initial planning had estimated the need for about 4,000 US troops.

Secretary Perry said that while deliberations with other participants continued, a small US force of fewer than 100—a survey group—would remain in Kigali, Rwanda. He added that the US had also deployed three TALCEs at airfields in Kigali; Mombasa, Kenya (since redeployed); and Entebbe, Uganda. "These actions also provide the basis for a larger mission, should that become necessary," he added, emphasizing that the situation was fluid.

Gulf War Illness Probed

Continuing to take heat on its handling of the Persian Gulf War illness controversy, the Pentagon announced at a press briefing November 12 that it would initiate additional measures to "leave no stone unturned" in look-

ing for the causes of the reported illnesses.

Deputy Defense Secretary John P. White announced that the team would work under a new office, the Special Assistant for Gulf War Illnesses, headed by Dr. Bernard D. Rostker, assistant secretary of the Navy (Manpower and Reserve Affairs).

Dr. Rostker also led the action team created September 25 to reassess the Pentagon's efforts in dealing with Gulf War illnesses amid revelations of possible chemical weapons exposure to US troops. [See "Hot Seat: Gulf War Illness," December 1996 "Aerospace World," p. 11.] The department's investigative team will be expanded from 12 to 110 and the budget increased from about \$2 million to \$12 million, Dr. Rostker said.

Secretary White also pledged to "continue to monitor our efforts and the resources that we have committed, and if they are not sufficient, we will increase them."

He said that the department continues to "aggressively" investigate the March 1991 chemical weapons destruction at Khamisiyah, Iraq, and other, lesser incidents. Earlier, the Pentagon had focused on the illnesses themselves, treating patients rather than operational details from the Gulf War.

Secretary Rostker noted that the new members of the investigative staff will be "mainly people with backgrounds in operations, intelligence"—contractors with experience in the Persian Gulf area and the necessary security clearances.

Currently, the Army Inspector General is investigating events surrounding Khamisiyah. Secretary White also stated that he had asked the assistant to the secretary of defense (Intelligence Oversight) to investigate why intelligence information about the chemical weapons destruction provided to the department in 1991 did not resurface until 1995. It eventually led to the revelations about Khamisiyah.

That "dropped ball" created renewed calls for an independent investigation. However, the Pentagon maintains that it is the only agency that can effectively investigate the "millions of pages of documents" related to the Gulf War. Secretary White affirmed that DoD welcomes public oversight in this matter.

No Unexpected Hospitalizations

According to new research studies comparing hospitalizations and mortality rates of 1.1 million veterans, those veterans who served in the Gulf War are not being hospitalized or dy-

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ing any more frequently than veterans of the same era who did not deploy.

The *New England Journal of Medicine* published two papers covering the research on November 14.

For the studies, scientists from DoD, the University of California, San Diego, and Department of Veterans Affairs (VA) screened 487,549 hospitalizations, according to a Pentagon statement. They found that the 547,076 Gulf War veterans did not have any

unexpected increase in hospitalizations compared to their 618,333 non-deployed peers from the same period.

This research provides some of the first large-scale studies to compare health outcomes among Gulf War veterans with appropriate comparison groups of other active-duty personnel, stated Navy Capt. Greg Gray, an epidemiologist at the Naval Health Research Center in San Diego, Calif.

However, in an interview with the *New York Times*, Captain Gray revealed that his study only looked at military hospitals and covered just the 25 months following the Gulf War. He told the *Times* that scientific advisors for the study felt that that time period would capture the most important illnesses. Many veterans have said that their illnesses did not show up until after 1993, at least two years after the war.

Additionally, the *Baltimore Sun* revealed that the VA study only included veterans treated at VA hospitals. A VA official told the *Sun* that the VA is working to include veterans treated by private doctors or clinics in its computer database but maintained that the comparative research for the mortality study was sound.

Captain Gray's group and others are performing numerous studies. In particular, Captain Gray noted that his team will compare hospitalizations among veterans who may have been exposed to chemical weapons at Khamisiyah.

F-15 Mechanic Discharged

TSgt. William T. Campbell, an aircraft maintenance technician charged

with dereliction of duty and negligent homicide, requested an administrative separation rather than face a court-martial.

The convening authority, Maj. Gen. Tad J. Oelstrom, 3d Air Force commander, accepted the Sergeant's request on November 13.

Sergeant Campbell had been charged following the death of Maj. Donald G. Lowry, Jr., whose F-15C crashed May 30, 1995. The subsequent accident investigation found that maintenance personnel had improperly installed two flight-control rods on the aircraft.

TSgt. Thomas P. Mueller—who died of a self-inflicted gunshot wound on October 3—was also charged and would have stood trial with Sergeant Campbell. Both were members of the 52d Equipment Maintenance Squadron, Spangdahlem AB, Germany.

According to a USAF statement, General Oelstrom concluded that justice and the interests of the Air Force would best be served by accepting the request for administrative discharge and bringing the case to a conclusion.

The Air Force initially charged the mechanics on October 10, 1995, then

conducted an Article 32 investigation to determine whether to proceed with a trial. [See "F-15 Mechanics Stand Trial," May 1996 "Aerospace World," p. 30.]

Lockheed Martin Wins SBIR System

The Air Force selected the Lockheed Martin team on November 8 to complete the \$1.6 billion "high" segment of its Spacebased Infrared (SBIR) system satellite program. The program consists of high and low satellite segments designed to replace the Defense Support Program satellites used for missile warning.

Lockheed Martin and team members Aerojet, Honeywell, and Northrop Grumman will develop and deliver seven SBIR system high satellites and a ground system. USAF expects the contract to be completed by September 2006.

Lockheed Martin is also teamed with Rockwell International, who announced its selection for a \$179 million demonstration contract for SBIR system low satellites. Rockwell will build the satellite sensors and Lockheed Martin the spacecraft body and launch vehicle.



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Recruiting Hangs Tough

DoD reported that during the past five years, armed forces recruiting efforts produced "the right quantity and quality of new recruits." In Fiscal 1996, the services recruited 180,192 first-time enlistees and 5,795 individuals with previous service.

Frederick F. Y. Pang, assistant secretary of defense for Force Management Policy, noted that the services had successfully overcome the stigma of the drawdown years, during which many young people believed the military was not hiring. "Fortunately, Congress provided the necessary resources for increased advertising, and we were able to

counter those negative perceptions and improve youth awareness about the opportunities and benefits of military service."

The number of recruits who scored above average on the Armed Forces Qualification Test dropped by two points from last fiscal year. Only 69 percent of Fiscal 1996 recruits scored above average on the AFQT, compared to 71 percent in Fiscal 1995.

However, Pentagon officials pointed out that 69 percent still surpasses the quality benchmark of 60 percent.

Recruits surpassed the other quality benchmark—the number of first-time enlistees with high school diplo-

mas—at 96 percent for Fiscal 1996. The benchmark is set at 90 percent.

F-22 Iron Bird "Flies"

It is not set to fly before May, but many of the systems for USAF's new air-superiority fighter, the F-22, will already have faced simulated flight conditions via the "Iron Bird," or Vehicle System Simulator.

The VSS, a unique test facility located at Lockheed Martin Tactical Aircraft Systems in Fort Worth, Tex., provides the ability to test flight-critical systems before the first aircraft actually flies. The F-22's hydraulic and electrical systems and all of their associated hardware and con-

Senior Staff Changes

RETIREMENTS: L/G Edgar R. Anderson, Jr., M/G George K. Anderson, M/G Otto K. Habedank, B/G Orest L. Kohut.

PROMOTIONS: To be **Brigadier General:** Gary A. Ambrose, Frank J. Anderson, Jr., Thomas L. Baptiste, Barry W. Barksdale, Leroy Barnidge, Jr., Randall K. Bigum, Richard B. Bundy, Sharla J. Cook, Tommy F. Crawford, Charles E. Croom, Richard W. Davis, Robert R. Dierker, Jerry M. Drennan, Carol C. Elliott, Paul W. Essex, Michael N. Farage, Randall C. Gelwix, James A. Hawkins, Gary W. Heckman, Hiram L. Jones, Joseph E. Kelley, Christopher A. Kelly, Jeffrey B. Kohler, Edward L. LaFontaine.

William J. Lake, Dan L. Locker, Teddie M. McFarland, Michael C. McMahan, Duncan J. McNabb, Richard A. Mentemeyer, James W. Morehouse, Paul D. Nielsen, Thomas A. O'Riordan, Bentley B. Rayburn, Regner C. Rider, Gary L. Salisbury, Klaus O. Schafer, Charles N. Simpson, Andrew W. Smoak, John M. Speigel, Randall F. Starbuck, Scott P. Vancleef, Glenn C. Waltman, Craig P. Weston, Michael P. Wiedemer, Michael W. Wooley, Bruce A. Wright.

CHANGES: Col. (B/G selectee) Gary A. Ambrose, from Dir., Staff, Hq. ACC, Langley AFB, Va., to Cmdr., 55th Wing, ACC, Offutt AFB, Neb., replacing B/G Michael S. Kudlacz . . . B/G Richard T. Banholzer, from Spec. Ass't to the Principal Dep. to the Ass't Sec'y of the Air Force for Acquisition, Hq. USAF, Washington, D. C., to Spec. Ass't for Command and Control, DCS/P&O, Hq. USAF, Washington, D. C. . . . B/G Paul L. Bielowicz, from Dir., Log., Hq. AETC, Randolph AFB, Tex., to Cmdr., Defense Supply Center Columbus, DLA, Columbus, Ohio . . . Col. (B/G selectee) Sharla J. Cook, from Dir., Aircraft, Ogden ALC, AFMC, Hill AFB, Utah, to Dir., Log., Hq. AETC, Randolph AFB, Tex., replacing B/G Paul L. Bielowicz.

Col. (B/G selectee) Paul W. Essex, from Chief of Plans, Hq. AMC, Scott AFB, Ill., to Cmdr., 92d ARW, AMC, Fairchild AFB, Wash., replacing B/G Arthur J. Lichte . . . Col. (B/G selectee) Randall C. Gelwix, from Cmdr., 64th FTW, AETC, Reese AFB, Tex., to Dep. Dir., Leg. Liaison, OSAF, Washington, D. C., replacing B/G Lansford E. Trapp, Jr. . . . Col. (B/G selectee) Joseph E. Kelley, from Command Surgeon, Hq. PACAF, Hickam AFB, Hawaii, to Cmdr., 74th Medical Group, ASC, AFMC, and Lead Agent, DoD Health Services Region 5, Wright-Patterson AFB, Ohio, replacing B/G Earl W. Mabry II . . . B/G Michael S. Kudlacz, from Cmdr., 55th Wing, ACC, Offutt AFB, Neb., to Dir., Personnel Prgms., Education and Training, DCS/Personnel, Hq. USAF, Washington, D. C., replacing M/G (L/G selectee) Normand G. Lezy.

B/G Arthur J. Lichte, from Cmdr., 92d ARW, AMC, Fairchild AFB, Wash., to Cmdr., 89th AW, AMC, Andrews AFB, Md.,

replacing B/G Charles J. Wax . . . B/G Earl W. Mabry II, from Cmdr., 74th Medical Group, ASC, AFMC, and Lead Agent, DoD Health Services Region 5, Wright-Patterson AFB, Ohio, to Cmdr./Dir., AFMOA, Office of the Surgeon General, Bolling AFB, D. C., replacing M/G (L/G selectee) Charles H. Roadman II . . . M/G Ronald C. Marcotte, from Dir., Strategic Target Plans, J-52, and Dep. Dir., Plans and Policy, J-5, Hq. USSTRATCOM, Offutt AFB, Neb., to Dir., Plans and Policy, J-5, Hq. USSTRATCOM, Offutt AFB, Neb. . . . Col. (B/G selectee) Timothy J. McMahon, from Cmdr., 341st Missile Wing, AFSPC, Malmstrom AFB, Mont., to Dep. Dir., Ops. and Log., J-3/J-4, and Dir., Combat Ops. Staff, J-3/J-4, Hq. USSTRATCOM, Offutt AFB, Neb.

B/G Thomas H. Neary, from Dir., Ops. and Log., J-3/J-4, Hq. USSTRATCOM, Offutt AFB, Neb., to Dir., Nuclear and Proliferation Policy, Hq. USAF, Washington, D. C. . . . M/G Donald L. Peterson, from Dir., Plans, DCS/P&O, Hq. USAF, Washington, D. C., to Ass't DCS/P&O, Hq. USAF, Washington, D. C., replacing M/G Charles D. Link . . . Col. (B/G selectee) Glen D. Shaffer, from Cmdr., Air Force Technical Applications Ctr., Patrick AFB, Fla., to Ass't Dep. Dir., Ops., NSA, Fort Meade, Md. . . . Col. (B/G selectee) Glenn C. Waltman, from Mil. Ass't to the Sec'y of the Air Force, Hq. USAF, Washington, D. C., to Cmdr., 341st Missile Wing, AFSPC, Malmstrom AFB, Mont., replacing Col. (B/G selectee) Timothy J. McMahon . . . B/G John L. Woodward, Jr., from Dir., Communications and Information, Hq. ACC, Langley AFB, Va., to Dir., Command and Control Sys., J-6, Hq. USSPACECOM and NORAD, and Dir., Communications and Information, Hq. AFSPC, Peterson AFB, Colo., replacing M/G (L/G selectee) William J. Donahue.

SENIOR ENLISTED ADVISOR (SEA) RETIREMENT: CMSgt. Otis L. Scott, Jr.

SEA CHANGES: CMSgt. Ken Casey, to SEA, Hq. USAFE, Ramstein AB, Germany, replacing CMSAF Eric W. Benken . . . CMSgt. Kenneth E. Hair, to SEA, Hq. AETC, Randolph AFB, Tex. . . . CMSgt. Wayne D. Petro, to SEA, Hq. 11th Wing, Bolling AFB, D. C., replacing retired CMSgt. Otis L. Scott, Jr.

SENIOR EXECUTIVE SERVICE (SES) RETIREMENTS: Janet C. Cook, Richard Hendl.

SES CHANGES: Garry W. Barringer, to Dir., P&P, Rome Lab, Rome, N. Y., replacing Walter J. Senus . . . Herbert C. Carlson, to Chief Scientist, Geophysics, Phillips Lab, Hanscom AFB, Mass., replacing retired Richard Hendl . . . Janet S. Fender, to Senior Scientist, Advanced Imaging, Phillips Lab, Kirtland AFB, N. M. . . . Steven A. Shaw, to Deputy General Counsel (Contractor Responsibility), Office of the General Counsel, OSAF, Washington, D. C., replacing retired Janet C. Cook. ■



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Aerospace World

trol software will be tested via the VSS.

The Iron Bird does not look like a real F-22 but matches hardware to be found in the actual fighter. "The locations of actuators, pumps, [and] electrical systems are relative to the real aircraft within inches," said Gil Potter, who runs the VSS lab. "The layout of the plumbing accurately matches all the twists and bends associated with the routing of hydraulic tubes in an actual F-22." He added that such fidelity is critical to valid testing.

The facility helps cut the cost of the flight-test program for the developmental aircraft. It can also handle tests considered "too dangerous to attempt on a flying airplane, such as dual engine flameouts and flight-control actuator failures," stated company officials.

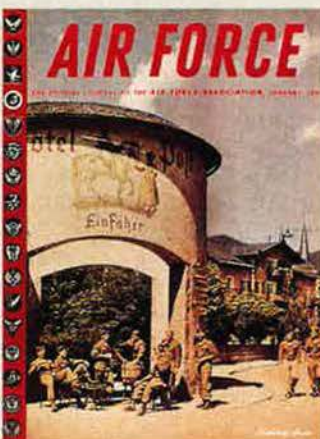
Most Potent ICBM Reaches 10

America's most accurate and powerful intercontinental ballistic missile (ICBM)—the LGM-118A Peacekeeper—passed the 10-year mark of alert duty on October 10. Still known to many as MX, its development label, the Peacekeeper's future is uncertain.

Under terms of the still-unratified Strategic Arms Reduction Talks II Treaty, the United States would eliminate all 50 of the 10-warhead ICBMs over a period of years. The US Senate has ratified START II, but Russia's lower house, the Duma, has not.

The US Air Force has already made plans to dismantle its Peacekeeper force, located near F. E. Warren AFB, Wyo. START II would eliminate all multiple warhead ICBMs.

Despite its relatively short history, many see the Peacekeeper as a cen-



50 Years Ago in Air Force Magazine

On the cover: For the "Holiday issue," troops gather around a keg in a picturesque German setting.

■ Reprints New York *Times* article by Secretary of War Robert P. Patterson, arguing for unification of the armed forces into a single Department of Defense with "three branches of equal standing—Army, Navy, and Air."

■ Annual AFA dues were \$3, of which \$2 was to cover a year's subscription to *Air Force Magazine*.

■ "Daring the Sonic Barrier," article on rocket-powered Bell XS-1, anticipated that Bell Chief Test Pilot Chalmers "Slick" Goodlin would fly

the XS-1 to break the sound barrier in early 1947. (In actuality, the feat would be accomplished on October 14, 1947, by Capt. Charles E. Yeager.)

■ AAF sends cooks to leading hotels and restaurants for training in how to improve the "attractiveness" of food served in GI mess halls.

■ **AFA news:** The Paducah (Ky.) Squadron (as chapters were called then) acquires a surplus nonflyable B-17 as a classroom for a troop of Air Scouts. AFA members lecture on navigation, radio, radar, etc. . . . The Phoenix (Ariz.) Squadron sponsors an aeronautical theory class in a local high school and guarantees lab fees for students who want to take the course.

USAF Celebrates 50

The Smithsonian Institution's National Air and Space Museum has a special exhibition, "US Air Force Fiftieth Anniversary," featuring a North American F-86A Sabre, more than 50 paintings from USAF's art collection, and two display cases with Air Force aircraft models. The Sabre is on display through May 5, 1997. The artwork is on exhibit through October 30, 1997. The aircraft models are on display until December 1, 1997.

On February 16, the Daytona 500 will feature an Air Force color guard and band and an Air Force Special Operations Command parachute team. The annual auto race in Daytona Beach, Fla., will be televised on CBS.

tral player in the end of the Cold War. "I think the Peacekeeper was incredibly important in our efforts to get our former adversary to agree with us in the need for reducing reliance upon nuclear weapons," said Brig. Gen. Gerald F. Perryman, Jr., Air Force Space Command director of Operations and former commander of the first Peacekeeper squadron, the 400th Missile Squadron.

"It showed the Soviets we would match their modernization efforts and that they could not gain an advantage on the United States," he added.

The current 400th MS commander, Lt. Col. Barry D. Kistler, emphasized that a threat remains. "The mission has actually changed very little," he said. "As the ultimate evolution of the ICBM, the Peacekeeper is still ideally suited to the task of holding hardened, strategic targets at risk. This is still our job."

Colonel Kistler added that everyone hopes the Russians do ratify START II and "put us out of a job." That would prove the Peacekeeper and its missileers "had been successful in keeping us out of nuclear war."

B-2 Pilots Test Endurance

The Air Force began preparing its B-2 crews at Whiteman AFB, Mo., for flights of 24 hours or more by testing their endurance in simulators. The first endurance test, conducted in October, lasted 34 hours. The second, in November, ran for 38 hours.

During the tests, the crew members had electrodes and wires attached to their heads and chests.

"Equipment measured sleep-wake patterns to learn if the pilot and mission commander were performing at peak performance during critical parts of the mission," said Capt. Steve Armstrong, a B-2 human factors test team engineer at Whiteman.

Experts from Armstrong Laboratory, at Brooks AFB, Tex., and Wright-Patterson AFB, Ohio, monitored the tests. They checked for eye movement and work-load activities, as well as pilot performance, reactions to unexpected events, vigilance, and sleep patterns.

Captain Armstrong noted that the first endurance mission is most difficult because pilots need to learn coping skills. He said the pilots completed the missions successfully.

One of the first crew members to be tested, Capt. Tony Monetti, who flew B-52s in the Persian Gulf War, thought it would be no "big deal" initially. "I learned the importance of listening to the experts," he said. He added that he followed their recommended sleep schedules and diets. "It worked. I was surprisingly refreshed after each 'power' nap."

News Notes

■ Two E-8C Joint Surveillance and Target Attack Radar System aircraft from the 93d Air Control Wing, Robins AFB, Ga., deployed to Rhein-Main AB, Germany, in November to monitor the withdrawal of Operation Joint Endeavor forces from Bosnia-Herzegovina. This is the first operational deployment for Joint STARS aircraft, although they flew more than

150 operational missions during Operations Desert Shield, Desert Storm, and Joint Endeavor as part of their operational test and evaluation.

■ The 488th Intelligence Squadron and 95th Reconnaissance Squadron, RAF Mildenhall, UK, completed their 1,000th Rivet Joint mission on October 17. To accomplish that feat over a four-year period, the units flew 9,140 hours in 1,588 days—averaging 9.2 hours per sortie. Working with the Mildenhall units on the missions were the pilots of the 38th RS and electronic warfare officers of the 343d RS from Offutt AFB, Neb.

■ Since the first US C-130 landed at Tuzla, Bosnia, in December 1995, members of the 4100th Air Base Group (Provisional) have "controlled, marshaled, unloaded, and loaded" more than 2,000 C-130s for Operation Joint Endeavor. A USAF release reported that the 2,000th C-130 arrived on October 21.

■ Air Education and Training Command and the Air Force Reserve have created two associate flights of instructor pilots. The first-of-its-kind reserve flights, to be located at Columbus AFB, Miss., and Vance AFB, Okla., will each have 25 fighter pilots and one enlisted administrator. AETC has set up a similar program with the Air National Guard, in which ANG has agreed to provide 44 fighter pilots to serve as IPs.

■ McDonnell Douglas delivered the twenty-seventh production C-17 airlifter to the Air Force on November 5.

■ Living legend John L. Levitow visited Lackland AFB, Tex., on November 8 to speak at a ceremony dedicating the 737th Training Group headquarters building in his name. During the Vietnam War as an airman first class loadmaster on an AC-47, he became the lowest-ranking airman in history to earn the Medal of Honor.

■ The Department of Veterans Affairs is now answering questions electronically on its customer service page on the Internet. To ask a question, scroll down to the bottom of the VA home page (<http://www.va.gov/>) and click on the button labeled "Putting Customers First." Below a set of "Frequently Asked Questions" are e-mail and information links for everything from home loans to medical matters, including a separate link for Persian Gulf War illness.

■ The Defense Prisoner of War/Missing in Action (POW/MIA) Office has changed its name to Defense POW/Missing Personnel Office. The change, according to a DPMO state-

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ment, reflects increased responsibilities—the addition of personnel recovery to its previous mission of missing personnel accounting—under Fiscal 1996 legislation.

■ Air Force officials activated the 394th Combat Training Squadron at Whiteman AFB, Mo., on November 6 to provide B-2-qualified pilots for Whiteman's 393d Bomb Squadron. The new unit's B-2 instructor pilots will not only train other B-2 pilots but also fill in with the 393d BS if needed during contingencies.

■ Defense Secretary Perry recognized Schneider National, a transportation company based in Green Bay, Wis., for its outstanding support as an employer of National Guard and Reserve members with the first Employer Support Freedom Award on November 4. Regional awards went to McDonnell Douglas, Saint Louis, Mo.; National Life, Montpelier, Vt.; Tektronix, Inc., Wilsonville, Ore.; and United Parcel Service, Orlando, Fla.

■ USAF selected 621 of 3,198 eligible senior master sergeants for promotion to chief master sergeant for an overall rate of 19.42 percent—the highest chief master sergeant promotion rate in the 1990s.

■ The American Medical Association selected Lt. Gen. (Dr.) Edgar R.

Anderson, Jr., USAF (Ret.), former USAF surgeon general, as the 1996 recipient of the Dr. Nathan Davis Award in the category of Executive Branch Member in Career Public Service. The Air Force Association nominated the General for the award, which recognizes outstanding public service to advance the public health.

■ Five airmen were among the first to earn Russian Federation Ministry of Defense Medals for their efforts in "strengthening military cooperation between nations." Lt. Col. Phil Bray and Ronald Parkhouse and TSgt. Scott Tompkins, all from the Alaska ANG; Lt. Col. David Bernacki, Alaskan Command, Elmendorf AFB, Alaska; and SrA. Vito Gurevich, Massachusetts ANG, received the medals in September during Arctic Sarex, a combined search-and-rescue exercise with Russia and Canada.

■ Navy and Air Force cooks are combining training. The first members of the Navy's Mess Management Specialist School began training at Lackland AFB, Tex., on October 28. Under base closure actions, the Navy school transferred from San Diego, Calif., to Lackland, where within two years it will combine with Air Force food service training. Once its new facilities are completed, the

combined school expects to train 1,300 mess specialists annually.

■ Freddie Beason, USAF's top consultant on facility energy conservation, received a 1996 Federal Energy and Water Management Award. He is the Air Force Facility Energy Program manager at the Civil Engineer Support Agency at Tyndall AFB, Fla.

■ By coordinating US Coast Guard and Navy aircraft on October 16, the 24th Wing's Joint Rescue Coordination Center at Howard AFB, Panama, helped save four people who had been drifting for six days in the Caribbean Sea.

■ Another joint Navy and Air Force mission on October 24, flown by USAF's 56th Rescue Squadron and Navy Patrol Squadron 26, both in Iceland, airlifted a Japanese seaman, who was suffering from internal bleeding and gastric ulcers, from the *Shinmei Maru*, which was drifting hundreds of miles south of Iceland.

■ Wilford Hall USAF Medical Center, Lackland AFB, Tex., sent 25 medical personnel and the 24th Medical Group, at Howard AFB, Panama, sent six aeromedical technicians as part of a US burn trauma assistance mission to Ecuador following the October 22 crash of a US-based Million Air 707 commercial aircraft. ■

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Future Engagement

By John A. Tirpak, Senior Editor





**USAF foresees an increased role for space
in an Air Force that will be the nation's
“strategic instrument of choice.”**

THE Air Force is in the midst of a technological and philosophical evolution. It is making a transition from the Air Force of the last 50 years—focused on aircraft and air operations—to the Air Force of the next 50 years, with an increasing

emphasis on spacecraft and space operations. This future Air Force, though smaller, will become the “strategic instrument of choice” for the nation’s leaders because of its ability to make war—or influence peace—decisively, accurately, over

long ranges, on short notice, while putting as few Americans in harm’s way as possible.

Space operations will be so critical and fundamental to the US military that USAF is “now transitioning from an ‘air’ force into an ‘air and

space' force on an evolutionary path to a 'space and air' force," the vision contends.

Changes on the way to this future, however, will be incremental, rather than sudden and wrenching, in an unusual combination of stability with transformation. Many of the systems that will create the future Air Force are already in service; many are just now being launched. The metamorphosis is inevitable, however, and it will happen within the career spans of those now entering the service.

Such is the future sketched out in "Global Engagement: A Vision for the Twenty-First-Century Air Force," released by USAF leaders in late November. The document, which succeeds "Global Reach, Global Power" as the Air Force's defining statement of missions and "core competencies," is the capstone of an 18-month long-range planning effort, which represents the most sweeping and ambitious self-examination USAF has ever performed.

First Among Equals

The new document revises and expands the Air Force's earlier list of core competencies and interprets their value to the nation, while laying out the Air Force's tacit claim to a "first among equals" status in the armed forces.

"Global Engagement is a corporate vision for the decades to come," explained Sheila E. Widnall, Secretary of the Air Force, as she offi-

fact that in the twenty-first century, "it will be possible to find, fix, and target anything stationary or moving on the surface of the Earth," said Gen. Ronald R. Fogleman, Air Force Chief of Staff. This single fact—that air and space forces "can touch 100 percent of the population of the Earth . . . at any time"—has shifted the weighting the US gives its armed forces, he said.

"New technology and new operational concepts already offer an alternative to the kind of military operation that pits large numbers of young Americans against an adversary in brute, force-on-force conflicts," the new vision paper asserts. Air- and spacepower—on its own merits—"offers potentially decisive capabilities to the Joint Force Commander. . . . It is a strategy of asymmetric force that applies US advantages to strike directly at an adversary's ability to wage war."

The Air Force will be the prime force in space operations, according to the vision statement. For the US and its potential foes alike, there will be an increasing dependence on space assets for intelligence, communications, weapons guidance, and navigation.

"Operations that now focus on air, land, and sea will ultimately evolve into space," Global Engagement asserts. Thus, it continues, "The medium of space is one [that] cannot be ceded to our nation's adversaries. . . . The nation will expect the Air Force

focused on truly military activities, while delegating "housekeeping" duties to private contractors.

The Global Engagement white paper also calls for the creation of a new, basic military course that must be passed by all newly minted officers and airmen alike. The course will describe the totality of the USAF mission and make each individual fully aware of his role in it before he embarks on his first assignment.

This course—as well as Global Engagement itself—will help "build a sense of institutional identity," Secretary Widnall explained. General Fogleman added that the course, vision statement, and a new document, tentatively titled "How We Fight," will bring each USAF member's role in the service's mission into sharp focus and work to abolish the "stovepipes," or cliquish "functional chains of command," within the service that at times set blue-suiters apart from one another.

The new vision also sounds the familiar theme that control over the battlefield—now expanded to the space above as well as the air—makes all US military operations on the surface below possible.

Critics Lash Out

Even before Global Engagement hit the street, the paper was taking fire. It was being attacked as a bald grab for some of the other services' roles and missions as the Pentagon embarks on its Quadrennial Defense

"New technology and new operational concepts already offer an alternative to the kind of military operation that pits large numbers of young Americans against an adversary in brute, force-on-force conflicts."

cially released the document at a ceremony in the Smithsonian Institution's National Air and Space Museum. Rather than presenting a strictly parochial view of service capabilities, she said, the vision "flows from the national security strategy," named "Engagement and Enlargement," which advocates the expansion of world democracies. It also ties into the Defense Department's "Joint Vision 2010," a joint-service concept paper released last summer.

The fundamental observation underlying Global Engagement is the

to be prepared to defend US interests in space when necessary."

Global Engagement also sees a prime role for USAF in managing ballistic missile defense, orchestrating theater warfare, conducting information warfare (IW), carrying out deterrence, establishing forward presence, and providing the means for robotic warfare. It preaches the use of military-tuned commercial hardware that is leased rather than bought in order to bypass a glacial acquisition system. It argues for creating a force whose uniformed members are

Review. The QDR is a follow-on to the 1993 Bottom-Up Review, which established the size of the current force as well as the national strategy of maintaining forces to fight and win two nearly simultaneous major regional conflicts. The QDR is expected to revisit the assumptions made four years ago and possibly redistribute roles and resources among the services.

Prominent among the attackers was the US Army, which unveiled its own new "vision" not long before the Air Force made Global Engage-

ment public. In "Army Vision 2010," that service flatly dismissed some basic assertions made in Global Engagement, arguing that, in spite of the "apparent" success of air- and spacepower in the Persian Gulf War and in Bosnia-Herzegovina, the "stand-off" approach to fighting wars amounts to "nothing more than twenty-first century attrition warfare." The idea

Force After Next' " until around 2015, said General Fogleman.

A massive effort went into crafting the new vision. The major building blocks included "New World Vistas," the Air Force Scientific Advisory Board's 30-year technology forecast; "Air Force 2025," Air University's view of the political and technological horizon 30 years

"Everyone knew this was going to be big."

Not Precooked

General Fogleman noted that the new vision was not handed down from above with instructions to make it work. "This was not a cookbook deal," said the Chief of Staff. "We played an open and honest game" in

"The Air Force . . . recognizes the emerging reality that in the twenty-first century, it will be possible to find, fix, or track and target anything that moves on the surface of the Earth."

of influencing events solely by inflicting damage from the air has been "proved . . . invalid," the Army asserted, without producing specifics. It argued for more "army-vs.-army contact" because there are more armies in the world than air forces.

When asked about the Army's claims, General Fogleman responded, "Those who say only ground forces can be decisive" in a conflict of the future "are clearly wrong."

In an interview with *Air Force Magazine*, General Fogleman maintained that Global Engagement is chiefly for consumption by the Air Force itself. However, he allowed that he's "just a little disappointed" in the Army vision.

"They must feel terribly threatened," he said, "but . . . there's no reason for them to feel threatened. I think that . . . we need to be looking to the future [and] . . . recognize the realities of what the battlefield is going to be like. And I have to tell you that we, as senior leaders in our military, should not take the potential for casualties lightly."

General Fogleman told *Air Force Magazine* that the investments being made in the force now will bear fruit in the 2010 to 2015 period, and the philosophical changes that go with "revolutionary" systems, such as the Airborne Laser and the F-22, will have most meaning then.

"Whatever comes out of this Quadrennial Defense Review, in my view, is going to be a transition force," he said, since the QDR will inform budgets that are already reaching to 2003. From where the service is now, it can "recognize" what the future will be like, "but we will not have fielded the technology . . . to go into 'The

out; "Spacecast 2020," an AU look at future space systems and operations; and a RAND Corp. study on Air Force structure and installations. Hundreds of experts and specialists contributed to the effort.

The RAND study, about which little has been said publicly, concluded that the Air Force cannot continue to allocate resources in the way it has in the past and that some "cherished" priorities may have to give way to less glamorous but far more valuable investments, General Fogleman told *Air Force Magazine*.

"To have something like that come out of RAND is a powerful message," he said.

The new vision was fine-tuned along the way by senior Air Force leaders. Its development was overseen by a "Board of Directors" comprising the vice commanders of the major commands and chaired by the Vice Chief of Staff, Gen. Thomas S. Moorman, Jr. Each command had its own action team contributing to the effort; as a result, the new vision had the "corporate buy-in" of the entire Air Force as it was taking shape, General Moorman reported.

"The socialization of this process was more pervasive than I thought it would be," he told *Air Force Magazine*. He said that, though he observed some "fear" about changing long-cherished notions of the service's mission, "I saw people start to identify with the enterprise . . . and really contribute."

The process culminated in October at the US Air Force Academy in Colorado Springs, Colo., site of the fall 1996 Corona meeting of USAF four-star generals. "There was real excitement," said General Moorman.

developing the vision, "and we feel pretty good about that."

The planning effort will yield not only Global Engagement, the "How We Fight" document, and the Basic Airman's Course, but also a long-range plan for the Air Force. The planning process itself will be institutionalized with a reorganization of the Air Staff, which was slated to be completed this month.

The long-range plan is intended as "something between" a philosophical statement and a dollars-and-cents budget, Maj. Gen. David W. McIlvoy, special assistant to the Air Force Chief of Staff for Long-Range Planning, said at the Smithsonian ceremony.

The plan, he added, will be akin to the Defense Planning Guidance issued annually by the Pentagon to the services. As the DPG establishes basic priorities, notes emerging or declining threats, and tells the military services where to invest more or less heavily, the long-range plan will similarly instruct the Air Force major commands on budgets. It will also provide a blueprint that will ensure that capabilities deemed necessary by a certain point will be ready in time.

One feature will be a "25-year master technology plan," General McIlvoy said.

"Our job now is to take the vision and turn it into desired end-states," he explained. Though it will "inform" the QDR and the program objective memorandum—or POM budget process—it will not simply be a ledger-and-green-eyeshade affair.

Force structure will be altered, for example, to introduce armed unin-

habited combat aerial vehicles into the force at some future date, and information warfare will have to be integrated at all levels of the Air Force, General McIlvoy observed.

Dr. Clark Murdock, General McIlvoy's deputy, said the long-range plan now being readied will be in draft form until October 1998, when it will be formalized. The plan is to be updated every two years thereafter.

information warfare didn't even make the list when we did Global Reach, Global Power," General Fogleman noted.

Air and Space Superiority, which the General described as "the freedom of action and attack," is counted as USAF's chief mission and strength. "It denies the enemy sanctuary. It's about gaining control quickly and decisively, the ability to operate with impunity," he told AFA's Montgom-

based missile legs of the nuclear triad, countering proliferation, deterring "rogue states" armed with nuclear weapons, and being "prepared to undertake further reductions as circumstances require."

The Global Engagement white paper asserts that USAF is ready to conduct global operations "using both lethal and nonlethal means." While nearly a quarter of all USAF personnel today are deployed over-

"Any military or civilian member who is experienced in the employment and doctrine of air- and spacepower will be considered an operator."

Key to Global Engagement is continued innovation on the part of the Air Force. That innovation is to be institutionalized in the form of "battle laboratories," which will be set up to explore new concepts in strategy and tactics, as well as in technology and coordination.

These battle labs will focus on space, air expeditionary forces, battle management, force protection, IW, and unmanned aerial vehicles (UAVs).

"They will be about prototyping new ideas and new concepts," General Moorman said. "We will test equipment and concepts in a real environment. We will play it and see how it works. The tangible result will be hands-on experience," he said, noting that the process will help to demonstrate whether a new idea or technology is worth pursuing with precious budget dollars.

With battle labs, "we will discover, 'Is it useful?' And, 'Is it value-added?'" General Moorman explained.

The battle labs will be tightly focused on enhancing the Air Force's stated "core competencies," which form the frame of Global Engagement.

The Critical Six

The core competencies identified in the new vision have been shifted and revised since Global Reach, Global Power was written in 1990 and revised in 1992. The new list includes Air and Space Superiority, Global Attack, Rapid Global Mobility, Precision Engagement, Information Superiority, and Agile Combat Support.

"Things are changing so fast that

ery (Ala.) Chapter on the day Global Engagement was released.

"The control of air and space is a critical enabler for the joint force," said the white paper, "because it allows all US forces freedom *from* attack and freedom *to* attack."

Given control of the air and access to space, while denying both to the enemy, the Joint Force Commander can prevail "quickly, efficiently, and decisively," according to the vision statement. Without it, "everything on the battlefield is at risk."

Ballistic and cruise missile defense is counted under this first competency. Global Engagement notes that the Air Force is "moving aggressively to counter this threat," chiefly through the Airborne Laser program. However, "although the global and theater missile threats are now addressed separately, over time they will merge into a common missile defense architecture, becoming a single counterair and space missile defense mission."

Alone among the services—and possibly among world air forces—USAF has the ability to attack any spot on the globe quickly and on demand, summed up as "Global Attack." As for the "find, fix, and attack any site on the globe" capability of USAF, "we can do it today, but not . . . in real time," General Fogleman told the Montgomery Chapter, "but the way we're moving, . . . this will be a reality."

While the vision recognizes that "nuclear weapons no longer play as central a role in America's security strategy as they [once] did," the Air Force will maintain the readiness and safety of the bomber and land-

seas, the Air Force expects international and domestic pressures to force the US back to an almost exclusively continental-US-based military posture.

The air expeditionary force is one way to address this trend. It can be tailored to fit the needs of the theater commander, able to carry out "lethal and nonlethal applications," such as combat air patrol or humanitarian assistance, and can be ready to fight within three days of the order.

But the trend is clear, according to Global Engagement: "In the future, capabilities based in the continental United States will likely become the primary means for crisis response and power projection." Long-range airborne and spacebased assets will fill the bill.

Finite Number of Carriers

General Fogleman told the Montgomery gathering—which included guests from the Army, Navy, and Marine Corps—that "the requirement to be expeditionary is not because we're trying to replace carriers but because there will be a finite number of carriers. . . . There will be times that we will need [those] carriers in other parts of the world, and land-based air . . . can [substitute for] them. . . . [It is] cheaper, can sustain a greater sortie rate over a longer period of time, and ought to be there. And so, this should not be something where we're trying to pit one organization . . . against another."

The General drew attention to another unique Air Force capability—its phenomenal airlift power and complementary aerial refueling capability. Rapid Global Mobility de-

scribes the Air Force's capacity to airlift enormous quantities of materiel on short notice over long distances. Airlift and aerial refueling are the enablers of forward-deployed forces, an expeditionary force, and a CONUS-based strategy. In such operations as humanitarian relief, "the rapid delivery of materiel is the campaign," the Air Force's vision maintains.

Another core competency, Precision Engagement, is "more than laser-guided bombs," General Fogleman said in Montgomery. "It may mean precisely delivering materiel to a forward location . . . via airlift. It may be precisely implanting a computer virus in some adversary's command-and-control network."

The new vision statement notes that the Air Force offers the nation "reliable precision, an ability to deliver what is needed for the desired effect but with minimal risk and collateral damage."

Given the enormous increases in available battlefield and peacetime information—and the importance it carries for both US forces and for adversaries—the Air Force has made

regard to battle management and command and control, as well as offensive IW, and "in conjunction with other federal agencies . . . support strategic information operations."

Responsiveness, Not Mass

Some of the newest Air Force concepts will be brought to bear in the area of Agile Combat Support. "Just in time" supply practices will be used to acquire and field only that support materiel that is necessary, and only when necessary, allowing USAF to "substitute responsiveness for massive deployed inventories." The Air Force believes that a shorter support tail will be quicker and cheaper to maintain. This competency keys onto a Joint Vision 2010 mandate for focused logistics.

The Air Force white paper said, "When combat commanders require an item, the system will reach back to the continental United States and deliver it where and when it is needed." This approach will mean fewer functions and personnel are put forward for the deployment and sustainment processes. "This, in turn, will re-

duce the size and . . . vulnerability of our forces forward."

under which speed, quality, and prior performance rule. Moreover, USAF will rely increasingly on private industry to carry on more sensitive work it has traditionally done in-house, including research, development, test, and evaluation. It will work with other services to form Joint Centers of Excellence for RDT&E to share knowledge, resources, and facilities.

As a result of the new vision paper, the Air Force plans to usher in new concepts of what it is to be a blue-suiter. Because the ways in which USAF will exert influence—by force or finesse—will change to include space-system technicians, IW specialists, and a host of new non-rated experts, it has embraced the idea that, in the future, "Any military or civilian member who is experienced in the employment and doctrine of air- and spacepower will be considered an operator."

The Air Force will look for new opportunities to hand more active-duty force missions to the Guard and Reserve components, and there will be an expansion of the use of Individual Mobilization Augmentees.

"In the future, capabilities based in the continental United States will likely become the primary means for crisis response and power projection as long-range air- and spacebased assets increasingly fill the requirements of the Global Attack core competency."

Information Superiority one of its core competencies, even though it "is not the Air Force's sole domain." Familiarity with and skill in operating air- and spacebased sensors "make airmen uniquely suited for information operations."

UAVs fall under Information Superiority for now, because in the present and in the near-term, they will be used chiefly to gather information and as communications relays. But in the mid- to long-term, the Air Force "expects" an expanding role for UAVs, beginning with high-risk missions, such as Suppression of Enemy Air Defenses. Later "migration of additional missions to UAVs" will depend on how fast technology matures and how warfare evolves.

USAF will continue to pursue defensive IW efforts, particularly with

duce the size and . . . vulnerability of our forces forward."

General Fogleman observed that this last comment was a "lesson learned from [the terrorist bombing of] Khobar Towers," the Saudi Arabian housing complex. Nineteen airmen perished and hundreds sustained injuries in the June 25 truck-bomb attack.

To make this logistics vision a reality will require instantaneous access to the whereabouts of any part or piece of equipment, as well as assiduous streamlining of the depot system, aggressive outsourcing and privatization, and a "factory to flight line" mentality. These concepts will first be explored in air expeditionary forces and later expanded USAF-wide.

Business transactions will have to follow "best practices" guidelines,

Implementation of Global Engagement will take a long time, said General Fogleman, who noted that, for this reason, he won't have to go back on the promise he made when he became Chief of Staff—that there would be some stability in the force under his tenure after the rocky, uncertain years of the early 1990s.

"The senior leadership is committed to *not* creating that kind of turbulence again," he insisted.

Air Force people will be encouraged to be "comfortable with uncertainty and willing to make decisions with less than perfect information," the new vision statement asserts. An environment of innovation must be fostered, and the system steered toward rewarding people who demonstrate "adaptability and agility," if the service is to make good on its new, bold covenant with the nation. ■

At AFA's symposium, USAF leaders laid out six critical capabilities that will make aerospace power "decisive."

The Core Competencies of the Force

By Robert S. Dudney, Executive Editor

General Fogleman

The Air Force has a new strategic blueprint, one that is grounded in six core competencies and the explicit conviction that aerospace power will be "decisive" in future operations, Gen. Ronald R. Fogleman, Air Force Chief of Staff, told AFA's Los Angeles symposium.

In his words, "Only air- and space-power provide the nation the ability to find and hit strategic centers of gravity directly, as well as the ability to operate at operational and tactical levels of war."

At the heart of the new vision—called "Global Engagement"—lies the "reality" that it soon will be possible "to find, fix, or track and target anything that moves on the surface of the Earth," said the General. The new architecture supersedes "Global Reach, Global Power," the white paper drawn up in 1990.

Making the vision possible, the Chief said at the October event, will be six core capabilities, comprising air and space superiority, global attack, rapid global mobility, precision engagement, information superiority, and agile combat support. Specific capabilities might change,

Six at the Core

A core competency comprises professional knowledge, specific airpower expertise, and technological prowess. USAF has six core competencies:

Air and Space Superiority: control over what moves through air and space.

Global Attack: ability to attack rapidly anywhere on the globe at any time.

Rapid Global Mobility: ability to move rapidly to any spot on the globe.

Precision Engagement: ability to apply selective force against specific targets and achieve discrete and discriminant effects.

Information Superiority: power to gain, exploit, defend, and attack information.

Agile Combat Support: provision of strong combat support and fewer and leaner logistics forces.



General Fogleman



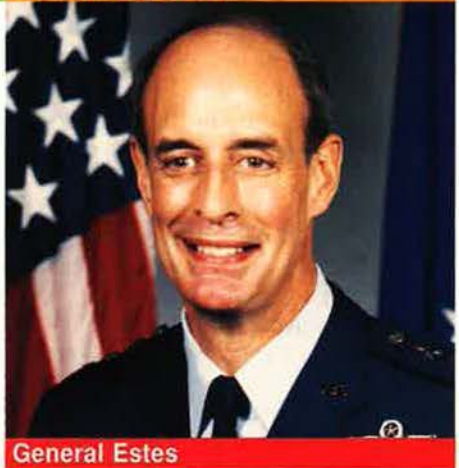
Under Secretary de Leon



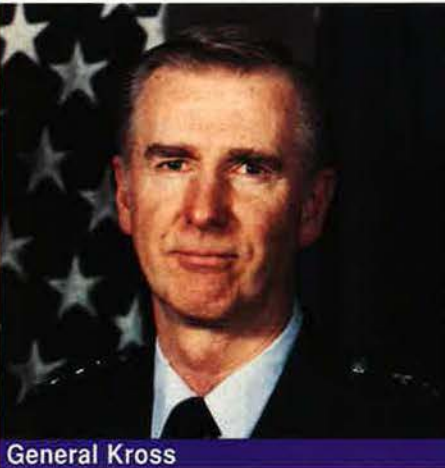
General Hawley



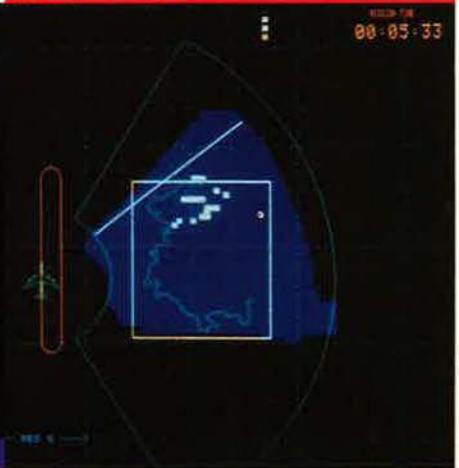
General Casciano



General Estes



General Kross



he said, but not "the vision of air- and spacepower as the decisive force for the twenty-first century."

General Fogleman emphasized that USAF will act as part of a joint force. He added, though, that speed, range, precision, and lethality will make aerospace power a singular contributor to American defense.

General Fogleman's comments were his first concerning the result of an 18-month-long review of Air Force plans and capabilities. Shortly before the Los Angeles symposium, senior USAF officials met at the US Air Force Academy to set a new service course.

Out of that Corona conference came an agreement to present three new or greatly revised core competencies.

Air and space superiority. Until now, "air superiority" and "space superiority" were separate concepts, but they now have been blended. At Corona, said General Fogleman, Air Force leaders decided it was vital to combine the two, the better to reflect "the transition [of the Air Force] to an air and space force and the need to control the entire vertical dimension—the domain of air- and spacepower."

The Chief went on to say that Air Force leaders see control of the combined air-space environment as the prime requirement for future military success, guaranteeing freedom from attack as well as freedom to attack. "Simply put, air and space superiority is the key to winning wars with the fewest losses," said the Chief of Staff.

Global attack. This new item has two distinct aspects, said the General. The first, seen at the strategic level of war, reflects "the ability of the Air Force to find and attack targets anywhere on the globe." The other aspect, General Fogleman said, concerns the expeditionary nature of today's Air Force, exemplified by US-based air expeditionary forces.

With the US reducing its number of fixed overseas bases, said the General, this characteristic of the evolving Air Force "will be key to rapidly providing tailored air and space capabilities" to theater commanders.

Agile combat support. Another new item, this core competency highlights the need for USAF units to move rapidly and be able to conduct

sustained combat operations after arriving. It comprises dozens of groundbased tasks and reaches outside pure logistics to include Security Police, engineering, and other critical combat-support functions.

According to General Fogleman, Air Force leaders adopted this new item at Corona "with the view of making our forces more expeditionary in nature." The Chief of Staff added, "We must never allow ourselves to get in the embarrassing position of having to rely on a contractor . . . to put combat forces in the field."

The other three core competencies had already been announced and were reaffirmed at Corona.

The Air Force officials restated the need for information superiority, claiming it has assumed critical importance. Here, USAF has built impressive offensive and defensive information capabilities, said the Chief, and will rely more and more on its ability to use and protect information. The Air Force leaders also restated the need for rapid global mobility in light of burgeoning United States combat, peacekeeping, and humanitarian activity and for precision engagement—the ability to apply selective force against specific targets to achieve decisive effects—to sharpen the "blunt instrument" of military power.

Under Secretary de Leon

When it needs to establish an armed overseas presence, and fast, Washington will turn more and more to the Air Force, whose expeditionary air units are as effective as aircraft carriers, Under Secretary of the Air Force Rudy de Leon told symposium attendees.

"Conventional deterrence has been traditionally thought of as, 'Where are we going to move the carrier?'" he said. "Now, it is being shown . . . to include, 'Where are we going to deploy the air expeditionary force?'"

The Air Force defines presence as "the posturing of military capability" to deter attack or influence adversaries or friends. The Navy has viewed presence primarily as a carrier mission, but over the past four years, the Air Force has developed the AEF option—fast-moving, self-contained packages of fighters and support aircraft backed up by bombers in the United States.

Four full-scale AEF deployments to the Persian Gulf region left little doubt about the utility of the concept, Secretary de Leon said. "The Air Force has shown it can do the presence mission as well as the sea-based component," he said. "We can generate more sorties, and we are more efficient."

Air Force leaders repeatedly have stated that USAF does not seek to supplant carriers, only complement them. The service most recently dispatched an AEF in September during the latest face-off with Iraq. It sent a package of 10 F-117 stealth fighters from New Mexico to Kuwait "in less than a weekend's time," Secretary de Leon said.

Such deployments are "previews" of the way airpower will be used in the future, he said, noting that AEFs generally do not inflame local sensitivities the way ground forces do. However, because the air units are deploying without Army support, they probably are more vulnerable—witness the terrorist bombing of the Khobar Towers complex in Saudi Arabia in June.

As a result, said Secretary de Leon, USAF will have to pay greater attention to force protection. "The air expeditionary force can put bombs on target in southern Iraq with great precision; you can't take our Air Force on in the sky," he said. "The challenge is to make sure that when we are home-based at a location, particularly overseas, the perimeter is secure and we know the threats that are out there."

The Secretary maintained that the Air Force is now in a "unique time," one in which the nation has put great emphasis on airpower and in which the Air Force has had the opportunity to develop many innovations and test them.

He said that Operations Deliberate Force—the short but intense 1995 bombing campaign against Bosnian Serbs—and Southern Watch—the long-running enforcement of the no-fly zone over southern Iraq—"have really allowed the Air Force to perfect many capabilities." These include the use of stealth, Suppression of Enemy Air Defenses, and combined use of airborne reconnaissance and communications platforms, such as the U-2, RC-135 Rivet Joint, E-8 Joint Surveillance and Target Attack Radar System (Joint STARS)

aircraft, and E-3 Airborne Warning and Control System aircraft. With the use of these aircraft and a host of unmanned air vehicles (UAVs), the Air Force view of the battlefield is increasing in clarity and scope.

USAF today has "the right modernization program" to meet future needs, said Secretary de Leon. Such major systems as the C-17, Joint STARS, and the Joint Strike Fighter are on track.

Most important, he said, the Air Force fighter of the future, the F-22, is on schedule, moving toward first flight this spring. The Air Force has dealt effectively with the technical problems. "If you asked me the biggest issue facing us now on the F-22, it is to make it affordable," said Secretary de Leon.

The Air Force established the Joint Estimate Process, an effort to scrub out costs and increase production efficiencies. "We have developed . . . an engineering marvel—low observability [with] a propulsion system that will cruise in excess of the speed of sound. Now our challenge is to [make] the F-22 affordable and [get it] into the field."

General Estes

The United States has begun preparing for a new era in both peaceful and hostile uses of space, reported Gen. Howell M. Estes III, commander in chief of US Space Command and North American Aerospace Defense Command and commander of Air Force Space Command.

"We are the world's most successful spacefaring nation," said General Estes, who quickly added, "We are also the world's most space-dependent nation, thereby making us vulnerable to hostile groups or powers." For the US, he said, interruption of spacebased intelligence or communications would be "crippling."

As a result, he said, spacepower will soon become as indispensable as airpower. He reported that potential adversaries are seeking the means to threaten the American edge in space, and the US has to respond.

"This is not a surprising development," said General Estes, "nor should it be either feared or welcomed. It is simply a fact. We have militarized space."

The General said these developments have several important impli-

cations for US Space Command and USAF's space forces.

For one thing, he said, the command must develop ways to prevent an enemy's use of space against the US. In future operations, US forces will not be able to maneuver and dominate a theater "if the enemy knows our every move," warned the space commander.

US Space Command would have "to deny the enemy access to space and to our dispositions and plans" by developing methods of "space control and spacebased information warfare."

A second task will be to thwart any attempts to disrupt space support of American forces. The General declared, "We must be able to [ensure] friendly access to space" and "if necessary, counter hostile terrestrial or space systems."

Air Force Space Command would perform these missions for US Space Command, said General Estes. He noted that the development of such capabilities, not to mention their actual use, would have to gain explicit approval from civilian leaders, though it is the duty of the military to start working up real options now.

Assuming such threats can be eliminated or at least controlled, space systems will make major contributions to the United States. In future conflicts, the General said, "we will know exactly where to maneuver and at what strength, at what time, and with what composition to have the greatest impact on the enemy. We will be able to do this because we will know with a high degree of accuracy where the enemy is and what they plan to do."

Space systems are poised to make a great leap in capability, said General Estes.

"We now have the ability to know and monitor the world situation on a daily basis," he continued. "As each day passes, we will gain more and more capability. Soon it will be on an hourly basis, and eventually we will have the kinds of information I am talking about within minutes—or even seconds."

Nevertheless, said the General, DoD must do a better job of supporting terrestrial operations worldwide. "We have to get the benefits provided by spacebased systems in the hands of the warfighter at the right

time," he said, adding, "I will assure you that that is where my focus is."

General Estes provided a snapshot of programs critical to Space Command's emerging mission. Near-term programs include the Evolved Expendable Launch Vehicle, Space-based Infrared system of warning satellites, Milstar communications satellites, and Global Broadcast System. In the longer term, said the General, DoD and the space establishment probably will need to pay attention to threats not only from ballistic missiles but also from cruise missiles.

General Hawley

At Air Combat Command, the precision "revolution" rolls on, leading to increasingly accurate and powerful weapons for theater combat, according to the ACC commander, Gen. Richard E. Hawley.

"The next stage in this revolution is now upon us," General Hawley declared to attendees at the AFA symposium.

He explained that USAF is starting to put into the field a new generation of systems that integrate air- and spacepower in heretofore unimagined ways. One result is bombs that exploit the power of satellite navigation to find their way to within a few feet of any target. The first of these, the Global Positioning System-Aided Munition, is now being integrated into B-2 bombers at Whiteman AFB, Mo. The GAM takes its bearings from the signals of GPS satellites.

To dramatize its power, General Hawley rolled video of an October 8 test at Nellis AFB, Nev., in which two GAM-equipped B-2s attacked an array of 16 targets on the Nellis Range Complex. The B-2s launched their weapons from an altitude of six miles and a horizontal distance from the target of six miles. Symposium attendees watched as, one by one, all 16 targets were struck and either destroyed or badly damaged.

General Hawley contrasted this with an Operation Desert Storm attack using standard ordnance that required the attacking aircraft to come close to the target. On January 19, 1991, an Air Force package raided a complex near Baghdad. It required 72 F-16s, supported by 18 other fighters. USAF lost two F-16s, and Iraq

captured Capt. Mike Roberts and Maj. Jeff Tice.

Despite such incidents, critics of high-tech weapons have not gone away. "They argue that the old ways are much less expensive and just as effective, and they build spreadsheets to prove the point," said the General. "Too bad they can't roll off base into a hail of AAA fire. It can be very enlightening. Maybe they should talk to Mike Roberts and Jeff Tice."

Similarly, said the General, USAF is now "fighting doggedly" against critics to acquire the stealthy F-22 fighter, crucial to the air-superiority mission of the future.

"The pundits . . . say there is no threat and that we are buying technology for technology's sake. They say we simply can't afford it." He added, "The pundits are wrong."

He recalled that, after setbacks in Vietnam, USAF vowed never to be caught short again. "We fielded the F-15 . . . over howls of protest that it was too costly, that we were buying technology for technology's sake." Vindication came in the Persian Gulf air war.

"We can no more guess what kind of challenge our nation will face in the year 2020 [after the F-22 is in service] than those who fought to field the F-15 in 1975 could predict an operation called Desert Storm in 1991," said General Hawley.

He said that "there is a lot going on" in aerial reconnaissance. The Air Force continues to hone a traditional fighter reconnaissance capability, he said, noting that the Virginia ANG exercises a low-altitude, under-the-weather capability. However, he said, the really big effort focuses on unmanned aerial vehicles.

"That is where we . . . and this whole family of UAVs that is emerging, such as the Predator, Global Hawk, DarkStar, and tactical UAVs for the Army and Marine Corps," are going, he said.

He noted that the first USAF unit of Predator aircraft has been operating out of Taszar AB, Hungary, in support of the NATO peacekeeping force in Bosnia-Herzegovina. These UAVs provide electro-optical, infrared, and synthetic-aperture-radar reconnaissance and can range out to 500 miles, loiter for six to eight hours, and downlink information via the Joint Broadcast System to a theater commander in real time.

"That is the future of reconnaissance," he observed.

Air Force space assets also shape up as major contributors in surveillance and reconnaissance, with quick feedback. "We don't have the luxury of time in the reconnaissance business any more," said the General. "We've got to be able to be over the targets, we've got to get the information, and we have to get it into the hands of the user in near real time."

General Kross

The C-17 Globemaster III transport finally is entering the Air Force but evidently not swiftly enough to prevent at least a temporary drop in airlift capacity after the turn of the century, said Gen. Walter Kross, commander of Air Mobility Command and commander in chief of US Transportation Command, to the AFA audience.

"Watch the numbers very carefully," he said. "Replacing 256 C-141s with 120 C-17s has some interesting arithmetic along the way and at the end."

Under the current plan, the Air Force will steadily retire older C-141s, the last of which will leave the active force in 2006. On January 1, 2000, General Kross noted, the Air Force will have in service only 52 C-17 advanced transports. As a result of the faster retirement of C-141s, Air Mobility Command will have 24 fewer strategic airlifters to carry out worldwide commitments.

In the words of the Air Mobility Command chief, "Fewer tails means less flexibility, means less responsiveness." The General said that the Air Force would have to try to make up for reduced capacity with greater efficiency.

The C-17 remains AMC's highest priority, according to General Kross. So far, the command has taken possession of and is operating 29 C-17s, or nearly a quarter of the total planned fleet. The new airlifters "are performing brilliantly," General Kross remarked.

Only a year ago, USAF was awaiting word on whether it would be permitted to proceed with the planned buy of 120 C-17s or would have to opt for a mix of C-17s and other aircraft. In the end, the Pentagon approved the full purchase. Later in the AFA symposium, Under Secretary Rudy de Leon declared an end

to the airlift debate. "We have, after many years of struggling, solved the airlift problem," he said, referring to the C-17 decision.

Also on the modernization front, General Kross noted that acquisition of new materiel-handling equipment is "critical."

"The backbone of our current MHE is the 40K loader, which is old and unreliable," he said. The Air Force wants to buy 318 of the new loaders to replace the older ones, but Congress failed to include funding for the procurement in the final 1997 Air Force budget. "We have got to have this program," said the General, because, collectively, the loaders are "the weakest link" in AMC's hardware inventory.

The current loaders average a mean time between failure of only 10 hours, said General Kross.

The command also has a requirement to replace 264 1960s-vintage, 25K loaders. AMC proposes to acquire an off-the-shelf candidate, one option being British and the other Australian.

"We at AMC need loaders because we have got to get the force providers to the fight," said the General. "Very simple. It might not be really interesting to many people, but we pay a lot of attention to it."

AMC is continuing to modernize its fleet of 602 KC-135 aerial tanker aircraft. They are among the oldest airplanes in the Air Force inventory. "Keeping them in a high state of readiness is one of our major challenges," noted the General.

He pointed out that the tankers are the leading edge of every Air Force operation and that the KC-135 provides some 90 percent of USAF's refueling capability.

"Right now, they are reliable," said the AMC commander, "but we are having some corrosion problems with them."

And that's just on the outside, noted General Kross. He pointed out that the "innards" of the entire fleet must at some point be upgraded, first with an improved radar, glass cockpit, and GPS receivers. After that, plans call for installing more advanced radios, antennas, and avionics to ensure that the aircraft operate effectively anywhere they are needed.

The General observed that AMC is a very busy command these days, and the public gets its money's worth.

He pointed out that the command is stretched tight.

"Supporting any particular [theater commander in chief] to fight his war, for us, is not enough," he said. "We have got to be ready to support two nearly simultaneous regional contingencies. This is an important point: Even when mobilized, nearly all of our mobility forces support one major regional contingency, and then they reroll to a second major contingency."

He added, "If you leave with one fact, that ought to be the fact that you leave with."

General Casciano

In the forthcoming battle of the infosphere, USAF faces three types of opponents—gunslingers, transnationals, and nations, according to Maj. Gen. John P. Casciano, assistant chief of staff, Intelligence, at Air Force headquarters in Washington, D. C.

By this, he means the lone computer hackers, tight-knit terrorist and other criminal groups, and regular defense establishments in foreign countries. In all cases, said the General, USAF has a simple objective: "Make sure that you can do unto others so they can't do unto you, and then take advantage of superior information capabilities."

The "infosphere" is the virtual world of linked computer networks and communications critical to modern militaries. General Fogleman calls it a fifth dimension of warfare, on a par with land, sea, air, and space.

General Casciano said USAF must be able to "attack," but he avoided detailed discussion of offensive information warfare (IW) in peacetime. "I don't see the US Air Force engaging in that," he said. "That is going to be a legal thicket that the national community is going to have to work through."

He focused his statements on defensive aspects of IW. Already, the Air Force is contending with attacks by computer hackers, whom the General referred to as "ankle biters."

"These are the gunslingers of the twenty-first century," he said. "They do attack. They use the same kinds of tools that we are [accustomed] to using in the military. They do reconnaissance in cyberspace, surfing the net, collecting information.

They will do intelligence preparation of the battlespace, so they can map our systems and our capabilities and our information. They use stealth tools, breaking into systems and leaving trapdoors for later exploitation. And they use precision attack."

In one recent case, he said, a hacker got on the Internet through a provider in Massachusetts and entered secure computer systems at Patrick AFB, Fla. The hacker then went to several sites on the West Coast, where he engaged in "password sniffing, probing, intel preparation of the battlespace." In another case, a hacker attacked an Air Force Academy system with an e-mail bomb, which drastically slowed Academy operations.

Other attackers are "transnational" groups of terrorists, narcotics traffickers, religious zealots, and criminals. Here, he said, "we are really moving into a multiplayer world where maybe you've got some different actors on the stage who can do you a lot of damage." He noted the example of an Italian leftist group that organized a shutdown of the Internet in Mexico and France.

Nation-states, too, are aware of the power of IW, the General said. About a dozen nations have active offensive or defensive programs, he reported, and NATO is talking about what it needs to do about IW. The US is engaged in bilateral discussions with several friends and allies about information warfare and command-and-control warfare.

The armed forces are deeply engaged, and for good reason. More than 90 percent of defense communications use commercial channels, said the General, and the military relies heavily on commercial databases.

He noted that many critical Air Force cybernetworks are at risk. These include medical, with its personnel and blood-supply records; maintenance, with its automated repair systems; transportation, with its cargo-control network; personnel and finance, with its pay data; munitions, with its stock records; and logistics, with its plans and parts control system.

Enemy information capabilities also threaten Air Force combat systems. According to General Casciano, IW attacks could destroy an aircraft's

hardware and software components; jam, upset, or burn out aircraft systems; corrupt its navigation capabilities; and pose a threat to onboard databases.

"Whether it is operational information, war-planning information, or intelligence information, we are very dependent on the microchip, on the Internet, [and] on global communications, [all of] which, by and large, are commercially driven," he said.

He continued, "We can talk about encrypting. We can talk about closing systems and all, but ultimately, what we've got to do is manage the risk that is out there. We cannot, at least within the current budget environment, build a completely closed system. It just would not work."

General Casciano said the Air Force has taken several important steps in recent years. In 1993, it opened the Air Force Information Warfare Center to develop concepts, build tools, and develop tactics and techniques to be used by combat commands.

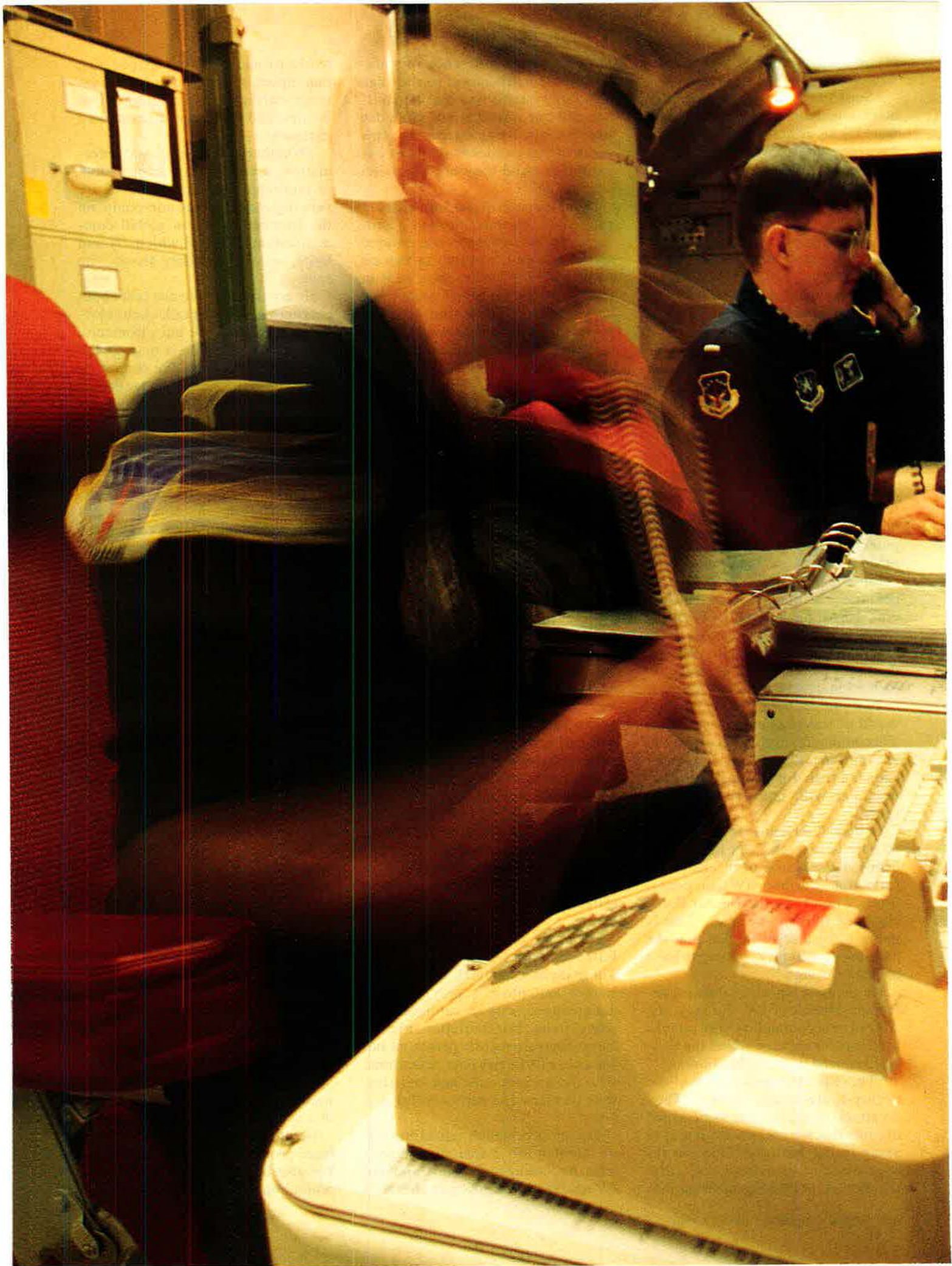
In addition, the Air Force in 1995 formed the 609th Information Warfare Squadron at Shaw AFB, S. C., to develop ways to integrate IW into operations.

The General said the Air Force is learning how to build a "cyber fence" around its bases and forces, whether in garrison or deployed overseas, so that anything that comes in enters through network-security monitoring equipment able to detect and characterize an attack.

To raise the level of IW knowledge in its ranks, the Air Force is implementing two new courses this year. One, a three-day course to be given at Maxwell AFB, Ala., focuses on general officers and senior civilians. The second will be given to lower-ranking members. The Air Force expects about 1,000 students per year to go through the one-week course.

"We have done a pretty good job in planning to protect our fixed-base structures," said General Casciano. "We have not really made the leap into a deployed situation, which is where we are going to be vulnerable in a conflict."

He added, "We have to worry about force protection in a physical sense. We also have to worry about force protection in a cyber sense." ■



Missile crews
stand prepared
with the ultimate
deterrent.

THE WARREN MISSILEERS

Photographs by Guy Aceto, Art Director

As vigilant as they were at the height of the Cold War, a maintenance crew (at right) completes work on a Minuteman III LGM-30G missile, while 2d Lt. Mike Kleppe (left) and 1st Lt. Mark McDonald work their shift inside a launch control center, capable of launching an intercontinental ballistic missile rapidly.





One of the oldest military installations in the Air Force, F. E. Warren AFB, Wyo., began as an Army post, Fort D. A. Russell, on guard in the "high frontier." Today, as home of the 90th Missile Wing and 20th Air Force headquarters, it guards a good deal more, in operating and maintaining 150 Minuteman III and 50 Peacekeeper missiles. Spread across parts of three states—Wyoming, Colorado, and Nebraska—missile fields under F. E. Warren AFB's control cover more than 12,600 square miles. On the base, 90th MW missileers gather for a morning pre-departure briefing (left) before heading out to their outlying missile alert facilities. The status of maintenance and other work being done in the wing, classified data, and even information on road conditions for their long commute ahead are covered in this briefing with the attention to detail that missileers are known for.

Though bristling with antennas and surrounded by fences, most missile alert facilities appear innocuous and have a low profile in the surrounding landscape. The actual launch control center, manned by two officers, is located 50 feet to 100 feet underground. A support crew is located "topside." Weather permitting, the support and security personnel stay on site for three days, with capsule crews changing out every 24 hours. The mission comes first, however, and everyone has anecdotes about much longer stretches of duty.



Sometimes the missile alert facility is the only structure for miles around and, as such, needs to be self-sufficient. The sites can seem isolated and desolate, so important lines of communication include more than just those carrying official business: At left, SSgt. Brian Posten, facility manager, checks the area surrounding a missile alert facility, including a television satellite dish.



At the heart of the missile systems are two people who, for at least 24 hours straight, must carefully account for every detail of their workday. Lieutenants Kleppe and McDonald (above) might be isolated below ground in their control capsule, but they are by no means out of touch. They keep in contact with national command authorities as well as the security personnel topside, other capsule crews, and the missiles themselves. From the launch facilities, they receive sensor information about the missile and the systems protecting the hardened silo. Minuteman III missile alert facilities recently completed an important systems improvement program. The Rapid Execution and Combat Targeting program was the first major upgrade to the command, control, and communications systems since the missile's development in the 1960s. New side-by-side consoles integrate communications and monitoring systems at a central location, allowing crew members to react more quickly to process message traffic and carry out execution orders.



Aboveground, some of the best Security Police in the Air Force guard the missiles and crews. Above right, Amn. Brian Wahlstedt checks a security code with his supervisor, SrA. Leonard T. Lewis II. The SPs take little for granted and, like everyone involved in this mission, they are well aware of their responsibilities.



A missile can't just sit untended in its silo until it is launched. Like any weapon, it requires attention. When a maintenance crew heads out for the distant silos, it must take everything its members might need, sometimes including food and sleeping bags. At right, MSgt. Charles Salisbury (on right) shows some of his newer troops what to look for as they check every piece of equipment while packing for an assignment.



Staff photos by Guy Aceto



Once at the site, the large maintenance trailer is parked right over the silo opening, both for convenience and to provide a sheltered environment. No elevators here: Technicians get into the silo by climbing down a ladder in an entry tube parallel to the missile. SrA. Juston Workman then lowers tools and other equipment to them by hand.

Inside the launch tube during a recent readiness test, SrA. Dennis Sasser (left) works off the "diving board," as SrA. Christopher Pierson works from the "cage," a platform that allows the technicians to be raised and lowered. They can thus inspect every inch of the 59-foot-tall Minuteman III. Safety is paramount. Tools are attached by cords to the technicians, and the crew is harnessed and wears hard hats for the job.

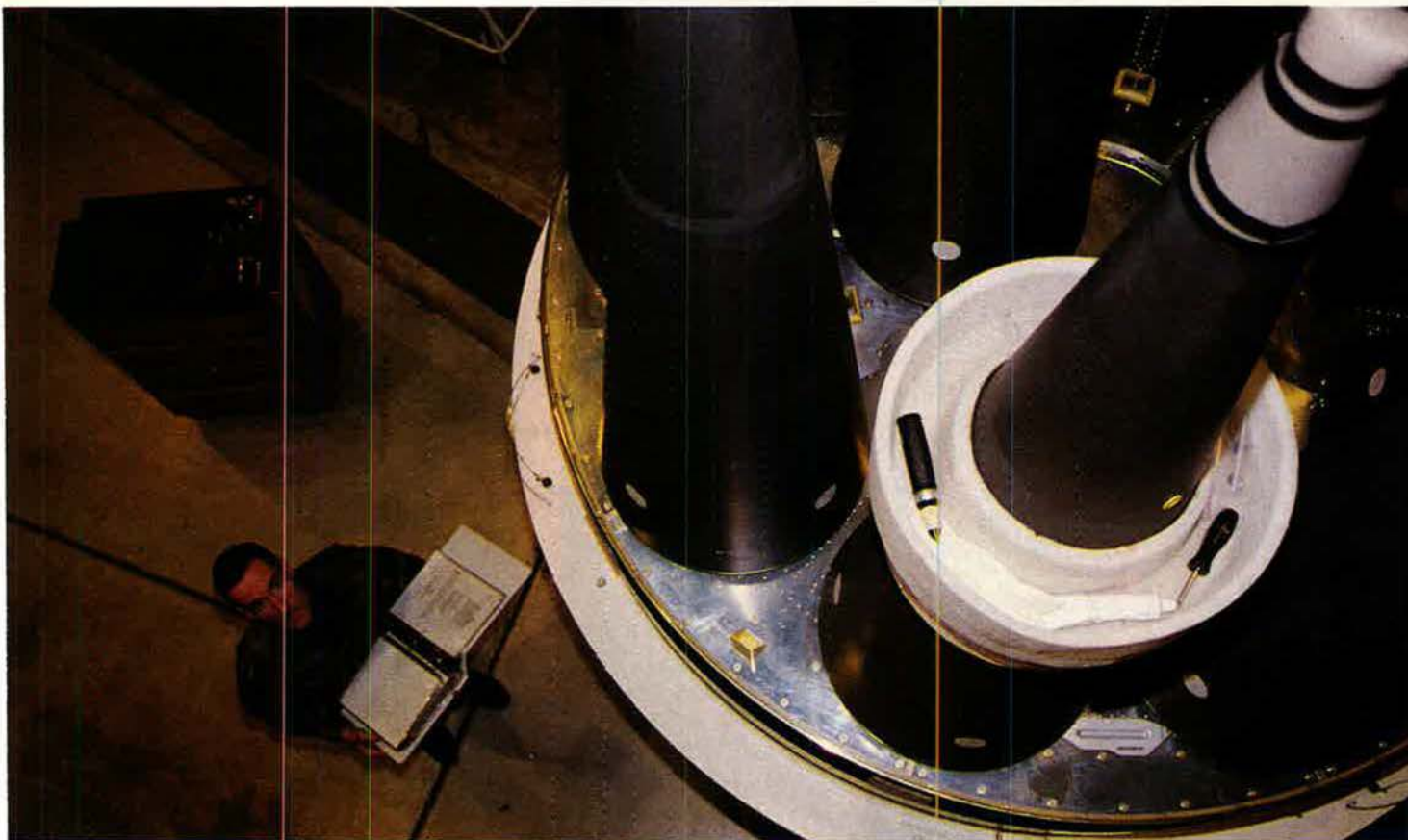




In the maintenance trailer, crew members have lifted the final stage off the missile in order to replace a tested section. At left, SrA. Sisto M. Ortiz and A1C Shane A. Mazur (right) prepare to lower the reentry vehicle back onto the missile. A winch built into the maintenance trailer helps them with this stage of reassembly. All told, the reassembled missile weighs 78,000 pounds. Above, the winch slowly lowers the missile section into the silo. From this vantage point, the need for safety cords and harnesses is apparent.



At bottom left is a missile shroud. Inside it are up to three reentry vehicles. If the Strategic Arms Reduction Treaty II is fully implemented, every Minuteman III missile will have a single warhead.



Like the rest of the missile, the reentry vehicles are periodically checked and maintained. At Ft. E. Warren, SSgt. Gary J. Skowronek, reentry vehicle maintenance team chief, goes by the book in overseeing the replacement of the last of up to 10 independently targetable reentry vehicles for the business end of an LGM-118A Peacekeeper missile. The Peacekeeper, fully operational since 1988, is larger, heavier, and more accurate than the Minuteman. The Styrofoam ring around one of the reentry vehicles protects it and also serves as a place for technicians to place their tools temporarily. At right, SrA. Kelly Summerfield and SrA. Mark Poani (right) carefully replace the cap on a reentry vehicle. Below, on the Minuteman III side of the base's weapons facility, SrA. Corey LaRack and SrA. James Cailari (right) check the forward component of the reentry system.





At left, a crew member in one of two training silos at F. E. Warren monitors the movement of a Peacekeeper missile's section into a transporter-erector-launcher vehicle. Though the three stages of the huge missile can be lifted right out of the silo, facilitating maintenance, reattaching the sections is a slow, exacting process. Practicing this procedure at a training silo is a good way to refine these skills.

The cycle of maintenance, testing, and training continues: Another missile crew meets for the morning "pre-D" and preparation for the drive out to the missile alert facility. At right, Capt. Scott W. Smith, from the 320th Missile Squadron, and his deputy for the day, 1st Lt. Chris Pearson (right), from the 321st MS, check the vehicle they will be driving out to the MAF. This is partly a security check, but they will also make sure everything they need for their shift is on the truck, including emergency supplies in case bad weather should delay them en route to the site.



The 90th MW is supported by the 37th Rescue Flight. Its UH-1N helicopters can provide rapid security response, medical assistance, or transportation for the missile crews. They also support the Security Police during transport of missile components. Such teamwork helps missileers like Lieutenants Kleppe and McDonald (at left) perform their unique mission of providing a combat-ready ICBM force for America's defense. In considering this role, Col. Robert P. Summers, 90th MW commander, commented, "I've been told by [four-star generals] overseas, 'We watch what you folks do every day, because you are keeping the stability and the peace at a level that allows us to deal with this transition . . . of the world from nondemocratic states to democratic states.'" ■

**When you hit 65, you are suddenly—very suddenly—
out of the military health-care system.**

Over the Cliff

By Suzann Chapman, Associate Editor

CONGRATULATIONS on your upcoming birthday!”

So declares a form letter that the Department of Defense sends to military retirees and their dependents as they approach age 65. It is also a polite precursor to an unfortunate kiss-off from the military health-care system.

The form letter notifies beneficiaries of the Military Health-Services System (MHSS) that they no longer will be eligible for enrollment in Tricare Standard (formerly CHAMP-US, the Civilian Health and Medical Program of the Uniformed Services). Then, it suggests that the recipient contact his or her nearest Social Security office to sign up for Medicare.

Doyle E. Larson, a retired Air Force officer who in September became National President of the Air Force Association, received his congratulatory letter last summer. Like many of his fellow retirees, he really had not given the event much thought. That changed—rapidly. He recalled that, when he made his first foray into the Medicare arena, he felt as if he had “stepped over a cliff.”

For example, simply locating a

Social Security office and trying to get basic information proved to be an ordeal. He said that on his first try, he searched in vain for the Social Security office closest to his home in Burnsville, Minn. (He later found the office tucked away behind a hand-lettered sign in a large office building.) Once he found a second office in the Twin-Cities area of Minneapolis–Saint Paul, he faced the proverbial stone-faced ranks of overworked government employees.

The DoD letter had clearly instructed him to present the letter and nothing else when he applied for Medicare. The Social Security Administration employees in Minneapolis–Saint Paul wanted more, however. He said that they pointedly informed him that they did not work for the Defense Department.

After waiting several hours, Doyle Larson finally saw a Medicare counselor. The counselor told him that he would have to present his birth certificate and a copy of his discharge papers (DD Form 214) to apply for Medicare.

In the wake of this first, highly unsatisfactory session with the Social Security bureaucracy, he said he also “felt cast adrift and overwhelmed by the intricacies of the Medicare program.” Unlike some two-thirds of his fellow retirees, he did not regularly use a military treatment facility (MTF) for his medical care,

USAF Retirees Reaching Age 65

Grade	Current	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
2d Lt.	204	6	2	7	2	3	2	2	0	5	3	6	242
1st Lt.	479	42	25	32	9	12	4	12	16	20	19	15	685
Capt.	1,275	151	173	220	282	302	351	363	459	449	413	468	4,906
Maj.	11,382	1,614	1,625	1,426	1,171	973	829	893	1,045	1,139	1,061	1,113	24,271
Lt. Col.	17,332	2,471	2,426	2,254	1,703	1,425	1,300	1,267	1,334	1,328	1,172	1,310	35,322
Col.	7,379	1,152	1,111	1,001	900	689	732	755	801	854	845	843	17,062
Brig. Gen.	357	52	44	49	47	34	23	25	17	13	25	17	703
Maj. Gen.	284	40	41	36	30	17	16	9	15	15	16	7	526
Lt. Gen.	75	9	8	7	5	13	9	6	3	2	4	3	144
Gen.	26	2	8	3	2	5	2	4	1	0	0	0	53
WO1	136	0	0	0	0	0	0	0	0	0	0	0	136
WO2	32	1	1	3	3	1	0	0	0	0	0	0	41
WO3	107	1	0	1	0	0	0	0	0	0	0	0	109
WO4	366	7	1	0	0	0	0	0	0	0	0	0	374
Amn. Basic	77	16	7	19	9	7	7	14	6	6	2	6	176
Amn.	271	72	57	71	46	59	57	62	56	48	45	44	888
A1C	345	104	93	109	99	121	152	140	90	92	118	147	1,610
SrA.	1,257	200	151	158	149	154	110	110	98	97	112	142	2,738
SSgt.	16,181	2,640	2,640	2,486	2,093	1,645	1,386	967	660	471	438	385	31,992
TSgt.	31,322	7,127	7,015	7,422	7,210	6,949	5,785	4,458	3,421	2,895	2,718	2,754	89,076
MSgt.	35,571	6,878	6,620	6,987	7,036	6,787	5,779	5,032	4,750	4,472	4,771	5,584	100,267
SMSgt.	13,707	2,375	2,092	2,046	2,198	1,981	1,608	1,489	1,251	1,248	1,370	1,706	33,071
CMSgt.	10,128	1,572	1,341	1,283	1,315	1,263	984	859	802	849	959	1,129	22,484
Aviation Cadet	4	0	0	0	2	0	2	0	0	0	0	0	8
Unknown	0	0	0	0	0	0	0	0	1	0	0	0	1
Total	148,297	26,532	25,481	25,620	24,311	22,440	19,138	16,467	14,826	14,003	14,091	15,679	366,885

for a simple reason: None was available near his home. He did occasionally use an MTF for his annual physical. Like most, he thought he would always have the option to use military medical care.

Handwriting on the Wall

Most of the more than two million military retirees and dependents are fully aware that, once they reach 65, the law will prohibit their participation in Tricare/CHAMPUS. When

the day actually arrives, however, it's still a shock.

In the past few years, it has become more of a shock to the more than one-third in that age group who routinely used MTFs for their medical care.

Some 380,000 military retirees and dependents aged 65 and older used MTFs exclusively during 1995. Another 600,000 used MTFs occasionally. It cost DoD about \$1.4 billion to treat them. The Pentagon con-

cluded that, in the post-Cold War world, it could no longer afford to foot that bill. Base closures and loss of medical personnel have taken their toll—effectively ending a “lifetime promise” of free medical care for retirees and dependents. Veterans who fought the nation's wars and served in the military until retirement fully believed that they would have lifetime health care for themselves and their families. They were wrong.

The handwriting has been on the wall throughout the drawdown. There have been deeper cuts within the MHSS than for the overall military force, so deep that some MTFs have even sent letters directly to retirees informing them that they should seek civilian health care rather than hang on to the hope of space-available care.

Today, neither the Defense Department nor Congress will dispute the claim that a "promise" was made. In fact, recruiting literature used as late as 1993 proclaimed free medical care for military retirees for their lifetimes. However, when Congress created CHAMPUS in 1966, a year after it enacted Medicare legislation, lawmakers believed that military retirees who reached 65 would have two choices: space-available care in MTFs or Medicare.

In 1966, space-available care was easy to get, because space was plentiful. Today, it is not. It will be even less so once Tricare is fully implemented. [See "The Transition to Tri-

an agreement in September on a Medicare Subvention test. It would have permitted the HCFA to reimburse DoD for health care provided to Medicare-eligible retirees.

This was a win-win situation for both agencies. Unfortunately, despite assurances from both organizations that the test would not cost the Medicare program more of its scarce dollars, some lawmakers said they needed more time.

The near miss was much on the mind of James M. McCoy, a former Chief Master Sergeant of the Air Force and later an AFA National President, who recently was appointed chairman of the Air Force Retiree Council. He said, "The Medicare Subvention test almost survived," and it lasted "until the eleventh hour and 59 minutes and 59 seconds." He added that he is confident the legislation will be reintroduced in 1997.

"It will be a very important piece of legislation in the next Congress," he said. "Very senior people on the

"bugs" in Tricare, "it is reality." It supports Medicare Subvention for those Medicare-eligible beneficiaries who live near MTFs and the FEHBP option for those who do not live near an MTF.

The Defense Department supports Medicare Subvention, but it still sees the FEHBP option as a potential problem.

Some retirees have decided to try the courts rather than wait for Congress to act. Although several have gone to court, only one, to date, has successfully filed a class-action lawsuit. Col. George E. Day, USAF (Ret.), a former prisoner of war and Medal of Honor recipient of the Vietnam War era, filed a class-action case in US District Court in Florida in July. The 71-year-old Florida lawyer filed for "breach of contract and [age] discrimination." By December 1996, almost 900 military retirees had joined the lawsuit.

Wake-Up Call

Broad relief from the problem, whether as a result of Congressional action or court decisions, appears to be several years away. The Medicare Subvention test itself was planned to cover a period of three years and now probably could not be started before 1998. Retirees who are now 65 and those who will reach that age in the next few years may not want to wait for their DoD birthday letter.

There are currently more than 148,000 Air Force retirees aged 65 or older. Between 1997 and 2001 (probably the first year the Pentagon could implement full Medicare Subvention), another 123,376 Air Force retirees will go "over the cliff." [See chart, above.]

The Defense Enrollment/Eligibility Reporting System (DEERS) Support Office (DSO), located in California, tracks the eligibility of all MHSS beneficiaries. It sends out the birthday letters and other notifications. Jack Evarrt, deputy director of the DSO, said that his center has worked with the HCFA and the Social Security Administration to develop the instructions in the letters.

However, he emphasized that the procedures worked out at the top of the organization do not always filter down to each SSA office. "We are continually updating the information in the letters," based not only on

**Almost
125,000
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eligibility in
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four years.**

Over the cliff

Senate and House sides have indicated they have a strong interest in reintroducing it."

The Military Coalition, an assembly of American veterans organizations (AFA included), has worked for years on the Medicare Subvention proposal. Many groups also supported legislation last year to let Medicare-eligible military retirees and their dependents participate in the Federal Employees Health Benefits Program (FEHBP).

Following a six-month study, the Military Coalition proposed a three-tier health plan: Tricare, Medicare Subvention, and FEHBP. Although the coalition believes there are many

care," December 1996, p. 46.] The Medicare-eligible military retirees, the group least able to cope with the burden of paying for high-cost medical care, are faced with a broken promise.

Congress had an opportunity this year to help rectify that situation, but it did not take it. The Defense Department and the Health Care Financing Administration finally reached

program changes but also on feedback from beneficiaries, he said.

The DSO mails the official notification of loss of Tricare/CHAMPUS eligibility to each MHSS beneficiary four months before his or her sixty-fifth birthday.

The period for making critical decisions regarding Medicare begins three months before an individual turns 65 and runs for three months after his or her birthday—essentially a seven-month initial enrollment period. Missing this seven-month period means paying higher premiums.

Once a retiree applies and is determined eligible for Medicare, he or she automatically receives coverage under the no-premium Part A, which is basic hospital coverage. According to the HCFA, you also are automatically enrolled in Part B, which provides some medical coverage and costs an enrollee \$42.50 per month (1996 rate). Those who don't want to enroll in Part B (and incur the monthly premium) must specifically state that when they sign up for Medicare.

The HCFA considers Part B "generally a good deal" because the federal government subsidizes about 75 percent of the program costs. It is important to obtain Part B coverage within the initial seven-month enrollment period. If a person elects not to take the coverage and then changes his mind later, he can still get into the program. However, the premium goes up 10 percent for each 12-month period after initial eligibility.

Handling the Medicare Gap

Most find that simply relying on Medicare's Part A and Part B is not enough. Medicare does not cover every type of health service and requires deductibles and some co-insurance. Consequently, Medicare beneficiaries usually purchase supplemental coverage, either through a Medigap fee-for-service policy or a managed-care health maintenance organization (HMO) with a Medicare risk contract. The General Accounting Office (GAO) estimated in a September 1996 report that more than 75 percent of Medicare beneficiaries obtain private insurance to help cover their medical bills.

Timing is critical when purchasing Medigap insurance. Federal law guarantees an individual the right to purchase a Medigap policy, regard-

Cliff

Retirees had every reason to believe that they could continue in the military medical system.

less of health condition, but only if he or she does so within six months of enrolling in Medicare Part B. Beyond that six-month period, the insurers can and do refuse to sell policies based on the applicant's health history or current condition.

Recently, GAO reviewed the practices of the 25 largest Medigap insurers, which write about 65 percent of the Medigap policies. The Congressional agency found at least one alternative to bypass medical underwriting. Seven of the 10 policies offered through the American Association of Retired Persons are available to all AARP members without medical underwriting based on current and previous health status.

Another way to avoid the Medigap time crunch is to join a managed-care HMO with a fixed monthly payment. The HCFA requires HMOs with Medicare risk contracts to offer annual open-enrollment periods and to accept any beneficiary on a first-come, first-served basis. They may turn down only Medicare beneficiaries with permanent kidney failure. However, with an HMO, beneficiaries normally have a limited selection of physicians and hospitals.

GAO also found that 99 percent of Medicare beneficiaries who had private health insurance in 1991 retained the same insurance in 1994. Reason: The act of changing plans lays you open to the risk of medical underwriting.

To help reduce confusion, the National Association of Insurance Commissioners adopted 10 standard plans (labeled A through J) for Medigap policies. For example, Plan A is a basic benefit package, covering Medicare co-insurance, while Plan J offers the most comprehensive coverage, including prescription drugs. The coverage for each plan, which went into effect in 1992, is the same, regardless of insurance company.

However, not all insurers or states carry every plan, although all must provide Plan A.

In 1993, Congress authorized a program called Medicare Select, which combines some managed-care provisions with the 10 standard Medigap policies. Initially, Medicare Select was limited as a demonstration project to 15 states. This year, Congress extended the program to all states, running through June 30, 1998. Medicare Select policies generally have lower premiums than normal Medigap policies. They require a beneficiary to use certain doctors and hospitals.

According to the HCFA, a policy holder in the Medicare Select program has the option to switch to a standard Medigap policy without medical underwriting.

These are just some of the critical decisions in store for military retirees when they reach 65. Most Americans face these same choices, but military retirees just now reaching 65 had every reason to expect to continue within the military medical system, if they so chose.

News reports around the country continue to document the unexpected financial burden of medical costs now faced by military retirees, especially enlisted members. There is ample evidence that neither defense officials nor Congress in years past foresaw the loss of access to military health care for retirees. The only question would seem to be whether Congress will allow DoD to remedy the situation. ■

More than 150 aviation greats have been enshrined in Dayton.

A V I A T I O N
Hall of Fame

All of Milton Caniff's portraits courtesy National Aviation Hall of Fame



Orville (left) and Wilbur Wright

The National Aviation Hall of Fame, in Dayton, Ohio, began inducting aviation pioneers in 1962. The first were, naturally enough, Wilbur and Orville Wright, followed by 153 other aviation notables. The Hall of Famers (with their year of induction) are as follows:

Allen, William McP. (1900–1985). Led development of commercial and military jet travel. Helped to advance supersonic flight and space travel in various roles at Boeing Airplane Co. **1971.**

Andrews, Frank M. (1884–1943). Reorganized Army Air Corps. Helped establish independent General Headquarters Air Force. **1986.**

Armstrong, Neil A. (born 1930). Served as a military pilot and test pilot of X-15 and other supersonic aircraft. Astronaut on the Gemini 8 and Apollo 11 space missions. First man to walk on the moon. **1979.**

Arnold, H. H. "Hap" (1886–1950). Made many pioneering flights. Won first Mackay Trophy. Led Army Air Forces in World War II. Only aviator to attain five-star rank. Founding father of the Air Force Association. **1967.**

Atwood, J. Leland (born 1904). Designed BT-9, O-47, AT-6, P-51, B-25, P-82, FJ-1, and AJ-1 aircraft for North American Aviation. Led company as it developed F-86, F-100, XB-70, X-15, B-1, and various spacecraft and boosters. **1984.**

Balchen, Bernt (1899–1973). First pilot to fly over the South Pole. Later, the first to fly over both poles. Founder of Norwegian Airlines. Served USAF as Arctic aviation expert. Received Harmon Trophy. **1973.**

Baldwin, Thomas S. (1854–1923). Pioneered balloon flights. Improved parachutes. Developed successful dirigibles (including the first one for the Signal Corps). **1964.**

Beachey, Lincoln (1887–1915). Demonstrated flight capabilities of aircraft. Performed such maneuvers as spin recovery and inside loop. **1966.**

Beech, Olive Ann (1903–1993). Led Beech Aircraft Co., including tenure as chief executive officer. Honored as "The First Lady of Aviation." **1981.**

Beech, Walter H. (1891–1950). Created such innovative aircraft as the Staggerwing, Model 18, Bonanza, UC-45, F-2, AT-7, AT-10, AT-11, and T-34. **1977.**

Bell, Alexander Graham (1847–1922). Performed research into principles of lift, propulsion, and control. Advanced scientific test facilities. Promoted independent US Air Force. **1965.**

Bell, Lawrence D. (1894–1956). Developed such innovative and unique aircraft as P-59 (first US jet aircraft), X-1 (used to break sound barrier), X-5, and X-14. Developed first commercially licensed helicopter. **1977.**

Bellanca, Giuseppe M. (1886–1960). Aerospace designer and aviator. Built first parasol monoplane. Built the Bellanca CF—first aircraft design to include distinctive wing struts. Designed the WB-1 for the Wright Aeronautical Corp. of Paterson, N. J. Designed and built *Miss Veedol*, which in 1931 completed the first nonstop Pacific crossing. **1993.**

Bendix, Vincent H. (1882–1945). Aerospace executive and designer. Founded Bendix Aviation Corp. Invented the pressure carburetor for aircraft engines. **1991.**

Boeing, William E. (1881–1956). Organized network of airline routes in the 1920s. Founded namesake company that would produce many military and commercial aircraft types from World War I to the present. **1966**.

Bong, Richard I. (1920–1945). Demonstrated immense skill as fighter pilot. Became America's all-time leading ace with 40 confirmed victories. Died preparing to test gunnery skills in new jet fighter, the P-80. **1986**.

Borman, Frank (born 1928). Military pilot and astronaut. Commanded Gemini 7 and Apollo 8 (first manned spacecraft to orbit the moon). Became Eastern Air Lines executive. **1982**.

Boyd, Albert (1906–1976). Set world speed record in the P-80R. Served as engineer and logistician during World War II. Promoted scientific flight test. **1984**.

Bradley, Mark E., Jr. (born 1907). USAF general and military aviator. Project officer for the newly ordered P-47. Assisted in improvement in P-51 design that helped decimate the German Luftwaffe. Among other posts, commanded 301st Fighter Wing on Okinawa in 1946 and Air Force Logistics Command from 1962 to 1965. **1992**.

Brown, George S. (1918–1978). Served as bomber pilot in World War II. Provided leadership during Korean and Vietnam Wars. Was Air Force Chief of Staff and later Chairman of Joint Chiefs of Staff. **1985**.

Byrd, Richard E. (1888–1957). Pioneered use of airplanes in polar regions, making flights over both poles. Acquired scientific knowledge of these regions for more than 30 years. Received peacetime Medal of Honor and Medal of Freedom. **1968**.

Cessna, Clyde V. (1879–1954). Developed early monoplanes. Formed and managed several aircraft manufacturing companies, including namesake company. Produced high-efficiency general-aviation aircraft. **1978**.

Chamberlin, Clarence D. (1893–1976). Set record endurance and altitude flights. Made 1927 nonstop flight from Long Island, N. Y., to Germany. Promoted public flying. **1976**.

Chanute, Octave (1832–1910). Wrote *Progress in Flying Machines*. Demonstrated successful man-carrying gliders. Served as counselor to the Wright brothers and others engaged in flight research. **1963**.

Chennault, Claire L. (1890–1958). Developed science of fighter tactics and doctrine. Showed distinguished leadership in China as commander of American Volunteer Group (the Flying Tigers) and Fourteenth Air Force. **1972**.

Cochran, Jacqueline (birthdate unknown; died 1980). Was first woman to fly in Bendix Trophy Race. Organized Women's Airforce Service Pilots (WASPs) program during World War II.

Won Harmon Trophy. Was first woman to exceed speed of sound. Served as president of National Aeronautic Association and Fédération Aéronautique Internationale. **1971**.

Collins, Michael (born 1930). Served as Air Force test pilot. Was astronaut on Gemini 10 and Apollo 11 missions. Was planner, developer, and overseer of Smithsonian Institution's National Air and Space Museum. **1985**.

Combs, Harry B. (born 1913). Aerospace executive and aviator. Founder of Combs Aircraft, which later became AMR Combs after merger with Gates Rubber Corp. Helped engineer merger with Learjet Corp. to form Gates Learjet



Eddie Rickenbacker

Corp. President of Gates Learjet from 1971 to 1982. Helped develop today's air traffic control system. Received the Wright Brothers Memorial Trophy in 1985 for "significant public service of enduring value to aviation in the United States." **1996**.

Conrad, Charles, Jr. (born 1930). Served as Navy test pilot. Was astronaut on Gemini 5, Gemini 11, Apollo 12, and Skylab 2 space missions. Was third man to walk on the moon. **1980**.

Crawford, Frederick C. (1891–1994). Aerospace executive and engineer. Served as president of Thompson Products, Inc. (now TRW, Inc.) which developed the sodium-cooled valve used in *Spirit of St. Louis*. Established Thompson Auto Album and Aviation Museum in Cleveland, Ohio. **1993**.

Crossfield, A. Scott (born 1921). Piloted such research aircraft as D-558-II, X-4, X-5, and X-15. Was first pilot to exceed Mach 2 and first to surpass Mach 3 and survive. Helped form Society of Experimental Test Pilots. Won Collier Trophy and SETP's Iven Kincheloe Award. Developed advanced flight controls. **1983**.

Cunningham, Alfred A. (1882–1939). Was first Marine aviator. Made first catapult launch from an underway ship.

Led Marine aviation in early decades of flight. **1965**.

Curtiss, Glenn H. (1878–1930). Developed lightweight engines. Improved airplanes and control systems. Created basic new craft, such as seaplanes and amphibians. Constructed first airplane to take off and land on a ship and first airplane to fly across the Atlantic. **1964**.

Davis, Benjamin O., Jr. (born 1912). USAF general and military aviator. First African-American cadet in the twentieth century to graduate from the US Military Academy at West Point. First black AAF pilot to earn wings. Member of the Tuskegee Airmen. Air Force's first black general officer. **1994**.

deSeversky, Alexander P. (1894–1974). Was industrialist, author, strategist, and pilot with 13 aerial victories in World War I. Invented in-flight refueling and first gyroscopically stabilized bombsight. **1970**.

Doolittle, James H. (1896–1993). Made first accurate measurement of effects of acceleration in flight. Made first take-off, flight, and landing completely on instruments. Made first outside loop. Organized and led first raid on Japan in April 1942 (for which he received the Medal of Honor). Commanded Twelfth, Fifteenth, and Eighth Air Forces during World War II. Was first National President of Air Force Association. **1967**.

Douglas, Donald W. (1892–1981). Designed and manufactured many types of military and commercial aircraft, including Douglas World Cruiser, SBD, A-26, C-74, D-558-II, C-124, A-4, and DC-3. **1969**.

Draper, Charles Stark (1901–1987). Developed new aircraft instruments (to monitor engines), gyroscopic sights, automatic inertial guidance systems for aircraft, missiles, and spacecraft, and fly-by-wire control systems for aircraft. **1981**.

Eaker, Ira C. (1896–1987). Served as chief pilot of *Question Mark* during 1929 record endurance flight. Made first "blind" transcontinental flight. Organized VIII Bomber Command. Commanded Eighth Air Force and served as deputy commander of Army Air Forces. **1970**.

Earhart, Amelia (1897–1937?). Promoted interests of women in flying. Set numerous records and milestones. Was first woman to fly (as a passenger) across the Atlantic, first to make a nonstop transcontinental flight (as pilot), and first to pilot an autogyro. **1968**.

Eielson, Carl Ben (1897–1929). Was first person to fly over polar regions. Devoted his life to bringing aviation to sparsely populated regions. **1985**.

Ellyson, Theodore G. (1885–1928). Pioneered with seaplanes and catapults. First naval aviator. **1964**.

Ely, Eugene B. (1886–1911). Made first unassisted takeoff from a naval vessel. Made first successful landing and take-



Robert Goddard

off from same ship, thus proving practicality of aircraft carriers. **1965.**

Everest, Frank K. "Pete" (born 1920). Served as pilot during World War II. As test pilot, established unofficial altitude record of 73,000 feet in X-1, set world speed record of 755.149 mph in F-100, and flew X-1B to Mach 2.3 and X-2 to record Mach 2.9 in 1956. Tested X-3, X-4, X-5, XF-92, YB-52, and most "Century Series" Air Force fighters. **1989.**

Fairchild, Sherman M. (1896–1971). Developed precision aerial cameras, such advanced types of commercial and military aircraft as the PT-19, C-119, and F-27 and their engines, and space-related satellites and components, including semiconductors. **1979.**

Fleet, Reuben H. (1887–1975). Provided leadership role in military flight training. Organized airmail service. Developed successful training aircraft and flying boats for commercial and military use and such multiengine bombers as B-24, B-32, and B-36. **1975.**

Fokker, Anthony H. G. (1890–1939). Designed Dr.I, D.VII, D.VIII, and T-2, which was first aircraft to fly across US nonstop. Designed synchronized machine gun. Developed airliners vital to establishment of worldwide air routes. **1980.**

Ford, Henry (1863–1947). Produced aircraft engines in World War I and aircraft and engines in World War II. Built first modern airport and trimotor airliner. **1984.**

Foss, Joe (born 1915). Was second leading Marine Corps ace in World War II. Received Medal of Honor. Established South Dakota Air National Guard. Was National President of Air Force Association. **1984.**

Foulois, Benjamin D. (1879–1967). Participated in trials of first military airplane and designed first airplane radio receiver. Pressed for improved long-range military aircraft. Served as Chief of the Army Air Corps from 1931 to 1935. **1963.**

Frye, William J. "Jack" (1904–1959). Airline executive and aviator. Founded Aero Corp., which formed Standard Airlines, a major airmail transporter later consolidated to make TWA. Served as president of TWA. Set numerous records in commercial aircraft. Set and broke the transcontinental speed record three times. **1992.**

Gabreski, Francis S. "Gabby" (born 1919). Demonstrated unusual valor and combat tactics in becoming third leading Army Air Forces ace in World War II and one of the top aces in Korea. Number one living American ace. **1978.**

Gentile, Don S. (1920–1951). Military aviator. Part of fearsome two-man fighter team (with Capt. John T. Godfrey) that destroyed more than 50 German aircraft in the air and on the ground during World War II. **1995.**

Gilruth, Robert R. (born 1913). Aerospace executive. Managed the National Advisory Committee for Aeronautics, which became NASA. Directed the Manned Spacecraft Center and the Apollo 11 program. **1994.**

Glenn, John H., Jr. (born 1921). Was fighter pilot in World War II and Korea. First to make supersonic transcontinental flight. Was first American astronaut to orbit Earth, in 1962. Now a US Senator. **1976.**

Goddard, George W. (1889–1987). Developed aerial photography for wartime reconnaissance and peacetime aerial mapping. **1976.**

Goddard, Robert H. (1882–1945). Invented the bazooka. Launched first successful liquid-fueled rocket. Solved problems of rocket control. Developed parachute recovery system for rockets. **1966.**

Godfrey, Arthur (1903–1983). Promoted aviation on radio and television programs. As a pilot, carried out record-setting, around-the-world flight in a JetCommander business aircraft. **1987.**

Goldwater, Barry M. (born 1909). Served military aviation as a pilot and administrator and as a US Senator supporting national defense, space developments, and commercial and private aviation. **1982.**

Grissom, Virgil I. "Gus" (1926–1967). Served as Air Force fighter pilot in Korea. Was astronaut on second Mercury mission and first Gemini mission. Died in Apollo capsule fire. **1987.**

Gross, Robert E. (1897–1961). Led Lockheed Aircraft Co. in various capacities in manufacture of commercial and military aircraft from 1932 to the space age. **1970.**

Grumman, Leroy R. (1895–1982). Developed such engineering innovations as folding wings. Designed aircraft from FF-1 through lunar module. **1972.**

Guggenheim, Harry F. (1890–1971). Operated Daniel Guggenheim Fund (which proved feasibility of passenger service). Provided first aviation

weather-reporting service. Provided full-flight laboratory where Jimmy Doolittle made the first "blind" flight. **1971.**

Haughton, Daniel J. (1911–1987). Led development of Lockheed C-130 transport. Brought the L-1011 TriStar to market. Served as Lockheed's board chairman. **1987.**

Hegenberger, Albert F. (1895–1983). Pioneered instruments and systems, such as first fully automatic flight control. Made first flight to Hawaii (which won the 1927 Mackay Trophy) and first solo "blind" flight (which won the 1934 Collier Trophy). Served in the Army Air Forces. **1976.**

Heinemann, Edward H. (1908–1991). Designed and developed such military aircraft as the Douglas A-20, A-26, A-1, D-558-11, A-3, and A-4. Worked as aerospace consultant. **1981.**

Hoover, Robert A. (born 1922). As long-time test pilot for North American Aviation, performed aerobatics for millions of spectators. Led Society of Experimental Test Pilots. **1988.**

Hughes, Howard R. (1905–1976). Developed such advanced design aircraft as the H-1 and H-4. Set aerial records demonstrating the capabilities of a variety of aircraft. Developed domestic and international commercial aviation. **1973.**

Ingalls, David S. (1899–1985). Was only US Navy ace in World War I. Established aviation legal codes. Developed Naval Air Transport Service during World War II. Promoted commercial and private flying. **1983.**

James, Daniel "Chappie," Jr. (1920–1978). USAF general and military aviator. Member of the Tuskegee Airmen during World War II. Flew 101 combat missions in Korean War. First African-American four-star general. **1993.**

Jeppesen, Elrey B. (born 1907). Aerial cartographer and aviator. Created the Jepp Charts—the first navigational aid



"Hap" Arnold

designed specifically for use by pilots to guide them in their flights. Charts were adopted by the US Navy as the "Airways Manual," now a standard guide for pilots. **1990.**

Johnson, Clarence L. "Kelly" (1910–1990). Created innovative technical concepts that significantly advanced aircraft design, performance, and reliability. Helped design Lockheed P-38, T-33, U-2, and SR-71 aircraft. Helped achieve supersonic flight and spaceflight. **1974.**

Johnston, Alvin M. "Tex" (born 1914). Test pilot and aerospace executive. While working at Bell Aircraft Co., tested some of the nation's most advanced aircraft. Flight-tested world's first swept-wing bomber for Boeing Aircraft Co. **1993.**

Jones, Thomas V. (born 1920). Aerospace executive and aeronautical engineer. Helped establish the Aeronautical Institute of Technology in Brazil. Worked 39 years for Northrop Corp., establishing it as a multimillion dollar company. Developed several systems that became state of the art in aviation technology. **1992.**

Kenney, George C. (1889–1977). Developed wing-mounted machine guns and other warplane armament. Was Gen. Douglas MacArthur's top air officer in the Pacific region in World War II. Organized postwar Strategic Air Command. Was National President of Air Force Association. **1971.**

Kettering, Charles F. (1876–1958). Developed reliable engine ignition systems. Laid out principles for and built one of the first cruise missiles. Developed tetraethyl-lead engine "knock" suppressant and high-compression engines and fuels. **1979.**

Kindelberger, James H. "Dutch" (1895–1962). Developed aeronautical designs and precision manufacturing techniques that helped North American Aviation build the AT-6, B-25, P-51, F-86, F-100, X-15, and XB-70. Contributed to development of Apollo spacecraft. **1972.**

Knabenshue, A. Roy (1876–1960). Performed public demonstrations of balloons and steerable balloons. Designed and built early dirigibles. Managed airplane exhibition teams for the Wright brothers. **1965.**

Knight, William J. "Pete" (born 1929). Was Air Force test pilot in the F-100, F-104, F-5, and especially X-15, in which he set unofficial speed record of Mach 6.7 and earned astronaut wings. **1988.**

Lahm, Frank P. (1877–1963). Was the Army's first airplane and dirigible pilot and an early proponent of aircraft for military purposes. Organized training facilities for Army Air Corps. Held unofficial title "Father of the West Point of the Air." **1963.**

Langley, Samuel P. (1834–1906). Studied air and space. Demonstrated the practicality of mechanical flight and

provided inspirational guidance to others. **1963.**

Lear, William P., Sr. (1902–1978). Developed advanced radio-operated navigation and control systems and Learjet family of business aircraft. **1978.**

LeMay, Curtis E. (1906–1990). Was lead navigator on two historic B-17 flights to South America. Commanded XXI Bomber Command and Twentieth Air Force during World War II. Commanded US Air Forces in Europe (organized Berlin Airlift) and was architect of Strategic Air Command. Served as Air Force Chief of Staff from 1961 to 1965. **1972.**



Jimmy Doolittle

LeVier, Anthony W. (born 1913). Raced high-speed planes. Flight-tested Lockheed P-38, XP-80, F-104, and U-2 and contributed knowledge about flight safety. **1978.**

Lindbergh, Anne Morrow (born 1906). Made pioneering flights to survey air routes to the Orient and Europe. Wrote extensively to encourage aviation and air travel. **1979.**

Lindbergh, Charles A. (1902–1974). Made first solo flight across the Atlantic, in 1927. Pioneered the Great Circle Route. Provided valuable technical service to Army Air Forces before and during World War II. **1967.**

Link, Edwin A. (1904–1981). Pioneered improvements in flight training and safety through development of unique groundbased trainers and simulators. **1976.**

Lockheed, Allan H. (1889–1969). Made first dual-pilot controlled flight. Founded three airplane manufacturing firms and was consultant to namesake company. **1986.**

Loening, Grover C. (1888–1976). Developed new amphibian airplanes with retractable landing gear. Received Collier Trophy in 1921 for development of "Aerial Yacht." Furthered the utility of aircraft and helicopters. **1969.**

Luke, Frank, Jr. (1897–1918). Showed courage and skill as pursuit pilot and skill in development of new tactical combat maneuvers. Was America's second leading ace of World War I. **1975.**

MacCready, Paul B., Jr. (born 1925). Aerospace designer and glider pilot. Pioneered the concept of high-altitude wave soaring. First American to win the World Soaring Championship. Designed and built *Gossamer Condor*, the first sustained, controlled human-powered plane. **1991.**

Macready, John A. (1887–1979). As early test pilot, participated in first non-stop transcontinental flight in Fokker T-2. Won three consecutive Mackay Trophies. Pioneered high-altitude flight. **1968.**

Martin, Glenn L. (1886–1955). Made important advances in aircraft design. Manufactured such aircraft as MB-1, B-10, B-26, and Matador and Mace missiles. **1966.**

McCampbell, David (1910–1996). Served in World War II. Commander of Air Group 15 ("Fabled Fifteen") aboard USS *Essex*. Destroyed 34 airborne enemy planes, becoming the Navy's "Ace of Aces." Received Medal of Honor, among other honors. Commanded USS *Severn* and USS *Bon Homme Richard*. **1996.**

McDonnell, James S. (1899–1980). Advanced military aircraft design in F3H, F-101, F-4, F-15, AV-8B, and F/A-18. Did pioneering work in space technology with the Mercury and Gemini spacecraft. Developed such commercial aircraft as the DC-9 and DC-10. **1977.**

Meyer, John C. (1919–1975). Demonstrated extraordinary courage and skill as fighter pilot in World War II and Korea. Was seventh leading Air Force ace of all time. Commanded Twelfth Air Force. Was Air Force vice chief of staff and commander in chief of Strategic Air Command. **1988.**

Mitchell, William "Billy" (1879–1936). Developed early theories of airpower. Demonstrated concept of strategic bombing by sinking obsolete German battleship *Ostfriesland*. Defined roles and missions for an independent Air Force. **1966.**

Mitscher, Marc A. (1887–1947). Attempted to be first pilot to cross the Atlantic. Commanded USS *Hornet* (the carrier that launched Doolittle's 1942 raid on Japan). Participated in the Battle of Midway. Commanded Task Force 58 during World War II in the Pacific. **1989.**

Montgomery, John J. (1858–1911). Researched the nature of laws of flight. Constructed and tested a series of early gliders without flight-control systems. Made public demonstrations of gliders. **1964.**

Moorer, Thomas H. (born 1912). Was naval aviator during World War II. Commanded both Pacific and Atlantic Fleets.

Served as Chief of Naval Operations from 1967 to 1970 and Chairman of the Joint Chiefs of Staff from 1970 to 1974. **1987.**

Moss, Sanford A. (1872–1946). Studied and demonstrated gas turbine engines and developed aircraft turbo-superchargers while working for General Electric. **1976.**

Neumann, Gerhard (born 1917). Served as mechanic with American Volunteer Group in China. Technical expert in development of variable stator compressor system for jet engines. Led development of J79 engine while working for General Electric. **1986.**

Nichols, Ruth Rowland. (1901–1960). Aviatix and aerospace executive. First licensed female seaplane pilot. First to fly nonstop from New York, N. Y., to Miami, Fla. Co-founder of the women's flying group the "Ninety-Nines." Only woman to hold three maximum international records. "First woman" in nearly 30 categories. **1992.**

Norden, Carl L. (1880–1965). Aerospace designer. Developed the Norden bombsight, designed to drop bombs from an aircraft and hit targets on land or sea. **1994.**

Northrop, John K. (1895–1981). Demonstrated originality and ingenuity in aircraft construction and design, especially in "flying wing" designs in use today. Produced such aircraft as the P-61, F-89, X-4, and America's first rocket plane, the MX-324. Developed such missiles as the Snark. **1974.**

Pangborn, Clyde E. (1894–1958). Barnstormer. Formed the famous "Gates Flying Circus." Made first non-stop transpacific flight (with Hugh Herndon, Jr.). Formed the Ferry Command of the Royal Air Force during World War II. **1995.**

Patterson, William A. (1899–1980). Demonstrated professionalism in airline development, innovations in passenger service, and concern for employees in numerous official capacities at United Airlines. **1976.**

Piper, William T., Sr. (1881–1970). Developed, produced, and marketed such lightplanes as Cub, Tripacer, and Cherokee for general aviation use. Promoted their application to a wide variety of commercial and military uses. **1980.**

Pitcairn, Harold F. (1897–1960). Aerospace executive and designer. Formed Pitcairn Aviation. Designed and built the PA-5 Mailwing to carry mail from New York, N. Y., to Atlanta, Ga. Brought the autogiro to the US and made it the safest aircraft flown in this country. **1995.**

Post, Wiley H. (1898–1935). Performed flights around the world in Lockheed Vega *Winnie Mae*, demonstrating the practicality of new flight-related equipment. Conceived and proved feasibility of fully pressurized flying suit, which led to discovery of the jetstream. He

and Will Rogers were killed in a crash near Point Barrow, Alaska. **1969.**

Read, Albert C. (1887–1967). Was naval aviator and commander of NC-4 on first successful transatlantic flight in 1919. Pioneer of naval aviation. **1965.**

Reeve, Robert C. (1902–1980). As a barnstormer, airmail pilot, and bush pilot, played a vital role in demonstrating uses of the airplane in the economic, social, and cultural environment of Alaska. **1975.**



Ira Eaker

Rentschler, Frederick B. (1887–1956). Helped establish Pratt & Whitney, United Airlines, Sikorsky Helicopters, and Hamilton Standard, which developed controllable propellers. **1982.**

Richardson, Holden C. (1878–1960). Was naval aviator who conceived, developed, and demonstrated water- and ship-based aircraft and such devices as the turntable catapult for capital ships. **1978.**

Rickenbacker, Edward V. (1890–1973). Combat pilot and leading American ace of World War I. Managed several airlines, including Eastern. Assisted in the growth of modern commercial aviation. **1965.**

Rodgers, Calbraith P. (1879–1912). Made first flight across the United States in Wright EX *Vin Fiz* in 1911, surviving many hardships and crashes. **1964.**

Rogers, Will (1879–1935). Demonstrated public support of aviation for defense and transportation. He and Wiley Post were killed in an airplane crash near Point Barrow, Alaska. **1977.**

Rushworth, Robert A. (1924–1993). USAF general and military aviator. Test-flew a variety of planes. Second USAF X-15 pilot to attain the astronaut rating. Led major test programs, including the F-5, A-10, F-15, YF-16, and B-1. **1990.**

Rutan, Elbert L. (born 1943). Aerospace executive and designer. Invented *Voyager*—first plane to fly nonstop around the world without refueling. **1995.**

Ryan, T. Claude (1898–1982). Developed significantly advanced aircraft, such as M-1, PT-22, X-13, and Firebee drone. Trained critically needed pilots during World War II. Developed electronic space-navigation systems that helped make it possible for humans to land on the moon. **1974.**

Schirra, Walter M. "Wally", Jr. (born 1923). Was Navy fighter and test pilot and the only astronaut to fly in Mercury (Mercury-Atlas 8), Gemini (Gemini 6), and Apollo (Apollo 7) spacecraft. **1986.**

Schriever, Bernard A. (born 1910). Was Air Force test pilot and leader of USAF's research and development and ballistic missile and military space programs. Adapted those technologies to the nation's efforts to explore space. **1980.**

Selfridge, Thomas E. (1882–1908). Designed and developed airplanes and made pioneering flights. First Army officer to fly; first fatality of powered flight, killed while a passenger in an aircraft flown by Orville Wright. **1965.**

Shepard, Alan B., Jr. (born 1923). Was Navy test pilot and first US astronaut launched into space. Commanded Apollo 14. Was fifth man to walk on the moon. **1977.**

Sikorsky, Igor I. (1889–1972). Developed large multiengine aircraft, including flying boats used in commercial transoceanic flights. Developed single-rotor helicopter, of which VS-300 was the first successful example. **1968.**

Six, Robert F. (1907–1986). Developed regional airline that became Continental. Expanded it to serve both national and international routes. **1980.**

Slayton, Donald K. (1924–1993). Astronaut and test pilot. One of the original Mercury 7 astronauts. Member of the Apollo-Soyuz Test Project. First chief of the Astronaut Office and served as the director of Flight Crew Operations, directing all astronaut activities. Served as the manager of the Space Shuttle Approach and Landing Test program from 1975 to 1977. Managed the Shuttle Orbital Flight Test program until his retirement in 1982. **1996.**

Smith, C. R. (1899–1990). Developed domestic air transportation as president of American Airlines. Organized Army Air Forces Air Transport Command. Expanded international aviation. Was National President of Air Force Association. **1974.**

Spatz, Carl A. "Tooe" (1891–1974). Was pilot attached to Gen. John J. Pershing's 1916 expedition to Mexico. Won three aerial victories in World War I. Commanded *Question Mark* endurance flight. Commanded Eighth Air Force, Twelfth Air Force, and US Strategic Forces in Europe during World War II. USAF's first Chief of Staff, from 1947 to 1948. Was first Board Chairman of Air Force Association. **1967.**

Sperry, Elmer A., Sr. (1860–1930). Developed gyroscopic instruments, such

as the turn-and-bank indicator and artificial horizon, gyroscopic bombsight, and anti-aircraft searchlight. Was 1930 inventor of automatic pilot system that kept an airplane on a prescribed flight path. **1973.**

Sperry, Lawrence B., Sr. (1892–1923). Pioneered development of automatic flight stabilizers, flight instruments, including the side-slip indicator and optical drift indicator, guided missiles, and such innovative aircraft as the R-3 and Messenger. **1981.**

Stanley, Robert M. (1912–1977). Engineer and aviator. Pioneered development of aircraft and survival systems. Formed Stanley Aviation Corp. Developed USAF's first downward ejection seats and the automatic-release lap belts. Invented the Yankee extraction escape system. **1990.**

Stapp, John Paul (born 1910). Specialized in aerospace medicine. Proved that human bodies can withstand forces associated with ejecting from aircraft at high speeds and high altitudes. Promoted automobile seat belts. **1985.**



Claire Chennault

Stearman, Lloyd C. (1898–1975). Founded company that produced C-1, C-2, C-2C, C-2M, and PT-9. As president of Lockheed, oversaw design of Electra and development of Constellation. Stearman Division of Boeing produced the World War II PT-17 trainer. **1989.**

Taylor, Charles E. (1868–1956). Built first successful airplane engine for the Wright brothers. Maintained such early airplanes as Wright Military Flyer and Wright EX for their historic flights. **1965.**

Thomas, Lowell (1892–1981). Aviation promoter and enthusiast. Author and radio and TV personality. **1992.**

Tibbets, Paul W., Jr. (born 1915). Military aviator and aerospace executive. Piloted the *Enola Gay*, the B-29 that dropped the atomic bomb on Hiroshima on August 6, 1945. Technical advisor for Operation Crossroads project, the atom bomb tests at Bikini Atoll. President of Executive Jet Aviation, Inc., an all-jet, air-taxi company, from 1976 to 1986. **1996.**

Towers, John H. (1885–1955). Made first attempt to cross Atlantic in NC-3. Established first Naval Air Station at Pensacola, Fla. Commanded USS *Langley* and USS *Saratoga*. Fought for recognition of airpower as a vital part of naval doctrine. **1966.**

Trippe, Juan T. (1899–1981). Developed basic principles of airline operation and pioneered international commercial aviation as head of Pan American Airways. **1970.**

Turner, Roscoe (1895–1970). Participated in early commercial aviation and air races leading to important technical advancement in design and performance of high-speed aircraft and engines. **1975.**

Twining, Nathan F. (1897–1982). Commanded Thirteenth and Fifteenth Air Forces during World War II. Directed final Twentieth Air Force operations against Japan. Commanded Air Materiel Command and Alaskan Air Command. Air Force Chief of Staff from 1953 to 1957. First Air Force general to be Chairman of the Joint Chiefs of Staff, from 1957 to 1960. **1976.**

Vandenberg, Hoyt S. (1899–1954). USAF general and military aviator. Served in a number of high-level positions in World War II, including command of Ninth Air Force. Helped plan the Normandy invasion. Air Force Chief of Staff from 1948 to 1953. **1991.**

von Braun, Wernher (1912–1977). Developed rocket-powered ballistic missiles, satellites, space probes, and Earth-orbiting and lunar spacecraft that made up US manned space program. **1982.**

von Kármán, Theodore (1881–1963). Developed theoretical studies and practical applications of aerodynamics to improve aircraft performance. Developed rocketry in creating intercontinental ballistic missiles. **1983.**

von Ohain, Hans P. (born 1911). Aerospace scientist. Conceived the idea for jet propulsion. Designed and produced a successful liquid-fueled engine. USAF chief scientist from 1947 to 1979. **1990.**

Vought, Chance M. (1890–1930). Designed VE-7, first airplane to land on USS *Langley* (the Navy's first aircraft carrier), the OU-1 (the Navy's first aircraft to be catapult-launched), and F4U Corsair of World War II. Started what became LTV, which built the F-8 and the A-7 jet aircraft. **1989.**

Wade, Leigh (1896–1991). Flight-tested and achieved record-setting performances with new and improved air-



"Gabby" Gabreski

craft and equipment. Participated in 1924 round-the-world flight. **1974.**

Walden, Henry W. (1883–1964). Conceived, built, and demonstrated manned flight in the first successful monoplane in the United States. **1964.**

Wells, Edward C. (1910–1986). Aerospace designer. Served as chief engineer, vice president, and general manager at Boeing. Under his direction, Boeing won the first-phase development contract for the X-20 Dyna-Soar and the assembly and test of the Air Force Minuteman. Directed the design development of the Boeing B-17 Flying Fortress, B-29 Superfortress, and other jet transport aircraft. **1991.**

Wilson, Thornton A. (born 1921). Developed many Boeing aircraft and missiles. Led the planning, development, and production of such jetliners as the 707, 727, 737, and 747. **1983.**

Woolman, Collett Everman "C. E." (1889–1966). Airline executive. Proved that aerial application was a highly effective weapon against agricultural pests. Ran the world's first aerial crop dusting company, which evolved into Delta Airlines. **1994.**

Wright, Orville (1871–1948). Co-invented first successful man-carrying airplane. Became the first person to fly an airplane that achieved controlled, powered flight. Unlocked the secret of powered flight. **1962.**

Wright, Wilbur (1867–1912). Co-invented first successful man-carrying airplane. Showed unflinching devotion to the task of unlocking the secret of powered flight. **1962.**

Yeager, Charles E. (born 1923). Recorded 13 aerial victories in World War II. Conducted test flights that led to supersonic flight in the X-1. Contributed to aerospace research and safety. **1973.**

Young, John W. (born 1930). Was first astronaut to go into space six times (Gemini 3, Gemini 10, Apollo 10, Apollo 16, STS-1, and STS-9). Honored as leader of the US space program. **1988.**

Closing the Doctrine Gap

Joint doctrine perpetuates a "land-centric" focus because it is largely based on Army concepts. That may be about to change.

By Rebecca Grant

THE Air Force is stepping up to the challenge of revitalizing its doctrine for a world in which joint operations will depend on greater understanding of the contributions from air and space forces.

For years, USAF treated doctrine as a formality. Today, however, the Air Force is being pushed forward by awareness that its individual service doctrine could become a major ingredient in the development of joint-force military power.

In the wake of Operation Desert Storm, debates over joint doctrine revealed that the airman's view of warfare could spark doctrinal conflicts with other service components—even more so if aerospace doctrine is not clearly articulated.

Early last year, the Air Force Chief of Staff, Gen. Ronald R. Fogleman, and the Army Chief of Staff, Gen. Dennis J. Reimer, openly acknowledged their differences over such basic issues as control of air and missile defenses and deep operations conducted beyond the fire-support coordination line but within the land commander's area of operation. It became clear that neglect of doctrine can translate to less than optimal use of airpower and cloud the debate over future forces.

The Army, Navy, and Marine Corps maintain dedicated doctrine organizations under flag rank command. The purpose is to integrate doctrine with education and training and link it to the requirements process. In contrast, the Air Force traditionally has kept basic doctrine separate from the day-to-day business of airpower. The Air Force last published basic doctrine in 1992 and operational-level doctrine in 1969.

However, with the Chairman of the Joint Chiefs of Staff, Army Gen. John M. Shalikashvili, putting new emphasis on joint doctrine and vision, each service's approach to doc-

trine has become an important contributor to the overall shape of defense concepts.

Army: "Close Engagement" Decisive

Army doctrine encapsulates principles for maneuver warfare and acts as a springboard for advanced experiments with concepts for the future of land warfare. At the Army's Training and Doctrine Command (TRADOC) at Fort Monroe, Va., a four-star general oversees all Army training and doctrine. Two-star deputies supervise doctrine, training, combat development, and requirements.

Setting up a strong doctrine and training command was a step toward revitalizing the Army after the Vietnam War. In the 1980s, AirLand Battle doctrine emphasized the concept of maneuver warfare and the nonlinear battlefield as a way to capitalize on Army strengths and prepare to defeat the numerically superior forces of the Warsaw Pact. To the Army, the ground-war segment of Desert Storm proved the value of reinvigorated doctrine and training.

TRADOC supervises and integrates doctrine, but most of the Army's more than 600 tactical and operational doctrine publications are written in the field. "FM 100-5, Operations," the Army's best-known doctrine manual, is drafted at the Combined Arms Center at Fort Leavenworth, Kan., headed by a three-star general. Logistics doctrine comes from the two-star commander of Combined Arms Support Command at Fort Lee, Va. Specialized Army branch schools also contribute to the doctrine development process.

Doctrine goes hand in hand with what the Army calls combat development. TRADOC's combat development branch runs war games, field exercises—such as the Louisiana Maneuvers—and simulations that test

future concepts. By experimenting with combinations of soldiers, equipment, and tactics in real-world situations, the Army looks out about 10 years ahead of the basic doctrine cycle. Concepts for the Army's Force XXI stem from combat development and will feed into future revisions of basic doctrine. TRADOC also sponsored work on long-range planning for the Army of 2025.

The philosophy behind Army doctrine reveals why the Army crafts its doctrine with such care. Doctrine, to the Army, is more than just concepts. Army officers feel a special burden to win and terminate the nation's wars—a role that, in their view, is not shared by other services, who are considered valuable but supporting arms in the joint force. This is why Army doctrine, in FM 100-5, states that the Army is "the nation's historically proven decisive military force."

Army operational doctrine concentrates on the corps and maneuver warfare at the operational level, where commanders translate strategic goals into military objectives.

Maneuver is more than just mobility. It is a means to gain positional advantage over the enemy with armor, infantry, and attack helicopters. Firepower supports and enhances the maneuver-warfare plan of operations. Army forces conduct maneuver warfare by synchronizing close and deep operations while protecting the force. Simultaneous operations delay, disrupt, and de-

stroy the enemy's follow-on echelons and strategic areas behind the lines. Close engagement reaps these advantages and "is where soldiers close with and destroy the enemy," achieving victory. Even if this takes just 100 hours, as did the ground offensive in Desert Storm, Army doctrine defines close engagement as the point where decisive and lasting results are achieved.

Success in land warfare calls for principles that soldiers understand. Army officers promoted to the rank of major begin to draw on doctrine to master the basics of maneuver warfare and the art of commanding larger units and more complex missions. At Command and General Staff College, for example, officers learn to create operations orders for brigade, division, corps, and theater-level forces. For the field-grade Army officer, mastering operational doctrine, like leadership and battle management, is part of doing the job right.

Navy/USMC: Battlespace Dominance and Peacetime Presence

For most of its more than 200-year existence, the Navy has kept doctrine at arm's length for fear that a binding set of principles might restrict the initiative and independence of the captain at sea—the very foundation of naval combat arms. Strategy and tactics substituted as the focus of debate.

The Reagan Administration, for example, formally embraced the Maritime Strategy in early 1981, and much controversy ensued. Whatever it was, however, it wasn't doctrine. One defense analyst, John Mearsheimer, said it was "best described as a loose combination of four offensive concepts—direct military impact, horizontal escalation, offensive sea control, and counterforce coercion."

Desert Storm's joint-force air attack procedures on land targets jolted the Navy out of its independent operations.

In 1993, Adm. Frank B. Kelso II, the Chief of Naval Operations, reversed the Navy's course by establishing Naval Doctrine Command at Norfolk, Va. Chartered in part to provide the doctrinal foundation for "From the Sea," issued in 1992, Naval Doctrine Command followed up with publication of "NDP-1, Naval Warfare" in 1994. Naval Doctrine Command, headed by a rear admiral, still reports directly to the CNO.

Naval doctrine still shines with tradition. Adm. Horatio Nelson and Adm. Arleigh A. Burke appear frequently in sidebar illustrations of such concepts as commander's intent and other imperatives of operations at sea. Despite the reverence for history and aversion to formal doctrine, the Navy harnessed its new doctrine process to explain littoral warfare and how naval forces project combat power. The command compressed some 300 naval warfare publications into the new joint numbering system.

NDP-1 covers the Navy's role in national security and discusses dominant operational concepts. Prominent among them are two concepts: battlespace dominance and presence.

Naval doctrine defines battlespace dominance as establishment of a zone of superiority from which naval forces project power. Battlespace reaches as far as the combat radius of naval weapons and covers the surface, undersea, air, land, space, and time. In littoral warfare doctrine, battlespace stretches to permit projection of power over land. Naval forces act alone when required or serve as the node of control for a joint force.

Forward presence is another aspect of naval power grounded in new doctrine publications. When a crisis occurs, naval forces may be

US Navy photo by PH1 Dewayne B. Smith



The Army has the oldest, most-developed doctrine infrastructure in DoD. Training and Doctrine Command, which helped revitalize the Army after the Vietnam War, reflects the Army's view that it is "the nation's . . . decisive military force."



Marine Corps doctrine is part of Navy doctrine, with its emphasis on presence and battlespace dominance. USMC F/A-18s like this one will support naval and Marine forces in littoral warfare and any other level of warfare from the sea.

first on the scene and remain behind after other landbased forces depart. With such concepts as presence and battlespace dominance, Navy doctrine, like Army doctrine, offers a rationale for force roles and missions and a comprehensive perspective on the operational level of war from the sea.

Marine Corps doctrine is part of naval doctrine, but the Marine Corps also generates its own concepts of maneuver operations ashore. An elaborate, concept-based requirements system limits doctrine to organizing, training, and equipping Marine forces. Marine Corps doctrine publications begin with "FMFM-1, Warfighting," last published in 1991. FMFM-1 presents basic and enduring principles of warfare. A second layer of publications on strategy, campaigning, and tactics begins the discussion of the operational level of warfare and continues into a series of subordinate publications. Most of all, however, the Marine deliverable is Marines.

USAF: Airman's Perspective

During most of the 1990s, Air Force doctrine stood apart in its sparse organization and lack of attention to the operational level of warfare. Since 1947, the Air Force leadership within the Pentagon and Air University have waged a sporadic tug-of-war over responsibility for developing Air Force doctrine. The Air Force Doctrine Center at

Langley AFB, Va., commanded by a colonel, reported to the two-star deputy for Plans on the Air Staff at the Pentagon. A second Air Staff office assisted with headquarters and joint coordination, while the Center for Aerospace Doctrine, Research, and Education was a separate function under Air University at Maxwell AFB, Ala.

Organizational turmoil reflected the Air Force's tendency to approach doctrine as an academic exercise, but the raw material of air doctrine is a blueprint for concepts of warfare inherently different from surface maneuver traditions. Basic principles of air doctrine describe and present a view of warfare from the vertical dimension.

For biplane pilots and jet-age crew members alike, elevation above the surface gave a unique perspective and allowed aircraft to make use of increased range and speed to gain advantage over the enemy. The airman's perspective and ability to see and operate across the battlespace made unified command of air assets crucial to full success, while making decentralized execution of air operations highly efficient. While many of these advantages were available as early as World War I, the improved lethality and effectiveness of air attacks hold out the potential to change the focus of warfare from twentieth-century surface maneuver to twenty-first-century air and space dominance.

The Air Force developed a wealth of basic principles, but keeping doctrine publications up-to-date often proved arduous. Operational-level doctrine suffered. "Air Force Manual 2-1, Tactical Air Operations," written in 1969, has not been revised since it was adopted. This overarching operational-level publication discusses counterair, close air support, and air interdiction missions but has not been updated to reflect the maturing capabilities of the 1970s and 1980s or the success of these mission areas in Desert Storm. Save for a few publications co-written with the Army in the 1980s, the Air Force has failed to participate in formal discussion of doctrine at the operational level of war.

Until 1992, the development of operational-level doctrine suffered from fragmentation of the Air Force into the cultures and missions of Strategic Air Command, Tactical Air Command, and Military Airlift Command. SAC and TAC honed independent procedures and ways of thinking about airpower. At SAC, the mission to deter or fight a global nuclear war required a full suite of thinking on the tactical, operational, and strategic levels of war. However, SAC's association with the nuclear mission lessened its impact on overall air doctrine.

TAC concentrated on achieving air superiority over the battlefield and employing airpower in support of ground forces—a consuming challenge, especially because NATO's doctrine of Follow-On Forces Attack depended on air and ground forces working together to defeat the superior numbers of the Warsaw Pact without first resorting to nuclear weapons. Killing MiGs and flying close air support were the name of the game. Army and Air Force cooperation on AirLand Battle may have reduced the incentive to think about other roles for airpower in the joint battle.

Prior to Desert Storm, one of the few full-length discussions of air war at the operational level was Col. John Warden's *The Air Campaign*, published in 1988 by the National Defense University at Fort McNair, D. C. Milestones like the 1990 "Global Reach, Global Power" or 1995's "Global Presence" germinated outside the formal doctrine process.

The Air Force's apathy about op-

erational doctrine may have stemmed from the fact that tactical doctrine guides squadron and wing employment of airpower. Seldom are Air Force officers required to master principles of operational-level doctrine to carry out their day-to-day force-employment responsibilities. The numbered air force commander may be the first to take on responsibility for operational plans and understand how they fit with a Joint Force Commander's objectives. In contrast, Army and Marine majors are starting to master doctrine for combined arms warfare. This "fact of life" of airpower organization and employment creates a gap where there is little natural demand for operational doctrine.

Joint Vision

Gaps in formal airpower doctrine at the operational level can affect the role of airpower in joint doctrine. Joint doctrine is by law the near-exclusive province of the Chairman of the Joint Chiefs of Staff. Fully empowered by the Goldwater-Nichols Defense Reorganization Act of 1986, which emphasized joint operations, General Shalikashvili has spurred the process of joint-doctrine development in the 1990s.

Joint doctrine flows from service doctrine but takes on added responsibilities. Joint doctrine's charter is to help the theater commander in chief meld the different capabilities and perspectives provided by the

services into the most efficient and effective joint force possible. Joint doctrine knits together service components and concepts by prescribing guidelines for areas of operation, command relationships, and support and coordination of the joint force.

The goal is to create tight "seams." When seams pull apart, lives may be at risk. In the aftermath of the UH-60 Black Hawk shootdown in 1994, General Shalikashvili declared joint doctrine to be "authoritative." He said, "This doctrine will be followed except when, in the judgment of the commander, exceptional circumstances dictate otherwise." Changing the status of joint doctrine from "recommended" to "authoritative" crowned its emerging importance and impact on military power.

Joint Pub 3-0, Doctrine for Joint Operations, coordinates the surface maneuver of ground forces with the supporting abilities of naval and air forces. Drafted by the Army in 1993, before the Navy or Air Force re-engaged with joint doctrine, the current manual reflects the Army's emphasis on maneuver warfare. Specific instructions detail the task of establishing command and organization of joint forces.

For example, Joint Pub 3-0 says that Joint Force Commanders will establish the size, shape, and position of land and naval areas of operation, based on "the land or naval force commander's requirement to maneuver rapidly and to fight at ex-

tended ranges." Within their areas of operation, the land or naval component commander will be supported by other force elements and will be responsible for the "synchronization of fires, maneuver, and interdiction." The Joint Force Air Component Commander has no geographic area of operation but manages theater-wide air operations beyond land and naval areas of operation. Joint Pub 3-0 cautions commanders to "carefully balance doctrinal imperatives that may be in tension, including the needs of the maneuver force and the undesirability of fragmenting theater air assets."

However, gray areas remain at the intersection of air and surface operations. Joint Pub 3-0's authoritative prescriptions for organization and command affect operation of each component differently. As General Fogleman and General Reimer noted in their discussion of differences, "What might be optimum for one component can come at the expense of the other," either "decreasing its combat power or increasing its risk."

To balance each service's core capabilities, US joint doctrine must be able to draw on fully developed operational doctrine in each service. Air Force members working in the joint-doctrine process often experience disadvantages that stem from their service's lean doctrine structure.

A recent example was the drafting of a Joint Pub 3-09 on joint fires. Proposals for a joint-forces fires coordinator fit well with maneuver warfare doctrine. However, from an airman's perspective, it threatened to complicate the situation and weaken the air component commander's authority, depending on how much of the air component was grouped under the heading of indirect fires. Without a parallel publication on the operational level of war, Air Force doctrine representatives faced numerous uphill battles on this and other issues affecting the role of airpower in joint warfare.

There are those who say that the presence of several Army officers in key senior billets on the Joint Staff during the early 1990s resulted in a surface warfare tinge to joint doctrine produced after Desert Storm. While both Gen. Colin L. Powell and General Shalikashvili brought their

Photo by Randy Jolly / Arms Communications



Joint doctrine gives the theater commander in chief the latitude to employ his different capabilities in the most efficient and effective way possible, whether they are Navy EA-6Bs (perhaps with USAF crews) or Air Force KC-135s.



In the past, some key air concepts were given short shrift, but the Air Force is working to strengthen its doctrine organization to make sure all commanders will be aware of what USAF can bring to the fight.

Army experience to joint doctrine, it is also true that Army doctrine easily embraced joint doctrine. The Navy and Air Force were comparatively late players, not in position to dominate joint-doctrine dialogue.

Joint doctrine today carries forward a land-centric focus because it is still largely based on dominant surface maneuver. Key air concepts—and some naval concepts—receive short shrift. Differences between land and air components generally are resolved in favor of the land commander. Most of all, it is striking how closely joint doctrine runs parallel to the Army doctrine of maneuver, fires, and force protection. As a result, major conflicts in the joint-doctrine process most often erupt over differences between air and ground views of operational strategy, command, and organization. For all the periodic USAF-Navy fireworks over bombers and carriers, it is the clash of the surface soldier's view of the battlefield and the airman's perspective that creates the deepest misunderstandings.

One such misunderstanding that spread from joint doctrine to last year's "Joint Vision 2010" was the description of air superiority as a part of full-dimension protection—what might be called freedom from attack. But air superiority's goal as defined in air doctrine is to eliminate by one means or another the enemy force that can interfere with air operations. Air superiority pro-

vides positional advantage, with "supporting" firepower aboard the aircraft—a close match to the definition of dominant maneuver, but not how it is described in joint doctrine.

The Way Ahead

Joint Vision 2010 established the importance of joint doctrine as an influence on future military capability. Drawing on tested concepts of dominant maneuver, precision engagement, full-dimension protection, and focused logistics, Joint Vision 2010 springboards from doctrine to forward-looking concepts of operation that light the way for all components in the joint force. According to General Shalikashvili, Joint Vision 2010 will focus "the strengths of each individual service or component to exploit the full array of available capabilities" and "guide the evolution of joint doctrine, education, and training to [ensure that] we will be able to achieve more seamless joint operations in the future."

There are dangers, too. The increasing authority of joint doctrine may amplify the joint voice in future planning and investment. The danger is that, as joint doctrine and visions gain strength, the services may find it hard to carry out their missions if they are not allowed to de-

velop new doctrine and capabilities outside of the joint framework—a framework that hinges primarily on surface maneuver.

For the Air Force, Joint Vision 2010 appears to present an opportunity to expand on operational concepts for how inherent maneuver, battlespace control, air superiority, and fast, long-legged forces will strengthen future joint operations. The challenge is to clarify the links between airpower doctrine and the Joint Force Commander's priorities. General Shalikashvili chartered the Joint Warfighting Center at Fort Monroe, Va., to expand concepts and begin implementation of Joint Vision 2010. The Air Force and all the services have a chance to engage in debate to sharpen their capabilities and means of interaction.

First steps for the Air Force include plans to reorganize doctrine functions under a single two-star commander and to update doctrine publications. A single commander—with authority over every major doctrine function in the field—will strengthen the Air Force's doctrine organization by providing direct oversight of all major doctrine functions. Doctrine will be firmly linked to professional military education and training. An independent structure can also keep USAF up to speed with fast-moving changes in the world of joint doctrine.

General Fogleman discussed upcoming doctrine changes with senior leaders at the October 1996 Corona conference. Later this year, the Air Force will publish its "equivalent" of FM 100-5—a new operational doctrine publication that will document the basic principles, abilities, and operational concepts for air- and spacepower in joint warfare. At its best, doctrine is like an observation tower from which to survey past lessons, current practices, and future concepts for military operations.

As General Fogleman explained, "The ultimate goal of our doctrine should be the development of an airman's perspective on joint warfare and national security issues—not just among our generals but among all airmen, in all specialties." ■

Rebecca Grant is president of IRIS, a research organization in Arlington, Va. She has worked for RAND Corp., in the Office of Secretary of the Air Force, and for the Chief of Staff of the Air Force. This is her first article for Air Force Magazine.

By John L. Frisbee, Contributing Editor

When an Enemy Was a Friend

Brown's B-17 was perhaps the most heavily damaged bomber to return from combat. It survived because of an enemy's act of chivalry.

DECEMBER 20, 1943, was a typically cold, overcast winter day in Britain as 2d Lt. Charles L. Brown's B-17F lined up for takeoff. It was 21-year-old Charlie Brown's first combat mission as an aircraft commander with the 379th Bomb Group, the target an FW-190 factory at Bremen, Germany. He and his crew of *Ye Olde Pub* were to become participants in an event probably unique at that time in the air war over Europe—a mission that would remain shrouded in mystery for many years.

The bombers began their 10-minute bomb run at 27,300 feet, the temperature: -60° . Flak was heavy and accurate. Before "bombs away," Brown's B-17 took hits that shattered the Plexiglas nose, knocked out the number two engine, damaged number four—which frequently had to be throttled back to prevent overspeeding—and caused undetermined damage to the controls. Coming off target, Lieutenant Brown was unable to stay with the formation and became a straggler.

Almost immediately, the lone and limping B-17 came under a series of attacks from 12 to 15 Bf-109s and FW-190s that lasted for more than 10 minutes. The number three engine was hit and would produce only half power. Oxygen, hydraulic, and electrical systems were damaged, and the controls were only partially responsive. The bomber's 11 defensive guns were reduced by the extreme cold to only the two top turret guns and one forward-firing nose gun. The tailgunner was killed and all but one of the crew in the rear incapacitated by wounds or exposure to the frigid air. Lieutenant Brown took a bullet fragment in his right shoulder.

Charlie Brown figured the only chance of surviving this pitifully un-

equal battle was to go on the offensive. Each time a wave of attackers approached, he turned into them, trying to disrupt their aim with his remaining firepower. The last thing oxygen-starved Brown remembers was reversing a steep turn, becoming inverted, and looking "up" at the ground. When he regained full consciousness, the B-17 was miraculously level at less than 1,000 feet.

Still partially dazed, Lieutenant Brown began a slow climb with only one engine at full power. With three seriously injured aboard, he rejected bailing out or a crash landing. The alternative was a thin chance of reaching the UK. While nursing the battered bomber toward England, Brown looked out the right window and saw a Bf-109 flying on his wing. The pilot waved, then flew across the B-17's nose and motioned Brown to land in Germany, which the aircraft commander refused to do. After escorting them for several miles out over the North Sea, the Luftwaffe pilot saluted, rolled over, and disappeared. Why had he not shot them down? The answer did not emerge for many years.

The B-17 did make it across 250 miles of storm-tossed North Sea and landed at Seething near the English coast, home of the 448th Bomb Group, which had not yet flown its first mission. The crew was debriefed on their mission, including the strange encounter with the Bf-109. For unknown reasons, the debriefing was classified "secret" and remained so for many years. Lieutenant Brown went on to complete a combat tour, finish college, accept a regular commission, and serve in the Office of Special Investigations, with the Joint Chiefs of Staff, and in other Air Force and State Department assignments until his retirement. He now lives in Miami, Fla., where he is founder and president of an energy and environmental research center.

The image of his strange encounter with the Bf-109 remained firmly embedded in Charlie Brown's memory. In 1986, he began a search for the anonymous pilot. Finally, in 1990,



Stigler (left) and Brown met 45 years after the war and became close friends.

former Oberleutnant Franz Stigler, now living in Canada, responded to a notice published in a newsletter for German fighter pilots. By comparing time, place, and aircraft markings, it was determined that Stigler was the chivalrous pilot who had allowed Brown's crew to live. Not surprisingly, Brown and Stigler have become close friends.

On that December day in 1943, there had been two persuasive reasons why Stigler should have shot down the B-17. First, earlier in the day, he had downed two four-engine bombers and needed only one more that day to earn a Knight's Cross. Second, his decision to not finish off the aircraft was a court-martial offense in Nazi Germany and if revealed could have led to his execution. He considered these alternatives while flying formation with the B-17, "the most heavily damaged aircraft I ever saw that was still flying." He could see the wounded aboard and thought, "I cannot kill these half-dead people. It would be like shooting at a parachute."

Franz Stigler's act of chivalry has been justly, though belatedly, honored by several military organizations here and abroad. On the other hand, Charles Brown was not decorated for his heroism over Germany, which never was reported by the 448th Bomb Group at Seething to his commanders. Such are the fortunes of war and its aftermath. ■

Team Canada came out ahead in this year's revamped competition, a demanding test of skills for all participants.

William Tell '96

Photos by Lans Stout



Since 1954, fighter teams have gathered to compete at William Tell, the premier air-to-air weapons competition. This year, the tests were changed to make them tougher and more realistic. Some changes were brought about by the high operations tempo throughout the force, and some units that perform air-to-air combat as a secondary mission were able to compete. Air Education and Training Command, a first-time competitor, sent a combined active-duty and Air National Guard team. Just like today's short-notice deployments, the competition, held at Tyndall AFB, Fla., was "come as you are," with no credit given for fancy paint jobs.

Above, an F-15 pilot is ready for his competitors. Right, a 35th Fighter Wing F-16 sports its new WW tail code (indicative of its assumption of the "Wild Weasel" mission). Upper right, a 35th FW crew chief is hard at work.

Photo by Nate Leong



Top Team

Team	Score
Canada	30,434
Air Combat Command	28,533
Pacific Air Forces	28,105
Air Education and Training Command	27,119
Air National Guard	26,519
Air Force Reserve	26,503
US Air Forces in Europe	25,689

Top Gun

Unit	Aircraft	Score	
Capt. Steve Nierlich, Canada	4th Wing	CF-18	3,262
Capt. Daniel Daetz, ACC	33d FW	F-15C	3,235
Capt. Kenneth Carpenter and Capt. Louis Dupuis, USAF	48th FW	F-15E	3,182
Capt. Dave Mercer, Canada	4th Wing	CF-18	3,089
Capt. Jeremy Baenen, USAF	48th FW	F-15C	3,089
Capt. Leonard Dick, AFRES	944th FW	F-16	3,081
Maj. John Winters, AFRES	419th FW	F-16	3,046



The biennial competition has been gradually reduced from nearly two weeks to just a couple of intense days of flying and weapons loading. Teams were given only three weeks to prepare for battle. Each team was composed of personnel from two units, except for the teams from Canada and US Air Forces in Europe. Most used two types of aircraft. Only the Air Force Reserve team, with its F-16s, and the Canadian team, with its CF-18s (above and right), competed with a single aircraft type. Despite this, officials tried to ensure that the playing field was as even as possible.



Team Canada flew away with the team trophy, the first foreign group in the meet's history to win overall honors. Canada's Capt. Steve Nierlich took the individual Top Gun award, edging out Capt. Daniel Daetz of Air Combat Command's 33d FW by a mere 27 points.



The highly experienced members of the Guard and Reserve were excellent competitors. William Tell defending champions in the Top Team category, the 119th FW (ANG), Fargo, N. D., was part of the ANG team, along with the 142d FW from Portland, Ore. The weapons load event, Loado, consisted of a static munitions load. Repeating their 1994 feat, the 119th posted a perfect score. A matching perfect score from the 142d gave the ANG team top honors in the category.

Maintenance teams were judged on their every move. Scores were given on procedures, standards compliance, serviceability, and aircraft performance. At right, part of the Pacific Air Forces team, from the 35th FW, Misawa AB, Japan, loads an AIM-9M Sidewinder onto an F-16 launch rail.



Maintenance Team		Top Loado Team	
Team	Score	Team	Score
AFRES	9,670	ANG	5,000
AETC	9,610	AFRES	4,955
ACC	9,590	Canada	4,939
Canada	9,185	ACC	4,935
ANG	9,170	PACAF	4,838
USAFE	9,150	AETC	4,625
PACAF	8,705	USAFE	3,988



Above, a load crew prepares an AIM-120 Advanced Medium-Range Air-to-Air Missile for loading.



William Tell '96 contained only two flying profiles. Profile I pitted two aircraft flying a combat air patrol pattern against four adversaries, with an additional "friendly" in the area. Above, a pilot from the 48th FW, RAF Lakenheath, UK, prepares for the next challenge.

Profile I **Profile II**

Team	Aircraft	Score
Canada	CF-18	14,985
ACC	F-15/F-16	14,310
ANG	F-15/F-16	13,140
AFRES	F-16	12,875
PACAF	F-15/F-16	12,515
AETC	F-15/F-16	11,870
USAFE	F-15C/E	10,650

Team	Aircraft	Score
USAFE	F-15C/E	9,196
PACAF	F-15/F-16	8,852
AETC	F-15/F-16	8,824
Canada	CF-18	8,509
ACC	F-15/F-16	7,737
AFRES	F-16	6,923
ANG	F-15/F-16	6,629



Profile II had an element of two fighters, one employing a front-aspect radar missile and the other a heat-seeking Sidewinder against a target drone. Timing and a variety of altitudes make both scenarios a lot tougher than they sound. Above, a pilot and crew chief make plans, and at left, an F-15E pilot checks an AIM-9M Sidewinder before flying a morning profile.

The 48th FW brought two versions of the F-15 to form USAFE's team. It was the first air-to-air competition for the two-man F-15E (right). Its crews found a novel use for their Low-Altitude Navigation and Targeting Infrared for Night system: They used it to acquire and track secondary targets as they engaged the primary threat.





Competition at ground control is just as intense as it is in the skies. Weapons director teams like this pair are critical to a successful intercept and must meet the same high standards as anyone else at the meet. In an unusual turn of events, SSgt. Jeff Craver, a USAF NCO in an exchange program, took Top Scope for Team Canada.

Weapons Director Team

Team	Score
Canada	4,700
PACAF	4,350
ANG	4,250
AETC	3,800
AFRES	3,750
ACC	3,700
USAFE	3,100

Top Scope

Team	Score
SSgt. Jeff Craver	2,400
Capt. Wilf Edmond	2,300
SrA. William Ball	2,200
SSgt. Phillip Gumbs	2,150
Capt. Tiffany Tochterman	2,150
Capt. Patrick Pietrowski	2,100
Lt. Col. Luther Topper	2,050
Lt. Col. Richard Houck	2,000
SSgt. Patrick Wilson	1,950



The QF-106 above is used as an adversary in Profile I. The MQM-107D drone launching into the Florida sky at right was to be targeted in Profile II.



Top Element

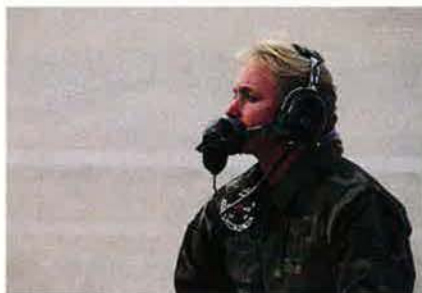
Team	Unit	Aircraft	Score
Canada	4th Wing	CF-18	6,528
ACC	33d FW	F-15C	5,480
USAFE	48th FW	F-15E	5,296
PACAF	35th FW	F-16	5,179
Canada	4th Wing	CF-18	5,080
PACAF	18th Wing	F-15C	5,082
AETC	173d FW	F-16	4,846

Photo by Nate Leong



The 18th FW's "Shoguns," like the one at left waiting for its next sortie, made up the other half of the PACAF team.

SSgt. Kim Long, a crew chief from the 173d FW (ANG), Klamath Falls, Ore., straps Maj. Kyle Hook into his F-16, below. Although ANG units are old hands at William Tell, this year AFRES sent teams to the meet for the first time.



Photos by Lams Strout



No matter what changes take place at William Tell, fighter pilots and crews will again be here to compete for the coveted number one slot. Vice Chief of Staff Gen. Thomas S. Moorman, Jr., summed it up best at the start of the meet: "The lessons learned from this competition will focus our tactics in the area of air superiority, and air superiority is the primary core of competency of not only the US Air Force but Canadian air forces as well." ■

In a matter of weeks, the Air Force established a more secure hub for Southern Watch operations and moved there without missing a beat.

Miracle in the Desert

By Bill Gertz

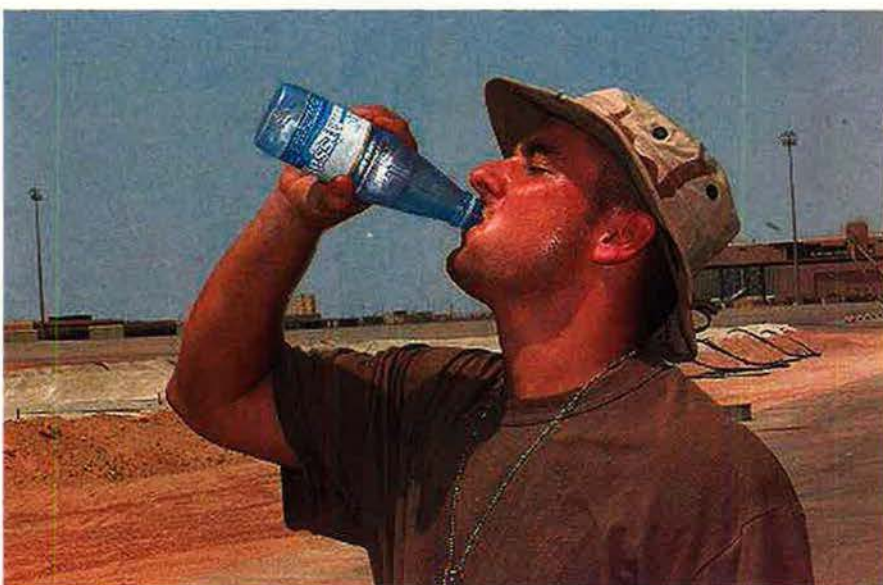
UNTIL recently, Saudi Arabia's Prince Sultan AB was nothing more than this: a remote patch of terrain in the blazing Arabian desert, a 13,000-foot runway buried in sand, with lots of camel spiders, scorpions, and heat-loving insects.

What a difference a few weeks can make.

With a short, furious burst of activity in late summer and fall, the Air Force transformed the site into its newest overseas base, bringing in thousands of airmen, scores of aircraft, tons of supplies, and hundreds of pieces of equipment formerly located two hundred miles away at Dhahran AB. Brig. Gen. Daniel M. Dick, the commander of the 4404th Composite Wing (Provisional) and officer in charge of Prince Sultan and seven other bases, said the facility has become the new hub of Operation Southern Watch, the mission to patrol the skies over southern Iraq.

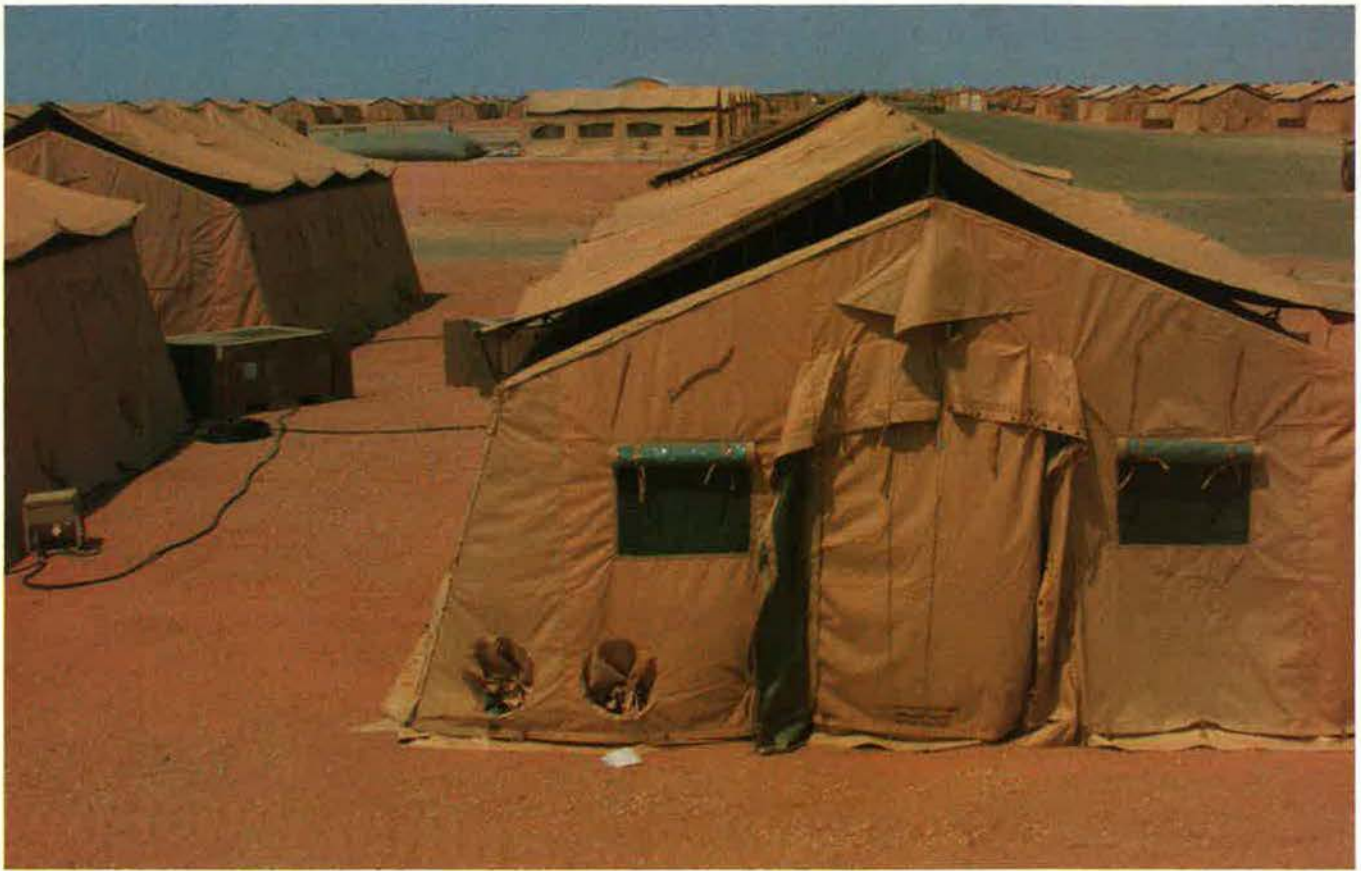
"We have risen like a phoenix out of the desert," said General Dick. "This is Air Force combat airpower at its finest."

The new site hums with nonstop activity. Prince Sultan AB, built during the 1990-91 Persian Gulf War period but virtually abandoned soon afterward, has become a sprawling city comprising some 700 semipermanent tent structures that house 4,500 US airmen and soldiers and British and French personnel. The inventory of allied fighter aircraft deployed at the base includes Air Force F-15s, F-16s, and EF-111s, plus French Mirages and British Tor-



USAF photo by SSGT Angela Stafford

Rising "like a phoenix" out of the desert, according to Brig. Gen. Daniel M. Dick, commander of the 4404th Composite Wing (Provisional), Prince Sultan AB, Saudi Arabia (opposite), gave US and allied air forces a safer place from which to launch their air patrols over Iraq. Above: A1C Jason Taylor of the 2D Supply Squadron, Barksdale AFB, La., copes with the blistering Saudi heat.



nados. Some F-16s are equipped with the AGM-88 High-Speed Anti-radiation Missile (HARM)—a key weapon in suppressing Iraqi air defenses. Also on hand are the Air Force's E-3 Airborne Warning and Control System (AWACS) aircraft, HC-130 and KC-135 tankers, and RC-135 Rivet Joint electronic reconnaissance aircraft.

The huge relocation project was launched by US Central Command following the June 25 terrorist bombing of Khobar Towers in Dhahran, a blast that killed 19 American airmen and wounded 500 others. By using an unguarded service road, the terrorists were able to drive an explosives-laden truck close enough to devastate the high-rise residence. The disaster convinced senior Defense Department and service officials that it was time to find a safer location.

"Al's Garage"

Prince Sultan AB is part of a 250-square-mile Saudi military complex situated near Al Kharj, 50 miles southeast of the capital of Riyadh. During the Gulf War, American troops jokingly referred to it as "Al's Garage." Coalition forces have con-

structed the new base around the existing airstrip and apron that were located within the complex's 22-mile perimeter. Now the entire area is considered an ultrahigh-security sector and is patrolled around the clock by hundreds of Air Force Security Police.

Since the bombing, US forces throughout the region have been placed on their highest state of alert, on guard for more terrorist attacks using vehicle bombs or possibly artillery or rocket attacks using chemical or biological weapons.

"We still assess the terrorist threat to be very high, and we are taking appropriate measures," said Maj. Gen. Kurt B. Anderson, commander of the Joint Task Force-Southwest Asia located near Riyadh.

For General Anderson, the biggest challenge of the relocation was to make the move and still carry out the mission—patrolling the skies over southern Iraq up to the thirty-third parallel north. The air exclusion zone was extended one degree closer to Baghdad, the Iraqi capital, following Iraq's attack on the Kurds in northern Iraq early last September. To prevent gaps in coverage, air op-

erations planners made sure the Air Force never moved all of a particular aircraft type at the same time.

"I would suspect that anybody watching what we were doing didn't even notice a blip in the performance of our mission," said General Anderson. "The sequencing of the relocation was such that we were able to continue our mission unabated."

Defense Secretary William J. Perry has called the six-week initial relocation effort from Riyadh and Dhahran "a logistics miracle." He pointed out that US military personnel transformed the empty base "from scratch" into a modern facility boasting an excellent runway, air traffic control tower, headquarters office, and maintenance buildings—and of course, hundreds of air-conditioned tents.

"All the while they were . . . moving, they maintained [more than] 100 sorties a day without missing a beat in support of this expanded no-fly zone," said the Pentagon chief.

Secretary Perry approved the relocation in July as part of a Pentagon "Force Protection Initiative" aimed at keeping American troops safe from terrorist attack, including the possible use of weapons of mass de-

struction by terrorists. He warned, "We cannot deal with those attacks adequately just by moving fences and just by putting more Mylar on glass. We have to make some fundamental, drastic changes in the way we configure and deploy our forces."

Forty-Five Days

A key assumption of the initiative is that the troops will be safer if they are moved away from urban areas, a major principle behind the desert relocation, said General Dick. "We, in fact, moved two entire air bases—over 78 aircraft, over 4,000 people, and about 25,000 tons of equipment—in 45 days," he said. "We did it in a hostile environment—hostile in terms of the threat from terrorism being very high as well as in the middle of combat operations against Iraq."

General Dick considers his forces to be prepared for any type of terrorist threat, and he maintains that the central location of the air base within the Saudi complex is the key to its security. The sprawling desert base has been designed with force protection in mind. "This place is just tremendously more secure than Dhahran or Riyadh," said General Dick. "We have great defense in depth."

In the first layer of security, Saudi Air Force police and foreign contractor personnel man checkpoints at the five entrance gates. The complex's perimeter is surrounded by a six-foot-high chain-link fence topped with triple-strand barbed or razor



USAF photos by SSGT. Angela Stafford

These F-15 maintainers do their part in helping to move the 25,000 tons of equipment necessary to transfer operations from Dhahran AB to Prince Sultan AB in 45 days without interrupting the mission.

wire. Heavily armed Saudis check all who enter.

The perimeter of Prince Sultan AB begins some 15 miles further into the complex. There, a visitor encounters another six-foot-high perimeter security fence. Twenty-four miles of concertina wire have been stretched around the site to deter any intruders. The perimeter fence has only two entrances—an American gate and a Saudi gate. All non-Saudi coalition forces use the American gate and must pass rigorous screening.

"There's an extremely tight security process," said General Dick.

Sniff and Dip

All vehicles entering the coalition sector are searched. Bomb-sniffing dogs are used to check for explosives. (The General jokes that "the only good dog is a bomb-sniffing dog.") Fuel and water trucks entering the base are "dipped" with probes to make sure no hidden areas within the cargo have been hollowed out to hide explosives.

The entrances are equipped with concrete barriers, which force vehicles to snake their way through. This security feature, known as "serpentineing," is designed to prevent a heavy vehicle from crashing through the gate at high speed. Garbage trucks and sewage vehicles must be empty when they enter the compound, so that the police know that they do not contain explosives.

Concern about foreign terrorists entering the base also has led to tight restrictions on admittance by so-called third-country nationals—foreigners employed as construction workers or in other contract occupations. Third-country nationals entering the base must be escorted at all times by security guards. Their identification cards are impounded for the duration of their time on the base.

Once on the American part of the air base, visitors must pass through at least four checkpoints before being allowed to enter the tent city. Each checkpoint is guarded by armed airmen and, in some cases, British Security Police.



When the Air Force returned to Prince Sultan AB, disused since the end of Desert Storm, it found only a K-Span structure, some vehicles, and a runway. All the necessary equipment, such as these fuel bladders, had to be brought in.

Concrete Jersey barriers like those used in highway construction surround the runway and parking areas. The barriers are doubled where the coalition portion of the base joins the Saudi portion.

Air operations also are carried out with security in mind. Departures and arrivals are scheduled in ways that minimize the risk of attack by terrorists armed with shoulder-fired antiaircraft missiles. For air and missile defense, the coalition has deployed a battery of Patriot missiles at the air base.

The size of the base and its location away from urban areas are major boosts to force protection. "Its sheer size gives us a lot of capability, both in being able to conduct surveillance around the area where we are living and operating generally," General Anderson said. "Anybody who would be interested in trying to conduct an operation would have to travel great distances to get to our people."

RED HORSE Rides Again

As always when it comes to major deployments, Air Force construction and engineering personnel played the key role in the desert relocation project.

On August 8, Capt. Don Keel of Huntsville, Ala., project engineer for the 823d Civil Engineering Squadron Rapid Engineer Deployable, Heavy Operational Repair Squadron, Engi-

neer (RED HORSE), was the first of the builders to step off the airplane at Prince Sultan. There to meet him and his crew was a handful of troops from the 89th Security Police Squadron at Andrews AFB, Md., and the 49th Security Police Squadron at Holloman AFB, N. M.

Captain Keel already had served a tour in Bosnia-Herzegovina, where he helped build another tent city for Americans on peacekeeping duty. When he and the other RED HORSE troops arrived at Prince Sultan, they encountered blistering 120° heat and little else. However, after Bosnia, Captain Keel had come to Saudi

Arabia with no illusions. "It was about what we expected," the Captain recalled. "There was nothing there."

The only structure on the base was a rusting K-Span round metal building constructed during the Gulf War. Nearby were a few Army Humvees (High-Mobility Multipurpose Wheeled Vehicles) and trucks in storage; they had been left there and never retrieved. The engineers got them working and started using them. Within several days, about 200 RED HORSE engineers had set up the first tents to house themselves, and then they set off at a frantic pace to build the



At first, USAF RED HORSE units did most of the heavy lifting. They handled the equivalent of 25 C-5 loads of lumber, canvas, generators, and other supplies so that arriving troops would have places to eat, sleep, and do their work.

TEMPER (Tent, Extendable, Modular Personnel) quarters for the forces due to arrive in just a few days.

"We lived on bottled water in those early days," recalled MSgt. William Davison, of Newaygo, Mich., part of the 823d RED HORSE advance team. "We drank it, and we ended up bathing in it."

The weather was a factor in the beginning, with August heat sometimes pushing temperatures over 130°. Several airmen became ill from the harsh conditions. During the day, bottled water became so hot it was almost undrinkable. As a result, most construction work was carried out at night when temperatures were relatively cool—around 100°. At night, said Sergeant Davison, the crew could erect 40 to 50 new tents at a crack.

In addition to building housing

USAF photos by SSGI. Angela Stafford



Despite the base's isolated location, sprawling size, and tight security, terrorism remains a concern. Operational flights, such as this KC-135 arriving from Grand Forks AFB, N. D., are staggered in ways to minimize the risk of attack.

tents, Captain Keel and his team put up temporary administrative, industrial, and storage buildings. They set up about 40 of these.

Things moved slowly at first, but once the logistics train got rolling, the base grew rapidly. By the time the RED HORSE team had left 45 days later, they had built 10 aircraft hangars and 625 air-conditioned TEMPER tents. The RED HORSE team had handled the equivalent of 25 C-5 airlifter loads of lumber, canvas, vehicles, power generators, supplies, and other equipment, Captain Keel said.

Sergeant Davison was proud to be working in the desert heat. "I saw my mission there as supporting our troops and moving our troops to a safe environment," he said, "and once again RED HORSE does it with class."

For Captain Keel, the task was to set up a new air base. "It's very rare in our careers to be able to build an Air Force base out of nothing but a K-Span," he observed. "We had Southern Watch fighters flying out of there in no time."

Phase Two Begins

The first phase of the buildup covered initial construction of tents and the setting up of basic infrastructure for air operations. The RED HORSE teams accomplished this mission in a record 45 days. By October, the second phase of base construction was well under way. Plans called for

replacing the TEMPER tents and temporary facilities with semipermanent modular structures resembling trailers. Air Force officials said they expect to complete the last phase of construction by spring.

Providing equipment and structures for communications and air traffic control were also key features of setting up the new base. Col. Thomas Verbeck, director of Command, Control, and Communications for Joint Task Force-Southwest Asia, brought in about 100 Air Force technicians to wire the base, so that air operations could resume with little interruption. The first task was to make sure the base had landing systems capable of handling fighters and heavy aircraft.

Tanker Airlift Control Elements also set up air traffic control at the base. The airmen came from the 615th Air Mobility Operations Group at Travis AFB, Calif.

TSgt. Steven Easterling, of Brooklyn, N. Y., said summer heat on the Arabian peninsula was oppressive. "You try to stay inside as much as you can," said the manpower management specialist at Prince Sultan. "And you drink as much water as possible."

By October, some of the officers had moved out of their tents into

trailers as work continued on more permanent structures. For Sergeant Easterling, the best part of the mission was getting a chance to help build the newest base in the US Air Force. "I'm glad that I'm a part of it," he said, adding that he volunteered for the assignment.

The most visible aspect of improved security for Sergeant Easterling is the absence of major roads passing close by the base. "In Dhahran, they had roads coming right by, as you can see from where they left [the bombing truck]. There is no way they can get into here like that."

The most difficult aspect of life at Prince Sultan during the initial relocation for Sergeant Easterling and other airmen was the lack of communications capability. The base still has no commercial incoming telephone lines. Contact by telephone can be made only through Defense Department DSN lines.

"Since August, it's gotten a lot better," said Sergeant Easterling, noting that the Air Force has installed a local area network that allows airmen to receive cable television. During leisure hours, the troops can watch football games piped in from the United States by satellite. In all, the airmen at Prince Sultan can get 11 television channels.

In the beginning, food was poor. Airmen got few cooked meals, eating mostly the ubiquitous meals, ready-to-eat. Now, airmen are served meals in three dining facilities. As a morale booster, they are served special meals on their birthdays. Recreational equipment, including free weights and exercise machines, have been moved down from Dhahran, and there are plans to put in a swimming pool.

After the RED HORSE teams had set up the basic infrastructure, the major force redeployment took place. Other Air Force personnel then took over for the RED HORSE units and continued construction work. General Dick said he was astonished by the spirit and determination of the Air Force personnel during the desert relocation.

"The relocation truly was a logistics miracle," he said. ■

Bill Gertz covers national security affairs and defense for the Washington Times. His most recent article for Air Force Magazine, "The Fast Pace of Special Ops," appeared in the September 1996 issue.

Fatal Flaw

"Nuclear weapons are inherently dangerous, hugely expensive, militarily inefficient, and morally indefensible. . . . I realize that the notion nuclear weapons bring security—the idea that somehow we were in charge, that somehow all of this was infallible and manageable, and we could make it work . . . is fatally flawed."

Gen. George Lee Butler, USAF (Ret.), Strategic Air Command's final commander in chief, in a December 4, 1996, Washington Post article.

Perilous Goal

"It [abolition of nuclear weapons] is an unachievable goal, and it is a perilous, potentially perilous, goal. Happily, it is unachievable, because if it were not, it would be quite dangerous to the country.

"It is perilous because the smaller the nuclear weapons inventories group, the greater is the premium on having just a few nuclear weapons. Under those circumstances, the inhibition on the use of nuclear weapons would diminish. The chief inhibition on the use of nuclear weapons today is the knowledge that there are powers—most notably the United States—that are in a position to retaliate if weapons are used. . . .

"[W]e must recognize . . . that that genie can never be stuffed back in the bottle. You cannot expunge from the mind of man the knowledge of producing nuclear weapons."

James R. Schlesinger, Secretary of Defense from 1973 to 1975, in a December 4, 1996, appearance on PBS's "NewsHour With Jim Lehrer."

Special Delivery

"We promised people over the past three or four decades that we would be there for them, cradle to grave, with no-cost health care. I believed that in the '60s. I believed that in the '70s. In the '90s, as we got smaller, we closed 40 percent of the Air Force beds. It's an undeliverable service in 1996 and beyond: . . . [a] total, in-house, direct, cradle-to-grave health-

care system. So, as we get smaller, we've got to turn to partnerships with the civilian sector to do it."

Lt. Gen. (Dr.) Edgar R. Anderson, Jr., Air Force surgeon general, in an interview with Air Force News Service on November 12, 1996, three days before he retired from active duty.

Army Vision

"The power to deny or to destroy is possessed by each of the military services. The contribution of land forces to the joint [military operation] is the power to exercise direct, continuing, and comprehensive control over land, its resources, and its peoples. It is this direct, continuing, and comprehensive control over land, resources, and people that allows land power to make permanent the otherwise transitory advantages achieved by air and naval forces."

"Army Vision 2010," a November 1996 US Army white paper spelling out the service's principles and concept of itself.

Death Watch

"We have successfully achieved every aspect of the military annex and the Dayton agreement, . . . [but] the conditions for peace still do not exist in Bosnia[Hercegovina], and there's still the danger that if our forces were to leave Bosnia next month, the war would resume, having thereby lost the very great benefits we got by going in with IFOR in the first place. . . . Putting it in simple terms, the operation was a success, but the patient is still in danger of dying."

Secretary of Defense William J. Perry, in a November 15, 1996, news conference called to announce that US troops would be staying in Bosnia for another year.

Liver Worst

"Our people are very patient, but if it gets into their liver, if patience snaps, nothing can stop them. Then one will have to work very seriously to restore everything to the channel of common sense."

Alexander Lebed, former Russian chief of national security, in a November 19, 1996, New York press conference wherein he warned of dangers posed by Russia's "humiliated and pauperized" armed forces.

"Erosion by Design"

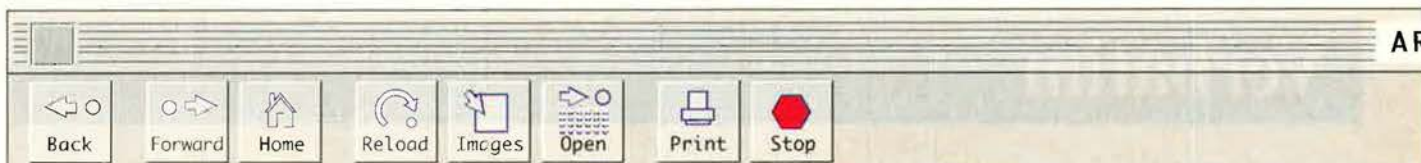
"The past four years have witnessed the dramatic decline of the US nuclear weapons complex and the uniquely skilled work force that is responsible for maintaining our nuclear deterrent. The Administration's laissez-faire approach to stewardship of the nuclear stockpile . . . is clearly threatening the nation's long-term ability to maintain a safe and reliable nuclear stockpile. . . . The Administration's actions—or, in this case, inactions—speak much louder than its words. . . . In my mind, it's no longer a question of the Administration's 'benign neglect' of our nation's nuclear forces but, instead, a compelling case can be made that it is a matter of 'erosion by design.'"

Rep. Floyd D. Spence (R-S.C.), chairman of the House National Security Committee, in an October 30, 1996, statement to accompany a report critical of US nuclear management.

Why the JSF?

"If I want the F-16 to operate in the 2010 environment—with increasing proliferation of things like SA-10s, -12s, -15s, -17s, which are not only being readily marketed but are being readily consumed around the world—I have to, to make an F-16 survive, add a great deal of packaging and other external support. . . . When we assess the cost of doing that vs. the cost of [building the Joint Strike Fighter] to provide survivability and lethality, this turns out to be the more cost-effective way to do that."

Lt. Gen. George K. Muellner, principal deputy assistant secretary of the Air Force (Acquisition), in a November 16, 1996, Pentagon briefing on the Joint Strike Fighter. ■



Go To:

The roots of the Internet can be traced to the Defense Department's Advanced Research Projects Agency.

In the Beginning, There Was ARPANET

By Peter Grier

ONE midsummer day in 1968, computer scientist Severo M. Ornstein was sitting in his office at the small Cambridge, Mass., firm Bolt Beranek and Newman, Inc., when his boss walked in and handed him a sheaf of papers. It was a request from the Defense Department's Advanced Research Projects Agency (ARPA) for companies to bid on a project that would link together computers at different sites, enabling them to swap data and files. Such a network had never really been built before. Mr. Ornstein's boss wanted to know if BBN could do it.

Ornstein took the papers home and studied them overnight. A day or two later, he slapped the proposal back down on his superior's desk.

"I suppose we could build that, if you wanted to," he said. "But I can't

see what one would want such a thing for."

Seldom in modern history has a technological prophecy been more wrong, as Ornstein himself has since laughingly admitted. Despite his reservations, BBN bid for and won the contract to construct ARPANET—a rudimentary, four-computer experiment that has since exploded into today's world-girdling, multipurpose Internet.

Maybe the Internet would have come into existence without ARPA funding. The utility of such a network is obvious, and numerous scientists, including some in other nations, were tinkering with similar technology at the time.

But US military funding gave computer networks a great boost and ensured American leadership in a

scientific area that has become crucial to the economy as well as national security. In fact, some of the researchers involved in ARPANET's development feel that history will judge their efforts as having been as important as the Manhattan Project. Flexible leadership from ARPA (today, the Defense Advanced Research Projects Agency, or DARPA) helped make it a reality.

"Great" and "Heroic"

In a 1990 oral history interview taped by the University of Minnesota's Charles Babbage Institute, Leonard Kleinrock, a UCLA researcher and ARPANET pioneer, said, "It was one of the great experiments in science. I think. . . . It was a heroic kind of thing."

However, it was the Air Force—not ARPA—that probably provided the first US military seed money for investigation of computer networks and their possible implications for national defense.

The time was the early 1960s and the place was the RAND Corp. in California. Using general research funds provided by the Air Force, researcher Paul Baran was investigating methods of making strategic military communications more robust.

Specifically, Mr. Baran was concerned about ensuring that national command authorities could order a retaliatory nuclear strike in the event of widespread war. At the time, the nuclear arsenals of both superpowers seemed vulnerable to decapitation by a first strike. The result was a hair-trigger balance, with each side eyeing the other nervously for signs of attack.

If leaders knew that they would be able to hit back under almost any circumstances, Baran reasoned, they'd be less likely to rush into nuclear

war. His solution: communication via a distributed network.

"The basic network configuration was simple," Baran said in his Babbage Institute interview. "Avoid any central node. Build a distributed network of nodes, each connected to its neighbor."

Such a spiderweb design would enable a message to get through even if a number of strands were broken. It was a relatively obvious solution to the problem. But Baran's second recommendation was perhaps not so obvious: Break down messages into components.

"Message blocks," he called them. Computers would chop up communications as they were sent, sending numerous message bits speeding over various paths toward the target. Computers at the receiving end would retrieve the bits and reassemble them in the correct order. The approach would increase the system's efficiency as well as its reliability.

Eventually, Baran produced 11 volumes explaining the technical details of his proposed system. The vast majority of the information contained in the volumes was unclassified. Baran did not mind if the Soviets picked up the distributed-node idea. After all, if they felt more secure, the nuclear balance might be more stable, and thus the United States would be safer.

Finally, in 1965, RAND formally proposed construction of Baran's system to the Air Force. Service officials vigorously backed the idea—though the nation's communications behemoth, AT&T, felt it could not be done.

The problem was that the relatively new Defense Communications Agency was responsible for the long-distance communications of all of the US military services. Baran and some higher-level Defense Depart-

ment officials did not feel DCA had the technical competence to do the job. The project was killed, at least until a more skilled implementing agency could be found.

Missed Opportunity?

The Air Force thus perhaps missed a chance to make computing history, but Baran still feels it was the right decision.

"If the project turned into a botch, it would be extremely difficult to get it going again," he said. "Detractors would have proof that it couldn't be done."

Enter ARPA. In 1966, Robert Taylor, then the head of ARPA's Information Processing Techniques Office, began actively looking for someone to run a computer network project. In part, Mr. Taylor was looking for ways to allow ARPA-funded researchers to work more efficiently. Linking computers at ARPA centers, he felt, would help accomplish this goal.

Taylor found his man in Larry Roberts, an intense scientist at Massachusetts Institute of Technology's Lincoln Laboratory, who had the requisite computer background. Mr. Roberts had twice turned down the ARPA project director job before he finally accepted. Many ARPANET pioneers say that, in retrospect, it was Roberts's energetic management and direction that made the project the success that it was.

Working with others in the field, Roberts by 1968 had pulled together the specifications for the new ARPANET. It would mirror Baran's idea—a distributed net, carrying message bits for reassembly at their destination. (Somewhere along the way, the message-block aspect of the system came to be called "packet switching," perhaps to elicit the image of millions of little packages racing to their electronic addresses. That's the term—and the underlying technology—that's still in use.)

In January 1969, BBN won the contract to build the first pieces of what would become the Internet. BBN had begun life as an acoustical design firm, consulting on such things as the shape of movie theaters, and was still relatively new in the computer field. Therefore, its ARPANET victory was something of a surprise. But by September, BBN was ready to install the first ARPANET com-

puter. Based on the Honeywell 516, the machine was known as an Interface Message Processor.

The first IMP went to UCLA, a center of ARPA-funded research. By the end of the year, IMPs had been shipped to three other ARPA hotbeds: Stanford Research Institute, the University of California, Santa Barbara, and the University of Utah. ARPANET was born, though initially it was little more than a local area network.

Hidden Agendas

The system was not an overnight success. To much of the US computer science world, the idea of packet switching seemed both revolutionary and dubious. Furthermore, the idea of sharing computer resources was not an attractive one for many academics. ARPA wanted them to use a computer on somebody else's campus, via phone line; what many of them really wanted was for ARPA to buy them spanking new computers of their own.

"For most of the people at any given site, it was at best neutral and at worse maybe a little antithetical to their own interests and aspirations," BBN scientist Alexander McKenzie told his Babbage Institute interviewer.

Each of the original ARPANET nodes was intended as a specialized software site. The University of Utah, for instance, was then experimenting with cutting-edge computer graphics. Among ARPANET's heaviest users in its early years were scientists who had changed jobs and moved from one site to another. They would log on to the system largely to take advantage of the specialized software back at their old universities.

By 1971, ARPANET consisted of 15 nodes. Around then, something began to happen, something not anticipated by the system's planners. Scientists began to use the system as a means of accessing data banks and swapping information, as opposed to a method of accessing somebody else's computer programs.

E-mail had not even been one of the Internet's original services. It was an afterthought, an add-on that did not start up until around 1970. Once the researchers realized the power of computer communications, cooperative software use was quickly forgotten. To a certain extent, that

original vision for ARPANET has yet to be realized, note its pioneers.

"Other things—people interactively working together, people being able to communicate with each other more easily, people being able to have joint projects, and just being able to use software they both had developed over the net—became much more important," said Frank Heart, BBN manager of the ARPANET project for more than 10 years.

In 1972, an ARPANET demonstration for the International Conference on Computer Communications became something of a coming-out party for the system. ARPA moved an IMP into a Washington, D. C., hotel and demonstrated everything from a remote air traffic control system to a tiny scouting robot directed from across the country. A new computer began hooking up to ARPA every 20 days, on average.

"Resistance" Within

Throughout ARPANET's early days, the influence of the military was somewhat muted. BBN and other contractors working on the system dealt largely with civilian ARPA officials whom they considered peers—not uniformed officers interested in the net's defense applications. Some of the ARPANET pioneers were even antiwar protestors. Ornstein, for one, used to joke that he was going to take a little "Resistance" button into the Pentagon and pin it on a colonel's jacket when he wasn't looking. (Ornstein, one of the Internet's key hardware designers, later became a founder of the antinuclear group Computer Professionals for Social Responsibility.)

Government bureaucracy wasn't much of a problem. ARPA was small and flexible, with project director Larry Roberts allowed considerable power to make key technical decisions, select projects for funds, and otherwise push his programs forward.

ARPA was so nimble that contractors at times found it easy to forget they were working for Uncle Sam. Ornstein was surprised one day when Roberts picked him up at an airport driving a cheap, battered rental car. Asked why he was driving such a turkey, Roberts, according to Ornstein, "muttered something I didn't understand at the time about government rules and government expenses and so forth. I had always thought of

him as passing out these millions of dollars, but it hadn't occurred to me that he was, in fact, living personally on quite a limited budget."

Military involvement with the ARPANET system gradually increased throughout the early 1970s. By 1975, military-related net traffic had reached the point that the DCA finally decided to take control of the system. Meanwhile, ARPA was experimenting with new military applications for ARPANET's basic packet-switching technology. The experiments were to have a direct bearing on the concept of the Internet—a network formed of other networks, not a single, self-contained system.

The Packet Radio Project was one such experiment. It was the brainchild of ARPA official Robert Kahn, a cousin of the famed nuclear theorist Herman Kahn. As outlined in the early 1970s, packet radio was to be a kind of wireless ARPANET. A central minicomputer near a powerful radio station would be used to communicate with smaller, mobile computing sites. If successful, the idea would have applications throughout the military but particularly within the Army. Mobile computers carried in tanks or trucks would be able to link together whole divisions with ease.

In the mid-1970s, packet radio prototypes were tested successfully in exercises with the XVIII Airborne Corps at Fort Bragg, N. C., and Strategic Air Command at Offutt AFB, Neb. Among other applications, ARPA showed how the equipment could be used for airborne forces on the tarmac to log on to a central computer and automatically reconfigure division load plans if airlift availability suddenly changed. Today, such a capability seems basic. Back then, it was revolutionary.

The system never made it into production or even into development. However, experiments with packet radio and a packet satellite project got Mr. Kahn thinking. What would happen if he could link all these different packet networks together—and with the ARPANET?

The result would be a powerful information tool.

Enter the Protocol

If this vision were to become reality, Kahn needed to find a way to connect separate computer nets that, in effect, spoke different languages. He needed a flexible translator—software called a "computer protocol."

The protocol would have to manage message traffic between many different computers. It would have to detect relay errors, sort out addresses, and perform all sorts of electronic "postal" tasks. With colleague Vinton Cerf, Kahn hammered out the Transmission Control Protocol over a period of several years in the 1970s. Published in a technical journal in May 1974, TCP introduced the concept of networking networks to the wider world.

Kahn described the development in an interview with the Babbage Institute oral history team: "I think the conception of the internetting effort is one that can be credited to Vint Cerf and myself. He and I . . . laid out the grand design, and then Vint worked with the community to develop and evolve it over time."

By the early 1980s, all the computers hooked to the now-exploding ARPANET had to be capable of using this internetting protocol. Thus was laid the foundation of today's Internet. Recognizing the civilian importance of computer networking, the Defense Department split ARPANET in two in 1984. The new MILNET would ensure the military had its own reliable network for communications, while a rump ARPANET continued to serve other users.

Soon, the civilian remnant of ARPANET faced a form of competition. The National Science Foundation set up NSFNET in 1984 as a high-speed computer net "backbone" between supercomputer research centers. NSFNET quickly diversified and upgraded, linking universities all across America on lines that were up to 25 times faster than ARPANET lines. This speed attracted many users who might earlier have wanted an ARPANET connection. By the late 1980s

the number of computers hooked up to NSF's net was far greater than the number of ARPANET users.

Within a few years, it became clear that ARPANET was totally obsolete. On June 1, 1990, it was "deinstalled," an act that ended the system's 21-year life.

Shortly thereafter, two events cemented NSFNET's future. In 1991, NSF officials decided to allow commerce on the net, exponentially expanding the universe of potential users. And in 1992, physicist Tim Berners-Lee, working at the Geneva, Switzerland-based Center for Nuclear Research (CERN), developed a method of organizing and linking Internet information that would underpin what soon would be called the World Wide Web.

By the end of 1992, there were one million host computers linked to the Internet. Since then, a graph line of the system's growth goes almost straight up, like a rocket ascending.

ARPANET left a legacy of both technical and social advances. Whole communities of like-minded souls—one of the first "chat groups" was for science fiction fans, for instance—were pulled together over its wires. Meanwhile, creating the net had produced a cadre of the finest computer scientists in the world for the US.

"I think that there isn't any doubt that the investment that DARPA made in the ARPANET put packet-switching technology on the map," said Cerf, now an official at MCI. "It convinced people it was real and has spawned a phenomenal explosion in new kinds of computer communications techniques."

Many ARPANET pioneers remain convinced that the ARPA bureaucratic model of the early 1970s, with a few bright people in a government office allowed the freedom to pursue particular goals, led to a very effective return on taxpayer investment. Some feel that today's defense bureaucracy is more ossified and that endless paperwork and a relentless search for the low bidder would make it difficult to duplicate ARPANET's success.

"It was a joy to be associated with the ARPANET project," said BBN scientist McKenzie. "It was fun. It was challenging, and I think it was good for the country. It's not so easy to find that mix now, and I think regulation is a big part of it." ■

Peter Grier, the Washington bureau chief of the Christian Science Monitor, is a longtime defense correspondent and regular contributor to Air Force Magazine. His most recent articles, "The Legacy of Airpower" and "Aerospace Technology Exposition," appeared in the November 1996 issue.

AFA/AEF National Report

By Frances McKenney, Assistant Managing Editor

AFA and USAF: Partners for Air Force Fifty

AFA continues to work closely with USAF in planning Air Force Fifty, the celebration of the US Air Force's fiftieth anniversary, to be held in Las Vegas, Nev., April 22–26.

Lt. Gen. Lloyd W. Newton, USAF assistant vice chief of staff, recently provided a briefing on the latest USAF plans to AFA state presidents, foreign air attachés, and industry representatives who gathered at AFA headquarters in November.

He noted that USAF's official fiftieth-anniversary commemoration period of 16 months began in September 1996 with "events closely tied to Air Force Association activities." *Air Force Magazine* notes major events each month in its "Aerospace World" department.

The Air Force Fifty celebration is the key event in the anniversary year.

Its planning and coordination involves two major areas of responsibility, with AFA handling a myriad of tasks in Las Vegas—ranging from registration, hotel reservations, and entertainment to the aerospace exposition and the international airpower symposium—while the Air Force is responsible for activities at Nellis AFB, Nev. These include the Global Air Chiefs Conference, to be held in conjunction with the airpower symposium, and a two-day airshow featuring the "Golden Air Tattoo," an exhibition of as many as seven international flying demonstration teams.

USAF officials view the chiefs conference—the first attempt to assemble such a large gathering of the world's airpower leaders—as an important opportunity for international coalition building. AFA has a significant role in helping forge this relationship with representatives invited from more than 100 countries.

In addition to transportation, meals, and entertainment, AFA is taking responsibility for major expenses that

USAF cannot cover with appropriated funds—logistics support for the Golden Air Tattoo and bus transportation, for example. With help from corporate sponsors, AFA will host dignitaries at the airshow: It will set up and equip air-conditioned chalets at the Nellis AFB flight line to provide refreshments and rest areas for approximately 600 air chiefs; the Secretary of the Air Force; the Chief of Staff; Congressional visitors; former Air Force Secretaries, Chiefs of Staff, and Chief Master Sergeants of the Air Force; Medal of Honor recipients; Doolittle Raiders; and AFA National Directors.

In addition, AFA has been tracking not only US reunion and affinity groups but also a number of foreign military reunion organizations that want to get involved with Air Force Fifty. [See box, *opposite*.] This includes reunion groups from the UK, Belgium, France, Japan, and New Zealand.

Information, Please

AFA has a home page on the World Wide Web at <http://www.afa.org/>.

Specific AFA departments are also accessible through e-mail, using a department abbreviation followed by afa.org. Some examples of addresses are MbrServ@afa.org (for Member Services), NDI@afa.org (for National Defense Issues), COM@afa.org (for Communications), or MAG@afa.org (for *Air Force Magazine*).

Now, AFA also has an e-mail address to use when you don't know exactly who can answer your question: information@afa.org.

Aboard a B-52

As a prisoner of war during the Vietnam War, F-105 pilot Gene Smith heard the bombs dropped by B-52s on Hanoi during Operation Linebacker. This past October, the AFA Chairman of the Board donned his flight suit again and climbed aboard a B-52 at the invitation of the 96th Bomb Squadron, 2d Bomb Wing, Barksdale AFB, La.

The sortie was part of a regular training mission, complete with air refueling, an electronic countermea-



With the Air Force Fifty flag in the background, AFA Chairman of the Board Gene Smith (center) joined (l-r) Lt. Gen. Phillip Ford, 8th Air Force commander; Gilbert Petrina, Jr., Ark-La-Tex (La.) Chapter president; Ivan McKinney, National Vice President (South Central Region); and Lt. Col. Jerry Maxwell, a Daedalian chapter flight captain, at a dinner at Barksdale AFB, La.



Meet You in Las Vegas

The following reunion and affinity groups and other participating organizations have notified AFA as of December 6, 1996, that they will be at Air Force Fifty in Las Vegas, Nev., in April. The point of contact for this list is the Air Force Association, Attn.: Shirley Bledsoe, 1501 Lee Highway, Arlington, VA 22209-1198. Phone: (800) 727-3337, extension 4875.

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|--|---|---|
| 2d Bombardment Association | 344th Fighter Squadron | Edgar Allen Poe Literary Group (the RAVEN) |
| 3d Military Airlift Squadron, ATS/MAS | 381st Bomb Group Memorial Association | F-86 Sabre Pilots Association |
| 5th Bomb Group Association (5th Air Force) | 384th Bomb Group (8th Air Force) | Flying Tigers of the 14th Air Force Association, Inc. |
| 8th Air Force Association | 388th Fighter-Bomber Wing | Former Air Commanders United of Air National Guard |
| 9th Bomb Wing | 405th Fighter-Bomber Wing | General B. A. Schriever Los Angeles (Calif.) Chapter |
| 11th Air Force Association | 449th Bomb Group Association | International Order of Characters, Inc., Aviation |
| 12th Air Force Association | 449th Bomb Squadron Association | Italian Air Force Association |
| 15th Air Force Association | 452d Bomb Squadron Association | Japan Association of Defense Industry |
| 15th Troop Carrier Squadron | 459th Bomb Group Association | Linebacker II (Vietnam) |
| 15th/20th Weather Squadrons Association | 460th Bomb Group (World War II, 15th Air Force) | Lockbourne AFB, Ohio, Officers |
| 18th Fighter-Interceptor Squadron | 465th Bomb Group Association | Miami (Fla.) Chapter |
| 20th Air Force Association | 465th Troop Carrier Wing Association | Moroccan Association, Inc. |
| 25th Bomb Group Association | 474th Tactical Fighter Wing "Roadrunners" | Nagoya/Komaki AB (Japan) Association |
| 28th Military Airlift Squadron Historical Association | 481st Tactical Fighter Squadron | National Aviation Hall of Fame |
| 31st Fighter Officers Association | 490th Bomb Group Association | National Guard Association of the US |
| 33d Fighter Group (58th, 59th, and 60th Fighter Squadrons) | 504th Bomb Group Association | New Mexico State AFA |
| 38th Tactical Reconnaissance Squadron | 6147th Tactical Control Group "Mosquitos" | New Zealand Fighter Pilots Museum |
| Cadet Class 40-H | 7499th Support Group (7405th, 7406th, and 7407th Squadrons) | New Zealand Wings Reunion Group |
| Class 41-G | A-37 Dragonfly | Oregon State AFA |
| Pilot Class 43-D "Delta Eagles" | Aeromedical Evacuation Association | P-47 Thunderbolt Pilots Association |
| 46th Tactical Fighter Squadron | Air Force Enlisted Widows Home Foundation | RAF Benevolent Fund |
| Pilot Training Class 49-B | Air Force Navigators Observers Association | RAF Station Manston, UK |
| 51st Fighter Squadron Association | Air Force Public Affairs Alumni Association | Red River Valley Fighter Pilots Association |
| Pilot Training Class 52-A | Air Force Security Police Association | Reserve Officers Association of the US |
| Pilot Training Class 52-D, Webb AFB, Tex. | Air Force Sergeants Association | Royal Air Force (UK) |
| Pilot Training Class 53-B | Air Force Village-West | Sampson AFB (N. Y.) Veterans Association |
| 54th Troop Carrier Wing (Army Air Forces) | Air University Foundation | Silver Wings (Belgian pilots) |
| Class 55-B "Melonheads" | Air Transport Command (North African Division) | Society of Strategic Air Command |
| Class 55-C, Officer Candidate School | Air War College Alumni Association | Stalag Luft I, Hungry Hollow, Room 7 (World War II) |
| 55th Weather Reconnaissance Association | American Air Museum in Britain | Texas State AFA |
| 56th USAF Hospital, Arizona Medical Clinic | American Fighter Aces Association | The Retired Officers Association |
| Class 58-D, Officer Candidate School | Association du Personnel Navigant Forme en Amérique | Tuskegee Airmen (332d Fighter, 477th Bomb, and 96th Service Groups) |
| 63d Troop Carrier Squadron | Association of Old Crows, Silver State Chapter | U-2 Pilots/Navigators |
| Class 66-C, Reese AFB, Tex. | Austin (Tex.) Chapter | USAF Helicopter Association |
| 68th Fighter-Interceptor Squadron (1950-55) | Aviation Cadet Museum Inc. | USAF Vietnam Veterans Reunion 1997 |
| 68th Fighter Squadron Association (World War II) | Berlin Airlift Veterans Association | Utah State AFA |
| 71st/341st Air Refueling Squadrons | California State AFA | Washington State AFA |
| 75th Fighter Squadron Association | Colorado State AFA | Women Airforce Service Pilots (WASPs), World War II |
| 306th Bomb Wing Association | Confederate Air Force | World War II Memorial |
| 307th Bomb Group/Wing (1946-54) | Delaware Valley Historical Aircraft Association | |
| 315th Bomb Wing (Guam) | Distinguished Flying Cross Society | |
| 319th Fighter-Interceptor Squadron | Doolittle Tokyo Raiders | |

sure run, and high and low releases, which took place over south Texas and parts of Louisiana and Arkansas.

Later, the **Ark-La-Tex (La.) Chapter** hosted an informal, grill-your-own-steak dinner at the Barksdale Officers' Club, in Mr. Smith's honor. The guests included Lt. Gen. Phillip J. Ford, commander of 8th Air Force, and Lt. Col. Floyd L. Carpenter, commander of the 96th Bomb Squadron,

who was also mission commander of one of the two B-52Hs that launched Conventional Air-Launched Cruise Missiles against Iraq during Operation Desert Strike in September 1996.

A-10 pilot Lt. Col. Robert L. White (AFRES), commander of the 917th Operations Support Squadron, 917th Wing (AFRES), at Barksdale, was among those at the dinner with special ties to Mr. Smith. As an active-

duty captain, he had checked out Mr. Smith in a T-38 at Randolph AFB, Tex., following Mr. Smith's return to duty after his POW years. Ivan L. McKinney, National Vice President (South Central Region), and Chapter President Gilbert E. Petrina, Jr., were in the crowd of 155 people at the event, as were members of the local Daedalian Chapter and ROTC cadets from Grambling State University



Fifteen current and past national officers posed informally for a "family portrait" at the National Convention: (bottom row, l-r) Judge John Brosky, Victor Kregel, Martin Harris, George Douglas, Joe Shosid; (middle, l-r) James McCoy, Harold Stuart, James Trail, David Blankenship, O. R. Crawford; (top, l-r) John Alison, John Henebery, Jack Price, Gerald Hasler, and Gene Smith.

in Grambling, La., and Louisiana Tech University at Ruston, La.

Destination Rhode Island

The keynote speaker, Maj. Gen. Jeffrey G. Cliver, flew in from Washington, D. C. A pianist from the Air Force Band of Liberty drove down from the Electronic Systems Center at Hanscom AFB, Mass. The honor guard made the trip from McGuire AFB, N. J. Then there were other special guests Rhode Island Gov. Lincoln C. Almond from Providence; Dr. Phillip J. Sleeman AFA National Vice President (New England Region), and National Directors Joseph R. Falcone and Joseph A. Zaranka from Connecticut; and R. L. Devcucoux all the way from New Hampshire.

They filled the parking lot with out-of-state license plates when they met at the Naval Education and Training Center Officers' Club in Newport, R. I., for the **Metro Rhode Island Chapter** awards dinner in September.

In keeping with the joint-services theme of the event, Army ROTC Cadet 1st Lt. Michael J. Pasquarello, from Bryant College in Smithfield, R. I., received the Outstanding ROTC Cadet award. The chapter's treasurer and vice president for Government Affairs, Anthony F. Ricci, made the presentation, recognizing the cadet's overall performance, leadership on campus, work with the other cadets, and physical fitness. Chapter President Dr. Eugene M. D'Andrea then presented a Community Partner plaque

to Ralph Alviti, a businessman from Attleboro, Mass., and an AEF Scott Associate Award (named after AEF President Walter E. Scott) and AFA membership to Governor Almond.

In his address to the gathering, General Cliver, deputy assistant secretary of defense for Reserve Affairs (Readiness, Training, and Mobilization), spoke about the challenges and the future of the Air National Guard and Reserve.

An Astronaut Among Us

The star attraction at the October meeting would be there "not as a guest speaker but as a member of our **PE-TO-SE-GA [Mich.] Chapter**," wrote Jon Dayton, chapter president, in a newsletter inviting members to hear Brig. Gen. James A. McDivitt, USAF (Ret.). Former astronaut McDivitt, who achieved many firsts in US space history, was to "shoot the breeze with all of us," Mr. Dayton wrote.

General McDivitt grew up in Kalamazoo, Mich., and became an aviation cadet in 1951. With the 35th Fighter-Bomber Squadron in Korea, he flew 145 combat missions in F-80 and F-86 fighters.

In 1965, Major McDivitt was aboard Gemini 4 as Maj. Edward H. White II made the first US spacewalk. They set a space endurance record, staying aloft for 97 hours during 62 orbits.

Four years later, with Apollo 9 crew members Col. David R. Scott and Russell L. Schweickart, Colonel McDivitt conducted the first test of a lunar module in Earth orbit. He went on to manage the Apollo program and to a career with industry, including Rockwell International.

General McDivitt is now retired and spends part of the year in Michigan, Mr. Dayton reported. The PE-TO-SE-GA Chapter has 89 members, and this meeting drew three times its usual turnout because of the former astronaut's appearance. "He's a fascinating guy," said Mr. Dayton.



Metro Rhode Island Chapter officers (l-r) Anthony Ricci, treasurer; Capt. Susar Hanley, ANG, executive vice president; and Dr. Eugene D'Andrea, president, invited guests from all over New England for an awards banquet where Maj. Gen. Jeffrey Cliver (second from right) was keynote speaker.

"A Fighter Pilot's Story"

Maryland AFA cosponsored a lecture by Quentin C. Aanenson, creator of the Public Broadcasting System (PBS) documentary "A Fighter Pilot's Story."

The presentation took place in October in Rockville, Md., at Montgomery College, which sponsored the event as part of its fiftieth-anniversary celebration.

A Minnesota native, Mr. Aanenson flew P-47s in Europe during World War II for the 391st Fighter Squadron, 366th Fighter Group. He also directed close air support for the Army's VII Corps during the Battle of the Bulge and later flew with other Ninth Air Force groups.

In 1987, after retiring from a career in insurance and investment marketing, Mr. Aanenson turned his wartime photos, letters, and memories into a documentary on the events and battles of the European theater in World War II. In 1994, as part of the fiftieth anniversary of D-Day, "A Fighter Pilot's Story" was shown on more than 300 PBS stations.

Central Maryland Chapter's James S. Culp saw the broadcast and mentioned it to a fellow board member of a local bank. The board member turned out to be Mr. Aanenson's golf

partner, and so Mr. Culp and Ronald E. Resh, president of the Central Maryland Chapter, were able to arrange for the fighter pilot's appearance.

His one-hour lecture to an audience of 300 covered the content as well as the making of the video and was interspersed with clips from the documentary. Mr. Aanenson received an AFA Citation of Honor at the 1995 National Convention.

First Flight

The **College Park Airport (Md.) Chapter** began a flight training program in May 1996 for AFROTC cadets in Det. 330, at the University of Maryland College Park.

Its first trainee, Cadet Kristofer D. Kelly, received flight instruction toward a private pilot's license from Chapter President Erwin B. Nase and in September completed the program and successfully soloed out of the College Park Airport, the oldest continuously operated airport in the world.

A few days later, chapter members in five private planes took more than two dozen cadets aloft for a bird's-eye view of their campus and its surrounding area. The chapter has been conducting this flight orientation annually, said Capt. Clare Reid, USAF,

the university's AFA liaison and the chapter vice president for Aerospace Education. The chapter and the detachment also held a picnic, where Cadet Kelly had his shirttail cut off, an aviation tradition after a first solo. The shirttail will be framed and hung at Det. 330, honoring the flight training program's first graduate.

Captain Reid—the daughter of Richard S. Reid, for whom the **Richard S. Reid (Ariz.) Chapter** is named—noted, that without the chapter's sponsorship, the pilot instruction would have been costly for Cadet Kelly.

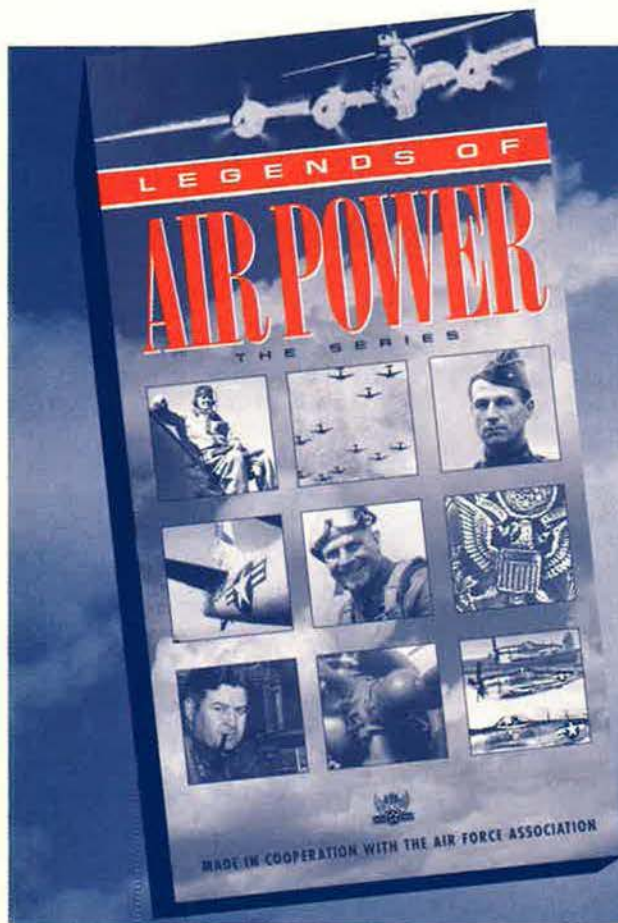
Pleased with the success of the flight training, Mr. Nase, who owns the Cessna 152 used for the student's flight instruction, said, "This is a program that we intend to continue."

Three Tours in Vietnam

Nolan W. Schmidt, past president of the **Central Indiana Chapter**, spoke at the chapter's quarterly meeting in December about his three tours of duty in the Vietnam War, showing film footage from some of his more than 120 A-26 missions.

Mr. Schmidt, a navigator on C-130, F-4, and A-26 aircraft, was with the 56th Air Commando Wing, Nakhon Phanom RTAB, Thailand.

Chapter President George Heller



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At historic College Park Airport, University of Maryland College Park AFOTC Det. 330 Commander Col. Donald Newton (right) and Maj. William Overby, AFA liaison (left), helped Cadet Kristofer Kelly (center) celebrate his first solo after instruction from College Park Airport Chapter President Erwin Nase.

found the presentation especially interesting because the A-26 was a World War II-vintage aircraft that many of the older chapter members had experience with. Mr. Helser added that the talk by Mr. Schmidt, a retired colonel, was part of the chapter's effort to bridge the gap between World War II veterans and younger chapter members.

The chapter also joined area military and veterans organizations at the annual Veterans Day Council of Indianapolis dinner on Veterans Day. The 500 guests included reserve and ROTC members who heard a keynote speech by Maj. Gen. John W. Hill, Marine Corps Reserve. Among the Central Indiana Chapter members who attended the gathering were Indiana State President Ted D. Eaton, National Director Harold F. Henneke, and former Chapter President William R. Gommel.

Before the Ball

As it does every year before the AFA National Symposium and Ball in Los Angeles, Calif., the **Orange County/Gen. Curtis E. LeMay Chapter** hosted AFA Golf Day at the Los Alamitos Navy Golf Course in Cypress, Calif. Chapter Secretary Richard C. Baynes reported that the winning team was from TRW in Redondo Beach. Donnie Blanks from CSC in Falls Church, Va., scored the low gross, while Tom Coney of Recon/Optical, Inc., in Alexandria, Va., scored the low net.

Mr. Baynes also said that the chap-

ter met in September at the 222d Combat Communications Squadron, Costa Mesa ANG Station, Calif. The newly elected chapter officers were introduced at this meeting: SMSgt. James Hollingshead, ANG, president; David Graham, executive vice president; Mr. Baynes, secretary; Neil R. Cole, treasurer; and Roy C. Redman, vice president for Education.

Guest speaker SMSgt. Douglas Zimmer, the 222d Combat Communications Squadron's senior NCO, explained the unit's federal and state missions. The visitors then toured the facility. The organization began in 1953 as the 222d Radio Relay Squadron, operating at various locations until moving in 1964 to its present site on a section of what had been the Santa Ana AAB during World War II. Costa Mesa ANGS operations are now the only military activity on base.

Supporting the Memorial

Maj. Gen. William A. Anders, AFRES (Ret.), of the **Greater Seattle (Wash.) Chapter** recently pledged \$200,000 to the Air Force Memorial. The Apollo 8 astronaut and retired chairman and chief executive officer of General Dynamics also will serve as the memorial's capital campaign co-chairman.

He met to discuss the project last fall with Air Force Memorial Foundation Board Chairman Joseph Coors, Jr., retired Air Force Chief of Staff Merrill A. McPeak, and Foundation Executive Director Lt. Gen. Robert D. Springer, USAF (Ret.).

A graduate of the US Naval Academy at Annapolis, Md., General Anders flew with the Air Force and has often stated a strong belief in air- and spacepower. He also funded an Air Force Memorial video in 1993.

The Air Force Memorial will be adjacent to Arlington National Cemetery in Virginia and is scheduled to open around 2000.

AFA's National Committees and Advisors for 1996-97

As of November 1, 1996

The makeup of AFA's National Committees for 1996-97 has been determined. The following association members have been named to serve on the committees. (Ex officio members of all committees are non-voting.)

Executive Committee

Gene Smith (*Chairman*)
James E. Callahan
Charles H. Church, Jr.
Michael J. Dugan
Martin H. Harris
Doyle E. Larson
Vic Seavers
Mary Anne Thompson
Cheryl L. Waller
Thomas J. McKee, *ex officio*
Walter E. Scott, *ex officio*
John A. Shaud, *ex officio*

Finance Committee

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R. L. Devoucoux
Charles B. Jiggetts
Ivan L. McKinney
Charles A. Nelson
Jack G. Powell
Gene Smith, *ex officio*

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Sandra L. Henninger
Thomas J. Kemp
Bob Krumpe
Stephen M. Mallon
CMSgt. Mike Reynolds
Eric D. Vander Linden
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Joan Blankenship
Tommy G. Harrison
Harold F. Henneke

P. K. Robinson
Gene Smith, *ex officio*

Resolutions Committee

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Charles H. Church, Jr.
Michael J. Dugan
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Doyle E. Larson
Thomas J. McKee
Walter E. Scott
Vic Seavers
Gene Smith
Cheryl L. Waller
John A. Shaud, *ex officio*

Long-Range Planning Committee

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James E. Callahan
Martin T. Capriglione
M. N. "Dan" Scott
Paul A. Maye
Robert E. Patterson
Gilbert E. Petrina, Jr.
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Charles A. Gabriel

John Michael Loh
Robert T. Marsh
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Henry C. Smyth, Jr.
James Tegnalia
Richard E. "Dick" Thomas
Leonard R. Vernamonti
Dr. Billy E. Welch
John G. Wilson
Doyle E. Larson, *ex officio*

Audit Committee

John J. Politi (*Chairman*)
(term expires September 1998)
Henry W. Boardman
(term expires September 1997)
William A. Lafferty
(term expires September 1999)
William L. Sparks
(term expires September 1999)
Lucius Theus
(term expires September 1997)
Walter G. Vartan
(term expires September 1998)
Gene Smith, *ex officio*

Advisors

To be determined (*Civil Air Patrol*)
Sandra Grese (*Civilian Personnel*)
Jule Zumwalt (*Junior AFROTC*)
Col. Julius McRee (*Senior AFROTC*)

More Chapter News

CMSgt. John H. Breslin, AFRES, Senior Enlisted Advisor for the 482d Fighter Wing at Homestead ARS, Fla., was elected president of the **John W. DeMilly, Jr. (Fla.) Chapter** in October. He is a personnel specialist for the US Customs Service. The chapter's new vice president is Maj. Dennis L. Daley, AFRES, a full-time Air Reserve technician with the 482d Operations Group. Raymond R. Monti is the newly elected secretary, and William Susser now serves as treasurer.

Col. Fred Feldman, AFRES (Ret.), who was serving as president of the **Union Morris (N. J.) Chapter**, died on October 18, 1996. He was 63. He received his USAF commission in 1954 and served until 1959. In 1962, he became the first helicopter pilot on the East Coast to broadcast traffic reports from the air.

Jodi L. Callahan (1968-1996)

Capt. Jodi L. Callahan, USAF, an Under-40 National Director and AEF trustee, died in November. She was 28 years old.

Born in Fayetteville, N. C., she received a bachelor's degree from Northern Arizona University and was

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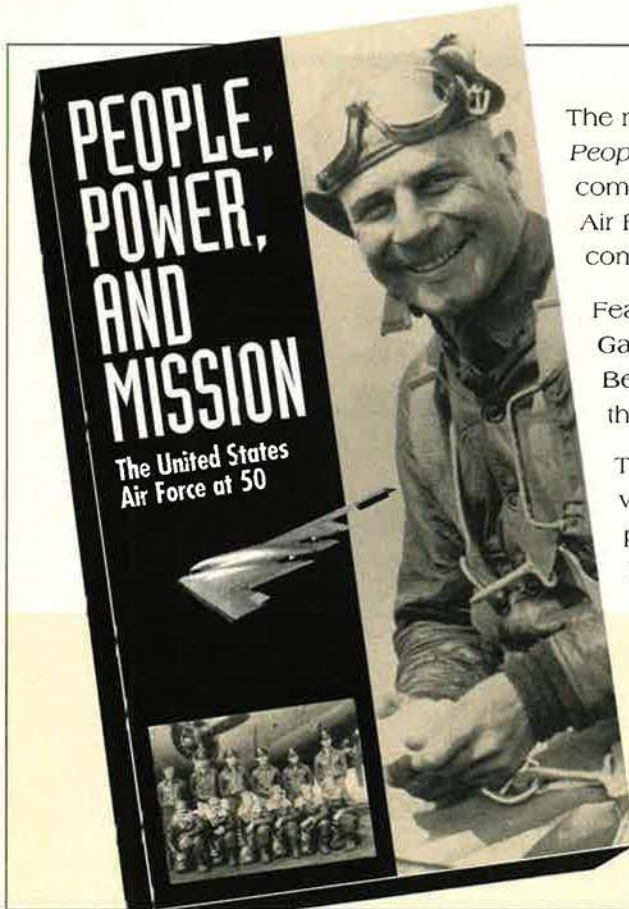


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Unit Reunions

A-37 Dragonfly. April 22-26, 1997, in Las Vegas, Nev. **Contact:** Ollie Maier, 306 Village West Dr., San Marcos, TX 78666. Phone: (512) 353-7432.

Aeromedical Evacuation Ass'n (1942-96) April 23-26, 1997, at the Showboat Hotel-Casino in Las Vegas, Nev. **Contact:** John H. Stephens, 3910 E. Palfrey Dr., San Antonio, TX 78223-3456.

Countermeasure Veterans. March 1997, in Orlando, Fla. **Contact:** Lt. Col. Arnold N. Martinsen, USAF (Ret.), 1 Coachlight Dr., Little Rock, AR 72227-6435. Phone: (501) 225-7254.

RF-101 Voodoo Units. June 19-21, 1997, in Reno, Nev. **Contact:** Lt. Col. Robert J. Beier, USAF (Ret.), 5205 Fenno Way, Reno, NV 89509. Phone: (702) 747-4839.

1st Fighter Squadron. February 14-17, 1997, at Tyndall AFB, Fla. **Contact:** Capt. Jim DeLeo, USAF, C Flight/CC 1st Fighter Squadron, Tyndall AFB, FL 32403. Phone: (904) 283-4327 or DSN 523-4327.

9th Air Force Ass'n (World War II to present). March 6-9, 1997, in Fort Walton Beach, Fla. **Contact:** Ray Lowman, 140 Baywind Dr., Niceville, FL 32578. Phone: (904) 897-6464.

Mail unit reunion notices well in advance of the event to "Unit Reunions," *Air Force Magazine*, 1501 Lee Highway, Arlington, VA 22209-1198. Please designate the unit holding the reunion, time, location, and a contact for more information.

19th Fighter Squadron. May 16-18, 1997, at Wright-Patterson AFB, Ohio. **Contact:** James G. Weir, 321 Kittanning Pike, Pittsburgh, PA 15215. Phone: (412) 963-8131.

59th Fighter Group, 339th Base Unit, Thomasville AAF, Ga. (1943-45). April 10-13, 1997, at the Holiday Inn in Thomasville, Ga. **Contact:** Col. Samuel A. Owens, USAF (Ret.), 125 Bayview Dr., Suite A, San Carlos, CA 94070-1672. Phone or fax: (415) 595-4344.

89th Attack Squadron, including the 8th and 90th Squadrons (World War II). April 30-May 4, 1997, at the Holiday Inn City Line in Philadelphia, Pa. **Contact:** Cass M. Simon, 500 N. Lemon St., Apt. A-13, Media, PA 19063-2333. Phone: (610) 566-5394.

388th Fighter-Bomber Wing. July 3-6, 1997, in Fargo, N. D. **Contact:** Maj. Gen. Darrol G. Schroeder, USAF (Ret.), 190 4th Ave., Davenport, ND 58021-0068. Phone: (701) 428-3369.

435th Fighter Squadron. February 26-28, 1997, at Holloman AFB, N. M. **Contacts:** Lt. Col. Frederick H. Zeitz, USAF, Major Byrne, USAF, or Lt. Col. Ed Hazlett, USAF, 1022 Fifth St., Holloman AFB, NM 88330-8039. Phone: (505) 475-7909 or DSN 867-7909.

839th/840th Engineer Aviation Battalions, Korea. Special Category Army with the Air Force (SCARWAF) welcome. July 10-12, 1997, at the Sheraton National Hotel in Arlington, Va. **Contact:** Don K. Tomajan, 1443 Avenida de Cortez, Pacific Palisades, CA 90272. Phone: (310) 459-4034. ■

AFA/AEF National Report

commissioned through its ROTC program in 1990. She also earned a master's degree from Gonzaga University in Spokane, Wash. Captain Callahan was participating in the Air Force intern program at Air Force headquarters in the Pentagon.

Captain Callahan is survived by her father, National Director and former National Vice President (North-east Region) James E. Callahan, her mother, Bonnie Callahan, and a sister, Jamie Callahan.

Contributions in Captain Callahan's memory may be made to the Aerospace Education Foundation, 1501 Lee Highway, Arlington, VA 22209-1198, for a scholarship in her name.

Have AFA/AEF News?

Contributions to "AFA/AEF National Report" should be sent to *Air Force Magazine*, 1501 Lee Highway, Arlington, VA 22209-1198. Phone: (703) 247-5828. Fax: (703) 247-5855. ■



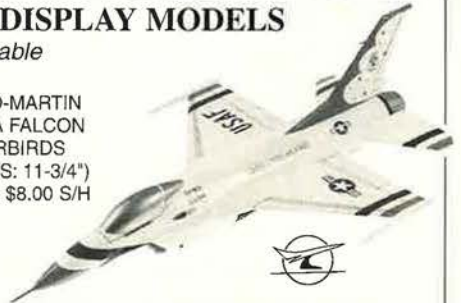
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Bulletin Board

Seeking information on **George S. McArdle**, stationed with the 1562d AAF Base Unit, in New Guinea, August 1944 to January 1946. **Contact:** Paul D. McArdle, 195 Jamestown Dr., Spring Lake, NC 28390.

Seeking the whereabouts of **Dale A. Struble** and **Robert Perry**, P-51 pilots with the 111th and 162d Tactical Reconnaissance Squadrons in Europe during World War II. **Contact:** W. R. Yarbrough, 7655 Le Grande Dr., Pensacola FL 32514.

Seeking the October 8, 1948, issue of the **Williams AFB, Ariz., newspaper**, featuring a story on Pilot Class 48-C's graduation. **Contact:** Maj. William F. Ricketts, Jr., USAF (Ret.), 11650 E. Calle Aurora, Tucson, AZ 85748-8319.

Seeking old and new USAF and AFRES squadron and wing patches. **Contact:** SSgt. Matthew S. Kernen, AFRES, 7021 Firsthorn Dr., Riverbank, CA 95367.

Seeking information about, photos of, and patches from the **3320th Air Base Group** and **461st Bomb Wing**, Amarillo AFB, Tex. Also seeking information on the **765th Radar Squadron**, Charleston AFB, S. C., 1966-69. **Contact:** Phillip R. Cobble, P. O. Box 2144, Peabody, MA 01960.

Seeking contact with pilots, planners, and other participants in the 1972 **Linebacker II** air campaign. **Contact:** A. Trades, KTPA, P. O. Box 26414, Tampa, FL 33623-6414.

If you need information on an individual, unit, or aircraft, or if you want to collect, donate, or trade USAF-related items, write to "Bulletin Board," Air Force Magazine, 1501 Lee Highway, Arlington, VA 22209-1198. Letters should be brief and type-written; we reserve the right to condense them as necessary. We cannot acknowledge receipt of letters. Unsigned letters, items or services for sale or otherwise intended to bring in money, and photographs will not be used or returned.—THE EDITORS

Seeking information on **Lt. Neill S. Walker**, who served with the 309th Fighter Squadron, 31st Fighter Group, during World War II and was killed December 15, 1943. **Contact:** George P. Feindell III, P. O. Box 12121, Rock Hill, SC 29731-2121.

Seeking contact with veterans of the **380th Bomb Squadron**, 310th Bomb Group, 12th Air Force, Ghisonaccia AB, France, 1943-45. **Contact:** Marc F. Casanova, "Gattone," 20240 Ghisonaccia, Corsica, France.

Seeking a **rate-of-climb indicator** (AN-5825-3) and an **airspeed indicator** (AN-5759-7) for a P-47-40RA Thunderbolt. **Contact:** Philip L. Munn, Jr., New England Air Museum, Bradley IAP, CT 06096.

Seeking contact with personnel from Hq. Squadron, **6160th ABW**, Itazuke, Japan, 1951-54. **Contact:** Nick Bakalis, 7227 39th Lane E., Sarasota, FL 34243.

Seeking contact with **Jack A. Horner**, a sergeant with the 2d Air Division, Horsham Saint Faith, UK, until 1945. **Contact:** L. S. Gasparro, 6 Liston Lane, Long Melford, Sudbury, Suffolk CO10 9LD, UK.

Seeking information on **374th Troop Carrier Squadron** and **98th Bomb Group** personnel aboard a C-54 that crashed near Johnston Island, southwest of Hawaii, January 5, 1948, and who were rescued by USS *Rendova*, CVE-114. **Contact:** Billy J. Evans, 6310 Kaybro St., Laurel, MD 20707-2621.

Seeking a copy of *Fighter Aces of the USA*, by Raymond F. Toliver and Trevor J. Constable, published in 1979. **Contact:** Lt. Col. W. H. Warren, USAF (Ret.), 1185 First St., Los Osos, CA 93402.

Seeking information about the **FB-111**. **Contact:** MSgt. Thomas W. Young, Sr., USAF (Ret.), 830 W. Amsden St., Denison, TX 75020-7929.

Seeking information on and photographs and markings of the **B-24G-1 #42-78347** from the 514th Bomb Squadron, 376th Bomb Group, that crashed December 25, 1944, in Austria. **Contact:** Matthew R. Riesmeyer, 12 Cloverleaf Lane, Manchester, MO 63011-4001.

Seeking memorabilia and anecdotes from **veterans of World War II** and USAF in the early 1950s. **Contact:** George E. Dively, Jr., P. O. Box 10743, Alexandria, VA 22310-0743.

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■ **Invited Speakers**

Recent long-term planning has generated new visions of air warfare requirements, weapon systems modernization, and technology developments that will shape the Air Force of tomorrow. Top military leaders will explore the impact of these efforts on the future of the Air Force. Planned speakers include Secretary of the Air Force **Shella E. Widnall** and **Gen. Ronald R. Fogleman**, Chief of Staff, USAF; **Gen. Joseph W. Ralston**, vice chairman, Joint Chiefs of Staff; **Gen. Richard E. Hawley**, commander, Air Combat Command; **Gen. Eugene E. Habiger**, commander in chief, US Strategic Command; **Gen. Walter Kross**, commander in chief, US Transportation Command, and com-

mander, Air Mobility Command; **Gen. Howell M. Estes III**, commander in chief, North American Aerospace Defense Command, commander in chief, US Space Command, and commander, Air Force Space Command; **Hon. Arthur L. Money**, assistant secretary of the Air Force (Acquisition); and **Lt. Gen. Kenneth A. Minihan**, director, National Security Agency. For more information, contact Jennifer Krause **703 / 247-5838** or Barbara Coffey **703 / 247-5805**, or call the AFA Fax Reply **800 / 232-3563** and follow the voice prompts. Your document number is #360.

■ **Golf Tournament**

AFA's Central Florida Chapter will sponsor a golf tournament on Walt

Disney World's Magnolia and Palm Courses on Wednesday, January 29. Contact Jim DeRose **407 / 356-5750**.

■ **Gala**

The chapter will sponsor its thirteenth annual black-tie Gala on Friday, January 31. Proceeds will benefit AFA's Aerospace Education Foundation and the Air Force Memorial Foundation as well as AFROTC scholarships and other aerospace education activities. Contact Marty Harris **407 / 356-4810**.

For hotel reservations, call the Buena Vista Palace Hotel **800 / 327-2990** or nearby Caribe Royal Resort Suites **800 / 823-8300**. Mention the AFA Symposium for special rate.

■ **Registration Form**

Advance registration closes Thursday, **January 23, 1997**. No refunds can be made for cancellations after this date.

Mail this form to:

Air Force Association
Attn.: Jennifer Krause
1501 Lee Highway
Arlington VA 22209-1198

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1997 Air Force Association National Symposium

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Pieces of History

Photography by Paul Kennedy

A New, Blue Suit



Though the US Air Force became an independent service in 1947, it wasn't until 1949 that its own blue uniform was ready to be issued. In the meantime, some airmen were reduced to adding the new Air Force patches to their old Army uniforms (top left) until they could get the newly designed USAF apparel. Over the years, the uniform has gone through

many changes, tracking style, mission needs, and new fabrics, not to mention the service's integration of women into more occupational specialties. Insignias have come and gone, including a brief and controversial removal of the "US" lapel pin. The blue suit may undergo repeated minor alterations, but it is always worn with pride.

Memorabilia courtesy Mike Keefe

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