

AUGUST 1997/S3

# AIR FORCE

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MAGAZINE

A photograph of an astronaut in a white spacesuit floating in space. The astronaut is positioned in the center-right of the frame, with their arms slightly out. To the left, the metallic structure of a spacecraft or space station is visible, extending from the top left towards the center. The background is a vast expanse of Earth's atmosphere, showing a dense layer of white clouds over a blue horizon. The lighting is bright, suggesting direct sunlight from the upper left.

**Space Almanac Issue**

**Projections From the QDR  
A Photo History of Uniforms**

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**LOCKHEED MARTIN**   
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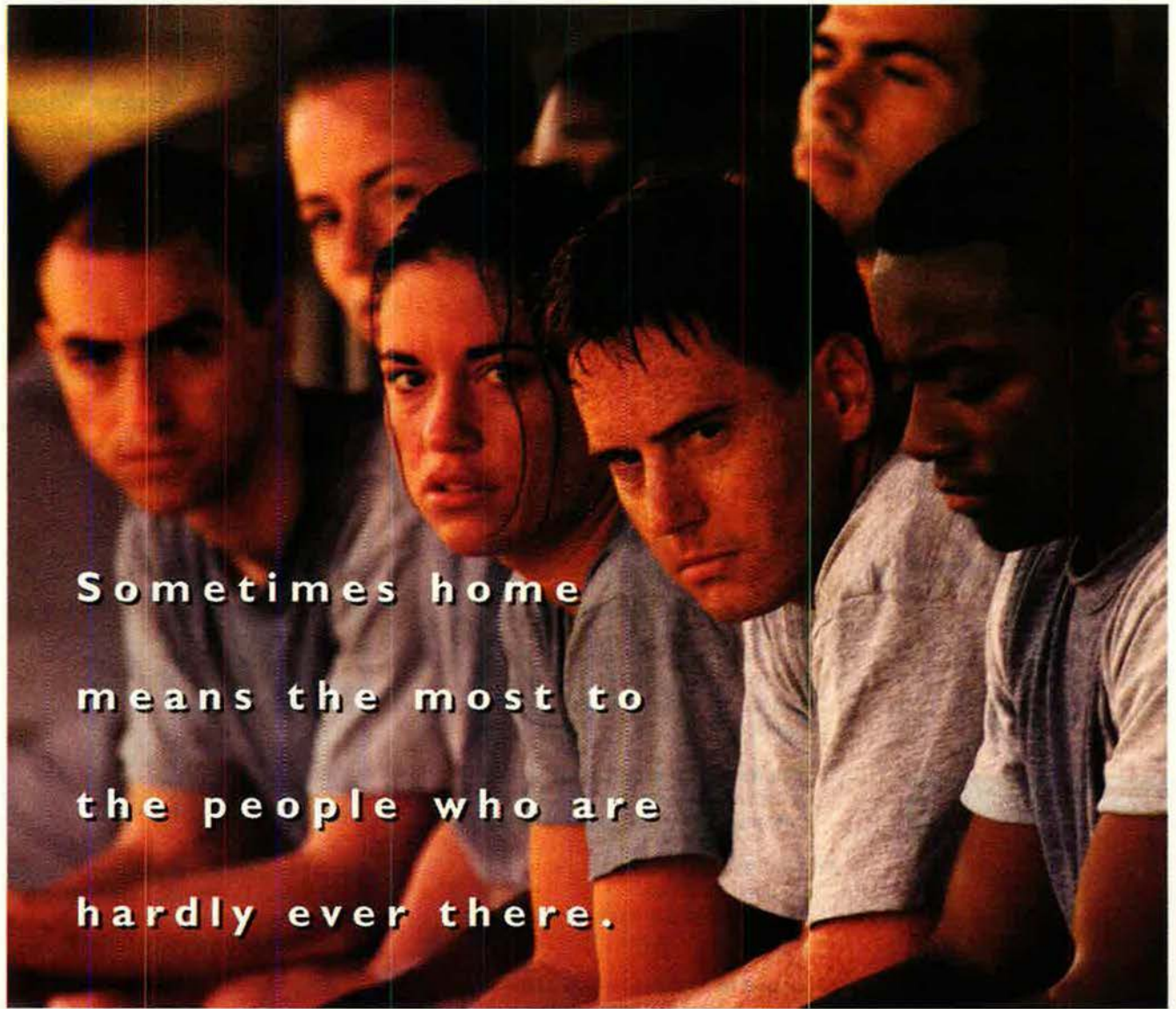


**About the cover:** Astronaut Mark Lee makes the first test flight of a miniature rocket backpack while on a 1994 *Discovery* mission. NASA photo by astronaut Carl Meade. "Space Almanac" begins on p. 18.



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By John T. Correll, Editor in Chief

## Scarlet Letters

**M**UCH of the news media—abetted by a host of political figures and activists—succeeded in making the Air Force look ridiculous in what was depicted as the “adultery” issue.

At the center of the story was Lt. Kelly Flinn, the Air Force’s first female B-52 copilot, who faced inter-related charges of adultery with the husband of an enlisted woman, lying under oath, disobeying a direct order, and fraternization in an earlier affair with an enlisted man.

The Air Force declined at first to discuss specifics of the case publicly because a court-martial was impending. In the meantime, Flinn went to the national news media and got a sympathetic reception. The coverage focused on the adultery aspect and said little about the more important charges. Flinn’s conduct was presented as “an affair of the heart.”

There was even a “Kelly Flinn Legal Defense Fund Home Page” on the Internet. (Click here for “I want to help Kelly.” Click here for “I want to send Kelly e-mail.”) Members of Congress and others rushed forward to stand by her side. She also fared quite well in public opinion polls.

The case continued to headline the national news, and on May 29, Flinn left the Air Force with a general discharge in lieu of court-martial. A week later, it was disclosed that Gen. Joseph W. Ralston, the leading contender for Chairman of the Joint Chiefs of Staff, had had an adulterous affair 13 years previously.

The uproar from Flinn supporters was overwhelming. They professed to see no difference in the two cases despite the charges against Flinn. On June 9, Ralston withdrew from consideration.

That was not the end of it, though. The myth has taken root that the Air Force prosecutes adultery alone, that it unfairly singles out women for prosecution, and that Kelly Flinn was treated badly.

Adultery by itself is not a violation of the Uniform Code of Military Justice. It is prosecuted only when “the conduct of the accused was to the

prejudice of good order and discipline of the armed forces or was of a nature to bring discredit upon the armed forces.”

It is further specified that, under Article 134 of the Code, “almost any irregular or improper act on the part of a member of the military service could be regarded as prejudicial [to good order and discipline] in some

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indirect or remote sense; however, this article does not include those distant effects. It is confined to cases in which the prejudice is reasonably direct and palpable.”

In the Air Force last year, there were 67 court-martial cases involving adultery. Sixty of those accused were men. Seven were women. Short of willful misunderstanding, it is difficult to perceive that the Air Force is enforcing some puritanical code of sexual behavior or that there has been bias against women.

In a signed column in *Newsweek* June 16, Kelly Flinn claimed that she was the victim of a “double standard” in the matter of “consensual sex” with a civilian soccer coach, Marc Zigo—she did not mention any of the other charges—and said that no one in her organization at Minot AFB, N. D., attempted to talk with her before lowering the boom.

In actuality, Flinn had at least two

official warnings. In August 1996, she received a complaint on behalf of Amn. Gayla Zigo, with whose husband Flinn was having the affair. It was delivered to Flinn by Airman Zigo’s first sergeant. In December, Flinn’s commander gave her a direct order to stay away from Marc Zigo. She chose to disobey the order and took Zigo home with her at Christmas to meet her parents.

As *Newsweek* acknowledged, “The base was buzzing with gossip about her ill-concealed adultery with the husband of an enlisted woman. (Flinn had begun picking up Zigo from work every night at the rec center.)”

Flinn minimizes the disparity of her own rank and Airman Zigo’s because they were in different units. Barbara Lerner was more to the point in the *Wall Street Journal*, noting that “Lieutenant Flinn’s rank gave her the power to command her lover’s wife to salute whenever their paths crossed, as they inevitably would” at Minot.

It does no one any good to misconstrue what happened or to fabricate myths about it.

This was not the equivalent of an office romance gone wrong, as some of Flinn’s supporters would have us believe. Nor was it just an instance of adultery. Surely it does not take too much imagination to see that Air Force officers cannot be allowed to disobey orders, lie in sworn statements, or undercut military order and discipline.

Selection of the Flinn case as a feminist issue is insulting, not only to the Air Force but also to Air Force women who take their responsibilities seriously and whose service is a credit to themselves and to the force.

In the long run, misrepresenting the Kelly Flinn affair does not even work to the advantage of the cause advocates who have made it a rallying point, because it does not add up to much unless the facts are manipulated and sensationalized. It speaks for itself that commentators and activists resort to precisely such tactics to keep the issue alive. ■

## Wins and Losses in May

Your May issue is excellent as usual. But . . . on p. 164 in the caption for the KC-97 photo you write, "Note the O before the serial number, which stands for 'Obsolete.'" I don't think so. Back in the 1960s, as I observed this digit being added to the tails of my squadron's aircraft, I was told it was a zero and meant the airplanes had passed their 10th birthday. It was pointed out that a C-54 parked on the ramp nearby had a two-zero prefix on its tail because it was more than 20 years old. I'll bet the latter explanation is correct.

By the way, . . . the serial number of that aircraft would be 52-918, meaning it was the 918th aircraft of all types authorized for construction in the Fiscal 1952 budget.

TSgt. John R. Radloff,  
USAF (Ret.)  
Rochester, N. Y.

■ *Reader Radloff, as well as Lt. Col. John W. Darr, USAF (Ret.), and MSgt. David W. Menard, USAF (Ret.), are correct.*—THE EDITORS

For many years I have learned from, been stimulated by, and thoroughly enjoyed your editorials. Thank you for the skill, insight, and mature perspective you bring to the editorial page. Voices of reasoned advocacy are hard to find. . . .

I reluctantly add a note of criticism to the accolades: On p. 35 of the May issue, a chart is labeled "USAF Total Force" but nowhere provides such data. The categories show Air Force active duty, which is totaled on a line which reads "Total, Air Force military" and the number "381,100." The correct total military should be 644,916—the sum of active duty, Guard, and Reserve.

Most readers tire of the Guard and Reserve always crying, "You forgot me," but imagine how tired the Guard and Reserve get of having to whine like this. . . . If [the Air Force] were like other services, and did not claim a triune integrated force consisting of all our components, it would be more understandable. As it is, this is

sad evidence of how far we still have to go to achieve that "common bond" among airmen which "Global Engagement, a Vision for the 21st Century Air Force," stated our goal to be.

Brig. Gen. Morton F. Harvey,  
USAF  
Fairfax Station, Va.

[In the] Almanac issue . . . p. 80, writing about and showing F-84s and F-4s—I flew the F-84, the F-84F, and the F-4C, D, and E. Of those, the F-84E (and other straight wing versions) did not have an in-flight refueling capability, at least not any of those I ever saw—and your picture is of E or G model F-84s. [On] pp. 101 and 164, writing about and showing F-104s, you call them one of USAF's sharpest daggers. OK, but those you show, and all other USAF F-104s that flew around Europe, were from Tactical Air Command's 479th Tactical Fighter Wing (George AFB, Calif.), which spent a lot of TDY time in Spain (Moron AB) and a fair bit in Germany. USAF never owned any F-104s, although 10 of our NATO allies had them.

Col. Morton C. Mumma III,  
USAF (Ret.)  
Fredericksburg, Va.

■ *Reader Mumma is mistaken; some straight wing F-84s were air refuelable. He's right about the F-104s.*—THE EDITORS

As always, the annual Almanac issue is a trove of invaluable resource material. . . . I draw your attention, however, to an omission in the sec-

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

tion "How the Air Force Is Organized" on p. 30.

The objective wing typically contains four, rather than three, group-level organizations. Not listed in your description is the Medical Group, which, although often the smallest group on a base, certainly plays a key role in the operational and support missions of the wing. . . .

We who serve in the Air Force Medical Service take great pride in our professionalism and role in supporting the USAF vision and mission. Our inclusion in descriptions of the Air Force organizational framework is necessary and important.

Maj. (Dr.) Brian D. Jarvis,  
USAF  
Dover AFB, Del.

I have some concerns with the display of wings and badges [*in the May issue, pp. 57 and 58*]. While the staff of *Air Force Magazine* went to some outstanding efforts to compile the tremendous amount of information contained in this issue, we wish you would have included the Air Traffic Control occupational badge in the issue. Given the note at the bottom of the page acknowledging the badge was to be reinstated on May 1, and the fact it was the May issue, it would have seemed more appropriate to the thousands of USAF air traffic controllers that their badge be pictured. We trust there are plans to include our badge in the next Almanac issue.

SSgt. J. Scott Cadigan,  
USAF  
Andrew AFB, Md.

You failed to show bombardier wings. Bombardiers flew many combat missions and lost many men. Without their special training, the bombs would never hit assigned targets.

John J. Fisher  
Mansfield, Ohio

■ *We feature only current wings and badges in the annual Almanac issue.*—THE EDITORS

I found your Almanac issue sadly lacking mention of one of the most

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lethal and potent force-multipliers in the Air Force inventory—the tactical air control party. While the aircraft deliver the weapons to the battlefield, more than 33 percent of the battlefield effects are controlled by Air Force Terminal Attack Control—qualified personnel stationed with and attached to Army maneuver units. . . .

They contribute far more to war-fighting than other Air Force agencies that were prominently mentioned in the May issue.

Maj. William R. Roberts,  
USAF  
Hinesville, Ga.

**Air War Vietnam**

I very much enjoyed your June feature, "Air War Vietnam" [p. 64]. [F]orgive me for pointing out a technical error in the text next to the center photo on p. 66. The last sentence makes reference to the airplane with the "signature triple tail" as a C-121, the military version of the Lockheed Constellation. However, the Constellation in your photograph bears the distinctive markings of one of four "Connies" operated by Flying Tiger Air Services, a subsidiary of Flying Tiger Line, the first all-cargo air service in the US. . . .

Maj. Scott Cummings,  
USAF  
McGuire AFB, N. J.

Your June article "Air War Vietnam" was great! I doubt I'll be the only reader to note the caption error on the lead photo of the F-105s and KC-135 on p. 65. The bombs being carried in this picture are identified in the caption as 2,000-pound bombs.

The fact of the matter is these are M-118 3,000-pound general-purpose bombs. We fondly referred to them as the "Instant, Esther Williams, Do-It-Yourself Pool Kit." I had the opportunity to drop several dozen of these weapons in North Vietnam in 1965-66. They were by far the weapon of choice for many targets, especially bridges. . . .

Lt. Col. Michael P. Cooper,  
USAF (Ret.)  
Goldsboro, N. C.

I have been a member of AFA for longer than I care to recall and thoroughly enjoy *Air Force Magazine*.

I [found] a discrepancy . . . on p. 73 of the June issue, regarding the Doumer Bridge.

The Doumer Bridge was first cut in July or August of 1967 (I forget the precise date). We had a concerted attack consisting of F-105s and F-4s specifically to put the bridge out of commission. I was in the 8th Wing

and a spare for the mission. Robin Olds led our contingent, which had a primary mission of bombing and a secondary mission of defending the "force" from MiGs. All the pilots were so glad to have a really important target (they were few and far between). . . .

Immediately after that mission, a large weather system moved over North Vietnam and obscured the ground for two weeks. Very few missions got to targets during those two weeks. When the weather cleared and we were back in the Hanoi area, the Doumer Bridge had been completely repaired.

Maj. Gen. Joseph D. Moore,  
USAF (Ret.)  
Vicksburg, Miss.

As an F-105 historian I very much enjoyed your June issue that included the photographic essay on the Vietnam Air War and the "Valor" article on p. 63 about the tanker crew saving two F-105s. However, the article is a bit misleading. The story implies the two F-105 pilots from Wabash Flight were covering another F-105 pilot downed on the date of the incident, May 3, 1967. They were actually continuing a search for an F-105 pilot, Capt. Joe Abbott, shot down by a MiG on April 30, 1967. Abbott had been searching for two other well-known F-105 crews—Lt. Col. Leo Thorsness and his Electronic Warfare Officer Capt. Harold Johnson and their wingman 1st Lt. Robert Abbott. All were shot down on April 30 and became POWs. Thorsness was one of two F-105 pilots awarded the Medal of Honor.

The article mentioned Col. Jack Broughton as the leader of Wabash Flight and refers to his book *Thud Ridge*. His unnamed wingman who made the flamed-out tanker hookup was Maj. Kenneth Bell, who also wrote a book, *100 Missions North*, in which he described the same episode. Your article added "the rest of the story."

There was an F-105 shot down on May 3, 1967, while the Wabash Flight pilots were struggling through their ordeal. Maj. Charles Vasiliades was rescued after ejecting from F-105D #62-4405 when it was hit by 37-mm fire over North Vietnam. Ironically, on p. 64 you have an excellent photograph of this same airplane.

Lt. Col. W. Howard Plunkett,  
USAF (Ret.)  
Albuquerque, N. M.

**Missing Faces**

I must take exception to one caption on p. 36 in the June issue about Capt. James Jabara becoming the

world's first jet ace on May 20, 1951.

I take this exception not as a means or way of degrading the captain's fine service and contributions to the Korean War. Nor do I imply that the notation is not warranted.

[But] there were several German aces of World War II who were qualified as jet aces before that war ended. Of these, here is a short list: Lt. Col. Heinz Baer, 16; Capt. Franz Schall, 14; Sgt. Hermann Buchner, 12; Lt. Gen. Adolf Galland, seven. This list shows a total of 23 pilots qualified as jet aces of World War II [each] with more than five certified kills to their credit. . . .

Randall L. Downey  
Mebane, N. C.

I read with great interest the article titled "Faces From the First 50 Years." I was looking for the faces of those whom I looked up to as role models during my career. After reading it I was disappointed.

The article failed to show the Air Force as a microcosm of American society and its citizens. I would have expected that the distinguished careers of General Felices, Lt. Gen. Leo Marquez, Brig. Gen. Ruben A. Cubero, General Negroni, Lt. Col. Donald S. Lopez (USAF ace), the FB-111 pilot shot down over Libya, and many others would have provided the opportunity for a more balanced article reflecting all the people of the Air Force who contributed over the past 50 years.

Lt. Col. Manuel F. Vega,  
USAF (Ret.)  
Burke, Va

**Air-, Ground-, and Seapower**

Your "Airpower and the Other Forces" [June 1997, p. 34] report on a panel discussion at Maxwell AFB, Ala., is all too typical of the self-congratulatory zealotry exhibited by many USAF leaders. First, history is rewritten by the pronouncement that "We are not . . . a seapower" in the traditional sense. That must be news to lots of graduates of our professional military educational system. Then the Army is insulted by characterizing it as unable to think beyond the first enemy troop coming across the horizon. Again, that must be a surprise to all the proponents of maneuver warfare. Finally, we belly-ache about a display in the Pentagon that fails to pay sufficient homage to the gods of airpower. Of course, Maxwell was the place where an earlier generation of airpower proponents announced that the bomber

would always get through (without fighter escorts). Thousands of airmen paid with their lives over Europe for that bit of bravado. Perhaps we should be less concerned with the hype and work harder to earn the trust and respect of future Joint commanders who might just have "grown up" driving a ship or tank and have the quaint idea that those tools have some application to the future defense needs of our nation.

Col. Michael R. Gallagher,  
USAF (Ret.)  
Sacramento, Calif.

■ *As our story noted, the colloquy was held in Washington, D. C., not Maxwell AFB, Ala.*—THE EDITORS

**Airpower Expeditionary Force**

I enjoyed "The Expeditionary Air Force Takes Shape" [June, p. 28]. The AEF concept is indeed an effective new use of airpower that will continue to develop over the coming years and into the next century. Brig. Gen. William R. Looney III is a pioneer who made the first "full scale" AEF (30 fighters and four KC-135R tankers) a huge success. I deployed with Looney to AEF II as maintenance officer. . . . One of your picture captions, however, was incorrect. It reads, "F-15Es have been a part of all four AEFs so far." F-15Es were not in Jordan as part of AEF II, nor were they deployed within Bahrain for AEF I. They have, however, been stalwarts in anchoring AEFs III and IV in Doha, Qatar. The precision bombing role in AEFs I and II was performed by LANTIRN-equipped, Block 40 F-16CG aircraft.

Maj. Robert L. Curtis,  
USAF  
Langley AFB, Va.

**McConnell's MiGs**

Shortly after receiving the March 1997 *Air Force Magazine* with that outstanding photograph of Joe McConnell at K-13 [p. 35], I happened to catch a rerun of the movie "The Joe McConnell Story" on television. Although the magazine story is about his shooting down three MiGs on his last mission, the movie version clearly indicates that he shot down only one. . . . Can you enlighten us as to which version is the truth?

Lt. Col. Ken Giles,  
USAF (Ret.)  
Santa Maria, Calif.

■ *McConnell shot down three MiGs on May 18, 1953, on two sorties (two plus one).*—THE EDITORS



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By Sarah Hood

## B-2 Passes Two Milestones

A B-2 stealth bomber assigned to the 509th Bomb Wing at Whiteman AFB, Mo., in late May carried out the longest B-2 global power mission and a first-of-its-kind precision munitions drop.

The record-setting B-2 flight began at Whiteman on May 23 at 11:00 p.m. and returned May 25 at 4:57 a.m. The nearly 30-hour mission took the bomber over RAF Mildenhall, UK, and then included simulated bomb runs over mid-America.

On May 29, USAF's new bomber reached a second milestone, when a B-2 dropped a Global Positioning System-Aided Munition-113 over the China Lake Range in California. It was the first pairing of the conventional 4,700-pound GAM-113 with the B-2.

Bombing accuracies during the training mission proved to be equal to those attained by the wing during its successful 2,000-pound GAM drops in October 1996. The bomber can carry up to eight of the GAM-113s.

## Air Force Begins QDR Changes

The Air Force has developed plans to meet manpower reduction requirements outlined in May's Quadrennial Defense Review report, according to senior USAF officials.

The service will work to maintain combat forces while cutting back mission-support and services functions. Top leaders said they hope to do this through gradual voluntary manpower reductions extending over the next six years.

QDR reductions from Fiscal 1998 through 2003 will include 26,900 active-duty military members, 700 Air Force Reserve Command and Air National Guard members, and 18,300 civilians, USAF said. The cuts come on top of reductions already programmed in the Fiscal 1998 budget—15,500 active-duty members, 2,900 Reserve Component personnel, and 13,800 civilians.

USAF Chief of Staff Gen. Ronald R. Fogleman said he will publicize the "plan of attack" so all members will see the means by which USAF

## Ralston Withdraws From JCS Consideration

Gen. Joseph W. Ralston, USAF, asked June 9 that his name be withdrawn from consideration for Chairman of the Joint Chiefs of Staff. Secretary of Defense William Cohen complied with Ralston's request, which followed a brief but intense controversy about the General's adulterous affair in the mid-1980s.

Cohen asked that the General stay on as vice chairman of the Joint Chiefs, and Ralston concurred. Cohen lauded Ralston's job performance in his current capacity as vice chairman of the Joint Chiefs of Staff and said Ralston is fully qualified to serve as Chairman.

Ralston was the leading candidate to replace Gen. John Shalikashvili, the retiring Chairman, until newspapers reported that Ralston, who separated from, but still married to, his first wife, had carried on an affair with a civilian CIA employee.

Cohen backed Ralston. Critics, charging "double standard," made invidious comparisons with the case of former USAF 1st Lt. Kelly Flinn, who left the Air Force with a general discharge. Flinn, the Air Force's first female bomber copilot, had been charged with adultery as well as other offenses—lying under oath, disobeying a direct order, and fraternization.

Ralston's supporters in Congress and in DoD attempted, without much apparent success, to highlight the fact that there were significant differences between the two cases. In the end, Ralston chose not to go forward in the prevailing political climate.

"General Ralston believes a prolonged fight for Senate confirmation would be harmful to his family and a distraction from other serious national security issues," Cohen explained.

The Secretary added he would continue his review of other candidates for the post of Chairman in the weeks ahead.

Ralston said the decision was "solely" his and made with a "sense of regret." "The regret is not for me personally because I never sought the office and have been, and continue to be, fully engaged in my current job as vice chairman. My regret is that the public discussion surrounding my potential nomination blurred the facts in a number of recent cases and gave the appearance of a double standard regarding military justice."

Ralston does not believe there is a double standard and is hopeful that review panels recently announced by Secretary Cohen will succeed in reaffirming public confidence in military judicial procedures.

hopes to make the "smartest possible" resource decisions.

The goal is to continue modernization, sustain readiness, and preserve forces needed to execute missions.

Fogleman emphasized that great care must be taken to avoid "hollowing out" the forces by reducing workload as manpower is reduced. He added that the Air Force plans "to meet the workload in designated support functions by outsourcing to the private sector where it makes sense and gains efficiencies."

The Air Force will spread its cuts and adjustments in the number of military members and civilians over the next six years, once Congress enacts legislation based on the QDR, according to the Chief of Staff.

Over the past nine years, the Air Force has reduced its strength by 227,000 military members and 87,000 civilians. Fogleman noted that the use of voluntary attrition programs and incentives has somewhat mitigated the impact of the military strength reduction. Some 95 percent of those personnel losses were voluntary. The Air Force also has had success with voluntary separation programs to minimize forced civilian losses.

The plan is to use incentive programs to encourage voluntary separations for the upcoming reductions, said Fogleman.

The Air Force has already sought Congressional approval to continue all voluntary separation incentives for military members and civilians through

the drawdown period. The Chief of Staff said senior leaders would continue to keep the force informed on drawdown actions as the details are available.

### AMC Beefs Up En Route System

The Air Force's Air Mobility Command is beefing up its worldwide en route system.

Gen. Walter Kross, AMC commander, last fall designated 1997 as the Year of the En Route System. Since then, the command has allocated more than \$200 million to improvements in the system vital to the command's day-to-day operations worldwide.

Improved passenger terminals have been funded at seven of the command's overseas locations, and design work is underway at five others. More than \$18 million will be spent on terminals.

More than \$2 million in freight terminal improvements are in the works at Osan AB, Korea, and Yokota and Kadena ABs in Japan, while upgrades at Osan, Hickam AFB, Hawaii, Andersen AFB, Guam, and Eielson AFB, Alaska, are in the design stage.

Also, AMC is spending nearly \$1 million to upgrade forward supply locations at Kadena and Andersen. Another \$1.3 has been tabbed for control centers at Osan and Ramstein AB, Germany.

Design work is being completed for control center facilities at Yokota and Aviano AB, Italy.

### House Preserves B-2 Option

A resumption of B-2 bomber production remained a live possibility

## Military Voting Participation Tops General Population

While less than half of eligible voters cast ballots in the last general election, almost two-thirds of military voters went to the polls.

Results of the Federal Voting Assistance Program's 1996 post-election survey reflect a military participation rate of 64 percent in last year's Presidential election. This was 15 percent higher than the general public's participation.

DoD voting officials conclude that aggressive voting assistance programs were a factor in votes cast. State and local governments also lent support to military absentee balloting at a time when the general public's participation declined to 49 percent from 55 percent in 1992.

The percentage of voting participation by service during the last three Presidential elections are:

Year	Army	Navy	USAF	USMC	Coast Guard	Total
1996	61	63	69	67	71	64
1992	60	69	75	66	75	67
1988	56	74	60	65	67	64

well into the summer as Congress began its last round of work on the Fiscal 1998 defense budget. The stealth aircraft was surviving despite Clinton Administration efforts to kill it once and for all.

The House on June 25 passed a defense authorization bill containing \$331 million to maintain the B-2's industrial base and preserve an option to build nine more of the advanced aircraft. The House bill, if enacted, would eliminate current restrictions that have capped the program at 21 aircraft and \$44.6 billion.

Without the new money, the B-2 line probably will cease all operations late next year.

The fate of the B-2 program probably will not be settled until fall, when

House and Senate defense negotiators work out a compromise in their bills. The B-2 will be a major issue because the Senate, unlike the House, opposes further B-2 production.

The Senate Armed Services Committee not only refused to provide new B-2 money but also added a provision prohibiting the use of new funds to procure any additional B-2s or to maintain any part of the bomber industrial base solely for the purpose of preserving an option to buy more bombers.

According to the B-2 contractor, Northrop Grumman, nine new B-2s would cost about \$9 billion. The Congressional Budget Office put the figure at \$12 billion for production and \$27 billion over two decades if operation and support costs are factored in.

Two DoD bomber studies over the past two years determined that the US could execute the national military strategy without a larger B-2 fleet. The Air Force also has opposed further B-2 production, pleading that it has higher priorities and that the stealth bomber add-on is "unaffordable."

However, the House Armed Services Committee stated that DoD's reviews reached wrong conclusions about the bomber, adding that it "rejects this 'unaffordable' assertion and strongly believes the United States can afford additional B-2s. . . . Twenty-one B-2s does not constitute an adequate force level to deal with the many likely contingencies and crises over the next 30 to 40 years."

### SOF in Congo Evacuation

An Air Force Special Operations Command MC-130H delivered a US military assessment team and evacuated 56 people from Brazzaville, as

USAF photo by A1C Sonny Coltrre



Members of the 437th Civil Engineer Squadron at Charleston AFB, S.C., showed their expertise by constructing this home in only three days as part of a "blitz build" project with the local Habitat for Humanity group.

## CMSAF Harlow Dies



Donald L. Harlow, the second Chief Master Sergeant of the Air Force, died in Arlington, Va., on June 18. He was 76.

Harlow served as the Air Force's top enlisted person from August 1, 1969, until his retirement on September 30, 1971. A veteran of World War II and the Korean and Vietnam Wars, he was the only enlisted person to receive the Order of the Sword.

Born in Waterville, Me., Harlow enlisted in the Army Air Corps in August 1942 and served as an armament and gunnery instructor at Eagle Pass, Tex. He cross-trained into personnel in 1945 then left active duty in February 1946. He was recalled to Air Force active duty in 1950 during the Korean War and remained on active duty until his retirement.

"The Air Force has lost one of its great leaders—a pioneer in Air Force history who made significant contributions to our service and our country," said CMSAF Eric W. Benken. "Don Harlow was a sergeant major in the Air Force vice chief of staff's office when the first CMSAF was selected. He began supporting this office from day one and never stopped. When he left active duty in 1971, he continued supporting the Air Force in every way."

During the Vietnam War, Harlow focused his attention where he thought it was most needed—on the young troops and their problems. He listened to them all—assignment concerns, promotion problems—took good notes, and reported his findings to the Chief of Staff.

Retiring in 1971, Harlow headed to Capitol Hill with his knowledge of the Air Force system. As the senior lobbyist for the Air Force Sergeants Association, he took his messages to the House of Representatives and the Senate and, as he had been in the Air Force, became well-known for getting results. As a lobbyist, his cause was to sell Congress on the idea that pay and benefits of enlisted men and women must be improved.

fighting raged in the Republic of Congo's capital June 10.

The aircraft, from the 7th Special Operations Squadron, RAF Mildenhall, UK, inserted a US European Command survey and assessment team and support vehicles. The team, consisting of communications, logistics, security, and other specialists, conducted infrastructure assessments and evaluated the need for further European Command support to the US Embassy in Brazzaville.

The AFSOC aircraft left Brazzaville's airport with 30 Americans and 26 third-country nationals. Evacuees were taken to Libreville, Gabon, where US State Department officials met them.

Fighting in Congo began a week before the evacuation when government troops clashed with supporters of former President Denis Sassou-Nguesso.

The deployment marks the second time in two months members of the 352d Special Operations Group have deployed to Africa to help US citizens caught in the middle of civil war. In April, about 200 group members deployed to Libreville to support a pos-

sible noncombatant evacuation from Kinshasa, Zaire, but were not called to respond.

### B-1B Crew Tests New Weapon

A crew from the US Air Force Weapons School's B-1B division at Ellsworth AFB, S. D., dropped a new antiarmor cluster bomb at Eglin AFB, Fla., on May 28.

The CBU-97 is the first multiple-kills-per-pass smart antiarmor weapon in production, said Col. Bill Wise, director of the Area Attack Systems Program Office at Eglin. Wise said it represents a significant capability for combat forces.

Although the CBU-97 was designed to interface with a wide variety of US and NATO aircraft, this was the first time one was dropped from a B-1B.

### Berlin Airlift Vets Try C-17

Veterans of the Berlin Airlift (Operation Vittles) recently found themselves reliving memories of that time on an orientation flight aboard an AMC C-17 Globemaster III.

From June 1948 until September 1949, more than 2.3 million tons of supplies were transported to belea-

guered citizens of Berlin cut off by a Soviet blockade.

Hank Moen observed that he flew C-82s, which were new to airlift back then. Another veteran, retired Lt. Col. Phil Stowell, a C-54 pilot during the airlift, said, "I really admired the German people, the way they stood behind us and cooperated and appreciated what we were doing." He added, "It was great how they would work to unload those airplanes—10 tons in 10 minutes, just putting it off."

Retired Col. Gail Halvorsen was known as the "Candy Bomber" for making airdrops of candy to the children in Berlin. An encounter with some kids at the end of the Tempelhof runway gave Halvorsen the idea.

"They hadn't had any gum or candy for months," Halvorsen said. "I only had two sticks [of gum]. It didn't go very far, and I told them the next time I came in I would drop them some."

Halvorsen then started getting rations from his flying buddies. When word spread to the US, the American public responded and more than 23 tons of candy poured in.

As for their inaugural ride on the C-17, these former pilots were impressed by the Air Force's newest airlifter and its capabilities. "We could have done the job with 25 airplanes instead of 225," said Halvorsen. "I like the air-conditioning in the cockpit—we had to open windows."

### New Trainer Is a "Texan"

The Air Force and Navy announced the official name of the Joint Primary Aircraft Training System aircraft—the T-6A Texan II—on June 2.

Gen. Lloyd "Fig" Newton, commander of Air Education and Training Command at Randolph AFB, Tex., and Vice Adm. Patricia Tracey, chief of Naval Education and Training, NAS Pensacola, Fla., made the formal introduction at Randolph.

The T-6A Texan II, the military version of the Raytheon Mk. II, replaces the Air Force's aging T-37 and the Navy's T-34 as the Joint primary trainer for both services. Initial deliveries to the Air Force are scheduled to begin in spring 1999.

### Reserve Dental Plan to Open

Starting October 1, some 889,000 members of the Selected Reserve, including about 72,000 members of Air Force Reserve Command, will have the option of signing up for a voluntary government-sponsored dental program. Family members are not eligible for the dental plan.

The new program will have cost-



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**Base Closures Opposed**

Both the House and Senate defense committees rejected calls for another round of base closures in their versions of the \$268 billion defense authorization bill for Fiscal 1998. Defense Secretary William S. Cohen, who is banking on base closures to produce funds for modernization, said DoD can reduce infrastructure. According to a Pentagon spokesman, defense infrastructure has been reduced by only 21 percent compared to a reduction in force structure of 36 percent.

Some \$1.4 billion can be saved in every Base Realignment and Closure round, the Pentagon said. That's money needed to ensure the services have the kind of modern, capable force projected in the Quadrennial Defense Review for 2005 and beyond.

The QDR proposed two additional BRAC rounds. Key members of Congress, however, have refused to cooperate unless and until the Clinton Administration changes a controversial stance on two Air Logistics Cen-

ters—at Kelly AFB, Tex., and McClellan AFB, Calif.—which were targeted for closure in the 1995 BRAC round. Clinton, in an election-year ploy, essentially permitted workers at these bases to continue their defense work rather than see the work shift to other Air Force depots in Utah, Oklahoma, and Georgia.

**Mixed-Gender Training**

In response to Congressional pressure, Defense Secretary Cohen has appointed a panel to review gender-integrated training and related issues in the services. The panel is one of three initiatives announced by Cohen on June 7 to maintain the effectiveness and readiness of US military forces and to ensure that policies governing good order and discipline are clear and fair. Cohen's announcement comes on the heels of several highly publicized sexual misconduct cases.

"We must address these issues in a thorough, well-informed way that has credibility with the military, the Congress, and the public," said

Cohen. He cited recent perceptions that the Defense Department's system is inconsistent and damages troop morale as the driving force behind his actions. The goal is to assure training remains "superb" and that the rules are well understood at all levels of command.

An independent panel of private citizens, headed by former Sen. Nancy Kassebaum Baker, will report its findings in six months. Along the same lines is a provision in the authorization bill that would create a panel of outside experts to review how well the services' basic-training programs prepare recruits. One focus would be whether each service's basic training should be gender-segregated.

Following Cohen's announcement of his plans to review gender-integrated training, Army, Navy, and Air Force officials recently told Congressional leaders that service members must train as they would fight—together. The Marine Corps training is already segregated. Cohen has the full support of the Joint Chiefs of Staff for these initiatives. ■

**Aerospace World**

share premiums, with reservists paying less than \$25 per month for services. Unit AFRC Reservists will have premiums deducted from their drill pay.

Services will include basic care and treatment; diagnostic, preventive, and restorative services; and emergency oral examinations. Treatment will have a \$1,000 annual cap.

Many reservists were unfit for mobilization during the Persian Gulf War because of poor dental health, which delayed deployment of needed troops. As a result, Congress in the Fiscal 1996 Defense Authorization Act directed the Defense Department to set up a low-cost dental plan for reservists. The department asked for and received authority to delay implementation of the plan until October 1.

The government expects to select by early July a contractor that will provide a network of dentists. Eligible reservists are to hear from the contractor by September 1. Reservists should ensure their addresses are correct in the Defense Enrollment/Eligibility Reporting System because the contractor will use addresses in the DEERS database to notify them.

Under proposed rules, if patients use a dentist within the dental net-

work, the dentist cannot bill them for any charges not paid by the contractor. Patients who use dentists outside the network could see charges in excess of the maximum amount allowed by the contractor.

**McChord Gains "Deep Freeze"**

Starting this month, McChord AFB, Wash., assumed responsibility for Operation Deep Freeze. The operation is a Presidentially mandated mission to support the National Science Foundation's experiments at McMurdo Station, Antarctica.

The operation entails three trips a year to haul to the frozen continent everything the science station needs to survive—from personnel, food, and medicine to heaters and scientific equipment. Travis AFB, Calif., had the mission for the past 35 years but surrendered it after losing its C-141 fleet.

Lt. Col. Ray Phillips, head of 7th Airlift Squadron and commander of McChord's Deep Freeze mission, acknowledged that Deep Freeze is a "demanding mission," but added, "We have the personnel who can step up to the plate and execute it safely."

Phillips flew Deep Freeze missions previously. He was also handpicked, along with Capt. Paul Double, 8th

Airlift Squadron, for an emergency medical mission to McMurdo Station last May to extract a scientist who was suffering from heart failure.

Regular Deep Freeze missions are scheduled around Antarctica's climate for times when there is a significant amount of daylight and temperatures are still cold enough to make the ice hard.

Once they land at McMurdo Station, McChord crews will have to use heaters to keep the hydraulics in the C-141 landing gears from freezing and use extreme weather gear to keep themselves warm. After a quick unloading and refueling, the crews will return to New Zealand and then to McChord.

**Satellite Gets Solar-Cycle Test**

MightySat I, a satellite carrying five Phillips Laboratory experiments, underwent a series of solar-cycle tests June 11 to 13 at Phillips' Aerospace Engineering Facility at Kirtland AFB, N. M.

The tests, which simulate the satellite as it moves from the shadow of the Earth into the sunlight and back again, are being used to check the power output of the spacecraft's solar cells.

The satellite is also undergoing a series of mission sequence tests to

simulate the spinning of the spacecraft in orbit and see how well its antennas can send and receive information.

The Air Force is conducting integration and testing of the spacecraft at Kirtland with the assistance of several contractors. The prime contractor for MightySat I, CTA Space Systems of McLean, Va., also provided the spacecraft bus. Jackson and Tull of Seabrook, Md., provided payload integration and test support, and the Aerospace Corp. of Los Angeles, Calif., contributed systems engineering assistance.

The Space and Missile Systems Center Test and Evaluation Directorate, also at Kirtland, will provide on-orbit operations after the satellite is launched.

MightySat I was slated to complete a five-day series of functional tests at Kirtland during the second week of July before being shipped to the Goddard Space Flight Center in Greenbelt, Md. The 135-pound satellite is expected to be launched into orbit aboard the space shuttle on STS-88 in July 1998 for a one-year journey.

#### Eglin Lab Copies Mother Nature

The Air Force is playing Mother Nature again after a three-year, \$75

million series of renovations at the McKinley Climatic Laboratory at Eglin AFB, Fla.

Eglin's most famous landmark reopened June 3 with a dedication ceremony. Present at the ceremony were a P-51 Mustang, the first aircraft tested in the chamber in 1947, and a C-130J, the first aircraft scheduled to be tested in the renovated chamber.

Originally constructed during the closing stages of World War II, the laboratory is the only one of its kind in the world. During its 50 years, the lab has frozen, fried, and abused more than 350 aircraft, 70 missile support systems, and approximately 2,000 pieces of equipment. It has also tested space-bound systems, such as the Apollo space capsule.

The lab was built with a 20-year life expectancy, which, before the renovations were started, had been exceeded by 27 years. Renovations included refurbishing the two largest chambers, replacing all electrical and fire protection systems, adding an additional air makeup system, and installing new refrigeration units.

#### USAF Revisits 1994 Accident

The Air Force on June 19 released results of a reinvestigation into the

three-year-old midair collision of an F-16D and a C-130E at Pope AFB, N. C.—a multifatality accident.

On March 23, 1994, the two Air Force aircraft collided just above the runway as the F-16 was landing. The F-16 pilot ejected and his fighter crashed into a staging area, killing 23 Army personnel and injuring more than 100 soldiers and civilians. The C-130 landed safely.

The original USAF accident investigation found there were multiple causes for the midair collision, most of which concerned the air traffic control system. Though it noted that the F-16 pilot did not "see and avoid" and stay "well clear" of the C-130, as required by regulation, the fault was mitigated by the pilot's statement that he could not see the C-130.

The DoD Inspector General reviewed the original report. The IG confirmed that faulty air traffic control was the prime cause of the accident but claimed that the Air Force failed to adequately inquire into the actions of the F-16 pilot. Thereupon, Secretary of the Air Force Sheila Widnall ordered a new look.

A new investigation team confirmed that the flight paths of the F-16 and the C-130 made it impossible for the F-16 pilot to see the

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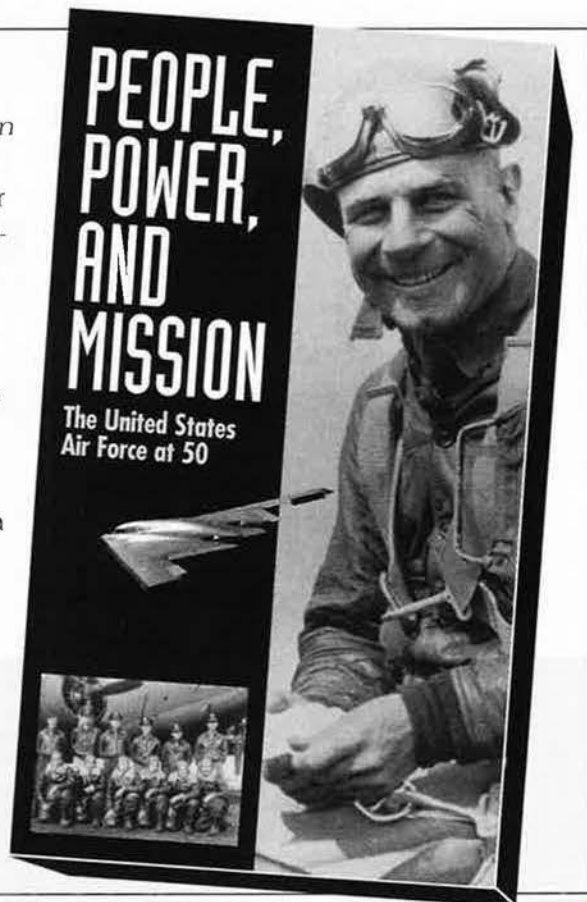
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## USAF Celebrates 50

The first Air Force Marathon in celebration of USAF's fiftieth anniversary is scheduled for September 20 at Wright-Patterson AFB, Ohio. All levels of marathoners, including those in wheelchairs, are invited to participate. Registration forms and other information on the 26.2-mile race are available through Marathon Central at (937) 656-0470/1 or on the Air Force Marathon web site (<http://www.afmarathon.wpafb.af.mil>). The registration fee for the run is \$30 before September 1 and \$35 thereafter. Completed forms, with payment and runner's signature, should be mailed to USAF Marathon, Building 70, 5215 Thurlow, Suite 2, Wright-Patterson AFB, OH 45433-5542.

The eighth annual FINA Dallas Air Show, celebrating the Air Force's golden anniversary, is set for September 6 and 7 at Dallas Love Field Airport and features more than 100 aircraft in the air and on the ground. Activities include wing walking, air acrobatics, the Air Force Academy's Wings of Blue parachute jumper cadets, and a host of hot air balloons. For more information call (214) 559-7136.

other aircraft except during a 12-second period after he initiated a simulated flameout maneuver. During those 12 seconds, the camouflage-painted C-130 was nearly undetectable against the forested terrain below.

The team found the F-16 pilot received confusing tower transmissions. After he heard the call, "C-130 traffic short final on the go," he had 17 to 20 seconds (excluding reaction time) to adjust to his flight path; immediately after this transmission, he was cleared to land.

However, the new investigation team also found that, after the confusing communications, the pilot did not ask the tower about the position of the other aircraft and did not stop flying the simulated flameout maneuver in order to look for the traffic.

The commander of 9th Air Force at Shaw AFB, S. C., will review the accident investigation report to determine whether any disciplinary, administrative, or other actions are appropriate.

## EF-111s End Northern Watch Stint

Air Force EF-111As at Incirlik AB, Turkey, departed the base for a final time June 24 after 2,091 days supporting Operation Northern Watch.

The 429th Electronic Combat Squadron from Cannon AFB, N. M., which has been involved with Operations Provide Comfort and Northern Watch since 1991, returned to Cannon where the Ravens will remain until March, when they will be formally retired from the inventory.

The first operational F-111 aircraft was delivered in October 1967 to Nellis AFB, Nev. The Air Force began the conversion to EF-111As in 1972.

During Desert Storm, all available Ravens were deployed to Middle East bases to support US and allied combat operations. More than 1,300 sorties were flown.

## USAF: Case Closed on Roswell

The Air Force on June 24 released its second report on a 1947 event that has become famous to UFO buffs as the "Roswell Incident."

The new report is entitled, "The Roswell Report: Case Closed." The other, "The Roswell Report: Fact vs. Fiction in the New Mexico Desert,"

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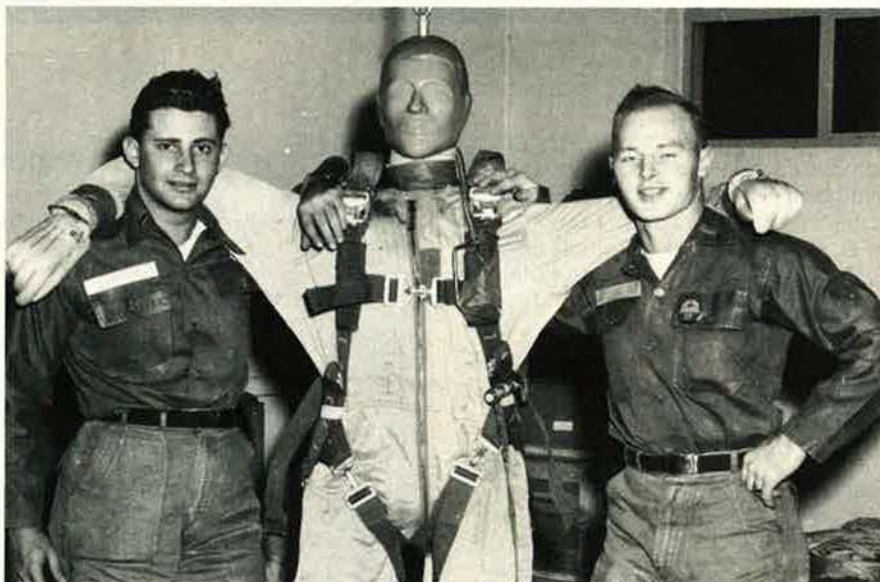
was issued in September 1994.

Taken together, the two reports go far to explain and demystify events that occurred in New Mexico 50 years ago. The key disclosure was that, during the 1940s and 1950s, the Air Force engaged in extensive high-altitude balloon experimentation, some of which involved using the balloons to carry and eject anthropomorphic dummies equipped with parachutes. This was done in order to determine the best way to return pilots or astronauts to Earth if they had to eject from high altitudes.

These experiments, as well as others described and explained in the report, including the 1947 crash of a balloon, correspond to many of the occurrences observed by local residents and later characterized as the Roswell Incident.

This latest report is noteworthy for the extensive background it provides on the scope of Air Force activities in the vicinity of Roswell, beginning in the mid-1940s and extending through the early 1960s.

"This is singularly the most exhaustive release of information on this subject," said Secretary Widnall. In 1994 the Air Force made all records on this subject publicly available, she said. Widnall added that the additional information will enlighten people



*The Air Force released several photos along with its latest report on the Roswell Incident. This one shows 1st Lts. Eugene M. Schwartz (left) and Raymond A. Madson with one of the dummies used in Project High Dive.*

about pioneer research and the "challenging and often heroic work of Air Force personnel during those early years."

The 230-page report can be obtained through the Government Printing Office World Wide Web site (<http://www.access.gpo.gov/index.html>) or by calling (202) 512-1800.

#### News Notes

■ One of the Air Force's 14 female fighter pilots died on May 27 when her A-10 fighter crashed during a training mission in Arizona. Capt. Amy Lynn Svoboda, 354th Fighter Squadron at Davis-Monthan AFB, Ariz., was participating in a two-aircraft mission in southwest Arizona when the crash

## Senior Staff Changes

**RETIREMENTS:** L/G Albert J. Edmonds, B/G Curtis H. Emery II, B/G Thomas O. Fleming, Jr., M/G James L. Hobson, Jr., B/G James D. Latham, Gen. John G. Lorber, M/G John M. McBroom, Jr., Gen. Thomas S. Moorman, Jr., L/G Everett H. Pratt, Jr., B/G Berwyn A. Reiter, M/G David A. Sawyer, L/G Edwin E. Tenoso, M/G Arthur S. Thomas.

**PROMOTION:** To be Lieutenant General: William J. Begert.

**CHANGES:** M/G (L/G selectee) William J. Begert, from Dir., Ops. and Log., Hq. USTRANSCOM, Scott AFB, Ill., to Vice Cmdr., Hq. USAFE, Ramstein AFB, Germany, replacing retired L/G Everett H. Pratt, Jr. . . . M/G Charles H. Coolidge, Jr., from Dir., Ops., Hq. AETC, Randolph AFB, Tex., to Dir., Ops. and Log., Hq. USTRANSCOM, Scott AFB, Ill., replacing M/G (L/G selectee) William J. Begert . . . Col. (B/G selectee) Richard W. Davis, from Cmdr., Wright Lab, Air Force Research Lab, AFMC, Wright-Patterson AFB, Ohio, to Ass't Dep. for Theater Missile Defense Prgms., BMDO, Washington, D. C., replacing retired B/G Curtis H. Emery II . . . Col. (B/G selectee) Thomas F. Gioconda, from Leg. Ass't to the Chairman, JCS, Washington D. C., to Principal Dep. Ass't Sec'y for Mil. Application, Dept. of Energy, Washington, D. C., replacing retiring M/G Eldon W. Joersz.

Col. (B/G selectee) James A. Hawkins, from C/S, White House Mil. Office, Washington, D. C., to Cmdr., 319th ARW, AMC, Grand Forks AFB, N. D., replacing B/G Kenneth W. Hess . . . M/G Michael V. Hayden, from Dir., Jt. Command and Control Warfare Ctr., and Cmdr., AIA, Kelly AFB, Tex., to DC/S, Hq. UN Command Korea, and DC/S, US Forces Korea, US Army Garrison, Yongsan, South Korea, replacing retiring M/G George W. Norwood . . . B/G Kenneth W. Hess, from Cmdr., 319th ARW, AMC, Grand Forks AFB, N. D., to Dep. Dir., Plans and Policy, Hq. PACOM, Camp Smith, Hawaii, replacing retired B/G Thomas O. Fleming, Jr. . . . B/G Leslie F. Kenne, from Dep. Dir., Jt. Strike Fighter Technology Prgm., Ass't Sec'y of the Air Force for

Acquisition, Arlington, Va., to Dir., Jt. Strike Fighter Technology Prgm., Ass't Sec'y of the Air Force for Acquisition, Arlington, Va.

M/G Richard C. Marr, from Cmdr., Air Mobility Warfare Ctr., Ft. Dix, N. J., to Dir., Ops., Hq. AETC, Randolph AFB, Tex., replacing M/G Charles H. Coolidge, Jr. . . . Col. (B/G selectee) Teddie M. McFarland, from Dep. for Aeronautical Sys., Dep. Directorate for Air Warfare, Directorate for Strategic and Tactical Sys., Under Sec'y of Defense for Acquisition, Washington D. C., to Vice Cmdr., ESC, AFMC, Hanscom AFB, Mass., replacing B/G Wilbert D. Pearson, Jr. . . . Col. (B/G selectee) Duncan J. McNabb, from Cmdr., 62d Airlift Wing, AMC, McChord AFB, Wash., to Cmdr., Tanker Airlift Control Ctr., AMC, Scott AFB, Ill., replacing B/G William Welser III . . . B/G James E. Miller, Jr., from Dir., Intel., Hq. USEUCOM, Stuttgart-Vaihingen, Germany, to Dir., Jt. Command and Control Warfare Ctr., and Cmdr., AIA, Kelly AFB, Tex., replacing M/G Michael V. Hayden.

Col. (B/G selectee) Gary L. Salisbury, from Dir., Jt. Transportation Corporate Information Mgmt. Ctr., USTRANSCOM, Scott AFB, Ill., to Dep. Dir., Engineering and Interoperability, DISA, Arlington, Va. . . . B/G Glen D. Shaffer, from Ass't Dep. Dir., Ops., NSA, Ft. Meade, Md., to Dir. Intel., Hq., USEUCOM, Stuttgart-Vaihingen, Germany, replacing B/G James E. Miller, Jr. . . . B/G Paul A. Weaver, Jr., from Dep. Dir., ANG, National Guard Bureau, Washington, D. C., to Dir., ANG, National Guard Bureau, Washington, D. C., replacing retiring M/G Donald W. Shepperd . . . B/G William Welser III, from Cmdr., Tanker Airlift Control Ctr., AMC, Scott AFB, Ill., to Cmdr., Air Mobility Warfare Ctr., AMC, Ft. Dix, N. J., replacing M/G Richard C. Marr.

**SENIOR EXECUTIVE SERVICE (SES) CHANGES:** Daniel E. Hastings, to Chief Scientist, Hq. USAF, Washington, D. C., replacing Edward A. Feigenbaum . . . James R. Speer, to Ass't Auditor General (Field Activities), Air Force Audit Agency, Washington, D. C.

occurred. The Air Force was still investigating the cause of the accident at press time.

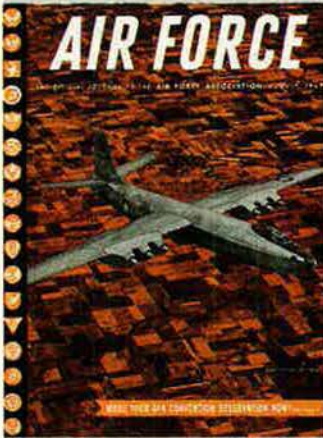
■ The Air Force said it recently completed two successful unarmed Minuteman III intercontinental ballistic missile launches from Vandenberg AFB, Calif. Randomly selected from F. E. Warren AFB, Wyo., and Malmstrom AFB, Mont., each ICBM covered 4,200 miles in 30 minutes, hitting predetermined targets at the Kwajalein Missile Range in the western Marshall Islands in the Pacific.

■ The California Air National Guard's 146th Airlift Wing earned the Spaatz Trophy for a third time and has been named the 1996 Air National Guard Outstanding Flying Unit. Named after the first Air Force Chief of Staff, Gen. Carl A. "Tooney" Spaatz, the Spaatz Trophy is awarded annually to the best ANG unit by the National Guard Association of the US. The outstanding flying unit honors were awarded by the Air Force Association.

■ The Air Force has earned four of 14 White House Closing the Circle Awards for 1997. The awards recognize people and groups for leadership in pollution prevention. USAF winners were Space and Missile Systems Center, Los Angeles AFB, Calif.; Air Combat Command, Langley AFB, Va.; Ogden Air Logistics Center, Hill AFB, Utah; and 375th Civil Engineering Squadron, Scott AFB, Ill.

■ Brig. Gen. Robert C. Hinson, director of operations at Air Force Space Command, and his wife, Karen, were selected for the 1997 Gen. and Mrs. Jerome F. O'Malley Award. The award is presented annually by the USAF Chief of Staff to recognize the best wing-commander-and-spouse

## 50 Years Ago in Air Force Magazine



### August 1947

**On the cover:** Martin's XB-48 bomber, recently test-flown at Middle River, Md., is billed as the "world's most powerful flying machine," its six jet engines generating a third more power than the world's largest conventionally powered aircraft, the XB-36.

■ AFA President Jimmy Doolittle announced that, effective this issue, the Association would take over the publishing of *Air Force Magazine*, which had previously been produced under contract. The wartime editor, James H. Straubel (later to become Executive Director), had been "called back" to head the magazine.

Among the aeronautical news items reported:

■ At Muroc, Calif., Col. Albert Boyd of Air Materiel Command, flying the Lockheed P-80R Shooting Star, set a new world's speed record at 623 mph.

■ The new "flying White House" is the Douglas DC-6 *Independence*, taking over from the famed DC-4 *Sacred Cow*. The aircraft was said to carry "all known airborne navigational equipment."

■ The first Boeing B-50, successor to the B-29, rolls off the production line at Seattle, Wash.

■ Ft. E. Warren, which had been a military post for 78 years, becomes an AAF base on June 1.

■ Total registered civil aircraft in the US and its territories now number more than 81,000. California leads the list with 8,456, followed by Texas with 7,789. The low number was from Vermont, with just 144 civil aircraft registered.

■ The National Air Races, to be held in Cleveland August 30–September 1, announced "125,000 (Minimum) cash prizes" and a program that would include "everything from supersonic jet speed dashes to quiet yet daring parachute jumps and helicopter demonstrations."

**AFA news:** Advertised daily room rates in Columbus, Ohio, during the AFA National Convention upcoming in September, range from \$3.50 for a single at the Seneca Hotel to \$16.50 for a room for six at the Neil House.

team in the service. Hinson was 45th Space Wing commander at the time.

■ Retired Navy Adm. William A. Owens was named winner of the 1997

AFCEA David Sarnoff Award. Owens is the president, chief operating officer, and vice chairman of the board of Science Applications International Corp. and was formerly vice chairman of the Joint Chiefs of Staff. The award, granted each year to an individual of international renown who has made lasting and significant contributions to world peace and security, lauded Owens for his JCS work.

■ Government life insurance coverage for reservists has changed, allowing them to keep coverage if they separate before a 20-year retirement or become eligible to draw retirement pay. According to the Department of Veterans Affairs, Reservists and Guard members can now generally apply for Veterans Group Life Insurance if they decide to separate before reaching a 20-year retirement. This expansion is among several insurance changes under the Veterans Benefits Improvement Act, signed into law October 9. ■

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0.05 g 60,000 miles

Geosynchronous Earth orbit 22,300 miles

Hard vacuum 1,000 miles

Medium Earth orbit begins 300 miles

0.95 g 100 miles

Low Earth orbit begins 60 miles

Astronaut wings awarded 50 miles

Limit for ramjet engines 28 miles

Limit for turbojet engines 20 miles

Stratosphere begins 10 miles

Earth



On the following pages appears a variety of information and statistical material about space—particularly military activity in space. This almanac was compiled by the staff of *Air Force Magazine*, with assistance and information from Dr. R. W. Sturdevant, Air Force Space Command History Office; Tina Thompson, editor of *TRW Space Log*; Phillip S. Clark, Molniya Space Consultancy, Whitton, UK; Theresa Foley; and Air Force Space Command Public Affairs Office.

# Space Almanac

Compiled by Tamar A. Mehuron, Associate Editor

Figures that appear in this section will not always agree because of different cutoff dates, rounding, or different methods of reporting. The information is intended to illustrate trends in space activity.

# Space Terms

**Aerospace.** A physical region made up of Earth's atmosphere and the space beyond.

**Aerospace plane.** A reusable spacecraft able to operate effectively in both the atmosphere and space. Also known as a "transatmospheric vehicle" or, more currently, "spaceplane."

**Apogee.** The point of greatest distance from Earth (or the moon, a planet, etc.) achieved by a body in elliptical orbit. Usually expressed as distance from Earth's surface.

**Atmosphere.** Earth's enveloping sphere of air.

**Boost phase.** Powered flight of a ballistic missile—*i.e.*, before the rocket burns out.

**Burn.** The process in which rocket engines consume fuel or other propellant.

**Circumterrestrial space.** "Inner space" or the atmospheric region that extends from 60 miles to about 50,000 miles from Earth's surface.

**Constellation.** A formation of satellites orbiting for a specific combined purpose.

**Deep space.** All space beyond the Earth-moon system, or from about 480,000 miles altitude outward.

**Eccentric orbit.** An extremely elongated elliptical orbit.

**Ecliptic plane.** The plane defined by the circle on the celestial sphere traced by the path of the sun.

**Elliptical orbit.** Any non-circular, closed spaceflight path.

**Exosphere.** The upper limits of Earth's atmosphere, ranging from about 300 miles altitude to about 2,000 miles altitude.

**Expendable launch vehicle (ELV).** A launch vehicle that cannot be reused after one flight.

**Ferret.** A satellite whose primary function is to gather electronic intelligence, such as microwave, radar, radio, and voice emissions.

**Geostationary Earth orbit.** A geosynchronous orbit with 0° inclination in which the spacecraft circles Earth 22,300 miles above the equator and appears from Earth to be standing still.

**Geosynchronous Earth orbit (GEO).** An orbit at 22,300 miles that is synchronized with Earth's rotation. If a satellite in GEO is not at 0° inclination, its ground path describes a figure eight as it travels around Earth.

**Geosynchronous transfer orbit (GTO).** An orbit that originates with the parking orbit and then reaches apogee at the GEO.

**Ground track.** An imaginary line on Earth's surface that traces the course of another imaginary line between Earth's center and an orbiting satellite.

**High Earth orbit (HEO).** Flight path above geosynchronous altitude (22,300 to 60,000 miles from Earth's surface).

**High-resolution imagery.** Detailed representations of actual objects that satellites produce electronically or optically on displays, film, or other visual devices.

**Inertial upper stage.** A two-stage solid-rocket motor used to propel heavy satellites into mission orbit.

**Ionosphere.** A region of electrically charged thin air layers that begins about 30 miles above Earth's atmosphere.

**Low Earth orbit (LEO).** Flight path between Earth's atmosphere and the bottom of the Van Allen belts, *i.e.*, from about 60 to 300 miles altitude.

**Magnetosphere.** A region dominated by Earth's magnetic field, which traps charged particles, including those in the Van Allen belts. It begins in the upper atmosphere, where it overlaps the ionosphere, and extends several thousand miles farther into space.

**Medium Earth orbit (MEO).** Flight path between LEO, which ends at about 300 miles altitude, and GEO, which is at an average altitude of 22,300 miles.

**Mesosphere.** A region of the atmosphere about 30 to 50 miles above Earth's surface.

**Orbital decay.** A condition in which spacecraft lose orbital altitude and orbital energy because of aerodynamic drag and other physical forces.

**Orbital inclination.** Angle of flight path in space relative to the equator of a planetary body. Equatorial paths are 0° for flights headed east, 180° for those headed west.

**Outer space.** Space that extends from about 50,000 miles above Earth's surface to a distance of about 480,000 miles.

**Parking orbit.** Flight path in which spacecraft go into LEO, circle the globe in a waiting posture, and then transfer payload to a final, higher orbit.

**Payload.** Any spacecraft's crew or cargo; the mission element supported by the spacecraft.

**Perigee.** The point of minimum altitude above Earth (or the moon, a planet, etc.) maintained by a body in elliptical orbit.

**Period.** The amount of time a spacecraft requires to go through one complete orbit.

**Polar orbit.** Earth orbit with a 90° inclination. Spacecraft on this path could pass over every spot on Earth as Earth rotates under the satellite's orbit (see orbital inclination).

**Remote imaging.** Images of Earth generated from a spacecraft that provide data for mapping, construction, agriculture, oil and gas exploration, news media services, and the like.

**Rocket.** An aerospace vehicle that carries its own fuel and oxidizer and can operate outside Earth's atmosphere.

**Semisynchronous orbit.** An orbit set at an altitude of 12,834 miles. Satellites in this orbit revolve around Earth in exactly 12 hours.

**Single-stage-to-orbit (SSTO) system.** A reusable single-stage rocket that can take off and land repeatedly and is able to boost payloads into orbit.

**Stratosphere.** That section of atmosphere about 10 to 30 miles above Earth's surface.

**Sun synchronous orbit.** An orbit inclined about 98° to the equator and at LEO altitude. At this inclination and altitude, a satellite's orbital plane always maintains the same relative orientation to the sun.

**Thermosphere.** The thin atmosphere about 50 to 300 miles above Earth's surface. It experiences dramatically increased levels of heat compared to the lower layers.

**Transfer.** Any maneuver that changes a spacecraft orbit.

**Transponder.** A radar or radio set that, upon receiving a designated signal, emits a radio signal of its own.

**Troposphere.** The region of the atmosphere from Earth's surface to about 10 miles above the equator and five miles above the poles. This is where most clouds, wind, rain, and other weather occurs.

**Van Allen belts.** Zones of intense radiation trapped in Earth's magnetosphere that could damage unshielded spacecraft.

# Space Firsts

**February 24, 1949** Project Bumper, the first fully successful two-stage rocket-launch into space, reaches a record altitude of 244 miles.

**July 24, 1950** Bumper-WAC becomes first missile launched from Cape Canaveral, Fla.

**September 20, 1956** US Jupiter C rocket achieves record first flight, reaching an altitude of 682 miles and landing 3,400 miles from Cape Canaveral.

**August 21, 1957** First successful launch of Soviet R7 rocket, which six weeks later will loft Sputnik into orbit.

**October 4** USSR launches Sputnik 1, the first man-made satellite, into Earth orbit.

**November 3** First animal in orbit, a dog, is carried aloft by Soviet Sputnik 2.

**December 6** First US attempt to orbit satellite fails when Vanguard rocket loses thrust and explodes.

**December 17** First successful Atlas booster launch.

**January 31, 1958** Explorer 1, first US satellite, launched.

**May 15** USSR launches first automatic scientific lab aboard Sputnik 3, proving satellites can have important military uses.

**December 18** Project Score spacecraft conducts first US active communication from space.

**February 28, 1959** Discoverer 1 becomes first satellite launched from Vandenberg AFB, Calif.

**June 9** First engineer group arrives at Cape Canaveral to prepare Atlas booster carrying first Mercury capsule.

**August 7** Explorer 6 spacecraft transmits first television pictures from space.

**September 12** Soviet Union launches Luna 2, which two days later becomes first man-made object to strike the moon.

**April 1, 1960** TIROS 1 becomes first US weather satellite to go aloft.

**April 13** Transit 1B becomes first US navigation satellite in space.

**May 24** Atlas D/Agenda A booster places MIDAS II, first early warning satellite, in orbit.

**June 22** US performs first successful launch of multiple independently instrumented satellites by a single rocket.

**August 11** Capsule ejected from Discoverer 13 parachutes into Pacific Ocean and becomes first orbital payload ever recovered.

**August 12** First passive communications carried via Echo 1 satellite.

**August 19** Capsule containing first satellite photographs of Soviet Union ejected from Discoverer 14 becomes first orbital payload recovered in midair by C-119 Flying Boxcar.

**January 31, 1961** Preparing for manned spaceflight, US launches a Mercury capsule carrying the chimpanzee Ham on a suborbital trajectory.

**February 16** Explorer 9 becomes first satellite launched from Wallops Island, Va.

**April 12** Soviet cosmonaut Yuri Gagarin pilots Vostok 1 through nearly one orbit to become first human in space.

**May 5** Lt. Cmdr. Alan B. Shepard, Jr., aboard Freedom 7 Mercury capsule, becomes first American in space, climbing to 116.5 miles during suborbital flight lasting 15 minutes, 28 seconds.

**October 27** First flight of Saturn rocket marks beginning of more than 11 years of Apollo launches.

**February 20, 1962** Project Mercury astronaut Lt. Col. John H. Glenn, Jr., aboard the Friendship 7 capsule, completes the first US manned orbital flight.

**December 14** Mariner 2 passes Venus at a distance of 21,600 miles, becoming the first space probe to encounter another planet.

**June 16, 1963** Valentina Tereshkova of USSR pilots Vostok 6 to become first woman in space.

**July 26** Hughes Corp.'s Syncom 2 (prototype of Early Bird communications satellite) orbits and "parks" over the Atlantic to become world's first geosynchronous satellite.

**October 17** Vela Hotel satellite performs first

spacebased detection of a nuclear explosion.

**July 28, 1964** First close-up lunar pictures provided by Ranger 7 spacecraft.

**August 14** First Atlas/Agenda D standard launch vehicle successfully fired from Vandenberg AFB.

**March 18, 1965** First spacewalk conducted by Alexei Leonov of Soviet Voskhod 2.

**March 23** Gemini 3 astronauts Maj. Virgil I. "Gus" Grissom and Lt. Cmdr. John W. Young complete world's first piloted orbital maneuver.

**June 4** Gemini 4 astronaut Maj. Edward H. White performs first American spacewalk.

**July 14** Mariner provides the first close-up pictures of Mars.

**August 21** Gemini 5 launched as first manned spacecraft using fuel cells for electrical power rather than batteries.

**March 16, 1966** Gemini 8 astronauts Neil A. Armstrong and Maj. David R. Scott perform first manual docking in space with Agena rocket stage.

**June 2** Surveyor 1 is first US spacecraft to land softly on the moon. It analyzes soil content and transmits surface images to Earth.

**January 25, 1967** Soviet Cosmos 139 antisatellite weapon carries out first fractional orbit bombardment.

**January 27** First deaths of US space program occur in flash fire in Apollo 1 command module, killing astronauts Grissom, White, and Lt. Cmdr. Roger B. Chaffee.

**September 8** Surveyor 5 conducts first chemical analysis of lunar soil.

**October 20, 1968** Soviet Cosmos 248 and Cosmos 249 spacecraft carry out first co-orbital antisatellite test.

**December 21–27** Apollo 8 becomes first manned spacecraft to escape Earth's gravity and enter lunar orbit. First live lunar television broadcast.

**March 3–13, 1969** Apollo 9 crew members Col. James A. McDivitt, Col. David R. Scott, and Russell L. Schweickart conduct first test of lunar module in Earth orbit.

**July 20** Apollo 11 puts first human, Neil A. Armstrong, on the moon.

**November 14–24** US Apollo 12 mission deploys first major scientific experiments on the moon and completes first acquisition of samples from an earlier spacecraft—Surveyor 3.

**February 11, 1970** Japan launches first satellite, Osumi, from Kagoshima Space Center using Lambda 4S solid-fuel rocket.

**January 31, 1971** Apollo 14 launched; its astronauts will complete first manned landing on lunar highlands.

**April 19** First space station, Salyut 1, goes aloft.

**June 6** USSR's Soyuz 11 performs first successful docking with Salyut space station.

**October 28** First British satellite, Prospero, launched into orbit on Black Arrow rocket.

**November 2** Titan IIIC launches first Defense Satellite Communications System Phase II (DSCS II) satellites into GEO.

**April 16–27, 1972** Apollo 16 astronauts Capt. John Young, Lt. Cmdr. Thomas K. Mattingly II, and Lt. Col. Charles M. Duke, Jr., are first to use the moon as an astronomical laboratory.

**July 23** US launches first Earth Resources Technology Satellite (ERTS A), later renamed Landsat 1.

**December 3, 1973** Pioneer 10 becomes first space probe to come within reach of Jupiter.

**July 15, 1975** US Apollo and Soviet Soyuz 19 perform first international docking of spacecraft in space.

**August 12, 1977** Space shuttle *Enterprise* performs first free flight after release from a Boeing 747 at 22,800 feet.

**February 22, 1978** Atlas booster carries first Global Positioning System (GPS) Block I satellite into orbit.

**December 13** Successful launch of two DSCS II satellites puts a full four-satellite constellation at users' disposal for first time.

**July 18, 1980** India places its first satellite, Rohini 1, into

## Space Firsts, continued

orbit using its own SLV-3 launcher.

**April 12–14, 1981** First orbital flight of shuttle *Columbia* (STS-1) and first landing from orbit of reusable spacecraft.

**December 20, 1982** First Defense Meteorological Satellite Program Block 5D-2 satellite launched.

**June 13, 1983** Pioneer 10 becomes first spacecraft to leave solar system.

**June 18** Space shuttle *Challenger* crew member Sally K. Ride becomes first American woman in space.

**September 11, 1985** International Cometary Explorer becomes first man-made object to encounter a comet (Giacobini-Zinner).

**September 13** First US antisatellite intercept test destroys Solwind scientific satellite by air-launched weapon.

**January 28, 1986** In the first shuttle mishap, *Challenger* explodes after liftoff, killing seven astronauts.

**February 22** France launches first *Satellite Pour l'Observation de la Terre* (SPOT) for remote sensing.

**August 12** First launch of Japanese H-I rocket puts Experimental Geodetic Satellite into circular orbit.

**May 15, 1987** USSR stages first flight of its Energia heavy launcher, designed to lift 100 tons into low Earth orbit.

**November 15, 1988** USSR makes first launch of 30-ton shuttle *Buran* using Energia rocket.

**February 14, 1989** Launch of first Block II GPS satellite begins an operational constellation.

**January 17, 1991** What the Air Force calls "the first space war," Operation Desert Storm, opens with air attacks.

**October 29** Galileo swings within 10,000 miles of Gaspia, snapping first close-up images of an asteroid.

**May 13, 1992** The first trio of spacewalking astronauts, working from the shuttle *Endeavour*, rescues Intelsat 6 from useless low orbit.

**January 13, 1993** USAF Maj. Susan Helms, flying aboard

*Endeavour*, becomes first US military woman in space.

**July 19** Launch of a DSCS Phase III satellite into GEO provides the first full five-satellite DSCS III constellation.

**December 2–13** USAF Col. Richard O. Covey pilots shuttle *Endeavour* on successful \$674 million mission to repair \$2 billion Hubble Space Telescope, a mission for which the crew wins the 1993 Collier Trophy.

**January 25, 1994** Launch of the 500-pound unpowered Clementine spacecraft marks the first post-Apollo US lunar mission.

**February 7** First Titan IV–Centaur booster launches first Milstar Block I satellite into orbit.

**March 13** First launch of Taurus booster (from Vandenberg AFB) places two military satellites in orbit.

**June 29** First visit of a US space shuttle to a space station, the Russian Mir.

**November 5** Ulysses, first probe to explore the sun's environment at high latitudes, completes a pass over the sun's southern pole and reveals that solar wind's velocity at high latitudes (*i.e.*, about two million mph) is nearly twice its velocity at lower latitudes.

**February 6, 1995** Shuttle *Discovery* (STS-63) and space station Mir perform first US-Russian space rendezvous in 20 years, with Air Force Lt. Col. Eileen M. Collins coincidentally becoming first woman to pilot a US spaceship.

**March 14** US astronaut Norman E. Thagard becomes first American to accompany Russian cosmonauts aboard Soyuz TM-21 spacecraft and, two days later, becomes first American to inhabit space station Mir.

**June 29** *Atlantis* (STS-71) docks with Mir, the first docking of a US spacecraft and a Russian space station.

**March 8, 1996** First successful launch of Pegasus XL rocket from beneath modified L-1011 aircraft sends Air Force Radiation Experiment-II satellite into polar orbit.

**June 27** Galileo captures first close-up images of Jupiter's moon Ganymede.

## The Year in Space

**July 2, 1996** At Jet Propulsion Laboratory in Pasadena, Calif., Vice President Al Gore and NASA Administrator Dan Goldin announce winner of X-33 reusable launch vehicle competition is Lockheed Martin's VentureStar.

**July 24** First verifiable collision between working satellite and space junk occurs when suitcase-sized fragment from exploded third stage of Ariane rocket breaks stabilizing boom on Cerise, a British-built French military microsatellite.

**August 21** Orbital Sciences Corp.'s L-1011, flying from Vandenberg AFB, Calif., launches Pegasus XL rocket carrying NASA's Fast Auroral Snapshot Explorer to investigate plasma physics of low-altitude auroral zone.

**September 8** Atlas IIA from Cape Canaveral launches GE Americom's first satellite, GE-1, built by Lockheed Martin Astro Space to provide cable, broadcast, educational, government, and business communication services on Ku- and C-band frequencies.

*The six-wheeled Sojourner rover rolled off the Mars Pathfinder lander onto the Martian surface July 5, 1997. It was designed to range up to 500 meters from the lander and still relay data effectively about the soil surface and rocks.*



**July 31** After flying and landing successfully for three flights, NASA's McDonnell Douglas-built Clipper Graham experimental, SSTO reusable rocket topples over and burns when one of its four landing legs fails to deploy after its fourth flight.

**August 6** Indian Ocean Station, an Air Force Satellite Control Network tracking site on Mahe island in the Seychelles, ceases operations after more than 30 years.

**August 7** Press conference at NASA headquarters in Washington, D. C., confirms *Space News* report of August 5 that scientists studying meteorite ALH84001 had detected what might be microscopic fossils of ancient Martian bacteria-like organisms.

**September 16–26** *Atlantis* (STS-79) mission, using Global Positioning System (GPS) navigational signal for first time in space shuttle daily operations, focuses on fourth rendezvous with Russian space station Mir to pick up astronaut Shannon Lucid, who sets 188-day world record for longest duration spaceflight by a woman, and drop off her replacement, Col. John Blaha, USAF (Ret.).

**September 27** First launch of Ballistic Missile Defense Organization (BMDO) Minuteman II Multi-Service Launch System from Vandenberg AFB results in successful release of five suborbital test targets and demonstrates feasibility of using deactivated solid-



propellant intercontinental ballistic missiles as spacelifters.

**September 30** After highly productive contributions to space science for nearly 19 years, NASA's International Ultraviolet Explorer receives final "shutdown" command.

**September 30** Biggest change in history of space shuttle program occurs when NASA and United Space Alliance—a joint venture between Lockheed Martin and Rockwell International—sign \$7 billion contract consolidating day-to-

**November 19–December 7** *Columbia* (STS-80) sets shuttle flight record of almost 18 days on mission that includes Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer, Shuttle Pallet Satellite, and Wake Shield Facility.

**December 2** Astronaut Lucid becomes first scientist and first woman to receive Space Medal of Honor for her record 188 days aboard Mir.

**December 3** BMDO spokesman Rick Lehner announces that Clementine spacecraft apparently has discovered frozen water in a deep crater at the moon's south pole.

**December 4** Delta II rocket sends NASA's Mars Pathfinder from Cape Canaveral toward scheduled July 4, 1997, landing on Mars and deployment of 23-pound, six-wheeled robotic rover called Sojourner.

**December 20** Titan IV boosts National Reconnaissance Office satellite into orbit from Vandenberg AFB, marking first time US government acknowledges, in advance, the launch of a reconnaissance satellite.

**December 24, 1996–January 7, 1997** Russian Bion-11 mission sends two rhesus monkeys, Lapik and Multik, into space to test effects of weightlessness on vestibular and movement control systems, but Multik dies of cardiac arrest during removal of electrodes one day after return to Earth.

**January 11** Geomagnetic storm that began five days earlier on sun's surface temporarily disables GOES-8 weather satellite and apparently destroys Telstar 401, disrupting television service to millions of viewers, including students on Air Force distance-learning network.

**January 12–22** Shuttle *Atlantis* mission (STS-81) involves rendezvous with Mir to deliver 2,200 pounds of equipment and 1,400 pounds of drinking water, drop off mission specialist Navy Capt. Jerry Linenger, and pick up astronaut Blaha and 840 pounds of hardware and experiments belonging to the Russian Space Agency.

**January 17** Delta II booster explosion at Cape Canaveral destroys first \$35 million

GPS Block IIR satellite, and subsequent accident investigation delays further Delta II launches until May 1997.

**February 11–21** Shuttle *Discovery* (STS-82) crew performs second servicing mission to Hubble Space Telescope and completes emergency repairs after discovering numerous cracks and tears in the orbiting observatory's thin outer layer of insulation.

**February 12** Japan launches Muses-B, subsequently renamed Highly Advanced Laboratory for Communications and Astronomy, from Kagoshima Space Center to study supermassive black holes found at center of some galaxies.

**February 20** Flying within 363 miles of Jupiter's moon Europa, Galileo spacecraft transmits tantalizing images of iceberg-like formations, as well as relatively smooth white areas, which provide strongest evidence yet of life-sustaining ocean beneath frozen surface.

**March 4** First launch from Russia's Svobodny Cosmodrome successfully places Ministry of Defense's Zeya test satellite into circular sun synchronous orbit.

**March 22** One-year anniversary of continuous US human presence in space: Lucid, March 22–September 26, 1996; Blaha, September 16, 1996–January 22, 1997; and Linenger, beginning January 12, 1997.

**March 31** NASA receives final signal from 25-year-old Pioneer 10, first human-made object to escape solar system, at distance of 6.2 billion miles from Earth.

**April 4** Titan II rocket boosts last Block 5D-2 Defense Meteorological Satellite Program (DMSP) spacecraft into orbit from Vandenberg AFB.

**April 4–8** Shuttle *Columbia* (STS-83) mission, originally scheduled to perform microgravity science experiments for 15 days, is shortened due to malfunctioning fuel cell.

**April 15** As part of overall effort to merge DMSP and NOAA polar satellite systems, Fairchild Satellite Operations Center, Fairchild

AFB, Wash., ceases its dedicated tracking and backup command and control of DMSP satellites.

**April 17** NASA and Air Force Space Command announce partnership agreement to share assets and new technologies for overall cost savings and greater operational efficiencies.

**April 21** Celestis, Inc., of Houston, Tex., performs first space "burial" when Pegasus rocket launched from L-1011 off coast of northwest Africa carries cremated remains of "Star Trek" creator Gene Roddenberry, LSD guru Timothy Leary, and 22 other space enthusiasts into orbit 300 miles above Earth.

**April 29** US astronaut Linenger and Russian cosmonaut Vasily Tsibliev complete five-hour spacewalk outside Mir, the first such joint excursion in space history.

**May 5** After January launch disaster at Cape Canaveral, Delta II rocket returns to service with launch of first five Iridium mobile telephone satellites from Vandenberg AFB.

**May 15–24** *Atlantis* (STS-84) completes sixth shuttle docking mission with Mir to retrieve astronaut Linenger and deliver his replacement, C. Michael Foale.

**May 20** First Delta II launch from Cape Canaveral since January disaster sends Norwegian Thor IIA satellite into orbit.

**June 10–12** US Space Command, US Strategic Command, NRO, and Army Training and Doctrine Command jointly conduct "Space Game" exercise at Redstone Arsenal, Ala., to determine how best to use and protect satellites for warfare in 2020.

**June 27** In first flyby of "dark, primitive main-belt" type asteroid, NASA's Near-Earth Asteroid Rendezvous spacecraft passes 253 Mathilde.

**June 30** NASA's Foale and two Russian cosmonauts aboard Mir begin training for repair mission following June 25 crash in which unmanned cargo ship damaged Mir's solar array and Spektr module, cutting power generation capability in half.



day shuttle operations under single company.

**October 7–12** Corona meeting of senior leaders at US Air Force Academy in Colorado Springs, Colo., results in decision to shift emphasis from an "air and space force" to a "space and air force" as the service enters twenty-first century.

**November 7** Mars Global Surveyor, first in decade-long series of NASA orbiters and landers to explore the Red Planet, launches atop Delta II rocket from Space Launch Complex 17A at Cape Canaveral.

**November 16** Russia's Mars 96 interplanetary spacecraft, with plutonium-powered energy sources, crashes back to Earth when fourth stage of Proton booster fails.

# Major Military Satellite Systems

## Global Positioning System (GPS)

Constellation of 24 satellites used by military and civilians to determine a precise location anywhere on Earth. A small receiver takes signals from four GPS satellites and calculates a position. The satellites transmit a highly precise signal to authorized users, permitting accurate navigation to within 16 meters. DoD has deployed more than 110,000 GPS receivers to US government and allied users, with terminals becoming much more widely available since the 1991 Persian Gulf War. Civilians use a commercial version of the terminals, with a degraded signal with an accuracy to 100 meters. Receivers are priced as low as \$200. The less accurate signal prevents adversaries from using GPS for precision weapons targeting. Civilian users are working to obtain a much better signal through auxiliary equipment, known as differential GPS, that corrects the degradation. DoD has become increasingly concerned about enemy use of GPS during a conflict and has begun an effort called NAVWAR (navigation warfare) to protect its advantage while preventing adversary use of GPS. GPS III is an overarching requirements process to develop a document that encompasses civil, military, scientific, and commercial use of GPS. It is also referred to as positioning, navigation, and timing. The current constellation is 25 operational Block II/IIA series and one test-and-checkout satellite. The GPS office has procured 21 Block IIR replenishment satellites. GPS IIR-1 was destroyed in the January 1997 Delta rocket explosion. GPS IIR-2 was being readied for a July 12, 1997, launch. Five IIR launches are scheduled for Fiscal 1998.

## Defense Satellite Communications System (DSCS)

Constellation of five primary spacecraft in geostationary orbit provides voice, data, digital, and television transmissions between major military terminals and national command authorities. Secure voice and high-data-rate communications, operating in superhigh frequency, primarily for high-capacity fixed users. Five DSCS satellites remain to be launched in 1997–2002. The Air Force has funded a program that will allow more tactical users access on DSCS. The Pentagon is developing the architecture to replace the capacity in the next decade.

## Milstar

The first two Milstars of an intended constellation of four that would provide coverage between 65° north and 65° south latitude are in orbit. The first \$1 billion Milstar was launched February 7, 1994, and the second November 5, 1995. Originally conceived as a communications system that could survive a nuclear conflict and connect national command authorities to commanders of ships, aircraft, and missiles during a war, the

system's design and application have been altered in the aftermath of the Cold War. Milstar currently serves tactical forces as well as strategic, and the last four Milstars (Milstar IIs) will include medium-data-rate payloads able to transmit larger volumes of data up to 1.45 mbps. The four are scheduled for launch in 1998–2001. All satellites have low-data-rate payloads providing communications at five bps to 2.4 kbps. The system can handle a data stream equal to 50,000 fax pages an hour and 1,000 simultaneous users. The satellites are designed to be jam-proof and use sophisticated techniques to provide secure communications.

## Defense Support Program (DSP)

Infrared detectors aboard these satellites have provided early warning of ballistic missile attack to NORAD since the 1970s. During Operation Desert Storm, operators at Space Command used DSP data to provide warnings of Scud attacks to theater commanders, though DSP was not designed to spot and track smaller missiles. Information on procurement situation, number of satellites launched, and number to be launched is classified. DoD intends to replace the system with a new spacecraft, the Spacebased Infrared System, designed to spot and track the smaller, faster-burning theater missiles that have proliferated in recent years. It will be fielded in three increments: Increment 1, Fiscal 1999; Increment 2, Fiscal 2002; and Increment 3, Fiscal 2006.

## Defense Meteorological Satellite Program (DMSP)

Military weather satellites operating in LEO that collect and disseminate global weather information directly to the warfighter and government agencies. Operating in a two-satellite constellation, each spacecraft collects high-resolution cloud imagery (visible and infrared) from a 1,800-mile-wide area beneath it. Satellites collect other specialized data, such as atmospheric temperature and moisture, snow cover, precipitation intensity and area, and oceanographic and solar-geophysical information for DoD air, sea, land, and space operations. Five satellites remain to be launched (USAF launched its last on April 4, 1997). Joint satellites will be procured with NOAA for the follow-on system, with the first to be launched in the 2007–10 time frame. It will be called the National Polar-Orbiting Operational Environmental Satellite System (NPOESS).

## Fleet Satellite Communications (FLTSATCOM)

Constellation of four satellites operated by USN, USAF, and the Presidential command network. A secure link among the three, providing ultrahigh-frequency (UHF) communications. Satellites carry 23 channels for communications with naval forces, nuclear forces, and national command authorities. The last two

FLTSATCOM satellites (Flights 7 and 8) carry extremely high-frequency (EHF) payloads. In operation since 1978 in geostationary orbit, with a minimum of four satellites needed for worldwide coverage.

## UHF Follow-On (UFO) Satellites

New generation of satellites providing UHF communications to replace FLTSATCOM satellites. UFO satellites have 39 channels—compared to the FLTSATCOM's 23—are bigger and have higher power. Compatible with the same terminals used by the earlier systems. UFO-4 was first in the series to include an EHF communications payload with enhanced antijam telemetry, command, broadcast, and fleet interconnectivity. EHF channels provide an additional 11 channels. Ten UFO satellites were ordered; six are operational.

## Leasesat

Spacecraft that have been providing Navy UHF satellite communications since first launch in 1984 to augment FLTSATCOM. Leasesat was decommissioned at the end of 1996.

## Global Broadcast System (GBS)

GBS is projected to be a high-speed, one-way broadcast communications system that provides high-volume information worldwide directly to in-theater warfighters. GBS will provide data to large populations of dispersed users with small, mobile receive terminals. These terminals will allow data to be disseminated directly to lower-echelon forces, providing current weather, intelligence, news, imagery, and other mission-essential information. GBS will be implemented in three phases. Phase 1 will consist of leased commercial transponders. Phase 2 will consist of GBS packages aboard three UFO satellites. Phase 3 will be an objective system consisting of military assets, a commercial leased system, or a combination of the two.

## Dark and Spooky

An undisclosed number and type of intelligence satellites are operated by intelligence agencies in cooperation with the military. Satellites, which monitor Earth with radar, optical sensors and electronic intercept capability, have been treated as closely guarded secrets since the start of the space age. Even the names of satellites, like LaCrosse (radar imaging), Keyhole (optical imaging), White Cloud (ocean reconnaissance), and Aquacade (electronic ferret), are secret and cannot be confirmed by the intelligence agencies. However, the move to declassify space systems has begun, leading to the release of extensive information about one now-obsolete spy satellite called Corona. The Intelligence Community also will release selected archival images obtained by older spy satellites for scientific use. Some observers believe more military space secrets will be disclosed as the Cold War fades.

# Major US Civilian Satellites in Military Use

## Advanced Communications Technology Satellite (ACTS)

NASA's ACTS was launched in 1993 on the space shuttle to demonstrate Ka-band communications and onboard switching equipment. Military use of the technology demonstration satellite included communications service to US Army troops deployed to Haiti in 1994.

## Geostationary Operational Environmental Satellite (GOES)

NOAA operates GOES-8 and GOES-9. GOES-7 provides backup. Satellites hover at 22,300 miles altitude over the equator, monitoring storms and tracking their movements for short-term forecasting. Satellites are a new design that has improved spatial resolution and full-time operational soundings of the atmosphere.

## International Telecommunications Satellite Organization (Intelsat)

Established in 1964 to own and operate a global constellation of communications satellites. Has 141 members and 24 operational satellites. Intelsat is in the process of restructuring into an intergovernmental treaty organization, which will continue to provide basic global satellite connectivity, and a commercial spin-off

called INC, which will be given three to seven satellites for competitive services like broadcasting and data networking. The restructuring should be approved in early 1998 and implemented in the following months. US signatory to Intelsat is Comsat Corp. The US military uses the system for routine communications and to distribute the Armed Forces Radio and TV Services network and used it to set up a Very Small Aperture Terminal data network for field commanders in Bosnia in 1996.

## International Maritime Satellite (Inmarsat)

Established in 1979 to own and operate satellites for mobile communications. Has 79 member-countries. Inmarsat is 10.5 percent owner of ICO Global Communications, which was spun off as a separate company in 1995 to develop a satellite system for global mobile telephone services. Inmarsat operates seven satellites, including the first three of the third-generation Inmarsat 3 series and one Inmarsat 2 satellite. Another three satellites serve as orbital spares. The spacecraft are sometimes used by military forces for peacetime mobile communications services. Inmarsat is prohibited by convention from being used for military purposes. Briefcase- and laptop-sized satellite telephone terminals are used to communicate through the satellites. Inmarsat use in Somalia and Bosnia included the transmission of medical data and supply orders.

## Landsat

US government's civilian remote sensing satellite system. Used in polar orbit since 1972. Carries a multispectral scanner able to operate at a resolution of 30 meters and provide imagery that can be computer enhanced to show deforestation, expanding deserts, crop blight, and other phenomena. Space Imaging EOSAT operates the aging Landsat 5. The government plans to launch a Landsat 7 satellite in 1998. Military use of Landsat imagery has included mapping and planning for tactical operations.

## NOAA-12 and NOAA-14

Two polar orbit satellites for long-term forecasting of weather, operated by NOAA. The satellites fly in a 450-nautical-mile orbit, carrying visible and infrared radiometry imaging sensors and ultraviolet sensors to map ozone levels in the atmosphere. Provide weather updates for all areas of the world every six hours to civil and military users.

## Orbcomm

Orbcomm Global L.P.'s first two satellites were launched in April 1995 and commercial service in the US and Canada began in February 1996. Orbcomm is a joint venture between Orbital Sciences Corp. and Teleglobe of Canada. Orbcomm's

satellite constellation will comprise 28 satellites, with an additional eight satellites to serve as ground spares or to be launched at a later date. Orbcomm worked with DoD in 1995 and 1996 to demonstrate the potential military use of the commercial system under the Joint Interoperability Warfighter Program. Today, DoD still possesses more than 100 Orbcomm units.

## Orion Network Systems

Orion provides commercial satellite-based, rooftop-to-rooftop communications in support of the US Army Trojan program via its own satellite as part of the GE American Communications team. In addition, Orion provides communications through wholesalers to other DoD agency locations in the US and Europe. Rooftop-to-rooftop support is also provided to selected State Department overseas locations. Orion continues its support for the troops deployed to Bosnia via leased capacity to the Defense Information Systems Agency. Future plans include the launch and operation of two additional satellites covering the Asia-Pacific region, Latin America, the Middle East, and parts of Russia and Africa.

## Satellite Pour l'Observation de la Terre (SPOT)

Remote sensing satellite system developed by the French space agency, CNES. Owned and operated by a commercial firm, SPOT Image S. A. of Toulouse. Two satellites produce images with resolution as fine as 10 meters and can be used for stereoscopic viewing for three-dimensional terrain modeling. SPOT 3 failed in November, and SPOT 1 was reactivated to augment SPOT 2. SPOT 4 is scheduled for launch in early 1998 and SPOT 5 in 2002. DoD is a large customer, purchasing the images for mission-planning systems, terrain analysis, mapping, and humanitarian missions.

## Tracking and Data Relay Satellite System (TDRSS)

NASA operates six TDRSS satellites to form a global network that allows low Earth orbiting spacecraft, such as the space shuttle, to communicate with a control center without an elaborate network of ground stations. The geostationary TDRSS, with its ground station at White Sands, N. M., allows mission control in Houston, Tex., to maintain nearly constant contact with the shuttle. Other satellites using TDRSS include the Hubble Space Telescope, Compton Gamma Ray Observatory, Earth Radiation Budget Satellite, and military satellites. TDRSS satellites have been used since 1983. Three next-generation satellites are being built for use with the shuttle, the space station, and satellites. Hughes is the contractor for TDRSS H, I, and J. The first will be launched in July 1999.



Six TDRSS satellites now on orbit enable NASA to communicate with the space shuttles.

# Military Functions in Space

## Communications

Provide communications from national command authorities to Joint Force Commander. Provide communications from JFC to squadron-level commanders. Permit transfer of imagery and situational awareness to tactical operations. Permit rapid transmission of JFC intent, ground force observations, and adaptive planning.

## Environmental/Remote Sensing

Use space systems to create topographical, hydrographic, and geological maps and charts and to develop systems of topographic measurement.

## Space Environment/Meteorological Support

Operate groundbased and spacebased systems to provide solar/geophysical support to the warfighter. Operate weather satellites to provide data on worldwide and local weather systems affecting combat operations. NOAA will take over flight operations of weather satellites from the Air Force in May 1998. USAF will continue to provide backup satellite command and control of weather satellites.

## Missile Defense

Employ space assets to identify, acquire, track, and destroy ballistic and cruise missiles launched against forward-deployed US forces, allied forces, or US territory.

## Navigation

Operate GPS network and certain smaller Navy systems. Enable commanders to determine precise locations of friendly and enemy forces and targets. Permit accurate, timely rendezvous of combat forces. Map minefields and other obstacles.

## On-Orbit Support

Track and control satellites, operate their payloads, and disseminate data from them.

## Reconnaissance and Surveillance

Identify possible global threats and surveillance of specific activity that might be threatening to US or allied military forces or US territory. Reduce effectiveness of camouflage and decoys. Identify "centers of gravity" in enemy forces. Accurately characterize electronic emissions.

## Space Control

Control and exploit space using offensive and defensive measures to ensure that friendly forces can use space capabilities, while denying their use to the enemy. This mission is assigned to USCINCSpace in the Unified Command Plan.

## Spacelift

Prepare satellite and booster, joining the two. Conduct checkout prior to launch, carry out launch, and conduct on-orbit checkout.

## Strategic Early Warning

Operate satellites to give national leaders early warning of all possible strategic events, including launch of intercontinental ballistic missiles. Identify launch locations and impact areas. Cue area and point defense systems.

## Tactical Warning/Attack Assessment

Discharge the NORAD mission calling for use of all sensors to detect and characterize an attack on US or Canadian territory. US Space Command carries out similar tactical warning in other theaters.

# Major US Agencies in Space

## National Imagery and Mapping Agency (NIMA)

Headquarters: Fairfax, Va.  
Established: October 1, 1996  
Director (acting): Rear Adm. Joseph J. Dantone, Jr.

### Mission, Purpose, Operations

Provide timely, relevant, and accurate imagery intelligence and geospatial information to support national security objectives. This DoD-chartered combat support agency was formed through the consolidation: Defense Mapping Agency, Central Imagery Office, and Defense Dissemination Program Office, in their entirety; National Photographic Interpretation Center, which is now under NIMA's operational control; and the imagery exploitation, dissemination, and processing elements and programs of the CIA, Defense Intelligence Agency, National Reconnaissance Office, and Defense Airborne Reconnaissance Office. This agency is also a member of the Intelligence Community and has been assigned, by statute, important national-level support responsibilities.

### Structure

Three principal directorates: Operations, Systems and Technology, and Corporate Affairs.

Major facilities in Virginia, Maryland, Washington, D. C., Missouri, and California, with the NIMA College located at Ft. Belvoir, Va. Also, customer support teams and technical representatives stationed around the world at major customer locations.

**Personnel:** Classified

## Central Intelligence Agency (CIA) Office of Development and Engineering

Headquarters: Washington, D. C.  
Established: 1973  
Director: Dennis Fitzgerald

### Mission, Purpose, Operations

Develop systems from requirements definition through design, testing, and evaluation to operations. Works with systems not available commercially. Disciplines include laser communications, digital imagery processing, real-time data collection and processing, electro-optics, advanced signal collection, artificial intelligence, advanced antenna design, mass data storage and retrieval, and large systems modeling and simulations. Work includes new concepts and systems upgrades.

**Structure:** Classified

**Personnel:** Classified

## National Aeronautics and Space Administration (NASA)

Headquarters: Washington, D. C.  
Established: 1958  
Administrator: Daniel S. Goldin

### Mission, Purpose, Operations

Explore and develop space for human enterprise, increase knowledge about Earth and space, and conduct research in space and aeronautics. Operate the space shuttle and lead an international program to build a permanently occupied space station, which will be launched starting in 1998. Launch satellites for space science, Earth observations, and a

broad range of technology research and development. Conduct aeronautical research and development.

### Structure

Ten centers around the US: Johnson Space Center, Houston, Tex.; Marshall Space Flight Center, Huntsville, Ala.; Kennedy Space Center, Fla.; Lewis Research Center, Cleveland, Ohio; Langley Research Center, Hampton, Va.; Ames Research Center, Mountain View, Calif.; Dryden Flight Research Center, Edwards AFB, Calif.; Stennis Space Center, Bay St. Louis, Miss.; Jet Propulsion Laboratory, Pasadena, Calif.; and Goddard Space Flight Center, Greenbelt, Md.

### Personnel

Civilians ..... 19,700  
Contractors ..... 169,000

## National Oceanic and Atmospheric Administration (NOAA)

Headquarters: Washington, D. C.  
Established: October 3, 1970  
Director: Dr. D. James Baker

### Mission, Purpose, Operations

Provide satellite observations of the global environment by operating a national system of satellites. Explore, map, and chart the global ocean and its resources and describe, monitor, and predict conditions in the atmosphere, ocean, and space environment. Its National Environmental Satellite, Data and Information Service processes vast quantities of satellite images and data. Its prime customer is NOAA's National Weather

Service, which uses satellite information in creating forecasts.

**Structure**

- Headquarters
- National Environmental Satellite, Data, and Information Service
- National Weather Service
- National Ocean Service
- National Marine Fisheries Service
- Office of Oceanic and Atmospheric Research
- NOAA Corps
- Office of Sustainable Development and Intergovernmental Affairs
- Coastal Ocean Program

**Personnel**

- National Environmental Satellite, Data, and Information Service ..... 825
- Other NOAA employees ..... 11,560
- Total ..... 12,385

**National Reconnaissance Office (NRO)**

Headquarters: Chantilly, Va.  
 Established: September 1961  
 Director: Keith R. Hall

**Mission, Purpose, Operations**

Design, build, and operate reconnaissance satellites to support global information superiority for the US. It has operated hundreds of satellites during its 35-year history. Responsible for innovative technology; systems engineering; development, acquisition, and operation of space reconnaissance systems; and related intelligence activities. Supports monitoring of arms-control agreements, military operations and exercises, natural disas-

ters, environmental issues, and worldwide events of interest to the US.

**Structure**

NRO is a DoD agency, funded through part of the National Foreign Intelligence Program, known as the National Reconnaissance Program. Both the Secretary of Defense and Director of Central Intelligence have approval of the program. Five offices and three directorates reporting up to the level of the director. Offices are management services and operations, plans and analysis, systems applications, space launch, and operational support. Directorates are signals intelligence systems acquisition and operations, communications systems acquisition and operations, and imagery systems acquisition and operations.

**Personnel**

Staffed by CIA (37 percent), USAF (51 percent), Navy (seven percent), Army (one percent), and National Security Agency (four percent), both military and civilian employees. Exact personnel numbers are classified.

**National Security Agency (NSA)**

Headquarters: Ft. Meade, Md.  
 Established: 1952  
 Director: Lt. Gen. Kenneth A. Minihan, USAF

**Mission, Purpose, Operations**

Protect US communications and produce foreign intelligence information. Supply leadership, products and services to pro-

tect classified and unclassified information from interception, unauthorized access, and technical intelligence threats. In the foreign signals intelligence area, the central point for collecting and processing activities conducted by the US government, with authority to produce signals intelligence in accord with objectives, requirements, and priorities established by the CIA director with the advice of the National Foreign Intelligence Board.

**Structure**

Established by a Presidential directive in 1952 as a separate agency within DoD under the direction, authority, and control of the Secretary of Defense, who serves as the executive agent of the US government for the production of communications intelligence information. The Central Security Service was established in 1972 by a Presidential memorandum to provide a more unified cryptological organization within DoD. The NSA director also serves as chief of the CSS and controls the signals intelligence activities of the military services.

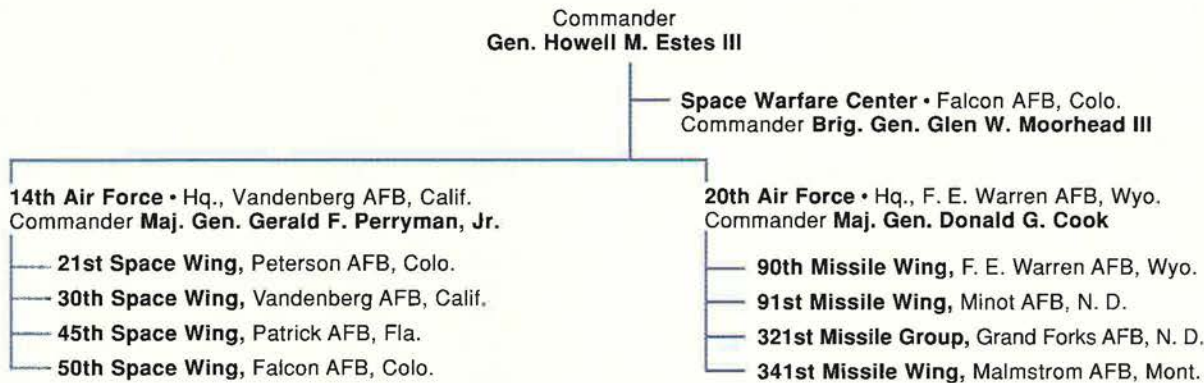
**Personnel:** Classified

**Other Agencies**

The White House Office of Science and Technology Policy; Defense Advanced Research Projects Agency; Ballistic Missile Defense Organization; US Space Command and the component commands of the Air Force, Navy, and Army; NORAD; and the FAA's Office of Commercial Space Transportation.

**Air Force Space Command Headquarters, Peterson AFB, Colo.**

(As of July 1, 1997)



**Air Force Space Acquisition Organizations**

**Air Force Materiel Command** • Wright-Patterson AFB, Ohio  
 Commander Gen. George T. Babbitt, Jr.

**Space and Missile Systems Center** • Los Angeles AFB, Calif.  
 Commander Lt. Gen. Roger G. DeKok

- Defense Meteorological Satellite SPO<sup>1</sup>
- Launch Programs SPO
- Advanced Systems SPO
- Satellite and Launch Control SPO
- Navstar Global Positioning System JPO<sup>2</sup>
- Phillips Laboratory, Kirtland AFB, N. M.

**Air Force Program Executive Office** • Washington, D. C.  
 Air Force Acquisition Executive Arthur L. Money

Program Executive Officer for Space Programs  
 Brent R. Collins

- MILSATCOM JPO
- Launch SPO (formerly Titan)
- Spacebased Infrared SPO
- Evolved Expendable Launch Vehicle SPO

<sup>1</sup>System(s) Program Office

<sup>2</sup>Joint Program Office

## Russian Space Activity, 1996

	Launches	Spacecraft
Communications .....	7	12
Photoreconnaissance .....	1	1
Unmanned space station resupply .....	3	3
Space station module .....	1	1
Navigation .....	3	3
Military ocean surveillance .....	1	1
Electronic intelligence .....	1	1
Manned flight .....	2	2
Science .....	3	6
Commercial .....	2	2
Atmospheric density/radar calibration .....	1	1
<b>Total .....</b>	<b>25</b>	<b>33</b>

## Russian Launch Site Activity, 1996

Spacecraft	Number of launches
<b>Baikonur Cosmodrome, Tyuratam, Kazakhstan</b>	
Proton-K .....	8
Soyuz-U .....	5
Zenit-2 .....	1
Tsyklon-M .....	1
<b>Total .....</b>	<b>15</b>
<b>Plesetsk Cosmodrome, Plesetsk, Russia</b>	
Tsyklon-3 .....	1
Kosmos-3M .....	4
Soyuz-U .....	2
Molniya-M .....	3
<b>Total .....</b>	<b>10</b>

## Russian Operational Spacecraft, 1996

Mission	Type	Number	
<b>Communications</b> .....	Kosmos (Strela-3) .....	30	
	Gonets-D .....	3	
	Raduga/Raduga-1 .....	9	
	Gorizont .....	11	
	Molniya-1 .....	8	
	Molniya-3 .....	8	
	Kosmos (Geizer) .....	2	
	Kosmos (Luch) .....	2	
	Luch-1 .....	1	
	Ekran-M .....	1	
	Ekspress .....	2	
	Gals .....	2	
	Radio Rosto .....	1	
<b>Navigation</b> .....	Kosmos GLONASS .....	24	
	Kosmos (military) .....	6	
	Kosmos (civil) .....	4	
<b>Meteorology</b> .....	Meteor-2 .....	2	
	Meteor-3 .....	2	
	Elektro (GOMS) .....	1	
<b>Early warning</b> .....	Kosmos (Oko) .....	8	
	Kosmos (Prognoz) .....	1	
<b>Electronic intelligence</b> .....	Kosmos (Tselina-2) .....	3	
	Kosmos (EORSAT) .....	3	
<b>Photoreconnaissance</b> .....		0	
<b>Remote sensing</b> .....	Okean-O .....	2	
	Resurs-O1 .....	1	
	Sich .....	1	
<b>Geodesy</b> .....	Kosmos (Etalon) .....	2	
	Kosmos (GEO-IK) .....	1	
<b>Radar calibration</b> .....	Kosmos (Romb) .....	1	
<b>Atmosphere density</b> .....	Kosmos (Yug) .....	1	
<b>Space station activity</b> .....	Mir .....	1	
	Kvant-1 .....	1	
	Kvant-2 .....	1	
	Kristall .....	1	
	Spektr .....	1	
	Priroda .....	1	
	Soyuz TM .....	1	
	Progress M .....	1	
	<b>Scientific activity</b> .....	Bion .....	1
		Coronas-I .....	1
Granat .....		1	
Interball .....		2	
	MAGION 4 (Czech satellite) .....	2	

Older spacecraft sometimes are placed in orbital standby mode.

## US Space Funding

(Millions of current dollars)

FY	NASA	DoD	Other	Total
1959 .....	\$ 261	\$ 490	\$ 34	\$ 785
1960 .....	462	561	43	1,066
1961 .....	926	814	69	1,809
1962 .....	1,797	1,298	200	3,295
1963 .....	3,626	1,550	259	5,435
1964 .....	5,016	1,599	216	6,831
1965 .....	5,138	1,574	244	6,956
1966 .....	5,065	1,689	217	6,971
1967 .....	4,830	1,664	216	6,710
1968 .....	4,430	1,922	177	6,529
1969 .....	3,822	2,013	141	5,976
1970 .....	3,547	1,678	115	5,340
1971 .....	3,101	1,512	127	4,740
1972 .....	3,071	1,407	97	4,575
1973 .....	3,093	1,623	109	4,825
1974 .....	2,759	1,766	116	4,641
1975 .....	2,915	1,892	107	4,914
1976 .....	4,074	2,443	142	6,659
1977 .....	3,440	2,412	131	5,983
1978 .....	3,623	2,738	157	6,518
1979 .....	4,030	3,036	178	7,244
1980 .....	4,680	3,848	160	8,688
1981 .....	4,992	4,828	158	9,978
1982 .....	5,528	6,679	234	12,441
1983 .....	6,328	9,019	242	15,589
1984 .....	6,648	10,195	293	17,136
1985 .....	6,925	12,768	474	20,167
1986 .....	7,165	14,126	368	21,659
1987 .....	9,809	16,287	352	26,448
1988 .....	8,302	17,679	626	26,607
1989 .....	10,098	17,906	444	28,448
1990 .....	12,142	15,616	387	28,145
1991 .....	13,036	14,181	566	27,783
1992 .....	13,199	15,023	624	28,846
1993 .....	13,077	14,106	559	27,742
1994 .....	13,022	13,166	465	26,653
1995 .....	12,543	10,644	489	23,676
1996 .....	12,569	11,514	707	24,790
<b>Total .....</b>	<b>229,089</b>	<b>243,266</b>	<b>10,243</b>	<b>482,598</b>

Figures are expressed in current dollars and are rounded. NASA totals represent space activities only. "Other" category includes the Departments of Energy, Commerce, Agriculture, Interior, and Transportation; the National Science Foundation; the Environmental Protection Agency; and other agencies. (Fiscal 1996 figures are preliminary.)

## Worldwide Launches by Site, 1957-96

Launch Site	Nation	Launches
Plesetsk	Russia	1,436
White Sands Missile Range, N. M.	US	1,087
Tyuratam/Baikonur	Russia	1,002
Vandenberg AFB, Calif.	US	516
Cape Canaveral AS, Fla.	US	509
Poker Flat Research Range, Alaska	US	271
JFK Space Center, Fla.	US	99
Kapustin Yar	Russia	83
Kourou	French Guiana	90
Tanegashima	Japan	28
Shuang Cheng-tzu/Jiuquan	China	23
Wallops Flight Facility, Va.	US	22
Uchinoura	Japan	21
Xichang	China	19
Indian Ocean Platform	Kenya	9
Sriharikota	India	7
Edwards AFB, Calif.	US	5
Hammaguir	Algeria	4
Yavne	Israel	3
Woomera	Australia	2
Taiyun	China	2
<b>Total</b>		<b>5,238</b>

## Military vs. Civilian Launches

Year	Military		Civilian	
	US	Russia	US	Russia
1957	0	0	0	2
1958	0	0	7	1
1959	6	0	5	3
1960	10	0	6	3
1961	19	0	10	6
1962	31	5	21	15
1963	26	7	12	10
1964	32	15	25	15
1965	28	25	35	23
1966	32	27	41	17
1967	24	46	34	20
1968	20	49	25	25
1969	16	51	24	19
1970	15	55	14	26
1971	10	60	22	23
1972	11	53	20	21
1973	8	58	15	28
1974	6	52	18	29
1975	7	60	21	29
1976	7	74	19	25
1977	9	69	15	29
1978	8	60	24	28
1979	4	60	12	27
1980	5	64	8	25
1981	5	59	13	39
1982	6	68	12	33
1983	7	58	15	40
1984	12	63	10	34
1985	6	64	11	34
1986	3	63	3	28
1987	6	62	2	33
1988	6	53	6	37
1989	13	42	5	32
1990	13	45	14	30
1991	9	30	9	29
1992	12	32	16	22
1993	13	26	10	21
1994	12	26	14	22
1995	9	15	18	17
1996	11	8	22	17
<b>Total</b>	<b>477</b>	<b>1,604</b>	<b>613</b>	<b>917</b>

## Manned Spaceflights

Year	US		Russia	
	Flights	Persons	Flights	Persons
1961	2	2	2	2
1962	3	3	2	2
1963	1	1	2	2
1964	0	0	1	3
1965	5	10	1	2
1966	5	10	0	0
1967	0	0	1	1
1968	2	6	1	1
1969	4	12	5	11
1970	1	3	1	2
1971	2	6	2	6
1972	2	6	0	0
1973	3	9	2	4
1974	0	0	3	6
1975	1	3	4	8
1976	0	0	3	6
1977	0	0	3	6
1978	0	0	5	10
1979	0	0	2	4
1980	0	0	6	13
1981	2	4	3	6
1982	3	8	3	8
1983	4	20	2	5
1984	5	28	3	9
1985	9	58	2	5
1986	1	7	1	2
1987	0	0	3	8
1988	2	10	3	9
1989	5	25	1	2
1990	6	32	3	7
1991	6	35	2	6
1992	8	53	2	6
1993	7	42	2	5
1994	7	42	3	8
1995	7	42	2	6
1996	7	43	2	5
<b>Total</b>	<b>110</b>	<b>520</b>	<b>83</b>	<b>186</b>

## Payloads by Mission, 1957-96

Category	US	Russia
<b>Platforms</b>	<b>0</b>	<b>480</b>
<b>Earth orbital science</b>	<b>221</b>	<b>210</b>
<b>Automated lunar, planetary</b>	<b>58</b>	<b>86</b>
Moon	25	34
Mercury	1	0
Venus	8	33
Mars	11	19
Outer planets	4	0
Interplanetary space	9	0
<b>Applications</b>	<b>420</b>	<b>499</b>
Communications	291	285
Weather	99	74
Geodesy	20	34
Earth resources	8	96
Materials processing	2	10
<b>Piloted activities</b>	<b>149</b>	<b>236</b>
Earth orbital	99	88
Earth orbital (related)	13	140
Lunar	20	0
Lunar (related)	17	8
<b>Launch vehicle tests</b>	<b>11</b>	<b>22</b>
<b>General engineering tests</b>	<b>57</b>	<b>4</b>
<b>Reconnaissance</b>	<b>427</b>	<b>1,081</b>
Photographic	248	796
Electronic intelligence	93	130
Ocean electronic intelligence	39	82
Early warning	47	73
<b>Minor military operations</b>	<b>44</b>	<b>161</b>
<b>Navigation</b>	<b>82</b>	<b>211</b>
<b>Theater communication</b>	<b>0</b>	<b>535</b>
<b>Weapons-related activities</b>	<b>2</b>	<b>56</b>
Fractional orbital bombardment	0	18
Antisatellite targets	2	18
Antisatellite interceptors	0	20
<b>Other military</b>	<b>18</b>	<b>1</b>
<b>Other civilian</b>	<b>2</b>	<b>1</b>
<b>Total</b>	<b>1,491</b>	<b>3,583</b>

## Spacefarers

(As of end of 1996)

Nation	Persons	Nation	Persons
Afghanistan	1	Mexico	1
Austria	1	Mongolia	1
Belgium	1	Netherlands	1
Bulgaria	2	Poland	1
Canada	5	Romania	1
Cuba	1	Russia	85
Czechoslovakia	1	Saudi Arabia	1
France	7	Switzerland	1
Germany	8	Syria	1
Hungary	1	United Kingdom	1
India	1	United States	223
Italy	3	Vietnam	1
Japan	4	<b>Total</b>	<b>354</b>

## Payloads in Orbit

(As of end of 1996)

Launcher/operator	Objects	Launcher/operator	Objects
Argentina	2	Luxembourg	6
Australia	6	Malaysia	2
Brazil	6	Mexico	5
Canada	17	NATO	8
China	16	Norway	1
Czechoslovakia	3	Portugal	1
ESA	30	Russia	1,353
France	30	Saudi Arabia	7
France/Germany	2	South Korea	4
Germany	14	Spain	4
India	14	Sweden	5
Indonesia	8	Thailand	2
Israel	2	Turkey	2
Italy	7	United Kingdom	25
ITSO <sup>1</sup>	50	United States	701
Japan	57	<b>Total</b>	<b>2,390</b>

<sup>1</sup>International Telecommunications Satellite Organization

## Other Spacefaring Nations

For eight years after Sputnik went into orbit in October 1957, the two superpowers alone were able to launch spacecraft. France broke the monopoly in 1965, establishing an independent capability. China, India, Japan, and Israel also have hurled satellites into space using indigenously built rockets. European capabilities are embodied in the European Space Agency (ESA), currently a group of 14 nations.

**China** launched its first satellite in 1970 and has had at least 42 satellites on orbit. China also launches science and military reconnaissance satellites and has made commercial launches for other nations. Its primary launch site is near Jiuquan, in northern China; a newer site is near Xichang, in southeastern China, and a third is at Taiyuan. The launch program relies on the Long March series of rockets, one version of which has a cryogenic upper stage. Chinese astronauts were in training in the 1970s, but the country has indefinitely deferred manned spaceflight.

**ESA** was formed in 1975 for civilian activities only. It has 14 members: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, and the UK. A major activity is development of the Ariane rocket. France led development of the booster, which is launched from Kourou, French Guiana.

Arianespace, a private company, markets Ariane and manages launches. France, Italy, and Germany all have strong programs.

**India** launched its first satellite, Rohini 1, into orbit in July 1980. The Indian Space Research Organization operates an offshore Sriharikota Island launch site in the Bay of Bengal. India's booster program includes the Satellite Launch Vehicle, Augmented Satellite Launch Vehicle, and Polar Satellite Launch Vehicle. The latter is capable of placing spacecraft into polar orbit. India is particularly interested in remote sensing for resource, weather, and reconnaissance purposes. An Indian cosmonaut flew on a Soviet Soyuz mission in 1984.

**Israel** launched its first test satellite, Ofeq 1, into orbit September 1988. Believed to have been launched from Yavne in the Negev Desert, satellites in the Ofeq series are thought to be dedicated to military purposes. Ofeq is seen as a step toward creation of a military satellite reconnaissance system. The prime booster is Shavit, possibly based on the Jericho 2 missile.

**Japan** put its first satellite into orbit in 1970 and has made at least 49 successful satellite launches. Communications, remote sensing, weather, and scientific satellites are on orbit. Japan's satellite program

## Launches

Year	France	China	Japan	Europe	India	Israel
1965	1					
1966	1					
1967	2					
1968						
1969						
1970	2	1	1			
1971	1	1	2			
1972			1			
1973						
1974			1			
1975	3	3	2			
1976	2		1			
1977			2			
1978	1		3			
1979			2	1		
1980			2		1	
1981	1	3	2	2	1	
1982	1		1			
1983	1	3	2	1		
1984	3	3	4			
1985	1	2	3			
1986	2	2	2			
1987	2	3	2			
1988	4	2	7			1
1989		2	7			
1990	5	3	5			1
1991	1	2	8			
1992	4	1	7		1	
1993	1	1	7			
1994	5	2	6		2	
1995	2	1	11			1
1996	3	1	10		1	
<b>Total</b>	<b>10</b>	<b>44</b>	<b>49</b>	<b>84</b>	<b>7</b>	<b>3</b>

is run by the National Space Development Agency and the Institute of Space and Astronautical Science. Main launch sites are Kagoshima, on Kyushu, southwest of Tokyo, and Tanegashima, an island south of Kyushu. The Mu series of launch vehicles

is used to orbit scientific satellites and toss spacecraft into deep space. N-1 and N-2 rockets were based on the US Delta. The H-1 has begun to replace the N-1 and N-2 boosters. The H-2 booster was first launched in 1994.



**Space and Missile Badges**



**Space/Missile  
Badge**



**Senior  
Space/Missile  
Badge**



**Master  
Space/Missile  
Badge**



**Astronaut Pilot\***



**Senior  
Astronaut Pilot**



**Command  
Astronaut Pilot**



**Missile Badge**



**Senior  
Missile Badge**



**Master  
Missile Badge**



**Missile Badge  
with Operations  
Designator**



**Senior Missile  
Badge with  
Operations  
Designator**



**Master Missile  
Badge with  
Operations  
Designator**

\*The astronaut designator indicates a USAF rated officer qualified to perform duties in space (fifty miles and up) and who has completed at least one operational mission. Pilot wings are used here only to illustrate the position of the designator on the wings.

## Recent Space Issues and Developments

### ■ Space Master Plan

The Space Master Plan to guide military space spending during the next 25 years produced a set of "guidestars," or guiding principles, to assure that military services work together and acquire space systems that are efficient, nonredundant, and work in an integrated fashion. The guidestars include such notions as technical superiority, customer focus, and cooperation. The Joint Space Management Board approved the classified plan, which was created by the Deputy Under Secretary of Defense for Space, an organization set up in 1994 to provide top-level oversight of space matters within the DoD and Intelligence Communities.

### ■ Space architecture

The DoD Space Architect office, headed by Air Force Maj. Gen. Robert S. Dickman, issued its first product—an architecture for future military communications satellite systems—in fall 1996. The architecture recommended that DoD continue to buy three to four lines of specialized spacecraft to fulfill needs met

by the current Milstar, DSCS (Defense Satellite Communications System) and UHF Follow-on satellites, plus an EHF system for communications over the poles. The architecture recommended against commercial leasing of systems to fill those requirements on the basis that leasing would be more expensive than buying for the military. In the case of satellites to replace the DSCS, the architecture recommended adapting satellites from a commercial production line to carry the DoD X-band payload, plus adding military Ka-band frequencies. The DSCS replacements would be launched beginning in 2002–06. DoD has spent \$50 billion during the last 20 years on military satellite equipment, and the new architecture would cost \$45 billion to \$54 billion over the next 20 years, depending on the number of upgrades included.

### ■ Commercial remote sensing

In 1998, two commercial companies operating high-resolution remote-sensing satellite systems are expected

to begin selling data to DoD, as well as many commercial and international customers. EarthWatch, Inc., was to orbit its first satellite, capable of providing imagery with three-meter resolution, in June 1997, followed by a one-meter-resolution spacecraft by mid-1998. Space Imaging, Inc., their leading competitor, was to launch its first satellite, capable of one-meter imagery, in December 1997. Several other companies have obtained remote-sensing satellite licenses from the Commerce Department and hope to launch satellites in the future, but EarthWatch and Space Imaging were the clear front-runners in the new commercial space application. The images will be useful for a variety of tactical defense missions and for mapping. The companies also expect to sell imagery to commercial and civil users to help agricultural production, urban planning, transportation planning, and many other endeavors.

### ■ Advanced technology

**launchers: X-33, X-34, EELV**  
The nation's efforts to develop new, lower cost launch

vehicles continued to receive funding support and achieve programmatic progress, which will lead to test flights of NASA's X-33 and X-34 reusable launch vehicles around 1999 and first flights of the Air Force's Evolved Expendable Launch Vehicle in 2001 and 2003. USAF narrowed the field from four to two competitors in late 1996 and will select a single winner in mid-1998. The service has budgeted \$2 billion through 2004 for the effort, including funds for three test flights. EELV is aimed at evolving current launcher systems—either the Atlas made by Lockheed Martin Corp. or the Delta made by McDonnell Douglas—into a common core family of medium- and heavy-lift boosters with launch costs 25 to 50 percent lower than today's rockets. The first medium launch is scheduled for 2001, and the first heavy launch is scheduled for 2003. USAF has begun manifesting satellites on EELV, with plans to phase out use of Titan 4, Atlas, and Delta when the new rocket becomes operational.



*Pioneer X-15 pilots (l-r) Joe Walker, USAF Maj. Bob White, and Scott Crossfield helped pave the way for today's astronauts. Walker and White, among other X-15 pilots, earned astronaut wings for flights above 264,000 feet in the X-15, which was designed to explore the identifiable problems of atmospheric flight at very high speeds and altitudes.*

# Proposals and Prospects

## Launcher Concepts

### ■ Sea Launch

Sea Launch Co., a partnership among Boeing Commercial Space Co., Kvaerner a.s. of Norway, RSC Energia of Moscow, and NPO Yuzhnoye of the Ukraine, has made major progress toward developing the Sea Launch commercial satellite launching operation. Launch services will commence in June 1998 when Sea Launch will utilize the three-stage Zenit SL rocket to place payloads of up to 5,900 kilograms (13,000 pounds) into GTO from a floating platform at sea. The launch site will be equatorial, near Christmas Island in the Pacific, with a home base in Long Beach, Calif. Construction of the launch platform and assembly and command ship continues, and both vessels are scheduled to arrive at the home port in early 1998. Hughes Space and Communications has purchased 13 launches, and Space Systems/Loral ordered five. Sea Launch is fully booked through 2000, with a launch rate of three missions in 1998 and six a year thereafter.

### ■ X-33

Lockheed Martin Corp. is developing an experimental reusable launch vehicle (RLV), called the X-33 or VentureStar, after being selected by NASA in July 1997 for a cooperative program to demonstrate technology for a single-stage-to-orbit rocket for use in the next century. NASA is putting nearly \$1 billion into the effort, with Lockheed Martin committing some \$220 million. Flight tests are scheduled for 1999, leading to a decision by 2001 on whether to proceed with an operational version. The terms of the project call for Lockheed Martin to use private financing to build the operational VentureStar, which is estimated to cost another \$5 billion to complete. With it, launch costs should drop to a few hundred dollars per pound, compared to \$10,000 to \$12,000 per pound using current launchers like the space shuttle.

### ■ X-34

In June 1996, Orbital Sciences Corp. (OSC) won a \$60 million contract from NASA to design and build a technology demonstration vehicle and operate two flight tests. The flight tests are scheduled in the latter half of 1998. The contract also allows NASA to exercise an option for up to 25 additional test flights. The options are not included in the original \$60 million contract. The subscale test vehicle will be taken aloft by an L-1011 aircraft, dropped from the airplane, and then test-flown at speeds up to Mach 8. The test vehicle will have no payload capability. Its goal is to have a recurring flight cost of \$500,000. NASA had no plan to build an operational small reusable launcher based on X-34 after the tests, but OSC was contemplating



*This computer concept shows Lockheed Martin's VentureStar RLV, chosen for NASA's X-33 technology demonstration program, docking with Japan's National Development Agency space station.*

whether to invest its money in a new small RLV. Technology from the program will feed into the decision on whether to build an operational X-33/VentureStar launcher.

### ■ Delta III

A new intermediate-class launcher, the Delta III is being developed without government support by McDonnell Douglas Corp. for a first launch in 1998. Delta III will be able to boost 8,400 pounds to GTO, more than twice Delta II's maximum payload. Its LEO capability will be 18,400 pounds. The rocket will have a new cryogenic upper stage and a larger fairing. The initial customer is Hughes Space and Communications, which has a contract for 10 launches plus additional options through 2005. Space Systems/Loral also has ordered five Delta IIIs.

### ■ Med Lite

McDonnell Douglas has a contract with NASA for Medium Light Expendable Launch Vehicle services, which is to provide launches to fill the gap between small- and medium-class launchers. Med Lite's objective is to support NASA science, including the Discovery and Surveyor programs. Launch vehicles include the Delta II and OSC's Taurus XL.

### ■ Atlas IIAR RD-180 Engine

Lockheed Martin will introduce the Atlas IIAR rocket in mid-1998. The new Atlas version has several propulsion upgrades that will allow it to carry 8,900 pounds to orbit. On the first stage, the Atlas IIAR will use one NPO Energomash-Pratt & Whitney RD-180 engine, built either in Russia or the US, to replace seven US-designed engines currently used on the Atlas IIAS. The Centaur upper stage will have one RL-10E engine instead of two RL-10 engines in the current configuration. The Atlas IIAR also is the basis for much of the design of the Evolved Expendable Launch Vehicle proposed by

Lockheed Martin to the Air Force as the nation's future family of low-cost launchers.

## Satellite Concepts

### ■ Combined weather satellites

Civil and military weather LEO polar satellites are being merged into a single system. The number of satellites will be reduced from four to three, with savings now estimated at \$560 million through 1999. DoD and NOAA are coordinating the purchase of the remaining satellites. NOAA, DoD, and NASA are maintaining a tri-agency office for the National Polar-Orbiting Operational Environmental Satellite System, which is to take responsibility for the Defense Meteorological Satellite Program (DMSP). Operational control at the primary site in Suitland, Md., is to begin in mid-1998, with the backup site at Falcon AFB, Colo., to be operational in the third quarter. The first NPOESS satellite is now scheduled for launch in 2007.

### ■ Milstar II

The last four Milstar satellites will have a higher data-rate capability added to respond to a shift in emphasis since the end of the Cold War from mostly strategic users to a more tactical use. The medium-data-rate payload takes advantage of current technology and includes two Nulling Spot Beam Antennas that give the satellite an antijam capability. The launch dates for the satellites are December 1998, December 1999, November 2000, and October 2001.

### ■ Spacebased Infrared System (SBIRS)

Advanced infrared sensing satellites to replace the Defense Satellite Program satellites and perform the four space surveillance missions of missile warning, theater and national missile defense,

battlespace characterization, and technical intelligence. The SBIRS architecture will deploy a combination of HEO and LEO satellite constellations to detect and track advanced missile threats that will not be detected by currently fielded DSP surveillance satellites. SBIRS high constellation will include four GEO satellites and two sensor payloads hosted on highly elliptical orbit satellites. The SBIRS high component, now in the engineering and manufacturing development phase, provides a near-term capability in all four infrared mission areas (first launch in 2001). The SBIRS low constellation of LEO satellites further enhances the SBIRS high and provides the unique capability to track ballistic missiles after booster burnout, significantly enhancing our nation's ability to target enemy warheads in midflight for intercept and destruction. The SBIRS low component is currently in program definition and risk reduction phase, with two contractor teams scheduled to launch demonstra-

tion satellites in 1999. An SBIRS low EMD milestone decision is planned in Fiscal 2000 with first operational satellite launch projected for Fiscal 2004. SBIRS low was formerly known as the space and missile tracking system and, prior to that, as Brilliant Eyes.

■ **Small satellites**

The National Reconnaissance Office decided in 1996 to move to a smaller class of satellites than the very large spacecraft that had supported its intelligence-gathering mission in the past, after pressure from Congress and an independent advisory panel. Details of the new satellites and design changes to current satellites to downsize them remain classified, but one indication of a drop in satellite size was a decision to switch some NRO payloads from the large Titan IV to Atlas-class launchers in the next decade. The NRO commissioned a study scheduled for completion this month that will provide intelligence leaders and the Secretary of Defense with options on how to proceed with NRO's adoption of small satellites.

USAF's Phillips Laboratory is a leader in the development of advanced technology for small satellites. Phillips is involved in the Space Test Experiments Platform series of satellites, having successfully launched the STEP/Technology for Autonomous Operational Survivability satellite, which just passed its third anniversary. Additionally Phillips Laboratory is developing the Clementine 2 Micro-Satellites mother ship, which will be launched within the next two years, and a new, inexpensive series of spacecraft known as MightySat, the first of which is to be launched in July 1998. In the past year Phillips Laboratory integrated and launched MSTI (Miniature Sensor Technology Integration) III spacecraft. Phillips also has a program called the Integrated Space Technology Demonstration, which supports the integration and demonstration of technologies critical to the warfighter. The lab is also involved in NASA's Lewis and Clark and New Millenium small-satellite projects.

## US Space Command

	Personnel	Budget, Fiscal 1998	Activities
US Space Command Peterson AFB, Colo.	786	\$18.2 million	Responsible for placing DoD satellites into orbit and operating them; supports unified commands with spacebased communications, weather, intelligence information, navigation, and ballistic missile attack warning; enforces space superiority through protection, prevention, negation, and surveillance; ensures freedom of access to and operations in space and denies same to adversaries; applies force from or through space; plans for and executes strategic ballistic missile defense operations; supports NORAD by providing missile warning and space surveillance information; advocates the space and missile warning requirements of the other unified commands.
<b>Component</b>			
Air Force Space Command Peterson AFB, Colo.	37,625	\$1.7 billion	Operates military space systems, groundbased missile-warning radars and sensors, missile-warning satellites, national launch centers, and ranges; tracks space debris; operates and maintains the USAF ICBM force (as a component of US Strategic Command). Budget includes funding for 11,100 contractor personnel and operations and maintenance for six bases and 50 worldwide sites.
Naval Space Command Dahlgren, Va.	562	\$70 million	Operates assigned space systems for surveillance and warning; provides spacecraft telemetry and on-orbit engineering; develops space plans, programs, concepts and doctrine; advocates naval warfighting requirements in the Joint arena. Budget includes funding for nearly 100 contractor personnel and operations and maintenance of headquarters, component commands, and field sites.
Army Space Command Colorado Springs, Colo.	652	\$51 million	Provides input for DoD space plans; manages Joint tactical uses of DSCS; conducts planning for national and theater missile defense; operates the Army Theater Missile Defense Element force projection Tactical Operations Center; exploits leading-edge space technologies in support of warfighter needs; manages the Army Astronaut Program; and operates Joint Tactical Ground Station.

NASA astronauts C. Michael Foale (left) and Navy Capt. Jerry M. Linenger pose aboard the Mir before Linenger returned from his nearly six-month stay aboard the Russian space station. Foale began training with his Russian counterparts on June 30 to repair the Mir, which was damaged June 25.



## Selected NASA Projects Fiscal 1998 Proposal Current Dollars

### ■ AXAF, \$92.2 million.

Space science. The Advanced X-Ray Astrophysics Facility spacecraft to study the composition and nature of galaxies, stellar objects, and interstellar phenomena. Scheduled for launch aboard the space shuttle in August 1998.

### ■ Cassini, \$9.0 million.

Space science. Spacecraft mission to Saturn. Seeks data on formation of solar system and on how the building blocks needed for the chemical evolution of life are formed elsewhere in universe. Scheduled for launch in October 1997.

### ■ Discovery, \$106.5 million.

Space science. Spacecraft missions Mars Pathfinder and Near-Earth Asteroid Rendezvous (NEAR). Mars Pathfinder landed successfully on Mars on July 4, 1997. NEAR successfully launched in February 1996, now en route for a year-long rendezvous with asteroid 433 Eros in February 1999. Lunar Prospector is scheduled for launch in September 1997 and will search for resources on the moon, especially for water in the shaded polar regions.

The Stardust mission, scheduled for launch in February 1999, is designed to gather dust samples from the comet Wild-2 and return the samples to Earth for analysis. Discovery is intended as NASA's low-cost planetary exploration program.

### ■ Earth Observing System, \$679.7 million.

Mission to Planet Earth environmental project. Series of satellites to document global climatic change and observe environmental processes. Scheduled launches start in 1998.

### ■ Explorer, \$142.7 million.

Space science. Four missions and spacecraft development. Study of X-ray sources, solar corona, and organic compounds in interstellar clouds. Scheduled launches each year from 1997 to 2000.

### ■ Galileo, \$29.8 million.

Space science, planetary exploration. Funds to support operations of mission to explore Jupiter and its moons.

### ■ Mars Surveyor, \$139.7 million.

Space science. Launch of the Mars Global Surveyor orbiter occurred in November 1996. It is due to arrive in September 1997. Development of spacecraft for

new Mars exploration strategy. Mapping, in-situ climate and soil measurements, and eventual goal to return rock samples from Mars. Follow-on orbiter launch is planned for December 1998, and the first lander launch is scheduled for January 1999.

### ■ New Millennium Spacecraft, \$75.7 million.

Space science. Flight-technology demonstration to produce new microspacecraft with reduced weight and life-cycle costs. Funding increase to spur deep space mission technology and development. Demonstration flight test expected in 1998.

### ■ Relativity (Gravity Probe-B), \$45.6 million.

Space science. Major test of Einstein's general theory of relativity. Development of a gravity probe. Launch is scheduled for October 2000.

### ■ Space shuttle, \$3.0 billion.

Spaceflight. Program emphasizes continuing improvement of safety margins, fulfillment of the flight manifest, reduction of costs, and launch of seven flights for Fiscal 1998 and eight in Fiscal 1999.

### ■ Space station, \$2.1

billion. Spaceflight. International manned space facility. Ultimate capacity for seven persons. Crew capability for three persons to be available with delivery of Soyuz crew transfer vehicle in May 1998. Efficiencies gained through design changes and participation of the Russians in an international partnership.

■ US/Russian Cooperative Program. (Funding ended in Fiscal 1997, but activities still ongoing.) Spaceflight. Program provides for contract with Russian Space Agency for services and hardware and joint activities with Russia on the Mir. The eighth and ninth joint shuttle-Mir missions are scheduled for Fiscal 1998.

### ■ Other space operations, \$507.4 million.

Space science. Operation of Hubble Space Telescope, the AXAF program, the Global Geospace Science program, the Compton Gamma Ray Observatory, and the Collaborative Solar-Terrestrial Research program. Support of planetary missions includes Galileo, NEAR, Mars Surveyor, and Mars Pathfinder.

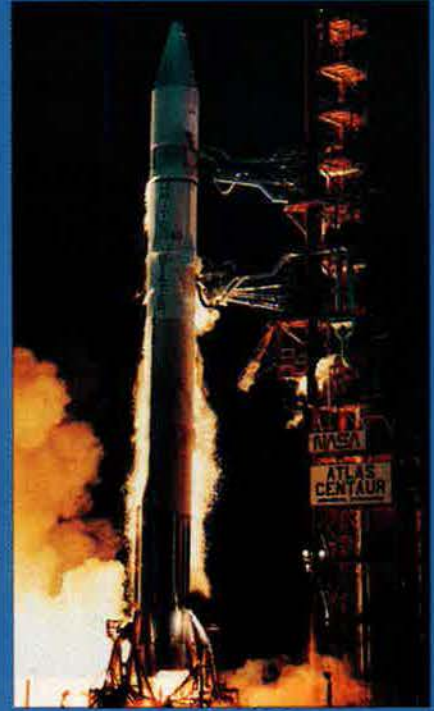
## Current US Launchers



*Titan II*



*Titan IV*



*Atlas II*

### **Titan II (Lockheed Martin Astronautics)**

Modified ICBM. Fourteen missiles have been modified; six have been launched successfully. Puts 4,200 pounds into polar LEO. The Air Force used it for DMSP launches. Titan II is launched from Vandenberg AFB, Calif. It launched the Clementine I mission to the moon and places NOAA satellites into orbit. In the 1960s, NASA used Titan II for the manned Gemini flights.

### **Titan IV (Lockheed Martin Astronautics)**

Heavy-lift launcher, adapted from an ICBM as an expendable launch system. First launch in 1989. Due to be phased out by about 2003 when the EELV becomes operational. Carries DSP, Milstar, and classified satellites and will launch NASA's Cassini to Saturn this fall. With Centaur G-prime upper stages, lifts 10,200 pounds to GEO, 39,000 pounds to LEO, and 32,000 pounds into polar LEO. Titan IVB, with upgraded solid rocket motors that provide 25 percent better performance, had its first launch on February 23, 1997. The Air Force has contracted for 41 Titan IVs; 20 have flown as of late April 1997. Lockheed Martin will complete production of all Titan IVs by 1999 but will continue to launch them through 2003.

### **Atlas II (Lockheed Martin Astronautics)**

Modified version of nation's first ICBM carries DSCS satellites and NASA and commercial payloads. The range of payloads Atlas II through IIAS can lift into GTO from Cape Canaveral AS, Fla., is 4,900 to 8,200 pounds and 13,650 to 15,900 pounds to LEO from Vandenberg AFB. The 100th Atlas-Centaur launch occurred in April 1996. A new configuration, the Atlas IIAF (with a Russian-designed RD-180 engine), will be used starting in mid-1998. It will increase the payload capability to 8,900 pounds to GTO.

### **Lockheed Martin Launch Vehicle (Lockheed Martin Astronautics)**

Family of commercially developed boosters with varying configurations of solid motors that allow payloads weighing one to four tons to be placed into LEO or on interplanetary trajectories. The LMLV-1 rocket, a two-stage version, failed on its first launch attempt in August 1995. A second launch attempt was still unscheduled. The design is for "stack and shoot," which means the rocket can be launched within 15 days of arrival at the SLC-3 launch site at Vandenberg AFB or LC-46 at Cape Canaveral AS. Although to date no military use has been contracted for, Lockheed Martin had sold seven LMLVs to commercial, foreign and US government customers by spring 1997.

### **Multiservice Launch System (Lockheed Martin Astronautics)**

Launcher is based on refurbished Minuteman II ICBMs. First launch of the MSLS occurred on September 27, 1996, with a suborbital targeting test payload. Lockheed Martin's contract calls for four suborbital flights in support of BMDO objectives in 1997 and 1998, with three more options for other missions available. MSLS can launch up to 330 pounds on suborbital missions with a range of 4,100 nautical miles, approximately 400 pounds into 100-nautical-mile polar orbit. MSLS orbital configurations are under consideration in support of Air Force follow-on contract competitions for more refurbished Minuteman IIs to be converted to space launchers in 1997.

### **Delta II (McDonnell Douglas)**

Medium launcher, in operation since 1989. Payloads include Global Positioning System and other DoD, scientific, and commercial communications satellites. Launches from both Cape Canaveral AS and Vandenberg AFB. Available in two- and three-stage configurations. Latest model lifts 11,100 pounds to LEO, 4,010 pounds to GTO. Has successfully launched 27 GPS satellites for USAF. On January 7, a Delta rocket exploded seconds after liftoff when one of its nine strap-on solid motors developed a split



*Delta II*



*Lockheed Martin Launch Vehicle*



*Space Shuttle*

casing. The failure destroyed a GPS IIR satellite and grounded the system for more than three months. The Delta II successfully launched a commercial satellite in May 1997 and was slated to launch another GPS in July.

#### **Space Shuttle (NASA)**

Manned space transportation system operated by United Space Alliance, a venture between Lockheed Martin and Boeing North American, under contract to NASA. Launched from Kennedy Space Center, Fla., lifts 46,000 pounds to 160-nautical-mile, 28.5°-inclined orbit. The delta-winged orbiter has flown more than 80 missions since its first use April 12, 1981. The shuttle carries science payloads and experiments and will be used to assemble the international space station starting in 1998.

#### **Pegasus (Orbital Sciences Corp.)**

Winged small launcher, dropped from a B-52 to carry payloads weighing 850 to 1,050 pounds to LEO of 100 nautical miles, 28.5° inclination. Two versions, priced at \$11 million to \$15 million, are available, including the more powerful XL. Pegasus flew its fifteenth mission on April 21, 1997. Of the 15 missions, two flights failed, one in 1994 and one in 1995. In November 1996, after a flawless flight to the targeted altitude, a Pegasus component malfunctioned and was



*Pegasus, mounted under an L-1011*

unable to separate the two on-board satellites, resulting in a mission failure for the payloads. Orbital plans five more launches in 1997 and seven in 1998.

#### **Taurus (Orbital Sciences Corp.)**

Ground-launched, four-stage rocket with some Pegasus commonality and a Peacekeeper or Castor 120 motor as the first stage. Capable of boosting 3,200 pounds to LEO of 100 nautical miles, 1,130 pounds to GTO with a Star 37

perigee kick motor. The rocket flew its first mission March 13, 1994. Taurus's next mission is planned for late 1997. It will carry the Ball Aerospace-built GeoSat Follow-on space-craft, as well as two Orbcomm satellites as secondary payloads. A late 1997 launch of a classified payload is also planned. Price is \$19 million to \$21 million.

# US Space Launch Sites

## Orbital Sites

**Cape Canaveral AS, Fla.**  
 Located 28.5° N, 80° W. One of two primary US space-launch sites. Handles piloted, lunar, and planetary launches and launches of satellites into geostationary orbit. First US satellite in space, first manned spaceflight, and first flight of a reusable spacecraft all originated here. Scene of more than 3,000 launches since 1950. Tract covers 15,000 acres. Cape Canaveral also provides range operations for NASA's shuttle, Navy ballistic missiles, and some research and development tests.

**John F. Kennedy Space Center, Fla.**  
 Located 28° N, 80° W. NASA's primary launch base for the space shuttle. Occupies 140,000 acres of land and water on Merritt Island, adjacent coastal strand, and the Indian and Banana Rivers and Mosquito Lagoon surrounding the center. NASA holdings include 84,031 acres. The Merritt Island location was better suited than nearby Cape Canaveral to serve as a launch site for the Apollo program's 363-foot-tall Saturn V, the largest rocket ever built. With the 1972 completion of the Apollo lunar landing program, KSC's Complex 39 was used to launch four Skylab missions and for the Apollo spacecraft for the Apollo-Soyuz Test Project. In the mid- to late 1970s, the Kennedy facilities were modified to accommodate the space shuttle program.

**Vandenberg AFB, Calif.**  
 Located 35° N, 121° W. Second of two primary US launch sites. Used for satellites (mostly weather, remote sensing, navigation, and reconnaissance) that must go into polar orbits. Provides basic support for R&D tests for DoD, USAF, and NASA space, ballistic missile, and aeronautical systems. Furnishes facilities and essential services to more than 60 aerospace contractors on base. Base covers 98,400 acres. Originally Army's Camp Cooke, taken over by USAF on June 7, 1957.

**Wallops Flight Facility, Va.**  
 Located 38° N, 76° W. Founded in 1945 on Wallops Island, Va. One of the oldest launch sites in the world. First

research rocket launched July 4, 1945. Resumed orbital launches in 1995 with the EER Systems Conestoga rocket. From 1960 to 1985, 21 satellites were placed in orbit from Wallops using the Scout vehicle. Wallops currently serves as the East Coast launch site for Orbital Sciences' Pegasus missions, and EER operates a launch site for its Conestoga vehicles. Additional small launch vehicles are expected to be launched from Wallops with the establishment of the Virginia Space Flight Center. Site for launches of NASA's suborbital sounding rockets and the like. Conducts about 15 suborbital launches per year. Covers 6,166 acres on Virginia's eastern shore.

**Spaceport Florida Facility**  
 Located 28.5° N, 80° W. New commercial launch site at Cape Canaveral AS. Designed to meet growing demand for private-sector access to space and to tap underutilized military launch sites. Operated by the Spaceport Florida Authority (SFA), a state agency. Launch Complex 46 launchpad has been converted to handle small to medium commercial launch vehicles, boosting satellites into equatorial orbit. The Navy originally used LC-46 to support landbased testing of the Trident II fleet ballistic program. The Naval Ordnance Test Unit will maintain launch capability for future programs. Lockheed Martin is scheduled to launch NASA's Lunar Prospector in September 1997 on its LMLV-2, a dual-stacked Castor 120 solid rocket motor. Expected to handle up to 12 launches per year.

**California Spaceport**  
 Located 34.33° N, 120.37° W. Designed to handle polar and near-polar LEO launches, the California Spaceport is a commercial launch facility at Vandenberg AFB. Spaceport Systems International, a limited partnership formed by ITT Federal Services Corp. and California Commercial Spaceport, Inc., is to build and operate the facility. The spaceport will provide both commercial launch and payload processing capability. Payload processing is operational. Construction of the launch duct was completed in early 1997, with design

plans ongoing for launchpad completion. The launchpad will have an initial rate of 15 launches per year.

**Alaska Spaceport**  
 Located 57.5° N, 153° W. Designed for polar and near-polar launches, the proposed dual-use commercial launch facility will be sited on 3,100 acres at Kodiak Island, Alaska. Construction for the Kodiak Launch Complex to begin in 1997. The target date for initial operational capability is summer 1998, with an eventual capacity for nine launches per year. With its large launch corridor, the spaceport would provide an additional backup launch capability for both polar satellites and for DoD's ICBM launches at Vandenberg AFB.

**Virginia Space Flight Center**  
 Located 38° N, 76° W. NASA and the Commonwealth of Virginia reached an agreement in March 1997 for the establishment of a Virginia Spaceport on the south end of Wallops Island. Ground-breaking for construction of the commercial launch facility is expected in 1997. The flight center can currently accommodate some small ELVs using up to a Castor 120 powerplant at the EER Systems launch tower located on the island, in addition to payload processing. When fully operational, the flight center is expected to be able to handle launch vehicles up to the LMLV-3.

## Suborbital Sites

**Poker Flat Research Range, Alaska**  
 Located 65° N, 147° W. Owned by the University of Alaska. Established 1968. Operated by the Geophysical Institute under contract to NASA/Goddard Space Flight Center, Wallops Flight Facility. Only US launch facility currently in polar region. World's largest landbased range. Payload recovery and observatories in flight zone extending north 600 kilometers to coast and over Arctic Ocean. Conducts launches primarily to investigate aurora borealis and other middle- to upper-atmosphere phenomena. Site of more than 271 military and civilian launches.

**White Sands Missile Range, N. M.**  
 Located 32° N, 106° W. Established July 9, 1945, as White Sands Proving Ground. Site of July 16, 1945, Trinity shot, world's first test of atomic bomb, and of postwar test and experimental flights with captured German V-2 rockets. Scene of February 24, 1949, launch of Bumper rocket, whose second stage achieved altitude of 244 miles—becoming the first man-made object in space. Now used for launches of suborbital sounding rockets. New Mexico is in the process of establishing a spaceport adjacent to White Sands for conducting commercial orbital launches.

## NASA Spending on Major Space Missions

Fiscal Year 1998 Proposal, Current Dollars

Project Office	Millions
Spaceflight .....	\$5,326.5
Space sciences .....	2,043.8
Mission to Planet Earth .....	1,417.3
Aeronautics .....	1,469.5
Mission communication services .....	400.8
Life and microgravity sciences .....	214.2
Safety and mission assurance .....	37.8
<b>Total .....</b>	<b>\$10,909.9</b>

## Upcoming Shuttle Flights

Fiscal Year 1998 Proposal

Month/Year, Mission, Name
10/1997, STS-87, <i>Columbia</i>
12/1997, STS-88, <i>Endeavour</i>
1/1998, STS-89, <i>Discovery</i>
3/1998, STS-90, <i>Columbia</i>
5/1998, STS-91, <i>Discovery</i>
7/1998, STS-92, <i>Endeavour</i>
8/1998, STS-93, <i>Columbia</i>



# The Golden Age of NASA

**Name** Project Mercury  
**Duration** November 3, 1958–May 16, 1963  
**Cost** \$392.1 million (cost figures are in current dollars)  
**Distinction** First US manned spaceflight program  
**Highlight** Astronauts are launched into space and returned safely to Earth  
**Number of flights** Six  
**Key events** **May 5, 1961** Lt. Cmdr. Alan B. Shepard, Jr., makes first US manned flight, a suborbital trip of 15 minutes.  
**February 20, 1962** Lt. Col. John H. Glenn, Jr., becomes first American to orbit Earth.  
**May 15, 1963** Maj. L. Gordon Cooper, Jr., begins flight of 22 orbits in 34 hours.

**Name** Project Gemini  
**Duration** January 15, 1962–November 15, 1966  
**Cost** \$1.3 billion  
**Distinction** First program to explore docking, long-duration flight, rendezvous, spacewalks, and guided reentry  
**Highlight** Dockings and rendezvous techniques practiced in preparation for Project Apollo  
**Number of flights** 10  
**Key events** **June 3–7, 1965** Flight in which Maj. Edward H. White II makes first spacewalk.  
**August 21–29, 1965** Cooper and Lt. Cmdr. Charles "Pete" Conrad, Jr., withstand weightlessness.  
**March 16, 1966** Neil A. Armstrong and Maj. David R. Scott execute the first space docking.  
**September 15, 1966** Conrad and Richard F. Gordon, Jr., make first successful automatic, computer-steered reentry.

**Name** Project Apollo  
**Duration** July 25, 1960–December 19, 1972  
**Cost** \$24 billion  
**Distinction** Space program that put humans on the moon  
**Highlights** Neil Armstrong steps onto lunar surface. Twelve astronauts spend 160 hours on the moon.  
**Number of flights** 11  
**Key events** **May 28, 1964** First Apollo command module is launched into orbit aboard a Saturn 1 rocket.  
**January 27, 1967** Lt. Col. Virgil I. "Gus" Grissom, Lt. Cmdr. Roger B. Chaffee, and White die in a command module fire in ground test.  
**October 11–22, 1968** First manned Apollo flight proves "moonworthiness" of spacecraft.  
**December 21–27, 1968** First manned flight to moon and first lunar orbit.  
**July 16–24, 1969** Apollo 11 takes Armstrong, Col. Edwin E. "Buzz" Aldrin, Jr., and Lt. Col. Michael Collins to the moon and back. Armstrong and Aldrin make first and second moon walks.  
**December 7–19, 1972** Final Apollo lunar flight produces sixth manned moon landing.

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*continued next page*

## Space Leaders

(As of July 1, 1997)

### Directors, National Reconnaissance Office

Joseph V. Charyk ..... Sept. 6, 1961–Mar. 1, 1963  
 Brockway McMillan ..... Mar. 1, 1963–Oct. 1, 1965  
 Alexander H. Flax ..... Oct. 1, 1965–Mar. 11, 1969  
 John L. McLucas ..... Mar. 17, 1969–Dec. 20, 1973  
 James W. Plummer ..... Dec. 21, 1973–June 28, 1976  
 Thomas C. Reed ..... Aug. 9, 1976–Apr. 7, 1977  
 Hans Mark ..... Aug. 3, 1977–Oct. 8, 1979  
 Robert J. Hermann ..... Oct. 8, 1979–Aug. 2, 1981  
 Edward C. Aldridge, Jr. .... Aug. 3, 1981–Dec. 16, 1988  
 Martin C. Faga ..... Sept. 26, 1989–Mar. 5, 1993  
 Jeffrey K. Harris ..... May 19, 1994–Feb. 26, 1996  
 Keith R. Hall (acting) ..... Feb. 27, 1996–Mar. 27, 1997  
 Keith R. Hall ..... Mar. 28, 1997

### Commanders, Air Force Space Command

Gen. James V. Hartinger ..... Sept. 1, 1982–July 30, 1984  
 Gen. Robert T. Herres ..... July 30, 1984–Oct. 1, 1986  
 Maj. Gen. Maurice C. Padden ..... Oct. 1, 1986–Oct. 29, 1987  
 Lt. Gen. Donald J. Kutyna ..... Oct. 29, 1987–Mar. 29, 1990  
 Lt. Gen. Thomas S. Moorman, Jr. ... Mar. 29, 1990–Mar. 23, 1992  
 Gen. Donald J. Kutyna ..... Mar. 23, 1992–July 1, 1992  
 Gen. Charles A. Horner ..... July 1, 1992–Sept. 13, 1994  
 Gen. Joseph W. Ashy ..... Sept. 13, 1994–Aug. 26, 1996  
 Gen. Howell M. Estes III ..... Aug. 26, 1996

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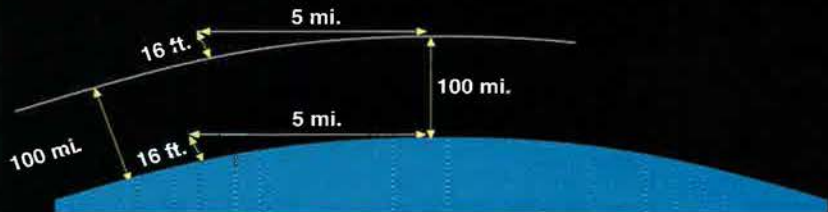
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## Orbits

Orbits result from the mutual attraction of any two bodies with a force proportional to the product of their individual masses and inversely proportional to the square of the distance between them. The curvature of the Earth, on average, drops sixteen feet below the horizontal over a distance of about five miles. A spacecraft circling above would "fall" that same amount over the same distance. It travels five miles in one second if gravitational pull equals one G. Therefore, spacecraft velocity of five miles per second (18,000 mph) produces perpetual orbit at constant altitude, unless the spacecraft's flight is upset by perturbations, such as solar wind or mechanical anomalies.



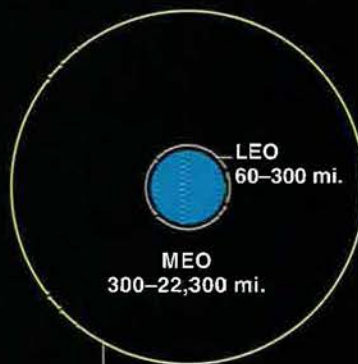
### Orbital Radii

LEO Low Earth orbit  
 MEO Medium Earth orbit  
 GEO Geosynchronous Earth orbit  
 HEO High Earth orbit

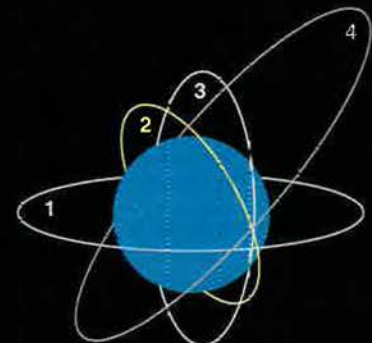
### Orbital Inclinations

1 Equatorial  
 2 Sun synchronous  
 3 Polar  
 4 Eccentric

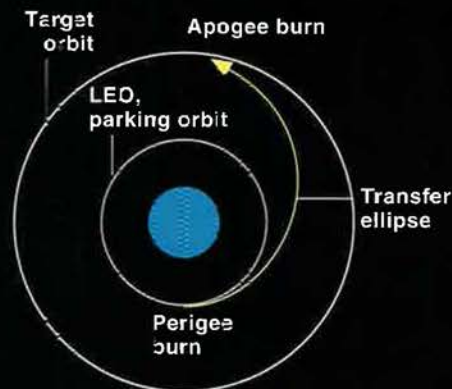
HEO 22,300-60,000 mi.



GEO 22,300 mi.



### Geosynchronous Transfer Orbit



It is common procedure to pick an initial "parking" orbit, usually at LEO, then boost payloads to higher altitude. Engines are fired first (at perigee) to reach the apogee of an elliptical transfer orbit and then are fired again to put the spacecraft into a circular orbit at that higher altitude.

Illustrations are not drawn to scale.

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PUT INTO COMMERCIAL TECHNOLOGY,  
ONE OF OUR MOST COMPELLING  
FINDINGS IS HOW TO SAVE  
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**The Pentagon's latest strategy and forces review will guide the next six years of programming, budgeting, and operations.**

# Projections From the QDR

**By John A. Tirpak, Senior Editor**

**T**HE Pentagon's long-anticipated report on the Quadrennial Defense Review premiered in Washington this spring, opening to mixed reviews. A sequel to the 1991 Base Force Review, the 1993 Bottom-Up Review, and the 1995 Commission on Roles and Missions study, the Congressionally mandated QDR attempted once again to answer the question of what it means—and what it takes—to be the world's lone superpower.

Many critics voiced concern that the course laid out in the QDR is too risky; that it would cut forces beyond prudent levels, counts on unmeasurable savings from streamlining DoD business practices, assumes a not-yet-shown capability for rapidly yanking forces out of one hot spot to insert them somewhere deemed more important, and shortsightedly reduces airpower modernization programs.

Others said the QDR report—intended to guide the next six years of defense programming, budgeting, and operations—was not bold enough in cutting away parts of the armed services they consider irrelevant in the post-Cold War world. Still others maintained that the QDR didn't do enough to hasten a revolutionary

transformation of US forces and weapons.

All agreed, however, that the QDR is by no means the last word on national defense and is in fact, according to Defense Secretary William S. Cohen, "the beginning of a process . . . that may take years" to come up with a working plan and rationale for how to organize, equip, and use the American military in the decades ahead.

## **Smaller Forces**

The QDR calls for a further cut-back in the end strength of the armed forces, which today stands at a bit under 1.5 million. Previously, the Defense Department planned to go down to a level of 1.42 million by Fiscal 2003. After the QDR, however, DoD would drop down to 1.36 million troops, eliminating 60,000 more troops. If the cuts are approved by Congress, it would mark an overall reduction in force structure of 36 percent from the levels of 1989.

The QDR would trim, slow, or stretch out the buys of new combat aircraft, restructure some of the forces of the Reserve and National Guard, accelerate a few high-priority programs, and increase spending on defense of the US from ballistic mis-

## QDR Force-Structure Changes

Major Force Elements	FY 1997 (BUR)	FY 2003 (BUR)	FY 2003 (QDR)
<b>USAF:</b> Heavy bombers .....	202	187	187
Fighter wings, active .....	13	13	12
Fighter wings, reserve .....	7	7	8
Air defense squadrons, reserve .....	10	6	4
<b>ARMY:</b> Divisions, active .....	10	10	10
Divisions, reserve .....	8	8	8
Armored cavalry regiments, active .....	2	2	2
Enhanced separate brigades, reserve .....	15	15	15
<b>NAVY:</b> Aircraft carriers, active .....	11	11	11
Aircraft carriers, reserve .....	1	1	1
Air wings, active .....	10	10	10
Air wings, reserve .....	1	1	1
Amphibious ready groups .....	12	12	12
Attack submarines .....	73	52	50
Surface combatants .....	128	131	116
<b>USMC:</b> Expeditionary force, active .....	3	3	3
Expeditionary force, reserve .....	1	1	1

Source: DoD

sile attack. It also called for undertaking at least two further rounds of base closures, which have lagged well behind cuts in the force structure they host.

The military's workload has risen significantly since the end of the Cold War, and the QDR doesn't anticipate a letup any time soon. Thus, the reduction in force levels threatens to compound current problems caused by high personnel and operational tempos and would affect the choices of many troops when they decide whether to remain in the services in years to come.

To avoid "overstressing" the troops, the Joint Chiefs have ordered a reduction in exercises wherever practicable, as well as monitoring measures to identify overworked units and find ways to spread the load more evenly, especially in "high demand" but small-staffed mission areas. Even so, many worried that the QDR set up a basic mismatch between a diminished US military force and an expansive American military strategy.

The QDR also reaffirmed the national strategy (Cohen calls it the national "capability") of being able to fight and win two nearly simultaneous Major Regional Conflicts, now

referred to as Major Theater Wars (MTWs), preferably in concert with allies. The most critical aspect of the two-MTW strategy, according to the QDR, is having the capability to rapidly halt an enemy's advance while other US forces are en route to the conflict.

However, the QDR strategy also identifies a need to plan, budget, and train for so-called Smaller-scale Contingencies (SSCs), as well as the role US military forces have in shaping world events before they erupt into armed conflict. It embraces an ever more technologically oriented military and one able to deal with "wild card" unanticipated crises, such as the sudden fall of a friendly regime or the emergence of a powerful new weapon. It also demands a revolution in the way the Defense Department does business, essential to saving money desperately needed for modernization.

Summing up the QDR, Cohen told the Senate Armed Services Committee it "takes a . . . cautious approach. It puts more emphasis on continuity than on change."

### Threat Assessment

The world foreseen by the Pentagon's analysts between now and

2015 is characterized by increased threats from weapons of mass destruction, information warfare, terrorism, and efforts by enemies to play against US weaknesses. Further, it is a world where a "peer competitor"—that is, another superpower—is not expected to emerge until after 2015. However, it was judged likely that well before then, "more than one aspiring regional power will have both the desire and the means to challenge US interests militarily."

Those interests will include, among others, continued access to oil, security for Israel, free navigation of the seas, security for NATO, and defense of US partners worldwide.

The QDR analysts determined that Iraq remains the greatest threat in the Middle East, with Iran on the rise, but gauged both nations as having far less military power than Iraq enjoyed on the eve of the 1991 Persian Gulf War. DoD also calculates that North Korea's military strength will erode as that nation descends into ever more desperate economic straits. The reduced threat in these two vital theaters made possible some of the force-structure cuts called for in the QDR, Cohen told the Senate Armed Services Committee.

As for Russia, it remains to be seen whether that nation will reorganize and downsize its military toward a professional fighting force "or face a continued process of progressive deterioration." The most likely "peer competitor" arising after 2015 is China, the Pentagon said.

The given assessment of the international "environment" of the next 20 years assumes that the US remains politically and militarily engaged overseas while willing and able to militarily defeat any enemy. Cohen noted that if the US were to adopt a more isolationist attitude and withdraw from its overseas commitments and diplomatic leadership, "the world would become an even more dangerous place, and the threats to the United States, our allies, friends, and interests would be more severe."

He told the House National Security Committee, "We simply cannot afford to come back to the continental United States, sort of zip ourselves in a continental cocoon, and watch the world unfold on CNN."

## Strategy in Three Boxes

Cohen summed up his new strategy—and it was, in fact, his choice from a number of options presented—in the introduction to the QDR report.

“We determined,” Cohen wrote, “that US defense strategy for the near and long term must continue to *shape* the strategic environment to advance US interests, maintain the capability to *respond* to the full spectrum of threats, and *prepare* now for the threats and dangers of tomorrow and beyond.” The pillars of the strat-

## QDR End-Strength Reductions

Service	Active	Reserve	Civilian	Total
USAF	26,900	700	18,300	45,900
ARMY	15,000	20,000*	33,700	68,700
NAVY	18,000	4,100	8,400	30,500
USMC	1,800	4,200	400	6,400
<b>Total</b>	<b>61,700</b>	<b>29,000</b>	<b>60,800</b>	<b>151,500</b>

\*Note: Additional cuts of up to 25,000 after 2000.

USAF photo by MSgt. Val Gempis, Airman Magazine



**Defense Secretary Cohen sees no reduction in the heavy use of US military forces in Military Operations Other Than War. However, some believe the QDR has set up a mismatch between fewer troops and an expansive US strategy.**

egy would be quality people, ready forces, superior organization, doctrine, and technology.

**1. Shaping.** Shaping missions would include peacekeeping, promoting regional stability, deterring aggression, preventing terrorism, arms-control measures, narcotics interdiction, and security assistance, among others.

To carry out these missions, the US would need forward-presence and forward-deployment assets, such as aircraft carriers and expeditionary forces, special operations forces, air and sealift, as well as deterrence forces, such as bombers. As a result, the Pentagon decided to leave intact its current overseas deployment of some 200,000 troops (100,000 each in Europe and in the Pacific). The QDR, however, made no specific reference to USAF's Air Expeditionary Forces as useful tools for the shaping mission.

The maintenance of strategic nuclear forces comes under “shaping,” and Cohen noted that they “remain important as a hedge against NBC [nuclear, biological, and chemical weapons] proliferation and the uncertain futures of existing nuclear powers,” as well as to mutual security relationships with allies. Though the Pentagon believes a survivable nuclear force is essential to nuclear deterrence, “we believe these goals can be achieved at lower force levels” and that negotiation with Russia toward a START III treaty is desirable.

**2. Responding.** Under the “responding” category, the lowest order task would be what is now called SSC operations. These “encompass the full range of Joint military operations beyond peacetime engagement activities but short of Major Theater Warfare” and would include

enforcing the Iraqi no-fly zones, Bosnian peace enforcement, maritime sanctions enforcement, noncombatant evacuation operations, such as the recent NEOs in Congo and Sierra Leone, limited strikes, humanitarian assistance, disaster relief, show-of-force operations, and counterterrorism.

Cohen noted that, based on recent history, “the demand for Smaller-scale Contingency operations is expected to remain high over the next 15 to 20 years.” He added, though, that even “small” operations can be very taxing to the military—especially when they occur simultaneously—and that the US leadership must be “highly selective” in choosing which ones really merit the action of the US military, weighing “the interests at stake and the risk of aggression elsewhere.”

In the responding category, the “most stressing” requirement for the military is the ability to fight a Major Theater War, according to the QDR. The US must retain the ability to fight two of these wars almost simultaneously on its own, but preferably as part of a coalition, it said. The way to go about it is to have jointly trained and interoperable forces “deploy quickly across great distances to supplement forward-stationed and -deployed forces, to assist a threatened nation, rapidly stop an enemy invasion, and defeat an aggressor.”

The two-MTW requirement was described as the defining capability of a superpower. A mere one-theater capacity “would risk undermining both deterrence and the credibility of US security commitments in key regions of the world,” which would weaken the “web of alliances and coalitions” on which the US relies “to protect our interests abroad.” In

this view, regional aggressors might be tempted to act if they felt the US, engaged in a conflict elsewhere, would not be able to respond to a crisis in a second region.

The QDR stated flatly that if the US dropped its ability to defeat aggression in more than one theater at a time, "our standing as a global power, as the security partner of choice, and as the leader of the international community would be called into question." A one-war capability would be a sure sign that the US was backing away from its commitments to defend its allies, the QDR maintained.

According to Cohen, the strategy hinges on the US having a capability to do three things well:

- Rapidly halt an enemy invasion.
- Operate effectively in a battle area

threatened or actually attacked by weapons of mass destruction.

■ Swiftly pull up stakes from smaller contingencies, regroup the forces, and redeploy them to a theater war.

Properly equipping and training for the "halt" phase "is absolutely critical" to being able to seize the initiative in both theaters and limit the amount of ground that would have to be retaken from the aggressor, Cohen wrote.

"Failure to halt an enemy invasion rapidly can make the subsequent campaign to evict enemy forces from captured territory much more difficult, lengthy, and costly. It could also weaken coalition support, undermine US credibility, and increase the risk of conflict elsewhere."

The NBC threat, along with information warfare, and other "asym-

metric" weapons are expected to become "prevalent" in the near future, and so the ability to operate where they are a threat is key to having a credible force, Cohen said. He also noted that it will be essential to continually improve the ability to "locate and destroy" NBC weapons, "preferably before they can be used."

A "fundamental requirement of every unit" in the military will be to be able to quickly switch gears from peacetime operations to all-out war, the QDR asserts. The US must be able to quickly pull forces out of a small contingency and move them at need to a larger war, and forces must be organized, trained, and equipped "with multiple missions in mind."

The force necessary to carry out this strategy will have to be more proficient in Joint operations than ever before, Cohen added, praising last year's "Joint Vision 2010" effort as "the blueprint for our future operations."

Nevertheless, the QDR identified five "critical enablers" without which "the United States military could not execute the defense strategy." These critical capabilities are "quality people . . . superbly led; a globally vigilant intelligence system for advance warning of crises; timely and secure global communications and information superiority; superiority in space;" and "control of the seas and airspace, without which the US would be unable to project power worldwide."

**3. Preparing.** The "daunting" task before the Pentagon now is somehow to remain ready and able to shape world events in the near term while "transforming" the US military into the force it must become to deal with future threats, Cohen said.

"Fielding modern and capable forces in the future requires aggressive action today," Cohen asserted, given the "gradual aging" of systems now in use. "It is essential that the Department increase procurement spending now" and that furthermore it be "sustained, adequate spending" to preserve US dominance in all means of warfare.

To continue in the "status quo" way of funding and organizing the armed services would provide adequate money for either near-term readiness or long-term modernization, but not both, Cohen said. Analyses showed serious risks to US secu-



Staff photo by Guy Aecio

*Although the QDR did not specifically discuss USAF's Air Expeditionary Forces, theater commanders continue to request AEFs to respond to enhanced tensions during Smaller-scale Contingency operations, such as enforcing the Iraqi no-fly zones.*

### Then and Now: The Dozen-Year Drawdown

	1985	1997
Size of defense budget .....	\$400 billion	\$250 billion
Defense budget share of US budget .....	28%	15%
Defense budget as percentage of GDP .....	7%	3.2%
Total active-duty US troops .....	2.2 million	1.45 million
Permanent overseas .....	500,000	200,000
Total reserve troops .....	1.1 million	900,000
Total DoD civilian employment .....	1.1 million	800,000
DoD procurement budget .....	\$120 billion	\$44 billion
Defense contractor work force .....	3.7 million	2.2 million

rity if either readiness or modernization were given emphasis at the expense of the other.

So Cohen selected what he described as a “balanced approach” that “focuses on preparing for an uncertain future but not at the expense of meeting current challenges. . . . It introduces new systems and technologies at a reasonably aggressive rate, with modest room for new program starts.”

The QDR aims at taking the biggest bite out of force structure in the support or “tail” end of the military, rather than in the fighting or “tooth” end. Some of the funding for modernization would come from savings derived from fewer people, fewer installations, and consolidation of some units.

To help facilitate the transition to a better, faster, and cheaper way of



Photo by Nate Leong

**Despite Congressional resistance, the Pentagon maintains that it must close more military installations to pay for modernization. Senators complained that funds from previous closure actions, such as the one that turned Chanute AFB, Ill., into an industrial park, marked for modernization went elsewhere.**

### Personnel Strength From Cold War to QDR

(in thousands)

Category	FY 1989 (Cold War)	FY 1997 (BUR)	FY 2003 (BUR)	FY 2003 (QDR)
Active	2,130	1,450	1,420	1,360
Reserve	1,170	900	890	835
Civilian	1,110	800	720	640

doing business, Cohen created a Task Force on Defense Reform, which will look at efficient, successful businesses around the country and try to translate their practices into ones the Pentagon could apply.

Members of the Senate Armed Services and House National Security Committees complained bitterly to Cohen about his call for two more rounds of the Base Realignment and Closure (BRAC) commission, since military bases are the core of the economies in many Congressional districts. But Cohen rejoined that while force structure has come down a third and procurement by 63 percent since the mid-1980s, only a 21 percent reduction has been taken in bases, and the base structure has to “catch up” to the shrinking force.

“All I can do is make a recommendation to you,” Cohen told the Senate panel. “If you decide it’s not politically possible, it’s not popular,

. . . we have to live with that. But there are also consequences” of such a decision, he added.

In future testimony, “when I . . . present the charts, and you say, ‘You really haven’t moved very much . . . in terms of modernizing,’ I’ll say, ‘No. And it’s unlikely that I’ll be able to . . . because we are still carrying too much capacity [in bases].’ ”

However, under questioning from his former Senate colleague, Olympia J. Snowe (R-Me.), Cohen acknowledged that previous BRAC rounds were also intended to free up money for modernization, only to have the savings siphoned off to pay for operations such as Bosnia that were not covered by supplemental funding.

“There is no guarantee that you could somehow wall off those funds from going again to . . . contingency operations,” Cohen admitted. “There is no absolute guarantee that you can

prevent that from taking place.” He pledged to make frequent notifications to Congress about the up-front costs and savings of BRAC and how the savings would go to modernizing the force.

### Force Changes

The QDR report proposed end-strength, force-structure, and modernization cuts for all four armed services. These steps were directly affected by a critical DoD decision made in late 1996, as the QDR was just getting under way; plans, policies, and procurement programs all were to assume defense spending of no more than \$250 billion annually for the foreseeable future.

Among the services, the Air Force would take the most substantial reductions if the QDR is implemented. One case in point is end strength. From the baseline established in the 1993 Bottom-Up Review, USAF will now eliminate another 26,900 active-duty, 700 Reserve and Guard, and 18,300 civilian positions.

Force structure also took hits. Under the QDR plan, the service would retire about 60 older fighters from Air National Guard squadrons and replace them with airplanes drawn from active-duty units, and six continental air defense squadrons would be shifted to general-purpose, training, or other missions.

The current force structure of 20 fighter wing equivalents would be



maintained, but the Air Force would shift one active wing to reserve status, changing the mix of active-duty to reserve-component fighter wings from 13 and seven to 12 and eight.

Today's 10 separate air defense squadrons would drop to four (and be scored as "0.8" wings).

The Air Force is also to "consider" eliminating more wings as newer, more capable aircraft come into the inventory. The F-22, for example, would be reduced from 438 airplanes to 339, and in turn, F-22 force structure would fall from the previously planned four to three, on the strength of the anticipation that the F-22 will be far more effective than the F-15 it replaces.

USAF would retain 187 heavy bombers, but only 142 of them would be assigned to operational units. The Air Force would also return to using a standard fighter squadron of 24 airplanes, up from the 18 that currently constitute a "fully equipped" squadron. Chief of Staff Gen. Ronald R. Fogleman told Congress that of all the QDR recommendations, the squadron authorized aircraft change was his highest priority. It would consolidate units and allow some to be eliminated.

Further reductions would be made by "aggressively outsourcing" depot and support functions.

According to the QDR, the Air Force should make no changes in the size of the tanker or airlift fleets. Indeed, it noted, the reduction of

overseas bases and the profusion of small contingencies will cause the Pentagon to reevaluate and give "increased emphasis" to the lift issue in future budgets.

### Air Force Systems

The QDR's conclusions affected some of the Air Force's top-priority systems.

The Pentagon accepted USAF's offer to cut planned F-22 purchases by about 25 percent, but it then made another change—slowing down initial purchases of the fighter and stretching out the program. The QDR held out the possibility that a dedicated ground-attack version of the F-22 might be developed and purchased to replace the F-117 and F-15E when those airplanes start to retire around 2020.

The QDR concluded that the US should make no further purchases of B-2 stealth bombers beyond the 21 that are currently authorized. The Pentagon said it reached this conclusion as a result of an analysis performed in its long-running Deep Attack Weapons Mix Study. Even though the addition of B-2s improved the ability to "halt an adversary's advance in the opening days of a Major Theater War" and would be especially useful in no-warning conflicts, the QDR said that buying more B-2s would displace buys of tactical aircraft needed for air superiority and forward presence and would offer a less telling advantage as new stealth air-

craft start entering the inventory. In addition, it said, "existing forces would have to be retired immediately to pay for the additional B-2s," resulting in a short- to medium-term loss of warfighting capability.

The QDR recommended a cut in the planned fleet of E-8 Joint STARS aircraft. In addition to one test aircraft, the Air Force had planned to buy 19 production models. Now, that figure has been reduced to 13, enough for 24-hour surveillance in one MTW. The truncated fleet "could be augmented by NATO JSTARS aircraft" in an emergency, said the QDR report, which assumes that NATO will buy the system.

Air Force officials said the decision flowed from the desire to spend money only on "flying the sensor" and not the battle-management function that is part of Joint STARS today.

The QDR called for a reduction in the buy of the Joint Strike Fighter from 2,978 airplanes to 2,852, due to the expected lower attrition rates vs. current generation aircraft.

The review also found that the current munitions program, "with modest adjustments," will provide the capability to defeat potential aggressors in the years ahead. The adjustments would involve increasing the buys of some types—such as the Joint Air-to-Surface Standoff Missile and laser-guided bombs—and decreasing the buy of others, such as the version of the Joint Standoff Weapon that uses submunitions.

Under Cohen's reorganization and reduction plan, the other services will undergo the following changes:

**Army:** The Army would lose 15,000 active-duty and 33,700 civilian slots. Initially the QDR also trimmed 45,000 reserve-component slots, but after a negotiation with the Guard and Reserve, the Army agreed to cut only 20,000 by the year 2000 and up to 25,000 more afterwards. It would keep 10 active divisions and eight Guard and Reserve. Many of the personnel cuts would come from consolidating or realigning units, principally headquarters. Cohen and Army Chief of Staff Gen. Dennis Reimer acknowledged in Congressional hearings a "feud" between the active-duty and reserve components over the changes and expressed the desire to seamlessly integrate the "Total Force" as, in Reimer's words, "the Air Force does." The Force XXI,



*The QDR would reduce the buy of new F-22 Raptors from 438 to 339, with a corresponding cut in wings, based on the anticipation that the F-22 will be much more capable than the F-15 it replaces.*

or "Digital Army," effort would be accelerated two years and is expected to obtain more combat effectiveness out of fewer soldiers.

**Navy:** The Navy would lose 18,000 active-duty, 4,100 reserve, and 8,400 civilian slots. While keeping 12 carrier battle groups and 12 amphibious ready groups, the Navy would retire 12 surface combatants, made possible by the more advanced AEGIS cruisers and *Arleigh Burke* destroyers. The QDR says the Navy would drop from 73 to 50 attack submarines, but it was already headed down to 52 submarines under previous plans, so the QDR takes only two additional boats. Likewise, the QDR touts a cut in the F/A-18E/F program from 1,000 Super Hornets to a minimum of 548; however, the 1,000 figure was the original target, before the Marine Corps withdrew from the program, a move that reduced the requirement by several hundred airplanes. To preserve a "creative tension"—that is, a competitive element—in Navy combat-aircraft programs, the F/A-18E/F will be curtailed at 548 airplanes, and procurement would switch to the more capable Joint Strike Fighter if the JSF arrives on time and with the promised capability. If the JSF fails or is late, the Navy could buy up to a maximum of 785 F/A-18E/Fs. Other cuts would come from overseas infrastructure and shifting some ships to Sealift Command.

**Marine Corps:** The Marines would lose 1,800 active-duty, 4,200 reserve, and 400 civilian slots. Three active Marine Expeditionary Forces would be retained, each of which includes a division, air wing, and service support group, along with a command element. A single reserve division/wing/service support group would also be retained. The MV-22 tiltrotor program would be sped up, but the size of the buy would be reduced from 425 to 360, owing to the V-22's greater capability and reliability over the current aging helicopters. Personnel cuts would be taken by closer scrutiny of headquarters' requirements and expected success in "ongoing warfighting experiments."

Under terms of the QDR, the US would maintain a strategic nuclear force outlined in the START I agreement, which would include about 6,000 warheads. Washington had planned to begin dismantling some

of the systems soon as a result of lower ceilings approved in the START II negotiations. However, because of delays in the Russian Duma's ratification of the START II treaty, more money will have to be added to the Pentagon's budget to preserve nuclear forces at START I levels, which include 18 Trident ballistic missile submarines, 50 Peacekeeper missiles, 500 Minuteman III missiles, and 71 B-52H and 21 B-2A bombers.

While national missile defense remains "a high national priority," the review indicated that an infusion of \$2 billion over the next three years is needed to make a year 2000 deployment decision possible, but even with the extra money, the program will still have "very high schedule and technical risk."

Theater missile defense elements largely survived intact, with the exception of the Theater High-Altitude Area Defense system, which will have to be restructured due to "technical failures." The Pentagon put high confidence in the Airborne Laser and also noted that it is "committed to continue pursuing increases in capability in attack operations to address theater ballistic missile and cruise missile threats prior to launch, thereby reducing the stress and reliance on intercept systems."

Attracting and retaining the quality people necessary to make a smaller force capable and credible means there must be a continuing commitment "to funding pay raises and other

compensation," such as educational assistance. The Pentagon pledged continuing "adequate funding" in housing and community and family support.

### Airpower Shortchanged

The QDR found each service's evolved post-Cold War doctrine—the Air Force's "Global Engagement," the Navy's "Forward . . . From the Sea," the Marine Corps's "Operational Maneuver From the Sea," and the Army's "Force XXI/The Army After Next"—to be largely sound and in consonance with Joint Vision 2010. Part of the problem in making value judgments of one service's capabilities over another was due to the still inadequate capabilities of modeling and simulation, according to Maj. Gen. Charles Link, the Air Force's point man on the QDR and the earlier Commission on Roles and Missions.

"I come to the end of this effort still disappointed in our ability to model, simulate, and understand modern Joint warfare, and particularly the contribution that airpower can make," Link told reporters after the QDR's public release.

Preference for "air-, land-, or sea-power solutions to national security problems is largely a matter of beliefs," Link said. Having watched the most sophisticated computer models attack the problem, then be tweaked and rerun and still come up with nonsensical answers, "at the end of



*Because the Russian Duma has delayed ratifying the START II treaty, the Pentagon will have to spend more money to preserve its nuclear force, such as this Minuteman III ICBM at F. E. Warren AFB, Wyo., at START I levels.*

the day, beliefs sort of come back to rule how one makes decisions.”

Link said he wished the models could have demonstrated accurately what airpower could do to make efficiencies elsewhere possible.

While “I have never attempted to replace boots on the ground with airpower,” Link said that when comparing the power of ground forces and air forces to destroy the enemy, when ground forces do so, “they make themselves vulnerable, [with losses] in almost the same ratio.”

He hopes that the military community is starting to truly understand that “modern airpower gives us the ability to destroy the enemy’s military forces without giving the enemy as much to shoot at.”

That understanding manifested itself somewhat in the QDR’s emphasis on the halt phase in an MTW, Link said.

Though produced just as Washington was in the throes of creating a “glide slope” to a balanced federal budget in 2002, Cohen insisted that the QDR’s reductions were not “driven” by budget tightening. Instead, he said he instructed his QDR staff to “not make any unrealistic assumptions” about available funding. The assumption they were told to work with was that defense spending will remain relatively flat “for the foreseeable future.” To craft plans that anticipated—or even held out a hope for—large infusions of extra money later would have made for a completely pointless exercise and “a waste of time,” he told the Senate Armed Services Committee.

Instead, Cohen asserted that the strategy came first, and the funding shifts were made as a response to the strategy.

One Senator commented that the Pentagon seemed to be open to any strategy “as long as it cost \$250 billion” or less.

### **NDP Wades In**

In mandating the QDR, Congress also set up the National Defense Panel, a commission that would review the Pentagon’s QDR findings, comment on them, and offer alternatives where there was a difference of opinion.

The NDP approved of the strategy described in the QDR and said it represents “an improvement in understanding future threats and chal-



Photo by Ted Carlson

*The National Defense Panel praised the overall QDR strategy, but expressed concern that the QDR’s program decisions, such as no additional B-2 bombers, does not match its strategy.*

lenges.” However, the NDP expressed concern that “there is insufficient connectivity between strategy on the one hand and force structure, operational concepts, and procurement decisions on the other.” In other words, the QDR program decisions—such as no new buys of the B-2, cuts of the F-22, Joint STARS, and special operations forces—don’t seem to match a strategy that emphasizes the halt phase of an MTW, control of airspace, “seamless [intelligence] collection capabilities,” and finding and destroying weapons of mass destruction before they are used.

“The panel considers the modernization plan to have more budget risk than is acknowledged by the QDR,” the NDP said, because it assumes that there will be two more BRAC rounds, savings from other infrastructure reductions, savings from new business practices and acquisition reform, and a defense budget that will hover at \$250 billion in constant dollars. These assumptions, it said, are “somewhat tenuous.” The NDP suggested greater linkage between strategy and systems and asserted that the QDR didn’t focus enough on space threats and a strategy for “maintaining access to space.”

The NDP found the review weak in that it “views Major Theater Warfare as a traditional force-on-force challenge,” an assumption which “inhibits the transformation of the American military to fully exploit

our advantages as well as the vulnerabilities of potential opponents.” It warned the Pentagon not to get too comfortable with the current force structure; it may not be “optimal” as new technologies become available, which in turn “may permit us to be successful with smaller but far more lethal and effective forces.”

It also said the QDR failed to give adequate attention to the prospect that overseas basing may be increasingly denied the US—and what that means to “the ability to project power.”

The NDP agreed that the force cuts suggested in the QDR could be managed “without creating significant risk,” and it supported the infrastructure cuts offered by the Pentagon. It also said that while the doctrine/philosophies of the services embraced in the QDR are useful, “added effort is needed to encourage further development of Joint and combined operational concepts.” The panel urged the Department to improve its modeling and simulation capabilities as soon as possible.

In Senate testimony, Cohen said that “we don’t have a fall-back plan” to the QDR. “We’re saying here’s the best plan,” and if Congress doesn’t approve, “Here are the consequences. You don’t get [certain] things. You do put at risk our men and women, not now, but in the year 2005, 2010, 2015. We will not be as capable and as strong as we need to be.” ■

**A key USAF leader says the QDR puts emphasis on the “halt” phase of theater war.**

# *The New View of Airpower*

*Maj. Gen. Charles D. Link was special assistant to the USAF Chief of Staff for the national defense review (1996–97) and as such was point man for the Quadrennial Defense Review (QDR). He was also the Chief’s representative to the Commission on Roles and Missions (1994–95). Thus, Link was a key Air Force figure in the most recent defense reassessments. On May 22, 1997, he met with the Defense Writers Group in Washington, D. C.*

## **USAF’s View of QDR**

“At the end of the day, here, I think the Air Force is satisfied with the impact of the QDR on the Air Force—in fact, probably well satisfied. But it would be important to point out that that satisfaction doesn’t grow out of any increased confidence in our ability to analyze the problem and produce illuminating results. . . . I come to the end of this effort still disappointed in our ability to model, simulate, and understand modern joint warfare and, particularly, the contribution that modern airpower can make. . . .

“I am now convinced that the preference for air-, land-, or seapower solutions to national security problems is largely a matter of belief much more than a matter of science. I’ve watched science attack these problems in the forms of models and analyses, and at the end of the day, beliefs sort of come back to rule how one makes decisions.”

## **Emphasis on “Halt” Phase**

“The [QDR] strategy implores us to be able to *halt* aggression twice, one rapidly followed by the other. It implores us to *defeat* [the enemy] in two conflicts [Major Theater Wars, or MTWs] in overlapping time frames.

“It appropriately recognizes that, when we halt aggression, it’s not a stalemate—halt him short of his objectives. The enemy then has to figure out either how he lives in friendly territory under aerial bombardment from now on or how he gets back into some place where he’s no longer threatened.

“We can do that, pretty much, with modern airpower. Once you have him stopped, you can then keep him from regaining any military effectiveness with a smaller amount of force than it took you to stop him. . . .

“That counteroffensive, which we used to think had to happen in ‘x’ number of days, is no longer as time-sensitive. . . . It’s no longer just a point in the military plan that has to be honored because somebody says, ‘We’re going to do it on Day 62.’ ”

## **Revolutionary Thought**

“A lot of people think [the Revolution in Military Affairs] is about video to the foxhole. I like to think it’s about using America’s technology edge to reduce the military capability of a foe before we put too many American sons and daughters in a conflict. . . .

“We ought not to be working so hard to put large numbers of young Americans within range of enemy fire as soon as possible in the conflict, which sort of characterizes what we’ve been doing for 40 years. We ought to be working harder to find out how to find, fix, and kill moving enemy forces and [to be] reducing their military effectiveness before we expose too many folks on the ground to their fire.”

## **Chief’s F-22 Sacrifice**

“Frankly, I think [General Fogleman] was responding to concerns about defense spending [when he volunteered in the QDR to cut the top-priority F-22 program from 438 to 339 fighters].

“I think he feels strongly the responsibility to deliver to the American people the security they require in the most economic set of conditions he can achieve. As he looked down the road, he saw a possibility here to reduce the number of F-22s dedicated to air superiority. . . .

“Seeing an environment in which circumstances were fairly dire, and realizing that he did have a capability that was significantly improved over the capability that he was replacing—the F-22 com-

pared to the F-15C—he felt fairly comfortable in trimming one wing of F-22s in the air-superiority role.”

### No More Stretch-outs

“The Chief said we believe that, with prudent risk, we can replace four air-superiority wings of F-15Cs with three air-superiority wings of F-22s. When the decision made by the [Secretary of Defense] included some other adjustments [e.g., an F-22 stretch-out], I think those other adjustments gave the Chief pause.

“If it gave him a lot of pause—I mean, if it gave him the kind of pause where he felt the program, as presently structured, is now in trouble—I think he would take that up with the SECDEF. I think what he’s saying is that any further adjustments to this program are unappreciable.”

### F-22 in Good Health

“I would suggest that anybody who is worried about the health of the [F-22] program, or the intent on the part of the Department of Defense with regard to the program, go back and carefully review [Defense Secretary Cohen’s] and [Joint Chiefs of Staff Chairman General Shalikashvili’s] words in testimony. I am personally convinced that both those gentlemen understand that the future of American military superiority hinges on the F-22. . . .

“I haven’t seen any anti-F-22 rhetoric that concerns me in the last month or so. It’s important to remember how the F-22 got identified as being too expensive. For a short, unfortunate period of time, advocates of the [Navy F/A-18E/F] Super Hornet were holding it up as if it had some kind of similar capability. And, in the numbers in which the Super Hornet was projected to be bought, its unit cost made it look as if it were relatively inexpensive. That in turn made the F-22 look like an expensive airplane. We’ve sorted through most of those problems . . . and so I don’t hear that much anti-F-22 rhetoric occurring.”

### JSF for Deep Attack?

“I’ve never heard that [assertions that some senior USAF officers view the Joint Strike Fighter as a possible replacement for the F-15E and F-117 aircraft]. . . . I guess it would be hard to argue with that, if you could buy that kind of long-range, deep interdiction capability in the same airframe you’re buying for the high-quantity,

low-end of the combat area. I can tell you, having been around this discussion a long time, that it never occurred to me that we could replace the F-117 and F-15E kind of capability with the JSF, unless the JSF turns out to be somehow much more capable and much cheaper than our experience to date would indicate is possible.”

### DAWMS and the B-2

“The atmospherics around the [Deep Attack Weapons Mix Study] Part II required [the Pentagon] to produce a full round of analysis [of the B-2 bomber in comparison with other deep-attack systems]. . . . I got an opportunity to look at every piece of it, and frankly we questioned some of it and had some of it redone. . . . So, they did some more work, and we were satisfied that the work that they did [led to] the conclusion that the B-2 is an extraordinarily valuable asset in the halt phase, but that the trade-offs that one has to make in order to buy more of them within a given DoD top line would give up some capability that [is] not otherwise provided by the additional B-2s, and then there’s the capability gap to worry about.”

### Carriers vs. B-2s

“It’s hard to trade B-2s and carriers across the spectrum of their unique contributions. On the one hand we inherit the notion that somehow a carrier in the vicinity helps in shaping [events in a foreign environment]. On the other hand a carrier only helps in the area to which it has immediate access. The B-2, held in a secure reserve, can threaten anybody’s valued assets anywhere on the globe.”

### Enthusied About PGMs

“Overall, there’s a much broader consensus [after completion of the DAWMS] that investment in munitions is a good idea. I can’t tell you that it’s reflected in the program today, but I can tell you that it is reflected in the intellects of the people who will design the programs of tomorrow. Degradations in the ability of airpower to be effective in the course of a campaign, which were due to munitions shortfalls, are not appropriately compensated by the addition of other kinds of forces. They are appropriately compensated by the purchase of additional munitions.”

### Crazy Analytic Models

“At one point [in the DAWMS], it

looked as if we would be very foolish to buy any [Joint Standoff Weapon], and we ought to buy as much [Wind-Corrected Munitions Dispenser] as we possibly could. As we looked at it, we said, ‘Why would the model consistently choose wind-corrected munitions over the Joint Standoff Weapon?’ Finally, we realized it was because the model couldn’t distinguish between standoff at altitude and standoff horizontal. We had to go back in and say, ‘There simply are targets that you don’t want to fly over.’ We had to try to find a way to tell the model that there are tactical needs for certain kinds of munitions. We never did get the model fixed.”

### E-8 Joint STARS

“Since the Joint STARS construct was developed, the idea that you would always rely on ground forces to target enemy armor has lost some of its luster. The idea that you have to fly aboard Joint STARS all of the things that we now fly is being rethought. Maybe in the future we could reduce it, just flying the antenna, and leave the battle-management function somewhere else.

“This is one of those problems we always have. . . . Those of us who have day-to-day accountability for the U-2s’ operational mission are reluctant to sell it off in order to invest in the high-tech follow-on UAV [unmanned aerial vehicle]. . . . We could probably come up in a few years with a better way of doing the same mission—one that is perhaps less vulnerable, more easily deployed, and less costly.”

### Army Goes Along

“I see that decision [the QDR’s call to cut the planned Joint STARS fleet from 19 to 13] probably as a hedge against investing more money than might be necessary in what could quickly be older technologies.

“I have to tell you, the Air Force didn’t propose cuts in Joint STARS. When the primary Joint STARS customer—the United States Army—was comfortable with the cuts that were proposed, we went back and looked at [the question], ‘Will this significantly reduce our ability to be effective in the halt phase,’ which was receiving some increased emphasis in the strategy. We concluded that that would not, because the halt phase is going to go fairly rapidly, and then we would swing the Joint STARS assets to another area if we needed to.” ■

An aerial photograph of a river delta, likely the Nile, showing a complex network of channels and floodplains. The image is taken from a high altitude, showing the curvature of the Earth at the top. The colors range from dark blue in the water to light tan and brown in the land.

**USAF begins the transition toward a space and air force.**

**By John A. Tirpak, Senior Editor**

# The Rise of Space

**T**HE coming shift in emphasis to a "space and air force," touted in USAF's long-range planning, isn't a matter of changing philosophy or pioneering spirit but a practical recognition of risk, efficiency, commercial trends, and the fact that space will inevitably become a battle arena, according to Air Force Gen. Howell M. Estes III.

"Global Engagement," USAF's vision paper, says the service is "transitioning from an air force into an air and space force on an evolutionary path to a space and air force."

"A tremendous amount of our economic strength is migrating to space," said Estes, who serves as commander in chief of US Space Command and NORAD and commander of Air Force Space Command. Within a decade, he went on, government agencies and private concerns are "going to put 1,800 satellites into orbit," valued at a trillion dollars or more.

Dependence on these satellites, according to the General, will be akin to US dependence on foreign oil and will represent a target too tempting to an enemy.

"We ought to recognize that as a country," Estes asserted, "so it doesn't come as a surprise" when an enemy attempts to attack US space assets. When the attack comes, he added, "we as a nation are going to protect" the investment. One of the main reasons for having a military is to "make damn sure that economic investment survives."

In an interview with *Air Force Magazine*, Estes described the likely path toward the future space and air force, the enabling systems and philosophies that will make it possible, and the evolutionary problems that already are apparent.

The transition to the space and air force of the future is not going to be a sudden, jolting shift, Estes said—though he acknowledged there are some in the Air Force who believe it ought to be.

Within USAF, "you find those that think all this talk about space is interesting but a little bit irrelevant because they're dealing with real systems and problems today," Estes noted. "And then there are those on the other side . . . who want a revolution to take place, who think it's 'doable' today."

### **This Is It**

The advocates of the "space revolution," he observed, argue that, in an era of limited resources, now is the time to make the change because the world threat is so low. Their view, as Estes paraphrased it, is, "If we're ever going to do this thing, now is the time."

He prefers to navigate a course between the two paths, not because he is "a middle-of-the-roader" but because of his belief that an overly aggressive push would result in unfulfillable promises and because the slow-and-steady approach is "why we've gotten where we are today so quickly in space."

At the same time, "technology is moving very fast in space, and part of this is because of the commercial investment." USAF must keep up, he insisted.

Indeed, on its own, the Air Force won't be able to afford the technological steps necessary to become the space power Estes feels is necessary. It will have to take on industry partners for some technologies, while others will be purchased or leased.

Buying off-the-shelf has become a real possibility because "people in industry now have seen that there's a lot of money to be made" in space systems, "especially in some of the more modern technologies—communications, information flow, and things of that kind." Commercial progress in space systems "is far outstripping anything that we're doing in the military."

However, Estes thinks it's more likely that there will be "sharing in the development cost between government and industry."

Estes said that he is working to create that partnership with a new openness toward industry, seeking commercial input in Air Force ideas and in building simple, personal trust with industry leaders. He bemoaned the "adversarial relationship" that has sometimes plagued USAF in its business relations and the government-imposed rules which "made their life pretty difficult" and got in the way of a healthy partnership.

Most of the problems are "bureaucratic," Estes said, "which is one of the reasons I think it's not too hard to change."

He has promised that as soon as a definitive plan for the military space program is set, he will brief it to industry leaders, because "we've got to get [their] commitment behind this thing."

### **Profound Effects**

The commercial investment in space is set for a major expansion, Estes said, with private enterprise offering services of all types, from Internet links to terrestrial imagery to telephone service for the two-thirds of the world which doesn't yet have it. These businesses will have "profound consequences" for the world economy.

The Global Positioning System, for example, is already an \$8 billion market and holds out the prospect for becoming the "international standard for air navigation," Estes asserted.

The General noted that the Air Force has mounted an aggressive effort to find out how it can comply with President Clinton's order that the best GPS signal be made freely available by 2005. At present, only the US military has access to the best signal, while the rest of the world can receive "selective availability," which is of less accuracy.

The Air Force has until 2000 "to sort this out," Estes reported. If it has not done so by then, the service can get one-year extensions until

2005, when the most-accurate signal will be available to anyone “whether we’ve solved this or not.”

The GPS issue is a sensitive one because it is known that China, among other nations, is designing munitions that can use GPS for targeting. Estes said the Air Force is looking at various approaches to defeat such table-turning efforts. These include encryption and “skewing the signal . . . in a given region” if the US military is engaged in combat there.

However, Estes is enthusiastic about the prospect that GPS could be the cornerstone of a worldwide surveillance system that could monitor and track all air traffic on Earth. Such a system will become increasingly desirable because “in the next 10 years, we’re basically going to double the number of commercial airliners in the air. . . . The skies are getting pretty crowded, and so how . . . are you going to have a system that keeps these airplanes all deconflicted?”

Such a question gained importance when Air Force One, with President Clinton on board, had to be routed out of the way of an oncoming UPS cargo plane over the mid-Atlantic Ocean on May 27. The two airplanes passed within a few thousand feet of each other.

“If you could have a spacebased system that ties into GPS and ties into a surveillance system, you could not only keep track of everything that’s moving around the surface of the Earth, but in fact you could identify precisely where it is and use GPS for navigational aid to do landings,” Estes said.

Besides the “tremendous commercial application,” such a system “certainly has military application,” he added.

Estes has gone on the road talking to civilian groups about the ways that space systems affect their daily lives—systems, such as GPS and earth resources satellites, weather systems, and electronic banking—which they tend to take for granted. Estes promotes the idea that these pillars of daily life are worth protecting.

The debate over whether space-based systems or unmanned aerial vehicles are best for military surveillance is a hollow one, Estes said, observing that “We’re going to have to have both.” In peacetime, when threats are low, expensive, long-lived

satellites with the ability to watch large swaths of the Earth “make sense,” while in a tactical situation, cheap, highly targetable, and quickly responsive UAVs might make “more sense.”

However, the UAV lesson can be applied to satellites, too, and Estes would consider developing “tactical satellites” that can be quickly launched to look at a point of immediate interest and rapidly “fill the gap” if another satellite is blinded, destroyed, or otherwise neutralized. Similarly, a constellation of cheap satellites might do the same job, “so if you lose one, it doesn’t make any difference to you.”

### Getting Up There

The “cheapsat” idea quickly leads, though, to the toughest nut to crack: quick, cheap access to space.

“We’re trying to find ways to get something up there quickly, with . . . rapid relaunch capability,” Estes explained. So far, neither expendable rockets or reusable ones have done the trick, though “a reusable platform is a heck of a lot more attractive . . . just because of the cost.”

Air Force Space Command is working on a requirement for a spaceplane, which Estes said was to be completed this summer, though he is willing to extend the deadline until the fall.

“I want a quality product. I want something that makes sense,” he said, noting that “some folks with awfully good intentions and with some awfully healthy and fertile minds are thinking of spaceplanes doing lots of things.”

In the Air Force’s “New World Vistas” technology forecast, spaceplanes were mentioned as doing everything from refueling on-orbit satellites to inserting special operations forces teams into far distant areas on Earth.

“We have to be very careful to be credible,” Estes said of the spaceplane. He has already quashed some ideas because they were too ambitious.

“I’ve said, ‘This just isn’t going to sell,’ ” because the proposers were “trying to do too much right off the bat. You’re not going to have a full-up spaceplane—doing all the things you think it might do—the first one out of the chute.”

He prefers, instead, to take an

incremental approach, where each step has a clearly defined “military utility,” and each is an improvement on the last. Pursuing a highly aggressive course will lead to a situation in which “the spaceplane will suffer” from the same criticisms leveled at the idea of a spacebased radar: “too hard, too much money, too little utility, technologically not possible.”

While he believes it’s necessary to have people thinking “way out,” he’s concerned about getting “a little too far out in front.”

Right now, the space commands are focused on intelligence, communications, navigation, ballistic missile warning, and weather. These are missions that are largely understood throughout the Air Force—collectively referred to as “space support to the warfighter”—and they also represent the bulk of what the senior USAF leadership is talking about when they say missions will be “migrating” to space. More and more of the terrestrial, or even airborne, versions of these missions will come to reside on space platforms.

As Estes said, though, the dependence on these systems will be high, and that will require a mission now called “space control.”

Asked to define space control, Estes offered an analogy. “If I said ‘control of the air’ . . . you’d know exactly what I was talking about. [It means] I want to maintain superiority, . . . operate freely, and deny that to the enemy. Just translate those words up into space.”

He hastened to point out that space control is not synonymous with information operations. Some confuse the two because “if we were trying to limit somebody’s ability to use what’s in space, it would be to limit information, so that’s why they think it’s the same. There is an overlap between the two, but as the space-control mission evolves . . . those two circles are going to start separating.”

He defined space control as surveillance, deterrence, protection, and negation. Protection can mean anything from hardening—expensive to do—to the cheapsat concept. Surveillance means being able to see and track what’s in space, and negation can take many forms. Ironically most of the “negation” concepts are terrestrial in nature.



## Antisatellite Warfare

Estes pointed out that the Army has long been working on an anti-satellite capability, a program that's "very well known." Lasers also offer an option for antisatellite warfare, known as "blinding."

Then there is jamming. He noted that Indonesia is jamming a Hong Kong-emplaced satellite Indonesia feels has been wrongfully put in its own geosynchronous "slot," demonstrating that such forms of space warfare are already being practiced.

Information warfare could play a role, as well, because "if you can get into somebody's computer, . . . which prevents them from doing something in space, that's part of space control," Estes said.

Finally, there is interdiction.

"If you can take out a ground station, that's space control," Estes asserted. "You've denied the enemy access to space, and you didn't even have to go to space to do it."

Having an antisatellite capability that's down-to-earth is important, Estes said, because he predicts "great trouble, politically, with putting weapons in space. And probably . . . it shouldn't be an easy decision."

But just as armies were developed to protect landlines of communication, navies to protect sea lines, and air forces to protect air routes, "the same thing is going to happen in space," Estes maintained. "There are going to be threats to our national security as we put things in space, . . . and we may find the only way to protect ourselves—the best way to protect ourselves—is to go to space to do it."

Likewise, despite treaties governing the emplacement of spacebased antiballistic missile systems, Estes feels that circumstances may change.

The treaties are "OK today," said Estes, "but I'll tell you, if those ballistic missiles threaten this country, and we find" that spacebased weapons are the best means to defend against them, "I'm sure the issue's going to be revisited." If space offers "the best way" to defend the nation, "I think that we will make that decision," Estes said. "We're not going to leave our citizenry unprotected."

He winced at the idea of a threat to use ballistic missiles against the US and having no means to stop them. The American public, he said, as-

sumes that such systems exist because "they saw it in the Gulf" and logically assumes that with the passage of six years, the US has an even better system now.

"I wish we did," Estes said. The decision to develop and deploy such capabilities, he observed, is "going to rest on decisions made by our civilian leadership."

Piggybacking on commercial endeavors in space may not always work, Estes noted. For example, he finds it hard to see an immediate commercial benefit to putting people in space, which in turn affects the feasibility of the spaceplane.

"One of the technologies we've got to work on if we're going to make manned spaceflight in a spaceplane reasonable is getting down the cost of keeping man in space. It's very expensive to do that." Reusability of a spaceplane is a key to making it work, he thinks.

"I just can't imagine that we're not going to have military people in space at some point," he said, since they would be valuable in refueling satellites and in running surveillance equipment.

"Satellites normally don't quit on us," he noted. "We bring them [down] because we're out of gas."

Estes said the top programs for US and Air Force Space Commands and NORAD are, in this order:

**EELV:** Lockheed Martin and McDonnell Douglas have matching Evolved Expendable Launch Vehicle contracts to develop a medium and heavy booster for lofting USAF and other military satellites. "We'll try to launch the first medium EELV in about the year 2002 and probably 2003, 2004 try to do the heavy," Estes said. He noted that the EELV is a classic example of commercial technologies leading the military in space.

"EELV is going to fly commercially before we ever fly it in the military," he said. "There is a big need for access to space. . . . [T]he two competing companies are going to develop their own versions of this, regardless of whether they win the military contract, because there's a commercial application. . . . I don't know if they have a heavy contract yet, but they sure do have mediums. And you may see those launches as early as the year 2000." He believes that both competitors will provide a system with at least a 50 percent cost

advantage over current launch vehicles.

**SBIRS:** There are two Spacebased Infrared System platforms: SBIRS "high" and SBIRS "low." The high system, under development by Lockheed Martin, replaces the aging Defense Support Program satellites, which detect missile launches by the heat of their plumes. SBIRS high will "give us great improvement in capability over DSP, in terms of critical things: the launch point, the impact point, and the azimuth," which are critical to a future ballistic missile defense system.

SBIRS low has "great support in Congress," Estes said. While the high system tracks heat, the low system will be able to track the cold reentry vehicle when it separates from the booster, "which will give us even a further refinement . . . to very precise levels, launch point and impact point." The system is "key to our ability to cue a system [for] active defense: missile defense, theater systems, or national defense."

**MILSATCOM:** "We're in the process right now of refining the requirements to identify the priority of requirements that we could fit within the dollars we think are going to be available . . . for the next level of MILSATCOM [Military Satellite Communications]," Estes said.

"The real debate is over how much we're going to buy vs. how much we're going to lease from commercial," he added. The requirements are tricky because large savings could accrue from using commercial satellites for peacetime operations, but an all-military system would be preferable if the US were suddenly involved in one or two major theater wars.

Estes was asked why, when the Air Force leadership last fall elected to shift emphasis toward the "space and air force," that the name of the service was not changed to "Aerospace Force" or something similar.

He replied that, for now, "it was a bridge too far" and that the service must first flesh out what it really means to place the emphasis on space after 50 years of having it on "air."

However, he said that "there will come a time, I think, when you may see the word 'space' in our title. And there may be a time when there is nothing but 'space' in our title." ■

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By John L. Frisbee, Contributing Editor

## Project Aphrodite

In mid-1944, AAF moved to checkmate a potentially disastrous German threat to the UK and perhaps even to the US.

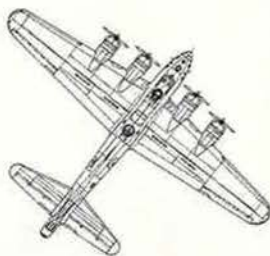
**O**PERATION Crossbow, the Allied bombing campaign against German V-weapon launching sites in northwest France, held top priority in early 1944. Despite hundreds of strikes against these sites, German attacks with V-1 buzz bombs against urban targets in the United Kingdom began in June 1944 and soon resulted in extensive loss of life and great property damage. It was known that the Germans were working on a supersonic guided missile, the V-2, which was believed by many to be technically infeasible at that time. But surprise. The first V-2 hit the London area in September of that year, with 800 to follow.

In the V-weapon launching area, a number of very different large sites were under construction—their walls 12- to 14-foot thick and with massive steel doors. Were they intended to launch V-2s, or perhaps a rumored V-3, a missile with the range to hit targets in the eastern US? The Germans were striving to develop nuclear weapons, though progress in that area was not known. At any rate, the possibility of an operational V-2, or perhaps a nuclear-armed V-3, was not a threat to be taken lightly. These mysterious, heavily defended sites were attacked at night by the Royal Air Force, using 12,000-pound Tallboy bombs, and during the day, by Eighth Air Force. Damage was minimal. A solution had to be found.

It was concluded that the most vulnerable element of the structures was their steel doors, which were virtually immune to damage by high-altitude bombing. Tactical fighters coming in at low altitude did not have the punch to do the job. Gen. Carl A. "Tooey" Spaatz and his scientific, technical, and operational advisors came up with a novel idea. Why not use war-weary B-17s as guided mis-

siles? That would call for more than a few innovations.

The plan, labeled Project Aphrodite, was tested inconclusively at Air Proving Command in Florida. Essentially, the idea was that a completely stripped-down and explosive-laden B-17 with a crew of two—a pilot and an autopilot technician—would take off from a base in the UK. Once safely



in the air, control of the B-17 would be turned over to a mother ship cruising at 20,000 feet, whose crew would fly it by radio signals fed into the B-17's autopilot. The B-17 crew would bail out over England. The mother ship then would fly the bomber, at an altitude of 200 to 400 feet, to the target and dive it into the steel doors. This, of course, was not an "any day" operation. Ceiling-and-visibility-unlimited weather was essential so that the mother ship's crew could follow the progress of its charge.

Crews for the 10 modified B-17s were volunteers from bomb groups of the Eighth Air Force 3d Division. Each B-17 had been stripped of everything but a pilot's seat and loaded with 22,000 pounds of RDX, the most powerful explosive available. The war-weary bombers were given new engines and beefed-up landing gear, since they would be about 5,000 pounds over designed gross weight. The boxes were connected and fused so the load would detonate simultaneously.

On August 4, the weather was good enough to launch the first two B-17 flying bombs. The first to go was piloted by Lt. Fain Pool with autopilot technician SSgt. Philip Enterline. They had to enter and leave the aircraft through the navigator's escape hatch,

the only entrance not sealed. After making sure the controls operated properly on radio signals, Enterline bailed out at 1,200 feet. Pool followed at a much lower altitude after he had armed the load. When he landed, several British civilians came up to inquire what had happened. Since Aphrodite was highly classified, he told them his plane was on fire, forcing him to use his parachute. Almost immediately they heard a terrific explosion, caused not by Pool's aircraft but by the second B-17 flying bomb. Its elevator control had malfunctioned, causing the plane to stall and crash before the pilot, Lt. John Fisher, could get out. Pool's plane made it to the target under radio control but on its second pass was shot down by ground fire. The crews of two other modified B-17s that were launched that day survived, but neither reached its target.

Never wanting to be far behind the Air Force, the Navy adopted the Aphrodite technique, using its version of the B-24, but with two pilots who also were to bail out over England, while their aircraft was to proceed under radio control to submarine pens at Heligoland, Germany. The first pilot was Navy Lt. Joseph Kennedy, Jr., older brother of John F. Kennedy, thirty-fifth US President. His copilot was Lt. Bud Willy. While still over England, the aircraft exploded, killing both men.

No aircraft subsequently launched under Project Aphrodite or its Navy counterpart hit its target. As the Germans retreated in the weeks after D-Day, the large sites in France no longer were within their reach, and the project was abandoned. Despite its lack of success, Aphrodite was a daring, imaginative undertaking that might be considered a first, short step toward the development of American guided missiles. The crews that volunteered for these missions were stepping into an unprecedented, but dangerous, venture. For each of them, it was an act of exceptional valor. ■

*Thanks to Herbert F. Mellor, president of the McChord Air Museum Foundation, and to Lt. Col. Fain Pool, USAF (Ret.).*

The quest for a distinctive uniform led to selection of Air Force blue, but didn't stop there.

# Suited for Service in War and Peace



**W**hen it became a separate service in 1947, the Air Force underwent many changes. One of the more important ones concerned the uniform. Early USAF leaders strongly believed it should be distinctive. A large inventory of Army olive drab material was on hand, and this somewhat hampered the new service's plans, but even Secretary of the Air Force Stuart Symington supported using a different color, saying, "For God's sake, let's not have ODs because it means 'olive drab.' And it means drab. That's the thing we should stay away from."

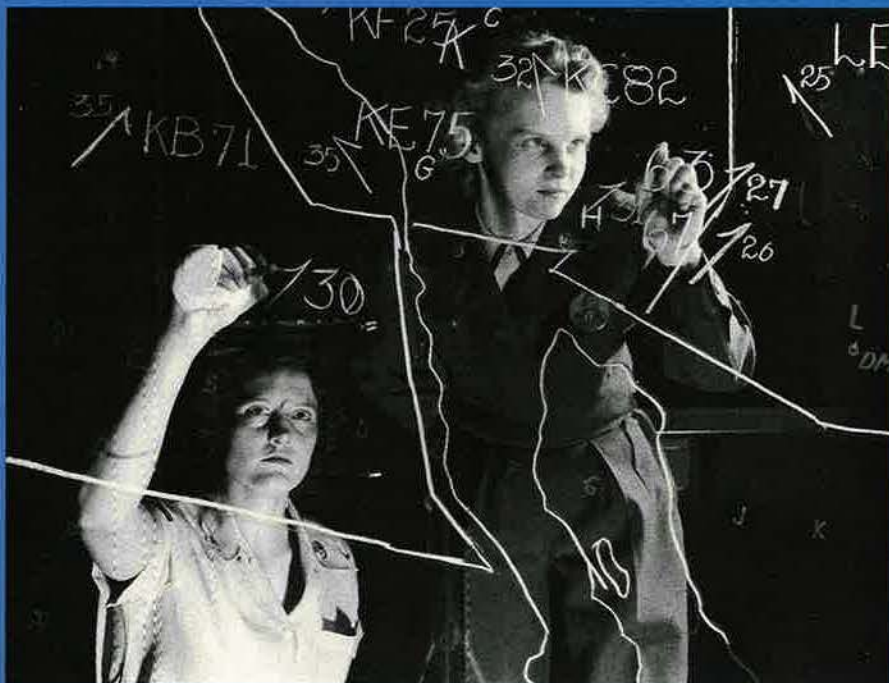
A mix of Army and Air Force uniforms and insignia was the rule until decisions and clothing replacements were complete. Above left, the new Air Force enlisted stripes are displayed on an "Ike" jacket.



Above, in an early publicity photo, Cpl. Claude Ridings (left) checks out the new uniform of MSgt. Edward Ancas.

Uniform photos by Paul Kennedy

Several colors for the uniforms came up for consideration, including sapphire blue, gray, and chocolate brown. But by late 1947, a group of seven designers had agreed on a medium blue shade called Uxbridge 1683. By spring 1949, most of the details for the new uniforms had been worked out, and specifications were released to the field. (The goal was to phase out the last of the olive drab by July 1952.) Airmen at Barksdale AFB, La., in February 1949 became the first to receive the new official-issue blue uniform. At right are two versions of that first uniform—the popular Ike jacket and the longer-length coat.



The process of developing a uniform for Air Force women suffered as many tribulations as the process for the men's uniform. Like men, women in the Air Force wore Army uniforms and substituted USAF chevrons and insignia as they became available. The Ike jacket (above) proved to be popular with both men and women.

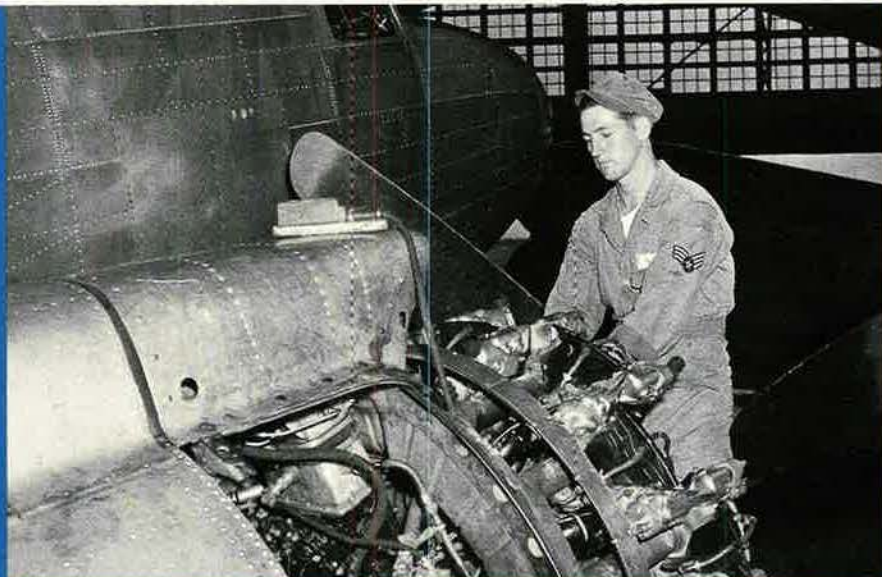
As with the selection of color, debates raged over chevrons and insignia. No one is certain who designed the Air Force chevron, with its star and circle; however, the minutes of a March 1948 meeting of USAF representatives state that designs had been sent to Bolling Field, D.C., where 150 airmen had been polled. Fifty-five percent chose the design used today, and Gen. Hoyt Vandenberg, USAF Chief of Staff, approved it. Specialty insignia and rank would linger but soon were limited to the simple "US" and the new standard insignia.

Changeover to a new uniform went right down to the shoes. During the transition period in the early 1950s, the troops were asked to dye their brown shoes black.

Ever since, the term "brown shoe" has denoted those airmen whose careers spanned two eras—that of Army olive and Air Force blue. At left is an early version of the black oxfords that were issued to new airmen.



The new blue uniform looked good, but the Korean War underscored the need for clothing that would hold up in combat conditions. Development of utility and fatigue wear had not received as much attention as dress and flight clothing, and even in work clothes, airmen wanted to show that they belonged to the new service. Below is an early fatigue shirt not unlike the one worn at right by A1C John Rainey in 1952, working on a C-47.



Despite the initial goal of simple uniformity, commands began to make exceptions, and in many career fields, specialized uniforms or variations cropped up. At right is an example—a dark blue fatigue uniform worn by missile crews.



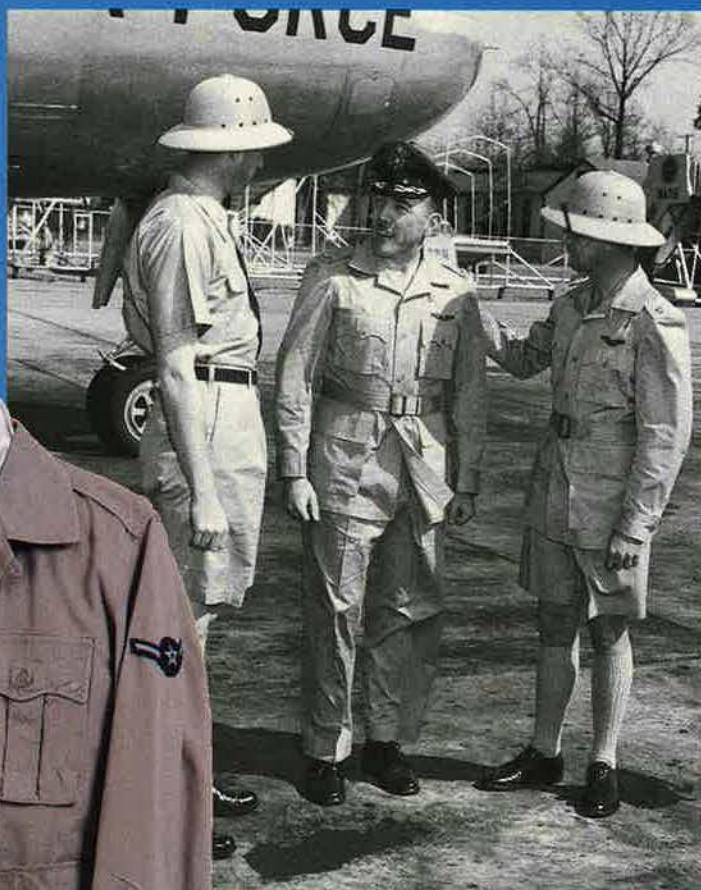
Uniform photos by Paul Kennedy

As USAF's commands became established, some utility uniforms began to proclaim the identity of an organization and even a specific crew member position. By the early 1960s, the standard olive green fatigue usually sported a command or squadron patch.



*In one of its more unusual decisions, the Air Force Uniform Board in the mid-1950s approved creation of the bush jacket. Designed as summer wear for troops in tropical climates, the uniform included shorts, knee socks, and an optional pith helmet. Knees could be "bared only under strict control," and officers were not to wear any of the uniform combinations in the Washington, D.C., area. By 1962, this summer uniform was no longer mandatory.*

*In early 1956, regulations covering the uniforms were laid out in Air Force Manual 35-10. The number 35-10 became synonymous with the wear and care of every part of virtually every USAF uniform. Over the years, it codified major changes, such as the demise of the popular Ike jacket in 1964, and lots of minor changes, such as wear and placement of insignia.*



*The baseball cap-style headgear has been a staple of utility uniforms for years, and the mid-1960s saw an abundance of colorful ball caps. Unit commanders approved them in order to foster esprit de corps, and the troops viewed them as a welcome relief from the green issue utility cap, at right.*



In the photo at left, MSgt. Lee Rogers, 1960 Recruiter of the Year, is wearing the highly popular "Silver Tan" summer-version dress uniform. Below, an officer (left) wears a Silver Tan shirt, which required officer rank on the collar when worn without the coat, while the master sergeant next to him appears "wilted" in his khaki 505 uniform. Even though they had to be starched to a "crackle," the 505s would not retain their crisp look throughout the workday. They were replaced by 1505 khakis, made of a different fabric that didn't require heavy starch and kept its fresh look longer. However, the summer-weight blue uniforms became the standard in 1961, leading to phaseout of the Silver Tans by 1965. The Air Force phased out the other khaki-style uniforms, the last vestige of its Army heritage, in September 1978.



In the early 1960s, the utility uniform appeared for the first time as part of 35-10. It included specifications for the ultramarine-colored JS Air Force tape and name tape, stenciled with white letters. During the Vietnam War, USAF personnel often wore fatigues made in Vietnam and Thailand, as unit commanders were able to authorize some changes and local industry was able to supply the sewing expertise. Local "improvements" included nonregulation subdued rank insignia and name tapes and, paradoxically, bold, multicolored unit patches.

At far left is an example of subdued stripes as well as name tapes made in Southeast Asia. At left, the brightly colored rank and name tapes were worn to clearly distinguish USAF personnel who were working with the South Vietnamese military. Camouflage, tiger stripes, solid green—what you wore depended on where you were and what you did.



Gen. John P. McConnell, USAF Chief of Staff from 1965–1969, led the way for a change in the service uniform to a darker shade of blue, smaller lapels, and elimination of what were sometimes called "Kaptain Kangaroo pockets," in favor of a hidden pocket. The alterations were described as the first style changes in the blue uniform since its introduction, and the service dress uniform generally retained this look until the 1990s.



By the late 1970s, the brightly colored name tapes and patches on the utility uniform gave way to the subdued look that had been popular in the Vietnam War. AFR 35-10 officially introduced the subdued insignia in 1980, and they became mandatory in 1983. The utility uniform material also changed from high-maintenance cotton to a lighter, permanent press fabric that was more comfortable and easier to care for. The light blue shirt and dark blue trousers were standard "office wear." Above right, at a training session at Sheppard AFB, Tex., an instructor in his blue shirt stands out from the students in their subdued fatigues.

Uniform photos by Paul Kennedy

Photo by Paul Kennedy

In the early 1980s, the woodland pattern Battle Dress Uniform began to appear. The Air Force BDUs were of the same design and color as those worn by the other services, part of a move toward standardization among the services.



BDUs became the standard utility uniform for men and women. They soon began to show unit variations in the form of specialized patches like the "Weasel Keeper" insignia on the BDU shirt at left or an aircrew-style leather patch, worn over the left pocket, sometimes with a specialty device. (Troops soon realized that the aircrew-style patch, stating name and rank, made it hard to determine rank quickly, so subdued stripes and eventually subdued name tapes returned to BDUs.)



Both photos by Goly Avella



Although few airmen knew it, there was a desert camouflage version of the BDU. With the Persian Gulf War, military and civilian alike became familiar with a pattern nicknamed "Chocolate Chips." Also in that war, a new version of the Vietnam-era "boonie" hat shielded troops from the intense sun. At left are the older, Chocolate-Chips-style hat and the simpler desert pattern that had supplanted it by the end of the Gulf War. On an Air Expeditionary Force deployment to the region last year, A1C Rueban Aguirre (above) wore the current version of the desert BDU with the approved Security Police arm band and US flag.



*At left and below are the current men's and women's service dress jackets.*



*In fall 1994, Gen. Ronald R. Fogleman, in one of his first moves as new USAF Chief of Staff, approved a return to epaulettes with the traditional rank for officers' coats, as well as the US insignia for lapels for both officers and enlisted personnel.*

*In fall 1991, Gen. Merrill A. McPeak, USAF Chief of Staff, led the most dramatic redesign of the Air Force uniform since McConnell's changes more than two decades before. The new look aimed for clean lines, upgraded material, and comfort. Notable, though short-lived, changes included silver-colored braided bands on the sleeves of officers' uniforms and elimination of the metal "US" insignia on the service coat's lapel. Interestingly, these elements were suggested by designers of the very first Air Force uniform but were rejected. The 1991 uniform's buttons—a takeoff on the Army Air Corps' World War II patch—harkened back to the service's roots.*

*Most troops liked the looser fit, and airmen seemed to like the larger, brighter enlisted stripes on the sleeve, but some changes were controversial and far from universally accepted.*



*Minor changes continue to alter and add to Air Force uniforms. Change has even come to 35-10, which became Air Force Instruction 36-2903 as part of a USAF streamlining effort. And changes come about not only through orders from the top. The Air Force Uniform Board that met in January 1996 received more than 2,500 suggestions—including one for a familiar summer-wear shorts set with matching socks—from active-duty service members and their families, retirees, and even former USAF members. The overwhelming interest in uniforms underscores the pride that comes with wearing Air Force blue. ■*

The Air Force's top medical officer talks about Tricare, medical readiness, and combat medicine.

# What's Up, Doc?

By Suzann Chapman, Managing Editor



*In a wide-ranging discussion with Air Force Magazine, Lt. Gen. Charles H. Roadman II, USAF surgeon general, talked extensively about military health-care issues. What follows is an edited version of his remarks.*

**F**ORCES over which we have no real control—such as the economy, rise of technology, increased social expectations, end of the Cold War—are fundamentally changing how we go about our business. The availability of new technology is adding to rising health costs. People today expect to have a \$600 to \$700 MRI when once a \$7.50 flat plate X ray would have sufficed.

I also believe military leaders are faced with a social expectation problem because we recruited and retained on a promise to provide military retirees and their dependents health care for life. It's not in Title 10. It's not funded. But there's not an ounce of doubt in my body that we recruited and retained based on that [promise].

We've got to have a strategy that works. However, many folks are sitting around saying, "I wish we could go back to the old system—lots of facilities, lots of capacity."

I don't dream about the old health-care system. The old system was not user-friendly. It was episodic, it was emergency room-based, it was staff-oriented, and it was expensive. No one knew who his or her doctor was, doctors didn't talk to each other, we repeated tests, and we wasted resources.

The agenda that I have is, first and foremost, to position our medical force to be ready to support combat arms and, second, to deploy Tricare, the military's triple-option managed health-care program.

Our military leaders have to recognize that, just as there is a Revolution in Military Affairs, this is also a period of revolutionary change in

medicine in general—particularly in military medicine. I tell them to strike out the word “military” in RMA and put in “medical.”

### Medical Readiness

The Revolution in Medical Affairs is transforming our combat mission. As the military health-care system becomes smaller, the footprint in the theater of combat is becoming smaller, transforming patient care in the theater of battle to a transportation or air evacuation problem. In effect, we have to get the patient out quicker.

We have gone from a process that calls for a patient to be stable (three or four days postoperative) before air evac to one who is stabilized, who is shock-treated, intravenous line in, and no longer hemorrhaging, and who must have care while in the air. That fundamental shift has caused us to change our doctrine, our training, our force structure, and our equipment.

**Reengineering.** Right now an Air-Transportable Hospital, which is really organic to wings, requires 7.5 C-141s—that’s mobile, but it’s heavy mobile. To make it more practical for Military Operations Other Than War, we are trying to decrease the size and weight—by digitizing X-ray equipment, by telemedicine, by a number of technology insertion initiatives—so that an ATH will go into one C-141.

Additionally, an [operation] into Haiti for nation building requires different capabilities than a war in the desert. So we’re reengineering all our mobility assets so that we have an air-transportable spine into which we plug and play various clinical capabilities. We’re developing small packages that we will [join] to the ATH—as needed by the theater commander—nothing more and nothing less.

**Mirror Force.** Although it’s 25 years old, I believe that we have only paid lip service to Total Force on the medical side. We have not really integrated the medical forces of the Air Reserve Components with the active duty. But I think we’re making progress.

The Air Force’s program, called “Mirror Force,” was developed to train the ARC and active force together, using the same equipment and technology, and to identify cul-

tural and resource constraints—so that we are interchangeable.

**Force Protection.** Biological and chemical warfare issues are on the scope big time. And it’s going to require things like anthrax immunization and others we have not done in the past but we clearly need to do because it’s good preventive medicine.

We have to continue to look at deployment toxicology. After Desert Shield/Storm we started worrying about occupational exposures. To ensure we have fact rather than just supposition, we need to do predeployment physicals, predeployment toxicology, predeployment evaluation, and then do them again in postdeployment.

### Managed Care Is Inevitable

Although no one is particularly happy with managed care, I think managed care is going to dominate the health-care industry. Managed care is not a dirty word to me. It simply means that you have to put in cost as well as clinical data in building a therapeutic plan. In other words, if you don’t need an MRI, don’t get an MRI.

I don’t believe there’s any honor in having the cheapest health-care system in the world, but there’s real honor in having the best bang for the buck. “Deny care” is not managed care—it’s poorly executed managed care. Managed care is optimizing quality, cost, and access.

During the Cold War, the military treatment facilities (MTFs) were the primary providers of care for all military beneficiaries—that is, we did all the health care within our facilities. As the force-structure line comes down, the medical force structure is also coming down. The problem is that now the sizes of the two segments of our beneficiary population—active and reserve vs. dependents and retirees—have reversed. Overall, though, we have the same number of beneficiaries, so we have a zero-sum game.

We have already cut about 36 percent of our medical facilities, so we have to buy some of our medical services to take care of our beneficiaries. We have to outsource and privatize a safety net—that’s the Tricare regional contracts.

We’ve got a problem in that many people see Tricare as a DoD pro-

gram or Headquarters Air Force program or major command program. We’re having problems with folks understanding that it is ownership by everybody.

### Marketing Failure

When we first began to implement Tricare, we failed “Marketing 101.” We didn’t market well to providers, leadership, or beneficiaries. Our beneficiaries had never had to buy health insurance before, so why should they think about that now—it confused everybody.

We have a leadership problem because many senior leaders have said that this Tricare stuff is just too complicated—they just don’t understand it. An active-duty three-star at a retiree meeting told the group he would answer questions on anything except on Tricare.

Even military providers have contributed to the confusion over Tricare. Doctors have told patients who ask about Tricare that they don’t know anything about it.

We can’t afford that type of approach to our health care. Everybody in the system needs to understand the whole context of the enterprise. We have a good strategy, but every time we look like we blink on this, we scare the population.

We have to market well to Congress, our beneficiaries, and our associations—and quite frankly, I think that has to be word of mouth. We’re going to win Tricare town by town, heart by heart—not by region. We’ve got to sit down and make the expectations clear: what it is we can do, can’t do, what the law says.

Additionally, we have to start forming strategic alliances among the patients, the contractors, and the military providers.

### Not the Enemy

We have to hit our reset button to change the idea that contractors are the enemy. They are the builders of the support path to manage the large patient population that we’ve got.

The contractors have a for-profit culture. Our military culture is one of caring—a commander takes care of his troops. But just because these cultures don’t come together easily is no reason that it’s not the right thing to do.

Everywhere I’ve gone where Tricare has been in trouble—Dyess

[AFB, Tex.] for example—it has been a leadership problem. We didn't bring the contractors together with the civilian medical society and the military providers. Instead of working out our problems jointly, we resorted to finger-pointing.

Moreover, during the Cold War, when we treated everyone within an MTF, patients often were seen as a liability, just more work. As we go out of the monopoly business and into a competitive business, using capitated managed care, patients go into the asset column.

That's important, because if our patients don't sign up, our system gets smaller and smaller—that's how capitation works.

### Life Support Strategy

The problem is that as we get smaller, we put at risk our ability to support the combat arms. So when you look at our two primary missions—supporting combat arms and community health care—community health care allows us to maintain a medical force that can support combat arms.

For that reason Tricare is not just a benefit, it is a strategy. It is designed to have community health care as a life support for military operations.

In the history of military medicine, where we only had troop clinics, military doctors took care of runny noses, upper respiratory infections, sprained ankles, and occasional social diseases. Those things you take care of in a troop clinic, with primarily a 19-year-old crowd, are not the things you take care of in the midst of battle.

Many arguments favor just taking care of the active duty in MTFs and buying [Federal Employees Health Benefits Program], or something like that, outside, for dependents and retirees, but we have to have a balanced system.

Clearly, we have to take care of the active duty, but we need dependents, retirees, and the over-65 retirees to get the right spectrum to maintain our clinical skills. Just as you don't want a pilot landing his aircraft once every three months, you don't want a doctor cracking a chest every three months. You don't want them doing that only in wartime.

This is a complex system. You

can't just pull out patient populations and still have the combat capability that you want to have. The two missions are absolutely intertwined.

### Least-Worst Option

Still, there's a great argument over FEHBP and Tricare. It is a fact that FEHBP, with plans ranging from \$1,700 to \$2,600, would be more expensive for the average military person or family than Tricare. The one strength of FEHBP is that retirees even at age 65 do not get eliminated from the program.

I'm not getting into the argument of whether we promised to provide free health care. What I think we promised to do is to provide retirees health care. Quite frankly, free health care is not executable. Our job is to find the least-worst option, to give them more choices, reduced cost, and quality care. Under any criteria, whether its inpatient or outpatient, I believe Tricare is a wonderful insurance plan.

The measure of satisfaction right now has to be whether an individual would enroll in Tricare Prime for a second year. In Region 11, the first region to open up, in a survey sample of about 7,300, nine out of 10 stated they would reenroll.

There is nobody who believes more in the fact that our health-care system—civilian and military—has got to fundamentally shift out of fee-for-service "churn and earn" to managed care. I believe that, in our business, Tricare will help accomplish that, so that we become fiscally competitive but also maintain the strategy of readiness.

### Challenges Remain

However, Tricare won't be totally stable until the year 2000. It's a big system, and we have lots of warts we're going to be shaving off.

The biggest problem we have is access. I believe that Tricare is going to fix access. If you look at our system—it's not the quality of care once you get in, it's getting in that's so hard. We need to turn the pyramid over, have more PCMs [primary-care managers] instead of specialists, to improve access.

When we say access standards, we're not just talking about our contractors. We're also talking about within MTFs. We want you to have

24-hour, 365-day access to your military PCM.

Our standards also call for you to be able to get a routine appointment, such as for dermatology, within seven days. The average waiting time in civilian HMOs was about 7.2 days according to 1995 data. Quite frankly, for a routine thing, seven days is reasonable. We want to have urgent-care appointments within 24 hours.

Do HMOs provide quality health care? Nationally, we're finding that the outcome within HMOs is better than what you see in fee-for-service arrangements.

Under Tricare, we're giving you more choices. We straddle the entire health-care debate—from straight fee-for-service (Tricare Standard) through preferred provider organization (Tricare Extra) to HMO (Tricare Prime).

If you want lowest cost, sign up for our HMO. If you don't want to sign up, recognize you will have the highest cost out of your pocket, but you can just use Standard. If you want an intermediate position, it's still going to cost you more than the HMO, but you can do that by using our PPO.

However, we can't let you flip back and forth because we won't be able to afford to execute our job. So we have to market better to make people understand that they're going to have to commit to us as their health-care system or not commit to us. If we can't control this part of our business, we will not be able to take care of anybody.

Tricare operates under the principle of utilization management—it is designed to contain cost. However, utilization management is not rationing care, not denying care. It is buying the right care for the right diagnosis. I think that's a critical differentiation.

I am not saying medicine needs to turn into business, but business techniques need to come into medicine so that we can afford to continue to care for as many people for as long as we can. But we cannot focus only on cost.

For example, some people have complained that, under Tricare, they needed "X" drug and haven't been able to get it. That isn't a flaw in the philosophy; that's a flaw in the execution. That is focusing only on

## USAF Surgeon General on Tricare Issues

**Portability.** Lack of portability from one region to another is unacceptable. We have all the contract change orders in, and we think that will be fixed by the end of 1997.

**Emergency services.** Emergency room visits are still going to require a \$30 copayment per visit. The Air Force position is that it should be \$6 if you have to go out to the civil sector. Unfortunately, we have been unsuccessful in trying to change that policy.

**Unbundled ancillary services.** If you have to go outside the MTF to see a specialist and he orders an X ray and a lab test, that's \$6 for each one of those—we have change orders in to bundle those services so it's treated as a single episode of care at a single \$6 copayment.

**Geographically separated units.** We have a number of "lost patrols" who don't live where Tricare Prime is available, but following a successful test in Region 11, Prime coverage will extend to GSUs across all the regions over the next year.

**Claims processing.** I am encouraged that in the first year of enrollment, more people signed up than had been projected by the models. I am discouraged that the contractors have inadequate support to process that number of enrollees. We had a number of providers leaving the network because they weren't getting paid. Everywhere we have found this problem, though, the contractors have started increasing their administrative support.

**Over-65 beneficiaries.** A big issue is that the people over age 65 can't sign up for Tricare. I believe that the 105th Congress is going to pass Medicare Subvention.

cost and not at all on the customer. You can't default to quality or to cost. We have to look at all three: cost, quality, and access.

### Day of the Dinosaurs

We also have to reduce our inefficient infrastructure and force structure—right-sizing. And in a time of great change, the worst problem you can have is to own hospitals. During the Cold War, medical care was built on an inpatient structure. Today, we have 26 hospitals that have a 165-bed capacity and only an average daily load of five or six patients.

New medical technology is helping to decrease the need for beds. When I trained, someone who had a gall bladder operation would still be in a hospital bed with a drain tube connected on the fifth day after surgery. Today, the procedure is done with a laparoscope, and the patient is home eating by the fifth day.

So big hospitals are dinosaurs. We are spending huge fixed costs to maintain old facilities. We can change some of those into outpatient clinics and eliminate the higher cost involved with maintaining hospital standards—turning those dollars into delivering care to more people.

It makes good business sense to reduce unneeded hospitals to outpatient clinics, then buy inpatient care on the local economy. Every year that we continue with a small, inefficient hospital we are losing dollars and slowly hemorrhaging.

### Blue-Suit Medicine

We will have reduced our medical manpower by 17.9 percent from Fiscal 1989 through 1998. At the same time, we are working to ensure blue-suit medicine takes care of active-duty members and their dependents on base, in what we're calling Community Health Clinics or CHCs. Although there are elements that say you don't need blue-suiters to take care of dependents, we see the issue as part of our fundamental shift to an occupational health-care system.

In the Air Force, an individual has some risk just by being in the Air Force. Dependents share in some of that risk. A USAF member has occupational risks of high operations tempo, family separation, being put into different environments, etc. Most civilian physicians don't have a clue what personnel reliability program is or what optempo does. Quite frankly, all they are in that sense are tech-

nicians looking at symptoms. They don't meet our requirements for occupational medicine.

However, the CHC concept, which will predominate at smaller bases, does not necessarily include retirees. They may be treated downtown rather than on the base. For retirees, particularly, military health care has got to transition from being a place to being a process.

It is no longer the base hospital. It is the health care delivered by this system, which may include the health-care facility on base. It may include a radiological diagnostic center downtown; it may include a health and wellness center downtown.

We will still have a few medical centers and a number of regional hospitals because they have the large surgery capability and high work load. They will continue to see a larger portion of our entire beneficiary population. And we are migrating all our mobility positions to those regional hospitals and the medical centers to provide the high work load and broad spectrum of patients they need to maintain their skills.

### Requirement for Readiness

Readiness requirements drive our medical force structure. We cannot be any smaller than our readiness requirements, which drive how many surgeons we have and whatever medical Air Force Specialty Codes we have, but anything above that is really a business decision. In other words, is it cheaper to provide it within our system or buy it outside? In the case of the smaller bases with CHCs, it may be cheaper to buy it or enter into a partnership, where our military physicians use a civilian facility.

By the year 2000, we will have transformed our system from a fee-for-service business to a capitated nationwide HMO. In addition, within five years I believe our health-care system will be the most stable in the United States. The reason for that is because we are already structurally at the endgame of what I think will occur in civilian medicine.

I am as optimistic as I have ever been about military health care. I believe we have a strategy to make it work. But every major command needs to have tactics to make that strategy effective. It is not only the strategy but the execution that has to be done very, very well. ■



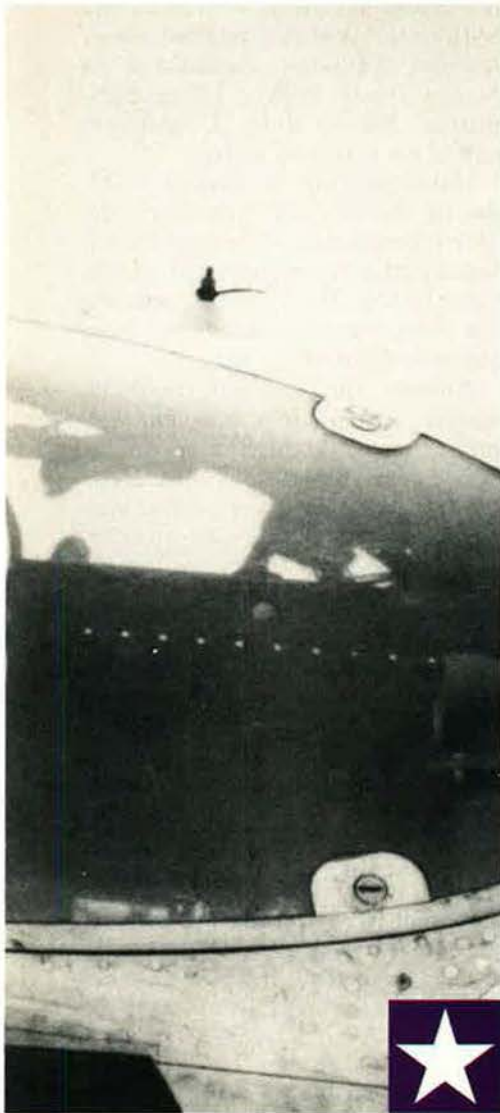
**Barred initially from flight training because of color, the leader of the Tuskegee Airmen became a major force for full integration in the Air Force.**

# Benjamin Davis, **American**



**By Col. Alan L. Gropman, USAF (Ret.)**





**B**ENJAMIN O. Davis, Jr., was born December 18, 1912, in Washington, D. C. His father, Benjamin O. Davis, Sr., was one of two black combat officers in the US Army. Davis Senior's career was badly stunted by segregation. He opposed the practice as not only harmful to black soldiers but also wasteful to the country. Young Ben Davis grew up inside his father's profession. From the beginning, he despised segregation and was determined to destroy it.

In a way, he did, performing so well and leading so effectively that the arguments used to prop up segregation in the Air Force were fatally undermined. He became the first African-American Air Force officer to achieve general's rank, retiring as a lieutenant general in 1970.

In 1991, he published his autobiography, and much about the man could be discerned in its simple title—*Benjamin O. Davis, Jr., American: An Autobiography*.

The younger Davis wanted to fly. To fulfill that ambition, he set his sights on the US Military Academy. He earned an appointment in 1932 from Rep. Oscar S. De Priest (R-Ill.), the only black Congressman at that time. Davis believed his classmates would accept him based on the content of his character and not reject him because of his race.

He was wrong about that. For four years he was shunned, meaning other cadets would only speak to him for official reasons. He had no roommate and took his meals in silence. Those who caused this had hoped to drive Davis from the Academy, but their actions only made him more determined to succeed. He graduated thirty-fifth out of 276 in the Class of 1936.

Davis was sure that he would be given the opportunity to fly because he was academically and physically qualified, but it was not to be—not then, anyway. He was turned down for flight training because there were no black units in the air service, and therefore he could not be accepted, despite his qualifications. Segregation was the barrier.

### Continued Shunning

Davis's first assignment was to Ft. Benning, Ga., where he commanded the black service company. After a year, he was appointed to the Infantry School. In the two years Davis served at Benning, the nine Academy classmates also assigned there only talked to him in the line of duty. When Davis graduated from the Infantry School, he was qualified to be in an infantry unit but instead was sent to be a Reserve Officers Training Corps instructor at Tuskegee Institute, Ala., replacing a sergeant.

Davis was serving at Tuskegee in 1940 during the second reelection



*Davis, above left in his P-51B, led many World War II missions, including a memorable 1,600-mile bomber escort to Berlin on March 24, 1945. In 1953 he became the first African-American Air Force officer to achieve general's rank.*



*Father and son: West Point Cadet Davis, shown here with his father, Benjamin O. Davis, Sr., graduated near the top of the Academy Class of 1936, after four years of shunning by classmates. The career of the elder Davis had been stunted by segregation, an evil the son was determined to destroy.*

campaign of President Franklin D. Roosevelt. Roosevelt, determined to hold on to every group that had supported him in his two previous election victories, was especially worried about the black vote. To solidify his African-American support, he promoted the elder Benjamin Davis to brigadier general and ordered the Army Air Corps to create a black flying organization.

The Air Corps wanted a black Academy graduate to command the first unit. The younger Davis was the only living black West Point graduate and was ordered to begin training at Tuskegee AAF, Ala. He clearly saw an opportunity to undermine segregation.

On March 7, 1942, Davis pinned on the silver wings of Army Air Forces pilots along with four other black officers. In time, they were joined by almost 1,000 Tuskegee Airmen.

In the spring of 1943, Davis and the 99th Fighter Squadron (first established as the 99th Pursuit Squadron) departed for North Africa to join the fight against the Axis. The Tuskegee Airmen carried with them the usual burdens borne by men about to enter combat but also the certain

knowledge that upon their inexperienced shoulders rested the future of black Americans in aviation.

The 99th was attached for operations to the 33d Fighter Group in Tunisia. On June 2, 1943, the 99th, led by Davis, flew its first mission, attacking troops on Pantelleria island, an enemy position between North Africa and Sicily. About 90 days later, after the squadron had flown many combat missions under Davis's leadership, the 33d Group commander accused the Tuskegee Airmen of not having the same desire to fight as white pilots. He recommended removing the Tuskegee Airmen from combat. The general who reviewed the report endorsed it and commented that "the Negro type has not the proper reflexes to make a first-class fighter pilot."

#### **Marshall's Wisdom**

By the time this proposal surfaced in Washington, other black flying organizations were being created, among them the 332d Fighter Group and the 477th Bombardment Group (Medium). However, Gen. George C. Marshall, the Chief of Staff of the Army, decided to study

the issue, assigning review of the 99th to the War Department's permanent Advisory Committee on Negro Troop Policies. The committee, led by John J. McCloy, called on Davis to testify.

Davis said that on June 9, 1943, during one of its first missions, the 99th formation disintegrated when it was struck by a German fighter force twice its size. The Germans surprised the Americans by attacking from above and out of the sun.

Nobody, Davis argued, could cite another example of a Tuskegee Airmen formation crumbling, and in this single case, the men did not flee the battle but fought it out man-to-man against superior German aircraft. Davis maintained, moreover, that his men were as eager for combat as white pilots, flying more often because his squadron was undermanned and replacements were short. Sometimes his men flew six combat missions per day, more than white pilots.

Davis's testimony carried the day. The Advisory Committee recommended—and Marshall agreed—that the 99th should not be pulled from combat, the 332d Fighter Group should move overseas when trained, and the 477th Bombardment Group should be formed. It was a wise decision—in the next 18 months, the Tuskegee Airmen wrote an impressive record.

In January 1944, the 332d, equipped with P-39 Airacobras, began arriving in southern Italy. At the same time, the 99th, now commanded by Maj. George S. "Spanky" Roberts, was flying missions in support of the Anzio landings. On the morning of January 27, 15 Tuskegee Airmen P-40s met a larger number of German Fw-190 fighters, shooting down six and damaging four others—a remarkable performance considering the mismatch in aircraft. That afternoon, the Tuskegee Airmen shot down three more Germans. On January 28, the black American pilots destroyed four German aircraft, and between February 5 and February 10 another four airplanes were downed by the Tuskegee Airmen. In that two-week stretch, the Tuskegee Airmen achieved a seven-to-one ratio of victories to losses.

A few months after arriving in the theater, Davis was assigned to the bomber-escort mission. He saw this change as a clear opportunity to dem-

onstrate the capabilities of black aviators and to further undermine segregation.

In June, the 99th Fighter Squadron joined the 332d, now equipped with P-47s, and a month later the 332d was given the P-51. Davis led the first escort mission, protecting B-24s bombing targets around Munich. That day, 39 P-47s held off more than 100 German fighters. At one point Davis personally led a flight of eight P-47s attacking 18 Bf-109s, scattering the Germans and shooting down several. During that mission the Tuskegee Airmen shot down five fighters and damaged another.

### Spectacular

Perhaps the most spectacular mission flown by the 332d was its mission on March 24, 1945, when Davis led the 332d on a 1,600-mile round-trip escort mission to Berlin. On that day, the Tuskegee Airmen met numerous Fw-190s and at least 30 of the new German jet aircraft. The Tuskegee Airmen shot down three of the jets and damaged another six fighters. One of the Tuskegee Airmen was lost on this mission, but none of the bombers were lost, de-

spite the fact that the Germans threw their latest and fastest fighters at the Americans.

Prior to March 24, only two jets had been shot down by any Allied airmen, and on that day the third, fourth, and fifth were destroyed by the Tuskegee Airmen.

How good were they? Davis and his men had destroyed far more aircraft than they lost—shooting down 111 enemy aircraft and destroying 150 aircraft on the ground, while losing 66 aircraft to all causes in the US and combat zones. The Tuskegee Airmen had also shattered or disabled more than 600 boxcars and other rolling stock. They had sunk one destroyer (a unique achievement) and more than 40 other boats and barges.

Most importantly, the Tuskegee Airmen had not lost a bomber to an enemy fighter during 200 escort missions, totaling about 10,000 sorties into some of the Third Reich's most heavily defended areas. It was a tribute to their skill and to Davis's leadership. He made the 332d a disciplined fighter group that knew they performed their escort missions as well as any in the entire Air Corps.

Davis returned to the US in April 1945, gaining command of the 477th Composite Group at Godman Field, Ky. He moved the 477th to Lockbourne AAB, Ohio, in 1946. He overcame local bigotry through his professionalism, and by the time the Air Force integrated in May 1949, his base had become a treasured part of the community.

In addition to commanding the flying unit at Lockbourne, Davis also served as base commander. Probably the most important aspect of his command was his relationship with whites on the base. Davis supported an Air National Guard fighter wing, a troop carrier squadron, and several other all-white Air Corps organizations, and the record shows only harmonious relations between the Tuskegee Airmen and their tenants.

Equally important, almost all of the civil servants then working at Lockbourne were white and all of their supervisors were black. Nowhere else in America could one find this situation. For centuries people said whites would never work for blacks, but at Lockbourne several hundred whites worked professionally and well for Davis and the Tuskegee Airmen.

Segregation was steadily undermined by Davis's performance, combined with the achievements of his 332d Fighter Group. When the Air Force separated from the Army in September 1947, Lt. Gen. Idwal H. Edwards, deputy chief of staff, personnel, directed a study of USAF racial segregation. He was aware of the unique success of the 332d (after 1947, the 332d Fighter Wing at Lockbourne AAB) during the war and its professional service after it.

### The Big Step

Edwards recommended racial integration and convinced the Chief of Staff that such a reform would mean a better Air Force. His principal argument was that Davis and the Tuskegee Airmen had proved in war and peace that blacks could perform all jobs as well as whites. That fact alone was enough to undermine segregation, and the Air Force, in 1949, became the first of the US armed services to integrate racially.

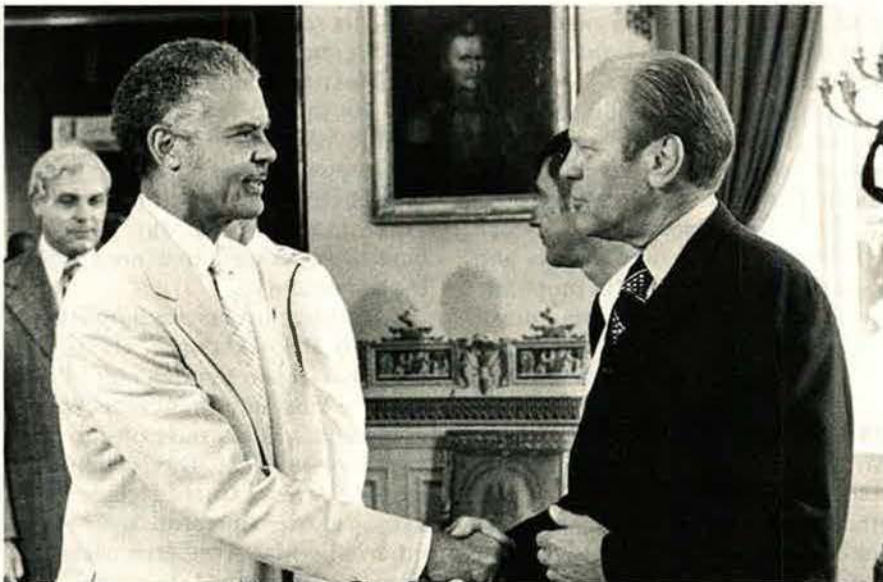
In the summer of 1949 Davis attended the Air War College, a key assignment because promotion be-



*In the spring of 1953, USAF assigned Davis as commander of the 51st Fighter-Interceptor Wing, Suwon AB, South Korea. He thrived in this wartime assignment, supervising a wing of thousands of airmen, almost all of them white.*



Photo courtesy of Lt. Gen. Benjamin O. Davis, Jr., USAF (Ret.)



**In 1970, Davis retired as a lieutenant general, having worn the uniform for some 33 years. He continued to work, serving in various roles, including assistant secretary of transportation for safety and consumer affairs. Here in 1974 he talks with President Gerald Ford.**

yond colonel depended upon attending war college. Before Davis did so, no black officer in any service had ever attended war college; segregation had barred such attendance.

Davis excelled, despite the fact that the Air War College was located on a base in Montgomery, Ala., an area hostile to any African Americans who aspired to rise economically or professionally. The best restaurants, hotels, and housing in the city were closed to Davis and his wife, Aggie. He and Mrs. Davis could anger the bigots among Montgomery's whites just by driving a late-model automobile. Davis detested this treatment but tolerated it to graduate from the Air War College. Like many of the best in his class of 1950, Davis moved from the Air War College to the Pentagon, where he served at Headquarters USAF.

Soon after arriving in Washington, Davis was made chief of the Air Defense Branch of Air Force Operations, a prestigious position in which he supervised white officers and enlisted men. So successful was Davis in his Pentagon position that in 1953, while the Korean War was still raging, the Air Force assigned him to take command of the 51st Fighter-Interceptor Wing, Suwon AB, South Korea.

Davis thrived in this assignment, supervising a wing of thousands of airmen, almost all white. The Air

Force learned that white airmen and officers would work loyally for a black commander, and the wing was as effective as any other Air Force unit in Asia. Having again demonstrated his skills as a commander, Davis was transferred to Japan, where he was appointed director of operations and training in Far East Air Forces. Three months later, he was promoted to brigadier general, the first black officer in the Air Force to achieve that grade.

Davis was soon reassigned to what proved to be his most significant postwar position—vice commander of 13th Air Force and commander of Air Task Force 13 (Provisional) at Taipei, Taiwan. He was to build a defensive air force from scratch, to deter Communist forces on mainland China from launching an air or sea attack on the Republic of China on Taiwan. In two years Davis built a formidable defensive air force.

Davis next moved to 12th Air Force in Germany and later became the deputy chief of staff for operations for US Air Forces in Europe. He returned to the US in 1961 as a major general and as USAF director of manpower and organization. He served

in the Pentagon for four years, earning a third star, and moved in April 1965 to Korea to become chief of staff of the United Nations Command and US Forces Korea.

Davis succeeded in Korea and became commander of 13th Air Force in August 1967, taking command of more than 55,000 people all over Asia, including many thousands who were flying and fighting in the Vietnam War. Davis was responsible for the air defense of the Philippines as well. He held this post for a year.

### Strike Command Days

Davis then moved back to the US, where he was assigned as deputy commander in chief of US Strike Command. No other assignment for Davis had such worldwide implications as this assignment, and he traveled widely to see for himself the conditions under which his men and women might have to fight.

After two years as the deputy commander in chief, in 1970, he retired from the Air Force. He had served more than 33 years on active duty and had been all around the world. He had excelled in every position, and he left the Air Force and the military service a much better institution than he had found it.

Davis was no longer in the Air Force, but his professional life was far from over. He became the director of public safety for Cleveland, Ohio, overseeing the city's fire and police departments. Later, Davis became director of civil aviation security and an assistant secretary at the US Department of Transportation.

When Davis joined the Army Air Forces, he was the only black officer and when the service integrated in 1949, there were only 375 black officers in the service (about 0.6 percent of the total number of officers). Today, there are about 4,000 black officers in the Air Force, almost six percent of the total. Davis can claim the largest portion of the credit for opening the doors to black men and women. None of his achievements mean as much to him as his role in bringing about the integration of the US Air Force. ■

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*Col. Alan L. Gropman, USAF (Ret.), a department chairman at National Defense University, has published widely on the topic of the Tuskegee Airmen and other subjects. His most recent article for Air Force Magazine, "The Tuskegee Airmen," appeared in the March 1996 issue.*

## The Missing Link

"Many . . . postwar claims about weapon system performance . . . were overstated, misleading, inconsistent with the best available data, or unverifiable. . . . There was no apparent link between the cost of aircraft and munitions, whether high or low, and their performance in Desert Storm."

**From "Operation Desert Storm: Evaluation of the Air Campaign," a June 1997 report prepared by the General Accounting Office.**

## Otherwise, It's Fine

"The report strikes me as the analytical equivalent of a dumb bomb—it's off target and loud. It really makes a series of very strange comparisons and takes the sort of lead-eyed view that there doesn't seem to be much difference between precision guided munitions and less-precise munitions or unguided munitions. . . .

"They made no allowance for the inherent differences in targets . . . and therefore assume that they could be hit equally with precision or nonprecision bombs. . . . It's like comparing a .350 hitter in the National League with a .350 hitter in high school and saying they're both the same because they both hit .350, without taking account of the different pitching conditions they encounter. . . .

"We have moved to a new generation of weaponry, and nobody denies that. We are not going to turn the clock back to an increased reliance on dumb bombs. We are going to continue to build an Air Force and a military based on precision guided munitions."

**DoD spokesman Kenneth Bacon, in July 1, 1997, press briefing during which he commented on the conclusions of the GAO report.**

## From the Foxhole

*First US Grunt:* "I don't understand why we're talking about expanding NATO! Why can't we just go home?"

*Second US Grunt:* "If we went

home, who would help our friends in eastern Europe defend themselves against our friends in Russia?"

**From political cartoon panel drawn by syndicated cartoonist Chuck Asay, carried in the June 15, 1997, Washington Times.**

## Absolutely Key

"It's important to reflect that over half of our sensors that provide us information about the battlefield are sensors that ride on air-breathers, not satellites. And so air dominance for us is absolutely key if we're going to maintain dominance on the battlefield. UAVs, other [systems]—from AWACS to Joint STARS to whatnot—over half of our sensors depend on having the ability to operate in the air. And so something like the F-22—that will be the premier aircraft to provide us air dominance—is absolutely key."

**Army Gen. John Shalikashvili, Chairman of the Joint Chiefs of Staff, in a May 20, 1997, Senate Armed Services Committee hearing on the F-22 fighter and the Quadrennial Defense Review.**

## Wirthwhile

"This is a legitimate military issue. This is not [the idea of] a bunch of trendy 'greenies.'"

**Timothy Wirth, undersecretary of state for global affairs, as quoted in June 5, 1997, Associated Press coverage of the Western Hemisphere Defense Environmental Conference. He referred to training Latin American troops to guard rain forests and endangered species.**

## It's Come to This

"It became increasingly evident during our travels that military personnel need to be informed what is *not* harassment as well as what *is*. . . . The [current antiharassment] training scared the men from interacting on any level with the women. Men reported that they were told, 'Don't talk to them, don't

sit near them in the mess, don't breathe near them.' Not surprisingly, the women reported that the men seemed 'scared to death of us.'"

**From a draft of a RAND Corp. study for DoD, "Recent Gender Integration in the Military: Effects on Readiness, Cohesion, and Morale," as excerpted in the July 7, 1997, Washington Times.**

## Separation of Powers

"The United States is moving with unparalleled velocity toward the kind of high-tech military equipment that has no match in Europe. I am beginning to worry that, one day, we will wake up and find that our armies [those of the US and of European nations] can no longer work well together."

**German Army Gen. Klaus Naumann, chairman of NATO's Military Committee, as quoted in the July 6, 1997, Washington Post.**

## Our Two New Friends

"During the last half of 1996, China was the most significant supplier of WMD [weapons of mass destruction]-related goods and technology to foreign countries. The Chinese provided a tremendous variety of assistance to both Iran's and Pakistan's ballistic missile programs. China also was the primary source of nuclear-related equipment and technology to Pakistan and a key supplier to Iran. . . . Iran also obtained considerable CW [chemical weapon]-related assistance from China in the form of production equipment and technology.

"Russia supplied a variety of ballistic missile-related goods to foreign countries, . . . especially to Iran. Russia was an important source for nuclear programs in Iran and, to a lesser extent, India and Pakistan."

**From CIA report, "The Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions," released in June 1997.** ■

Some of the ideas that looked radical in the 1992 Year of Training now seem almost tame.

# Air Force Training on the Move

By Bruce D. Callander

**I**MAGINE an Air Force in which high-fidelity, interactive video and audio devices link students to their instructors in a network of global classrooms; virtual-reality systems are used to train mechanics on non-existent engines; and pilots get a first, highly realistic taste of combat without leaving the ground.

It will be a decade or more before such a twenty-first-century Air Force arrives, but many of the technologies that will make remote learning and advanced simulation commonplace already are being exploited in limited ways by today's training establishment.

Some dramatic changes have occurred since 1992, when the Air Force launched its Year of Training study.

Most of the initiatives have been organizational, aimed at reshaping the training establishment to provide formal schooling for service members previously trained on the job and to relieve operational units of some basic chores. At the same time, USAF has explored advanced technologies that could make traditional teaching as obsolete as one-room schools.

In fact, some Year of Training



USAF photo by MSgt. Val Gempis, Airman Magazine

*Physical conditioning is still a necessary element of basic training, but beyond basic, Air Force training has changed significantly. It will change even more over the next decade as the service employs more interactive and virtual-reality training systems and other futuristic technologies.*

## AETC in Brief Fiscal 1996

Personnel	58,038
Operating budget	\$4.3 billion
Aircraft inventory	1,539
Students trained	361,025
Sorties flown	341,099
Flying hours	453,472

concepts that seemed extremely radical at the time now appear almost pedestrian when compared to long-range proposals generated by the Air Force's latest assessment of future prospects. That study, Air Force 2025, was ordered in 1996 by Air Force Chief of Staff Gen. Ronald R. Fogleman. It took a look at all elements of the future force, but one major section dealt with exotic training tools.

### Brilliant Warrior

Titled "Brilliant Warrior: Information Technology Integration in Education and Training," the section examines what it calls the "adaptive learning environment," which experts expect to become a reality in a few decades.

"By 2025," the study group predicted, "we will have an inexpensive, global, high-capacity information infrastructure. Personal information devices will give us integrated voice, video, and data capability in a package smaller than today's notebook computers. It will have computing power and speed virtually equivalent to the human brain and access to massive knowledge bases around the world. This will affect not only how we organize to present training, but how we develop learning material and track who has received what."

Officials at Air University, Maxwell AFB, Ala., added this description of a future training delivery system: "It [Air Force training] will be provided via a national knowledge superhighway, academic centers of excellence for curriculum development, and expert tutors."

AU officials maintain that such a system will require use of artificial intelligence, virtual reality, advanced simulation, and improvements in computing and communications technologies. In addition, they went on, "Advances in hyperlearning will create air- and spacepower experts in a shorter time and at lower costs than is currently possible. Enhanced selection and screening tools will further reduce costs by educating and training the right people for the right job."

AU officials reported, "Technologies, such as those identified by project 2025, . . . will help us leverage our ability to educate in terms of who, what, when, where, and how we will be able to teach. Attendant

## Aircrew Training

Training Category	FY 1995	FY 1996	FY 1997
Flight Screening Training	845	910	983
Undergraduate Pilot Training	532	523	591
Euro-NATO Joint Jet Pilot Training	201	196	213
Navigator Training	320	365	343
Pilot Instruction	420	436	415
Introduction to Fighter Fundamentals	332	376	431
Survival Training	5,321	5,933	6,350
Air Weapons Controller Training	420	355	462
Fighter Training	1,431	1,367	1,282
Mobility Training	2,382	2,377	2,440
Helicopter Training	223	207	291
C-130 Training	207	138	246
<b>Total Students Trained</b>	<b>12,634</b>	<b>13,183</b>	<b>14,047</b>

Figures for Fiscal 1995 and 1996 are actual. Figures for Fiscal 1997 are programmed.

## Basic, Technical, and Other Training

Training Category	FY 1995	FY 1996	FY 1997
Basic Military Training	27,771	30,917	32,813
Medical and Health Training	813	875	860
Technical Training	127,487	146,441	174,591
English Language Training	2,284	1,800	2,100
Air University Courses	145,258	167,809	166,264
<b>Total Students Trained</b>	<b>303,613</b>	<b>347,842</b>	<b>376,628</b>

Figures for Fiscal 1995 and 1996 are actual. Figures for Fiscal 1997 are programmed.

improvements in our educational programs and systems will lead to further changes in what our educational customers will come to expect regarding improved quality and convenience of the educational experience."

Shortly before he retired as commander of USAF's Air Education and Training Command, Gen. Billy Boles made some similar predictions.

Writing in *Military Training Technology*, he said, "We're going to have to find a lot of alternative delivery approaches that will be less manpower-intensive and less expensive. We're already using computer-based instruction in the classrooms. We found it saves manpower and students retain what they learn longer."

The General also forecast major advances in simulation. Said Boles, "Mission rehearsal systems will get to the point that a pilot should never perform an event for the first time in

an airplane. Aircrews will perfect their techniques without burning up fuel and using flying time to learn."

Thus, if predictions of the Air Force 2025 study prove true, the next generation of airmen will learn lessons in the classroom that, in the past, have only been possible to experience on the flight line or in combat.

Finding future students able to absorb the more technical, high-paced training is something of a concern. Air Force 2025 concluded that they will need skills for both independent and collaborative learning, including the ability to manipulate networks, deal with mountains of data, understand cyber systems, and synthesize information.

### All's Well So Far

Skeptics question whether students who have such skills will be available in sufficient numbers. Studies show that many leave public schools

poorly prepared either for further education or employment. They conclude that future employers will have to upgrade new employees' basic skills before training them for the job.

AETC officials say that, so far at least, the Air Force has not experienced that problem. "Today," they said, "99 percent of our new recruits are high school graduates and are required to meet entry testing criteria prior to entering the Air Force. AETC does not have to provide remedial training either in basic or ops training."

"We believe today's recruits are as ready to learn as their predecessors," the officials said, "and that our current Air Force training provides them with the necessary structure and discipline to successfully complete this training."

The concerns are anticipatory because it will be a while before Air Force training makes the leap into the technologies described by Air Force 2025. In the meantime, it has begun making major changes in the way it schools its troops.

Since March 1994, for example, the Air Force has been sending new members in all career fields to formal initial skills courses before moving them into operational duties. In the past, formal schooling was reserved for those in the more technical specialties. Other enlisted troops were expected to pick up their skill training on the job.

## More Than Technology

While the Air Force is eager to draw on new technology and adopt new training methods, it must do so with one eye on the bottom line. Recent budget cuts have shrunk AETC's infrastructure, and Defense officials are talking about still more strength reductions and base closures.

In four previous rounds of closures, AETC shut three flight training centers (Williams AFB, Ariz.; Reese AFB, Tex.; and Mather AFB, Calif.) and two operations training sites (Chanute AFB, Ill., and Lowry AFB, Colo.), passing their missions to other bases. It also combined many courses and reworked others to make them more efficient.

At the same time, it has drawn more members into the formal training environment, many of them from operational units.

For the most part, AETC officials said, the using units have supported the changes, even when it has meant releasing their members for additional training at a time when the drawdown has put a premium on manpower. AETC has courted this cooperation from the field by assuring operational units that their troops will not only be trained more thoroughly but will be able to go to work with less additional training on the job.

Providing improved training will not be easy for a training establishment already taxed by years of belt tightening. One solution to which the services have turned in such circumstances has been to farm out some training load to civilian contractors.

In flight training, AETC already outsources its enhanced flight screening (EFS) program (light-aircraft training) at Hondo, Tex. Contractors also have a hand in primary and advanced programs in areas such as courseware development, academics, and simulator instruction. One study is looking at electronics principles and selected telephone maintenance courses to see if they could be taught by contractor personnel.

There is a big "if" in the equation, however. "Our main concerns center around what we call 'blueing,'" said one AETC official. "That means how well can we instill military ethics and values in new recruits. . . . The ability of a contractor to provide adequate 'blueing' will be carefully evaluated."

More recently, the Air Force has begun requiring airmen to return to school after 18 months on the job. From now on, they will be required to take formal "craftsman courses" before receiving their seven-level Air Force Specialty Codes. All of these courses will be available online by September, officials said. Some air-

crew members and individuals in medical AFSCs will be allowed variances because of unique training requirements.

While craftsman courses may contain study material to be completed at the airmen's home bases, each requires some time in residence, usually about 10 training days.

The Year of Training study also recommended giving flight students more combat-related training before they graduate. AETC officials said they already have gone far in that direction.

They said that the "key" factor has been AETC's shift from undergraduate pilot training to Specialized UPT. The command's last traditional UPT class graduated from Columbus AFB, Miss., in March. Now, all students fly a common track for their primary flight training, then go into specialized advanced tracks based on the major weapon systems they are going to fly.

Air Force schools use the T-38 for fighter and bomber training, the T-1A for airlifters and tankers, the UH-1 for helicopters, and Navy T-44s for C-130s.

AETC officials said navigator training has progressed from basic under-

Photo by Randy Jolly



AETC believes Specialized UPT, in which students progress from a common track to specialized aircraft, such as this T-1A used for airlift and tanker pilots, will provide some combat-type training before students reach the field.



graduate navigator training to Specialized UNT to Joint UNT. All navigator training now takes place in a Joint environment with the Navy. Specialized tracks carry out training in strike, strike-fighter, electronic warfare officer, and airlift-tanker-maritime fields.

### Combat-Type Training

Such specialization has allowed AETC to give its students some of the combat-type training that they traditionally did not receive until they reached field units.

Helicopter pilots, for example, get night vision goggle training in their undergraduate advanced track. The tanker and airlift track includes low-altitude airdrop and air refueling profiles, low-level navigation systems, and global positioning systems. The fighter and bomber track now places more emphasis on tactical formation and fluid maneuvering in preparation for follow-on basic fighter maneuvers.

AETC has combined many of its own training programs and moved to share more training with other services. During the last three years, AETC reviewed 49 occupational areas covering 1,517 courses. It then consolidated 130 courses in fields such as civil engineering, fire protection, food service, helicopter maintenance, vehicle operations, and water survival. The command says that this streamlining has produced millions of dollars in annual savings.

Now, it is looking for consolidation candidates in areas, such as the medical field, where large blocks of training have similar resource requirements.

Professional military training also faces fundamental changes. In February, Air University received approval to develop a new program for newly commissioned Air Force officers, selected enlisted members, and civilian interns.

This Air and Space Basic Course—a six-to-eight-week-long, in-residence session—aims to produce graduates with a broad knowledge of USAF doctrine, history, and operations. Students will be taught to think of them-



Photo by Paul Kennedy

**By the time today's airmen reach the Senior NCO Academy they will probably have attended more formal training than their predecessors and have participated in online training via computer to maintain and enhance their skills.**

selves as "airmen" first and to share a common view of how air- and spacepower contribute to national defense.

AU will test the course next summer. If it is approved as a permanent addition to the professional military education system, future officer graduates will move on to operational assignments and be enrolled in another recently developed base-level program called the Company Grade Officer's Course.

It is probable that both courses will become institutionalized PME programs. "We expect they will change the face of professional military education dramatically," AU reported in a statement. "Schools, such as the Squadron Officer School, eventually will be able to expect students to arrive possessing some of the knowledge and skills currently taught at the school. SOS then can concentrate on elevating students' skills and knowledge to even higher levels. These effects will ripple through much of Air Force professional education."

### First-Day Capability

Just as flight training changes have been aimed at adding combat skills previously left to operational units, enlisted training has focused on pro-

ducing "mission-ready technicians," who will be able to start work the first day on the job.

AETC cites its Mission-Ready Technician program as one of its biggest successes in that area.

"In this program," AETC reports, "new airmen are no longer given just general skills training in their specialty area. Instead, they are trained on typical three-level tasks, on the actual equipment they will be using on their first assignments. This produces an airman ready to work on his or her first day on the job and significantly reduces the training burden on the operational unit."

AETC proposed the creation of an Air Force Training Battle Lab, similar to the service's other planning facilities but focused on exploiting new technology to deliver learning tools to the classroom and the flight line. The plan, which is still under Air Staff review, calls for assembling a small staff of training experts who will work with the Air Force's other battle labs to assess future training requirements and offer education and training solutions to operational problems.

"Our training programs are as healthy as at any time in Air Force history," AETC asserted in a statement. "Through the Year of Training and other initiatives, they have been refocused so that we are providing the best training, through the best methods, at the right time in a person's career." ■

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*Bruce D. Callander, a regular contributor to Air Force Magazine, served tours of active duty during World War II and the Korean War. In 1952, he joined Air Force Times, serving as editor from 1972 to 1986. His most recent story for Air Force Magazine, "Turnaround at Veterans Affairs," appeared in the March 1997 issue.*

# Congressional **Veterans'** **Affairs** Establishment

An Air Force Magazine Directory (Members arranged by seniority in committee)

## Senate Committee on Veterans' Affairs ■

### Republicans



**Arlen Specter**  
Chair  
Pennsylvania



**Strom Thurmond**  
South Carolina



**Frank H. Murkowski**  
Alaska



**James M. Jeffords**  
Vermont



**Ben Nighthorse  
Campbell**  
Colorado



**Larry E. Craig**  
Idaho



**Tim Hutchinson**  
Arkansas

### Democrats



**John D. Rockefeller IV**  
Ranking Minority Member  
West Virginia



**Bob Graham**  
Florida



**Daniel K. Akaka**  
Hawaii



**Paul D. Wellstone**  
Minnesota



**Patty Murray**  
Washington

# House Committee on Veterans' Affairs

## Republicans



**Bob Stump**  
Chair  
Arizona



**Christopher H. Smith**  
New Jersey



**Michael Bilirakis**  
Florida



**Floyd D. Spence**  
South Carolina



**Terry Everett**  
Alabama



**Steve Buyer**  
Indiana



**Jack Quinn**  
New York



**Spencer Bachus**  
Alabama



**Clifford B. Stearns**  
Florida



**Dan L. Schaefer**  
Colorado



**Jerry Moran**  
Kansas



**John C. Cooksey**  
Louisiana



**Asa Hutchinson**  
Arkansas



**J. D. Hayworth**  
Arizona



**Helen Chenoweth**  
Idaho



**Ray LaHood**  
Illinois

## Democrats



**Lane Evans**  
Ranking Minority Member  
Illinois



**Joseph P. Kennedy II**  
Massachusetts



**Bob Filner**  
California



**Luis V. Gutierrez**  
Illinois



**Sanford D. Bishop, Jr.**  
Georgia



**James E. Clyburn**  
South Carolina



**Corrine Brown**  
Florida



**Mike Doyle**  
Pennsylvania



**Frank R. Mascara**  
Pennsylvania



**Collin C. Peterson**  
Minnesota



**Julia M. Carson**  
Indiana



**Silvestre Reyes**  
Texas



**Vic Snyder**  
Arkansas



# AFA Nominees for 1997-98

**A**T A meeting May 24, 1997, in Colorado Springs, Colo., the Air Force Association Nominating Committee selected a slate of candidates for the four national officer positions and the six elective positions on the Board of Directors. This slate will be presented to the delegates at the National Convention in Washington, D. C., on September 15.

The Nominating Committee consists of the five most recent past National Presidents (not serving as Chairman of the Board) and one representative from each of the 12 US regions.

Nominated for his second term as National President was **Doyle E. Larson** of Burnsville, Minn. He retired from the Air Force in 1983 as a major general. He serves as president, D. E. Larssen Co. In addition to his AFA work, he serves as a trustee of Macalester College, St. Paul, Minn., and as a visiting lecturer at the National Security Agency.

Larson attended Madelia High School, Madelia, Minn., and Macalester College before the Korean War interrupted his studies. He enlisted in the Air Force in 1951 and served as a Russian linguist until entering flying training and receiv-

ing his wings and commission in 1953. He completed his BA degree at Hardin-Simmons University in Texas, on Project Bootstrap, earned his MA degree at Auburn University in Alabama, and received an honorary doctor of laws degree from Pikeville College in Kentucky.

Early assignments included radar observer in F-94C and F-89D Scorpion aircraft, chief of language training with USAF Security Service, and commander of RC-121, RC-130, and RC-135 reconnaissance squadrons. He is credited with 71 combat-support missions in the Vietnam War. He served as the director of intelligence at US Pacific Command and deputy chief of staff for intelligence at Strategic Air Command. In 1979, he became the commanding general of USAF Security Service, then the first commander of Electronic Security Command and the first director of the Joint Electronic Warfare Center. He was awarded two Distinguished Service Medals, three Legion of Merit medals, the Meritorious Service Medal, and four Air Medals. In 1982, he was inducted into the Order of the Sword by the noncommissioned officers of the Air Force.

He joined AFA in 1976. He has served on the Executive, Resolutions, Long-Range Planning, and Constitution Committees and as a National Director, National Vice President (North Central Region), Minnesota state president, and president of the General E. W. Rawlings Chapter. He also serves as a trustee of the Aerospace Education Foundation. His national AFA awards include the Medal of Merit, an Exceptional Service Award, and a Presidential Citation.

a Legion of Merit, two Distinguished Flying Crosses, two Purple Hearts, a Meritorious Service Medal, two Air Medals, Republic of Vietnam Gallantry Cross, and other military decorations.

Smith joined AFA in 1974. He is past National President. He is past chairman of the Long-Range Planning Committee and the Veterans/Retiree Council. He is also past president of Mississippi AFA and the Golden Triangle Chapter. His national

ing at Myrtle Beach AFB, S. C., Croom flew 218 combat sorties as an F-100 pilot while assigned to the 309th Tactical Fighter Squadron, 31st Tactical Fighter Wing, Tuy Hoa AB, South Vietnam, from July 1969 until June 1970. He was shot down and rescued on a close air support mission 12 miles from Tuy Hoa in May 1970.

Following Vietnam, Croom served as a T-38 instructor pilot, personnel officer, technical training manager,



Larson



Smith



Croom



Church

Larson is a Life Member of both AFA and AEF.

**Gene Smith** of West Point, Miss., was nominated for his second term as Chairman of the Board. Smith retired from the Air Force as a lieutenant colonel in 1978. Active in many business and civic organizations, he has served as president of the Starkville, Miss., Chamber of Commerce, Mississippi Airport Managers Association, Southeastern Airport, and the Greater Golden Triangle Economic Development Council Managers Association. He is a Rotarian.

Smith was born in Marks, Miss. He graduated from Tunica County High School in 1952. He earned a degree in chemical engineering in 1956 at Mississippi State University. He joined the Air Force in September 1956, serving in Air Defense Command and Tactical Air Command, flying a variety of fighter aircraft. On October 25, 1967, while flying his thirty-third combat mission over North Vietnam, he was shot down in Hanoi and captured. He was repatriated on March 14, 1973.

He completed his Air Force career as director of operations for Air Training Command's 14th Flying Training Wing. Smith received two Silver Stars,

AFA awards include two Medals of Merit, an Exceptional Service Award, a Special Citation, two State Storz Awards, and a Chapter Storz Award. Smith is a Life Member of AFA.

Nominated for his first term as National Secretary was **William D. Croom, Jr.**, of Colorado Springs, Colo. Croom retired from the Air Force in 1984 as a lieutenant colonel. Active in numerous civic and charitable organizations, he has served as a board member and as treasurer of both the Pikes Peak USO and the Air Academy Federal Credit Union. He is currently on the board of directors of the Pikes Peak Community College Foundation and is a member of the Colorado Springs Chamber of Commerce Military Affairs Council.

Croom was born in Raleigh, N. C. He graduated from Durham High School in Durham, N. C., and earned a BS degree in business administration from the University of North Carolina in 1963. He completed his MBA course work at Trinity University in San Antonio, Tex. Croom earned his pilot wings at Laughlin AFB, Tex., in 1964 and served as a T-37 instructor pilot at Moody AFB, Ga., until 1968. After upgrade train-

ing at Myrtle Beach AFB, S. C., Croom flew 218 combat sorties as an F-100 pilot while assigned to the 309th Tactical Fighter Squadron, 31st Tactical Fighter Wing, Tuy Hoa AB, South Vietnam, from July 1969 until June 1970. He was shot down and rescued on a close air support mission 12 miles from Tuy Hoa in May 1970.

Following Vietnam, Croom served as a T-38 instructor pilot, personnel officer, technical training manager, executive officer at a major command, director of protocol at both Air Training Command and the US Air Force Academy, and squadron operations officer. He completed his service as the assistant director for plans and operations at USAFA. During his career, he earned three DFCs, 12 Air Medals, the Purple Heart, two MSMs, two Air Force Commendation Medals, and the Republic of Vietnam Gallantry Cross with Palm. A Life Member, Croom joined AFA in 1964. He has served as vice president and president of the Colorado Springs/Lance Sijan Chapter, Colorado state president, and National Vice President (Rocky Mountain Region). He has been a member of the Long-Range Planning, Finance, Resolutions, and Executive Committees and is currently a member of the board of directors and chairman of the Long-Range Planning Committee. He also serves as chairman of the Colorado Constitution and Bylaws Committee and as a member of the Executive Council of his local chapter. Croom's National AFA awards include a Presidential Citation, Exceptional Service Award, and Medal of Merit, and he has been chosen Colorado AFAer of the Year.



Chapman



Gardner



Hendrickson



Seavers



Thompson



Webber

**Charles H. Church, Jr.**, of Lenexa, Kan., was nominated for his third term as National Treasurer. Church was born in Kansas City, Mo., and he graduated from Southwest High School and from the University of Kansas with a bachelor's degree in political science. He has also completed several specialized courses sponsored by the American Institute of Banking.

A World War II Navy veteran, Church was in training to be an aerial gunner when the war ended. He went on to a successful career in banking and retired as chairman of the United Missouri Bank of Hickman Mills. He still serves as an advisory director of the United Missouri Bank of Kansas City.

Church is past president of the Richards-Gebaur AFB, Mo., Community Council and was president of the South Jackson County Kiwanis, South Kansas City Chamber of Commerce, and the Bankers Consumer Credit Association of Kansas City. He has been an American Cancer Society volunteer.

An AFA member for more than 30 years, Church has been a Life Member since 1983 and also is a Life Member of AEF. He has held all chapter and state offices and currently serves on the Harry S. Truman Chapter's Executive Committee.

Nationally, he has been active for

18 years as a member of the Finance Committee and had been the National Treasurer's personal choice to be vice chairman of that committee for eight years. He was National Vice President (Midwest Region) for three years and has chaired AFA's Long-Range Planning Committee. He has received AFA's Medal of Merit, Exceptional Service Award, Presidential Citation, and Special Citation and has been designated an AEF Doolittle Fellow, in recognition of his superior service to both his region and national AFA.

The following individuals are permanent members of the AFA Board of Directors under the provisions of Article IX of AFA's National Constitution: John R. Alison, Joseph E. Assaf, Richard H. Becker, David L. Blankenship, John G. Brosky, Dan F. Callahan, Robert L. Carr, George H. Chabbott, Earl D. Clark, Jr., O. R. Crawford, R. L. Devoucoux, Jon R. Donnelly, Russell E. Dougherty, George M. Douglas, Joseph R. Falcone, E. F. Faust, Joe Foss, Barry Goldwater, John O. Gray, Jack B. Gross, Martin H. Harris, Gerald V. Hasler, Monroe W. Hatch, Jr., H. B. Henderson, John P. Henebry, Robert S. Johnson, David C. Jones, Arthur F. Kelly, Victor R. Kregel, Jan M. Laitos, Frank M. Lugo, Nathan H. Mazer, William V. McBride, James M. McCoy, Thomas J. McKee, Edward J. Monaghan, J. B.

Montgomery, Bryan L. Murphy, Jr., J. Gilbert Nettleton, Jr., Ellis Nottingham, Jack C. Price, William C. Rapp, Julian B. Rosenthal, Peter J. Schenk, Walter E. Scott, Mary Ann Seibel, Joe L. Shosid, James E. Smith, William W. Spruance, Thos. F. Stack, Harold C. Stuart, James M. Trail, A. A. West, and Sherman W. Wilkins.

The six people whose photographs appear on this page are nominees for the six elected Directorships for the coming year.

**Gerald S. Chapman**, California. Former National Director; National Vice President (Far West Region); state chairman of the board, president, vice president, and veterans affairs committee chairman; chapter president. Currently Tennessee Ernie Ford Chapter vice president for membership and chairman of the state Finance Committee. Life Member of AFA and AEF.

**Samuel M. Gardner**, Kansas. Former National Vice President (Midwest Region); AEF Board of Trustees; state president and chapter president. Currently Kansas state president. Life Member of AFA and AEF.

**Daniel C. Hendrickson**, Utah. Former state president and chapter president. Currently National Vice President (Rocky Mountain Region) and chairman of the National Membership Committee. Life Member of AFA.

**Victor C. Seavers**, Minnesota. Former state president; chapter president and vice president. Currently National Vice President (North Central Region) and member of the Executive Committee and Resolutions Committee.

**Mary Anne Thompson**, Virginia. Former National Vice President (Central East Region); state president, secretary, vice president for programs and North Area; chapter president, vice president, and secretary; member of the Membership Committee. Currently National Secretary, chairman of the Resolutions Committee, member of the Executive Committee, AEF Scholarship Committee, and AEF Board of Trustees. Life Member of AFA and AEF.

**L. B. "Buck" Webber**, Texas. Former National Vice President (Southwest Region); state president, vice president, executive vice president; chapter president, secretary, vice president for awards, and vice president for operations. Life Member of AFA. ■

# AFA State Contacts



Following each state name are the names of the communities in which AFA chapters are located. Information regarding these chapters or any of AFA's activities within the state may be obtained from the appropriate contact.

**ALABAMA** (Birmingham, Gadsden, Huntsville, Mobile, Montgomery): **William B. Divin**, 6404 Pinehurst Run, Mobile, AL 36608 (phone 334-342-7092).

**ALASKA** (Anchorage, Fairbanks): **Carl W. Bradford, Jr.**, 8040 Evans Cir., Anchorage, AK 99507 (phone 907-753-7143).

**ARIZONA** (Green Valley, Phoenix, Prescott, Sedona, Sierra Vista, Sun City, Tucson): **Raymond D. Chuvale**, 5039E N. Regency Cir., Tucson, AZ 85711-3000 (phone 520-747-2738).

**ARKANSAS** (Fayetteville, Hot Springs, Little Rock): **Marleen Eddlemon**, 2309 Linda Lane, Jacksonville, AR 72076-2814 (phone 501-378-3582).

**CALIFORNIA** (Apple Valley, Bakersfield, Edwards AFB, Fairfield, Fresno, Los Angeles, Merced, Monterey, Orange County, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, Sunnyvale, Vandenberg AFB, Yuba City): **Rich Taubinger**, 7113 Brookcrest Way, Citrus Heights, CA 95621-6416 (phone 916-331-8969).

**COLORADO** (Colorado Springs, Denver, Fort Collins, Grand Junction, Pueblo): **Mark Worrick**, 3210 S. Oneida Way, Denver, CO 80224-2830 (phone 303-757-8565).

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**FLORIDA** (Avon Park, Broward County, Cape Coral, Daytona Beach, Fort Walton Beach, Gainesville, Homestead, Hurlburt Field, Jacksonville, Leesburg, Miami, New Port Richey, Orlando, Palm Harbor, Panama City, Patrick AFB, Port Charlotte, St. Augustine, Sarasota, Spring Hill, Tallahassee, Tampa, Vero Beach, West Palm Beach, Winter Haven): **Robert E. Patterson**, 95 Country Club Rd., Shalimar, FL 32579-1610 (phone 904-882-9118).

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**MONTANA** (Bozeman, Great Falls): **John M. Wallace**, P. O. Box 6267, Great Falls, MT 59406-6267 (phone 406-587-8998).

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**NEW HAMPSHIRE** (Manchester, Portsmouth): **Baldwin M. Domingo**, 5 Birch Dr., Dover, NH 03820 (phone 603-742-0422).

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**NORTH CAROLINA** (Asheville, Charlotte, Fayetteville, Goldsboro, Greensboro, Greenville, Havelock, Kitty Hawk, Littleton, Raleigh, Wilmington): **John**

**W. White**, 245 S. Hillcrest Dr., Goldsboro, NC 27534-7540 (phone 919-735-3958).

**NORTH DAKOTA** (Fargo, Grand Forks, Minot): **George E. Masters**, 1029 6th Ave. S. W., Minot, ND 58701 (phone 701-723-6697).

**OHIO** (Cleveland, Columbus, Dayton, Mansfield, Newark, Youngstown): **William "Ron" Goerges**, 4201 W. Enon Rd., Fairborn, OH 45324 (phone 513-429-6070).

**OKLAHOMA** (Altus, Enid, Oklahoma City, Tulsa): **Jo Smith**, 3937 S. E. 14th Pl., Del City, OK 73115 (phone 405-736-5839).

**OREGON** (Eugene, Klamath Falls, Portland): **Thomas D. Stevenson**, 8138 S. W. Valley View Dr., Portland, OR 97225 (phone 503-297-5968).

**PENNSYLVANIA** (Allentown, Altoona, Beaver Falls, Coraopolis, Drexel Hill, Erie, Harrisburg, Johnstown, Lewistown, Philadelphia, Pittsburgh, Scranton, Shiremanstown, State College, Washington, Willow Grove, York): **Jerome P. Ashman**, R. R. 1, Box 266, Bolivar, PA 15923 (phone 412-238-4015).

**RHODE ISLAND** (Warwick): **Eugene M. D'Andrea**, P. O. Box 8674, Warwick, RI 02888 (phone 401-461-4559).

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**SOUTH DAKOTA** (Rapid City, Sioux Falls): **Barbara Anderson**, 757 E. Anamosa, #111, Rapid City, SD 57701-1309 (phone 605-399-6659).

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**TEXAS** (Abilene, Amarillo, Austin, Big Spring, College Station, Commerce, Dallas, Del Rio, Denton, El Paso, Fort Worth, Harlingen, Houston, Kerrville, Lubbock, San Angelo, San Antonio, Wichita Falls): **Thomas J. Kemp**, 3608 Kimberly Lane, Fort Worth, TX 76133-2147 (phone 817-695-7644).

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**WASHINGTON** (Seattle, Spokane, Tacoma): **Richard A. Seiber**, 5323 97th Ave. Court W., Tacoma, WA 98467 (phone 206-627-0700).

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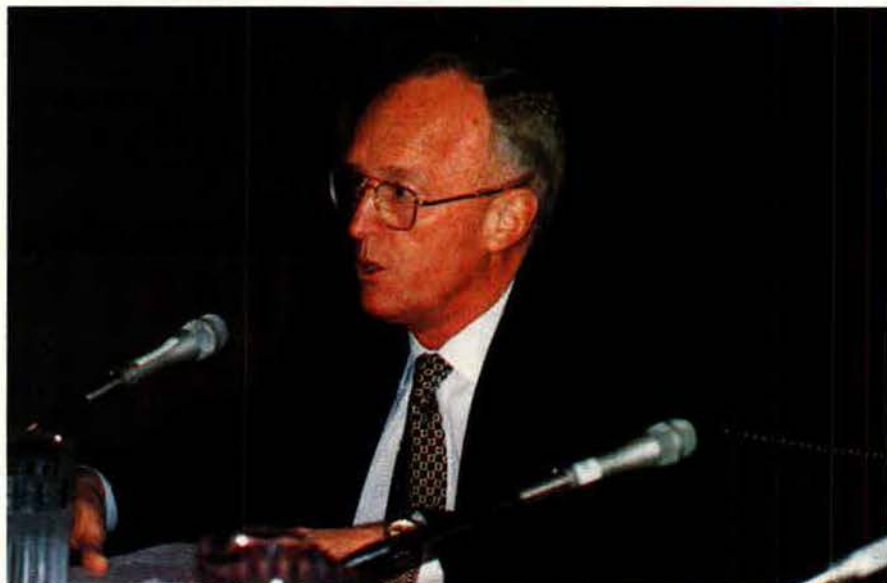
**WISCONSIN** (Madison, Milwaukee, General Mitchell IAP/ARS): **Gilbert M. Kwiatkowski**, 8260 W. Sheridan Ave., Milwaukee, WI 53218-3548 (phone 414-463-1849).

**WYOMING** (Cheyenne): **Irene G. Johnigan**, 503 Notre Dame Ct., Cheyenne, WY 82009 (phone 307-775-4552).

# AFA / AEF National Report

By Frances McKenney, Assistant Managing Editor

Photo by Susan Kennedy



*On behalf of the Military Coalition, Thad Wolfe, chairman of AFA's Veterans/Retiree Council, testified before the House Veterans' Affairs Committee on Capitol Hill in support of H.R. 699, the Military Voting Rights Act of 1997.*

## AFA Testifies For Military Voting Rights Act

Thad A. Wolfe, chairman of the Air Force Association's Veterans/Retiree Council, testified before the House Veterans' Affairs Committee on Capitol Hill in June, speaking on the issue of absentee voting by service members. His remarks supporting the Military Voting Rights Act of 1997 were made on behalf of the Military Coalition, a group of military and veterans organizations of which AFA is a part.

"The right of active-duty military personnel and their dependents to vote in all federal, state, and local elections needs to again be reemphasized to state and local election officials," he told the committee.

The issue came to light last year when a predominantly Democratic county in Texas became predominantly Republican dominated as a result of 800 absentee ballots cast mostly by service members. A federal lawsuit, disputing the right of absentee military voters to vote in state and local elections, ensued. To head off a precedent-setting ruling, several Congressmen have intro-

duced bills to ensure the voting rights of active-duty military personnel.

### AFA Councils Meet

Force readiness and health care emerged as the top issues at a gathering of the Air Force Association's

Civilian Advisory, Enlisted, Junior Officer Advisory, Reserve, and Veterans/Retiree Councils in June. The two days of meetings in Arlington, Va., were one step in the process paving the way for position proposals that delegates will consider when



*AFA's advisors and councils met in June to discuss issues that could become part of the Association's formal statement of policy. In one of their work sessions, members of the Enlisted Council (above) focused on quality-of-life topics that have a direct impact on their constituents.*

Photo by Susan Kennedy





setting AFA policy at the National Convention next month.

During council meetings, members discussed a broad range of topics. For the Civilian Advisory Council, subjects included pay, cost-of-living adjustments, and retaining the current Federal Employee Health Benefits Program. The Veterans/Retiree Council considered such topics as health care, COLAs, and transition assistance for service members separating from the military.

In the Reserve Council, force modernization was the primary concern, along with the impact of quality-of-life issues on recruiting and retention. Force modernization had also been number one with the Air National Guard Council—which had their spring meeting in March—in addition to the topics of funding for contingency operations and employer tax incentives.

The Enlisted Council had permanent change of station costs and survivor benefits high on their agenda. The Junior Officer Advisory Council was concerned that military compensation is falling behind the private sector and not fully keeping up with inflation. The members also perceive that the retirement system, the “crown jewel” of the compensation package, is losing its value to retention. Both councils talked about maintaining access to medical care for their families—a particular worry, they said, because their dependents are often on their own in these times of increased deployments. In addition to separate meetings, all the councils convened for a “Cross-Talk Session” where they shared these concerns.

AFA National President Doyle E. Larson welcomed the council members, and USAF officials delivered a personnel update and briefing on the status of the Transition Assistance Program. The councils also listened to an update on the work of the President's Commission on Critical Infrastructure Protection.

AFA's councils generally meet three times a year, bringing to the table firsthand experiences and input from their constituents around the world.



*In screen roles such as Col. “Dutch” Holland (above) in “Strategic Air Command,” Jimmy Stewart personified US Air Force ideals.*

## **James M. Stewart, 1908–1997**

James Maitland Stewart, the Hollywood legend who in 1946 joined 11 other men to found the Air Force Association, died July 2 at his home in Beverly Hills, Calif. He was 89.

A native of Indiana, Pa., Jimmy Stewart was a significant figure in the early years of the Association. He served as an AFA National Vice President. Moreover, as a famous and popular actor, he was instrumental in attracting numerous other celebrities to the cause of AFA and airpower.

Stewart was one of six officers of the newly formed AFA who met with President Truman at the White House in early 1946. He also played a major role in Hollywood's recognition of Air Force Day in 1946, taking part in a special coast-to-coast radio broadcast featuring fighter ace Lt. Col. John C. Meyer and many stars, including former Army Air Forces Capt. Ronald Reagan.

By the time the US entered World War II, Stewart already was a well-known star; he had won an Academy Award and was earning a princely \$3,000 a week in film work. Despite that, Stewart enlisted in the Army in 1941 and was assigned to the Air Corps and eventually went to Eighth Air Force in Europe. He flew 35 combat missions as pilot of a B-24 Liberator. He was the recipient of the Distinguished Flying Cross, Air Medal, and France's Croix de Guerre.

Stewart left the service in 1945 as a colonel. He remained active in the Air Force Reserve, from which he retired in 1968 as a brigadier general.

Stewart starred in more than 75 movies during a career that spanned five decades. Among his many screen roles were several memorable portrayals of airmen in films such as “The Glenn Miller Story” in 1954, “Strategic Air Command” in 1955, and “Spirit of St. Louis” in 1957.

Stewart was nominated for Oscars five times as best actor, winning for “The Philadelphia Story” in 1940. He also received an honorary Oscar from the Academy of Motion Picture Arts and Sciences in 1985. He was best known for his portrayals of modest, decent, and courageous individuals in movies such as “Mr. Smith Goes to Washington” and “It's a Wonderful Life.”

The *Washington Post* said of Stewart, “He was probably the most important American film actor since John Wayne.”

Speaking at a 1988 event sponsored by AFA's Aerospace Education Foundation, Stewart stated, “My service in the military has made me a better citizen, and for that I am grateful to the United States Air Force.”

### **Grand Old Flag**

AFA member Capt. Ellen Means watched in disbelief as a young employee at a Sacramento, Calif., fast-food restaurant brought the US flag down at the end of the day, let it drop on the ground, and placed his foot on it when the wind began to blow it

away. She spoke to him and found that he knew little about the proper treatment of the flag.

She then began thinking about the area elementary schools where she volunteered. Due to lack of funds, there were few flags in the schools, and many children were not exposed

Photo by Henry Grayson



**AFA National President Doyle Larson presented an AFA Academic Achievement Award to SMSgt. Daryl R. Lawrence of Scott AFB, Ill., at the graduation of the Senior Noncommissioned Officer Academy's Class 97-C, Gunter Annex, Maxwell AFB, Ala. Larson also visited Air University, Air War College, Enlisted Heritage Hall, and Civil Air Patrol headquarters.**

to the traditions surrounding the national symbol.

So Means presented a proposal to the **C. Farinha Gold Rush** (formerly Sacramento) **Chapter**. The result is a program called "Proud to Be an American." It aims to provide a flag for every classroom lacking one, and Means also sees it as a method to give children an understanding of the flag's meaning. With the chapter's backing, the first of 89 flags was presented to a classroom in Del Paso Heights School District in Sacramento on April 14.

Chapter members, the Company Grade Officers Council, and 30 military and civilian volunteers from McClellan AFB, Calif., have not only pitched in to buy the flags but are also visiting classrooms to talk about the history and traditions of the flag and to teach the students the Pledge of Allegiance.

Thomas A. Knowles, chapter vice president of communications, said the group's goal is to ensure that the children are not deprived of the US flag "and that they all understand, and never forget, its significance." The local chapter of the Veterans of Foreign Wars plans to keep the program going, expanding it throughout the region.

**Betting on AFA**

Southern California AFA chapters went to Santa Anita Race Track in Arcadia, Calif., for the tenth annual AFA Day at the Races. The **General**

**Doolittle Los Angeles Area Chapter** hosted more than 70 association members, including Martin W. Ledwitz, **Pasadena Area Chapter** president; G. Wesley Clark, **General B. A. Schriever Los Angeles Chapter** president; Louis J. Kridelbaugh, **General Doolittle Chapter** president; and Col. Charles E. Whited, state vice president for Area III.

Donald J. Keeffe, **Doolittle Chapter's** vice president for aerospace edu-

cation, also reported that in June the chapter presented \$50 awards to AFJROTC cadets Eric Wilson of St. Anthony's High School in Long Beach and Edith Vazquez of Canoga Park High School in Woodland Hills. The chapter supports JROTC at eight other high schools in the Los Angeles area, as well as ROTC at three universities.

**In the Volunteer State**

The **Chattanooga (Tenn.) Chapter** hosted the Tennessee State Convention in May. The guest speaker at the awards banquet was Albert L. Pruden, Lockheed Martin F-22 program manager for Advanced Product Development. He gave a multimedia presentation on the F-22 and reported the latest information on its development.

At the convention, the award for Outstanding AFROTC Detachment went to the University of Tennessee, Knoxville. Maplewood High School, Nashville, Tenn., received the Outstanding AFJROTC Unit Award. Rachel Temple Stewart was named Teacher of the Year, and the AFA Volunteers of the Year were Philip V. Maywald, state president and an **H. H. Arnold Memorial Chapter** member, and William E. Freeman, Jr., of the **Everett R. Cook Chapter**.

**On the "North Coast"**

The Ohio State Convention, hosted by the **Cleveland Chapter**, was held in June in downtown Cleveland, overlooking Lake Erie. The highlight was

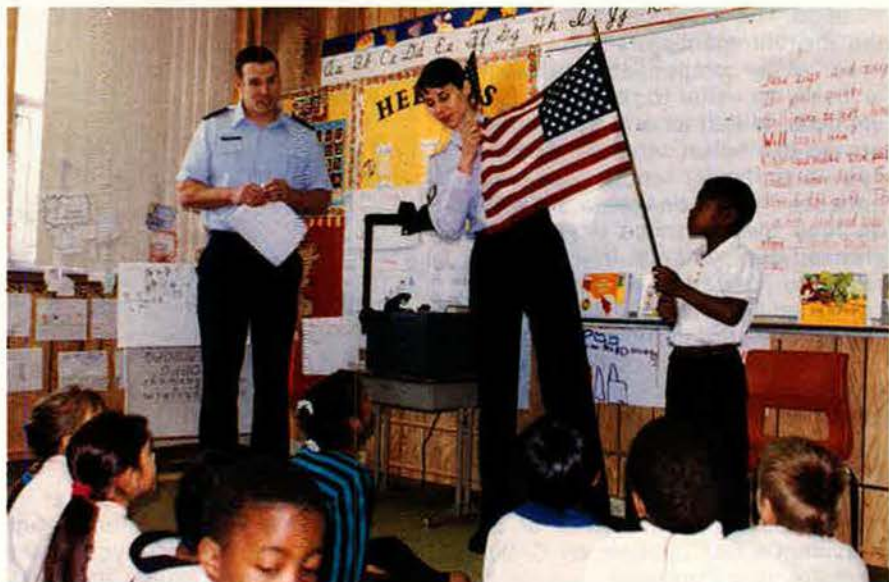


Photo by Thomas Knowles

**As part of the C. Farinha Gold Rush Chapter's "Proud to be an American" initiative, 1st Lt. Christopher Wyckoff and SSgt. Jessica Miller of McClellan AFB, Calif., teach flag etiquette and traditions to schoolchildren at Del Paso Heights Elementary School in Sacramento, Calif.**

a presentation by guest speaker Warren S. Weiant III, chairman of the Aviation Subcommittee of the Crawford Auto-Aviation Museum in Cleveland. He captivated the audience with the history of aviation in the Cleveland area and with a collection of vintage photos.

The **Frank P. Lahm Chapter** was selected Chapter of the Year at the convention. Also honored was the Ohio AFA Person of the Year, Ellen F. LaGrone, past president of the **Wright Memorial Chapter**. Under her leadership, the chapter sponsored an acquisition reform symposium, where Headquarters USAF and Air Force Materiel Command representatives discussed the Air Force's Lightning Bolt acquisition initiatives.

New officers for AFA in the Buckeye State were elected at the convention: William "Ron" Goerges, president; Joseph "Ray" Lesniok, Jr., vice president; Charles B. Spencer, treasurer; and Sandra G. Wolpert, secretary.

### Statue for an Astronaut

Former astronaut and AFA member John L. "Jack" Swigert, Jr., died in 1982, shortly before he was to take office as a US Representative for Colorado.

In 1996, the Colorado General Assembly chose him to represent the state in Washington, D. C. A seven-foot-tall bronze statue of Swigert now stands in the National Statuary Hall in the Capitol building. House Speaker Newt Gingrich (R-Ga.) and Sen. John Glenn (D-Ohio), a former astronaut, attended the unveiling ceremonies in May.

Swigert's career included USAF service in the Korean War and with the Massachusetts and Connecticut Air National Guards. To many, the most memorable event was his only spaceflight in April 1970—the Apollo 13 mission. After an explosion in the service module, Swigert and astronauts Jim Lovell and Fred Haise were forced to use the lunar module as a "lifeboat," a procedure for which Swigert had written the manual, to return safely to Earth.

Swigert was a member of the Front Range (Colo.) Chapter that, in 1987, merged with two other chapters to become the **Mile High Chapter**.

According to Mark J. Worrick, Colorado state president, Colorado State AFA helped make possible this recognition for the astronaut. James C. Hall, secretary of the **General Robert E. Huyser Chapter**, added that schoolchildren and Cub Scouts held bake sales to raise funds for the statue. A donation from Lockheed Martin completed the \$210,000 project.



*National Director Harold Stuart (left) and the Tulsa Chapter's first president, Brig. Gen. Joseph Turner, USAF (Ret.), helped celebrate the Air Force's fiftieth anniversary at a Tulsa Air and Space Center open house.*

### Visions of Rocketry

A rocket built by Visions of Exploration students from Martin Luther King, Jr., Elementary School in Security, Colo., was launched as part of the opening ceremonies at the 1997 National Space Symposium in Colorado Springs.

The symposium's sponsor, US Space Foundation, had asked the **Colorado Springs/Lance P. Sijan Chapter** to run a contest among its Visions classrooms, requiring the children to use a 6-foot-by-10-inch plastic pipe and their imaginations to create a rocket.

The chapter rewarded all participants with prizes that included posters autographed by six astronauts, who also attended the symposium and joined the schoolchildren on stage at the ceremonies: Vance D. Brand, Richard O. Covey, Bonnie Dunbar, Jon A. McBride, Bruce McCandless II, and Ronald M. Sega. Apollo 13's Jim Lovell also participated.

One hundred sixty-five chapter members recently turned out for the US Air Force Academy's annual charity boxing tournament to watch the cadets slug it out. For the past 13 years, the chapter has raised funds to support this event through a reception held before the tournament. This year, Chapter President Charles P. Zimkas, Jr., presented a check for \$1,500 to the Academy's boxing coach, Ed Weichers. Funds raised this year went to a 3-year-old girl with a rare type of cancer and an 8-year-old boy with sickle-cell anemia. Zimkas praised chapter members, guests, Community Partners, and local businesses who supported the cause.

The chapter also helped select local winners of seven Aerospace Education Foundation Eagle Grant Scholarships earlier this year. CMSgt. Rodney E. Ellison, chapter vice president for membership, presented the \$250 grants to Community College of the Air Force graduates SSgt. Stacey L. Frechette and SrA. William Thiel-foldt at the Academy's graduation ceremony. In a separate presentation, Richard G. Griffis, chapter co-vice president for aerospace education, awarded the grants to five scholarship winners from Peterson AFB, Colo. They were MSgt. Bruce E. Napier, Sgt. Claudia L. Rodriguez, SSgt. Robert E. Whitt, SSgt. Bryan G. Barnett, and SrA. Jill A. Villa.

### Celebrating in Tulsa

The **Tulsa (Okla.) Chapter** brought the Air Force's fiftieth-anniversary celebration to their city in May by cosponsoring an open house at the Tulsa Air and Space Center, located at Tulsa IAP.

Local media coverage brought more than 300 guests to view five airplanes and visit booths run by organizations such as the Tulsa Chapter, Air National Guard, and ROTC.

At the opening ceremonies, Joseph W. Turner, the Tulsa Chapter's first president, spoke about USAF heritage. Harold C. Stuart, AFA National President from 1951 to 1952 and a former assistant secretary of the Air Force, described his USAF experiences. Other speakers included Tom Vice, a Northrop Grumman project manager, who gave a presentation on the B-2.

## Coming Events

August 1-2, **Colorado State Convention**, Colorado Springs, Colo.; August 8-9, **Michigan State Convention**, Alpena, Mich.; August 14-17, **California State Convention**, Riverside, Calif.; August 15-16, **Oklahoma State Convention**, Oklahoma City, Okla.; August 16, **Connecticut State Convention**, East Hartford, Conn.; August 16, **Indiana State Convention**, Indianapolis, Ind.; September 5-6, **Oregon and Washington State Convention**, Tacoma, Wash.; September 6, **Delaware State Convention**, Dover, Del.; September 15-17, **AFA National Convention and Aerospace Technology Exposition**, Washington, D. C.

## Calling Berlin Airlift Veterans

*Air Force Magazine* would like to receive names, addresses, and telephone numbers of active AFA members who are also veterans of the Berlin Airlift for possible participation in a special project. Write to "Berlin Airlift," *Air Force Magazine*, 1501 Lee Highway, Arlington, VA 22209-1198, or send E-mail to [afmag@afa.org](mailto:afmag@afa.org).

Though not yet officially open to the public, the center will chronicle the city's aviation history and promote the aerospace industry. It has three aircraft in its permanent collection so far: a Spartan C-2, Spartan C-3, and Bell 47K helicopter.

The chapter-sponsored JROTC unit from Washington High School in Tulsa served as cosponsor for the Air and Space Center's open house.

### At Niagara Falls

The fourth annual golf "Tournament for Education" got the New York State Convention under way in June, with 76 players teeing off in support of the **L. D. Bell-Niagara Frontier Chapter's** Frontier Scholarship and its Visions of Exploration programs.

Later, at a luncheon attended by AFA members from nine chapters, AFA National President Doyle E. Larson spoke on information warfare and, along with State President William G. Stratemeier, Jr., presented several awards.

State-level Exceptional Service

Awards went to National Director William C. Rapp of the L. D. Bell-Niagara Chapter and State Treasurer Walter N. Zywan of the **Francis S. Gabreski Chapter** (formerly the Suffolk County Chapter).

William G. Birnbach, president of the **Lloyd Schloen-Empire Chapter**, also received a state-level ESA and accepted another for membership recruitment on behalf of his chapter. The chapter has also been named winner of a Jack Gross Award in the small-chapter category for the highest number of new members recruited as a percentage of size. As of May, it had 75 members, up from 51 in 1996.

The **Chautauqua Chapter** took home the Chapter of the Year Award, accepted by its president, John Dunderdale. Bonnie B. Callahan was named New York State AFA Person of the Year. The 914th Airlift Wing (AFRC), from Niagara Falls IAP/ARS, received an award for aviation excellence. MSgt. Joseph J. Riccio, TSgt. David Dexheimer, Sr. A. Richard Salton, and 1st Lt. Linda D. Blaszk, all from the 107th Air Refueling Wing at Niagara Falls, were recognized as outstanding Air National Guard members. Riccio also received honors as the state's outstanding Air National Guardsman.

Albert L. Pruden, from Lockheed Martin, served as keynote speaker for the evening banquet, presenting information on the F-22.

### Awards in Florida

At the **General Nathan F. Twining (Fla.) Chapter** awards dinner, retired Marine Corps Brig. Gen. Thomas Draude spoke about lessons learned from Operation Desert Storm, where he was assistant division commander of the 1st Marine Division. Now senior vice president and general manager of USAA's Southeast Regional Office, he also presented a \$500 check from USAA to Chapter President John G. Rose, in support of the Visions of Exploration program in the county.

Honored at the dinner were Civil Air Patrol Cadet of the Year Richard Martin and Pinellas County Teacher of the Year Cheryl Sinks, who teaches fourth grade at Frontier Elementary School, Clearwater, Fla. Sinks spoke to the gathering about her version of the "three Rs": recognition of your own potential, respect for yourself and others, and reaching for the future. In turn, she invited Draude and Martin, whom she called "great role models for the children," to speak at her school.

### Chapter Recognition

On Florida Space Industry Day in Tallahassee, Fla., April 23, Governor Lawton Chiles and the Florida Space Business Roundtable awarded the second annual Explorer Award to AFA's **Cape Canaveral (Fla.) Chapter**. William Barnett accepted the award on behalf of the chapter, which was recognized for its outstanding contributions in providing scholarships and sponsoring Visions of Exploration programs in 20 classrooms. The chapter also was cited for scholarships provided to JROTC seniors.

The Explorer Award was later presented again to David L. Pennoyer, chapter president, at a Space Business Roundtable Congressional Dinner that opened the thirty-seventh Space Congress, an annual, week-long exposition and symposium in Cocoa Beach, Fla. Pennoyer cited support from the chapter's Community Partners as essential to the success of their programs.

### Reunion of Childhood Friends

**On Wings of Eagles (Fla.) Chapter** Treasurer William B. Gemmill got a triple treat on Armed Forces Day, when the director of the Central Intelligence Agency during the Carter Administration, retired Adm. Stansfield Turner, spoke at the chapter's quarterly meeting. It was the first time Gemmill had seen Turner, his childhood friend, in more than 50 years.

They last saw each other just before Gemmill was transferred overseas as a second lieutenant in 1944. Turner was then a midshipman at the US Naval Academy in Annapolis, Md.

At the chapter meeting, Turner joined in honoring five outstanding cadets from the region: CAP cadets Matthew C. Booker and Matthew D. Pope and AFJROTC cadets Tommy B. Dorton, Kelly Edwards, and Becky Jones.

### More Chapter News

At the annual AFJROTC awards banquet and military ball for Patchogue-Medford High School in Medford, N. Y., the most prestigious honor was the AFA Award, sponsored by the **Francis S. Gabreski Chapter**. Roy F. Pitter, chapter president, presented the certificate and medal to Cadet Bryant Harrison at the May event. Harrison, who was recognized for his scholarship, military bearing, achievements as a varsity lacrosse player, and leadership of the school's color guard, will be cadet commander of the JROTC unit this fall. ■

# Unit Reunions

**AAF/USAF Crash Rescue Boat Ass'n.** October 10-12, 1997, in Orlando, Fla. **Contact:** Wayne A. Mellesmoen, 204 Gregory Rd., West Palm Beach, FL 33405-5032. Phone: (561) 588-5504.

**Air Commando Ass'n.** October 9-12, 1997, in Ft. Walton Beach, Fla. **Contact:** Air Commando Association, 2 David St., Fort Walton Beach, FL 32547. Phone: (904) 864-1953.

**Air Force Gunners Ass'n.** August 30-September 3, 1997, in Seattle, Wash. **Contact:** Jay E. Ingle, 35469 Colossians Way, Shingletown, CA 96088. Phone or fax: (916) 474-1632.

**Air Force Navigators/Observers Ass'n.** October 1-5, 1997, at the Best Western Le Baron Hotel in Colorado Springs, Colo. **Contact:** Phillip W. Foster, 14535 Timberedge Lane, Colorado Springs, CO 80921. Phone: (719) 488-2670.

**Air Rescue Ass'n.** October 6-9, 1997, in Albuquerque, N. M. **Contact:** Rich McVay, 3118 Tennessee St., N. E., Albuquerque, NM 87110. Phone: (505) 299-0846.

**Air Weather Reconnaissance Ass'n.** October 8-12, 1997, at the Broadwater Beach Resort Hotel in Biloxi, Miss. **Contact:** Henry M. Turk, 129 Watersedge Lane, Ocean Springs, MS 39564. Phone: (601) 875-1196.

**Aviation Cadets.** October 16-18, 1997, at Kelly AFB, Tex. **Contact:** Aviation Cadet Museum, Inc., 542 CR 2073, Eureka Springs, AR 72632. Phone: (501) 253-5008 (Errol D. Severe).

**Freedom Through Vigilance Ass'n** (formerly the USAF Security Service/Electronic Security Command Ass'n). September 26-28, 1997, in San Antonio, Tex. **Contact:** Lt. Col. Bill Radigan, 102 Hall Blvd., Suite 234, San Antonio, TX 78243-7036. Phone: (210) 977-2546. Fax: (210) 977-4948.

**Korean War Veterans.** October 15-19, 1997, in Virginia Beach, Va. **Contact:** Richard R. Gallmeyer, P. O. Box 8946, Virginia Beach, VA 23450. Phone: (757) 467-1233.

**Strategic Air Command Data Systems** personnel. September 25-28, 1997, at the Harveys Casino Hotel in Council Bluffs, Iowa. **Contact:** Robert A. Wicklund, 602 Martin Dr. N., Bellevue, NE 68005. Phone: (402) 291-4690.

**Women in the Air Force (WAF) Band.** October 1-5, 1997, in San Antonio, Tex. **Contact:** Betty DeVaughn, HCRI Box 54C, Central Bridge, NY 12035. Phone: (518) 868-4408.

**World War II Air Commando Ass'n.** October 9-12, 1997, at the Red Lion Hotel in Omaha, Neb. **Contact:** W. Robert Eason, 10031 Barnetts Ford Rd., Orange, VA 22960-2307. Phone: (540) 672-4074.

**1st Strategic Air Depot Ass'n** (1942-46), 8th Air Force, Honington-Troston, UK. October 16-19, 1997, in Savannah, Ga. **Contact:** Herb Kaster, 720 Society Hill, Cherry Hill, NJ 08003. Phone: (609) 751-1763.

**5th Fighter Squadron, 52d Fighter Group** (World War II). October 1-5, 1997, in Colorado Springs,

Colo. **Contact:** George A. Angle, 125 N. Market St., Suite 1720, Wichita, KS 67202. Phone: (800) 798-1204.

**C-7A Caribou Ass'n.** October 31-November 1, 1997, in Biloxi, Miss. **Contact:** Nick Evanish, 210 48th St., Gulfport, MS 39507-4317. Phone: (601) 863-8688.

**8th Photo Reconnaissance Squadron Ass'n,** 5th Air Force (World War II). September 17-21, 1997, at the Nassau Bay Hilton & Marina in Houston, Tex. **Contacts:** Cecil H. Rigsby, 9001 Collinfield Dr., Austin, TX 78758. Phone: (512) 836-0511. Tex Davis, 4310 Pebble Bay Ct., Pasadena, TX 77505. Phone: (713) 998-8689.

**11th Air Refueling Squadron (SAC).** September 24-28, 1997, at Dyess AFB, Tex. **Contact:** Lloyd Cizek, 810 Wapogasset Lake Lane Rd., Deronda, WI 54001. Phone: (715) 268-2496.

**13th Bomb Squadron Ass'n (Korea).** September 29-October 2, 1997, at the Radisson Hotel in Hampton, Va. **Contact:** William C. Gross, 7 Burns Dr., Newport News, VA 23601-1605. Phone: (757) 595-3203.

**Flying Tigers of the 14th Air Force Ass'n.** October 15-19, 1997, at the Hilton Cocoa Beach and Howard Johnson Plaza Hotel Oceanfront in Cocoa Beach, Fla. **Contact:** Dan McCollum, 27 Pembroke Dr., Turnersville, NJ 08012. Phone: (609) 582-4110.

**19th Bomb Group Ass'n.** October 20-24, 1997,

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## Unit Reunions

at the Holiday Inn Chattanooga Choo-Choo in Chattanooga, Tenn. **Contact:** Robert E. Ley, 3574 Wellston Ct., Simi Valley, CA 93063. Phone: (818) 703-7717.

**20th Airlift Squadron Alumni Ass'n**, including the 20th ACFS/ATS/MAS. October 2-5, 1997, in Hampton, Va. **Contact:** Charles Hropvich, 7453 S. Dupont Hwy., Felton, DE 19943-5722. Phone: (302) 697-1907.

**20th Fighter Group Ass'n** (World War II). October 19-21, 1997, at the Marriott Riverfront in Savannah, Ga. **Contact:** Leo H. Kerns, 9908 Hammocks Blvd., Miami, FL 33196. Phone: (305) 388-9909.

**23d Bomb Squadron** or 23d Strategic Reconnaissance Squadron. August 13-16, 1997, at Minot AFB, N. D. **Contact:** Lindsey Boyd, 3904 24th Ave. W., Bradenton, FL 34205. Phone: (800) 842-0550, ext. 23.

**30th Communications Squadron** (1946-76). October 2-4, 1997, in Bellevue, Neb. **Contact:** John W. Lahiff, 3304 Covered Wagon Ct., Sacramento, CA 95827-3215. Phone: (916) 366-7451.

**31st Air Transport Group** and 313th Air Transport and 806th and 811th Air Evacuation Squadrons. October 2-5, 1997, at the Ramada Henry VIII Hotel in St. Louis, Mo. **Contacts:** Daryl L. McCormick, 925 Angel St., #119, Elk River, MN 55330. Phone: (612) 441-2451 or (352) 376-8675 (John Oberg).

**39th Fighter Squadron Ass'n**, including the 40th and 41st Fighter Squadrons, 35th Fighter Group, 5th Air Force. October 22-26, 1997, at the

Green Oaks Inn and Conference Center in Fort Worth, Tex. **Contact:** Bob Latimer, 6139 Berwyn Lane, Dallas, TX 75214. Phone: (214) 691-7806.

**Aviation Cadet Class 43-A-1** (Mather Field, Calif.). September 3-7, 1997, at Cavanaugh's at Kalispell Center in Kalispell, Mont. **Contact:** Courtney Taylor, 169 Daly Ave., Hamilton, MT 59840. Phone: (406) 363-2154.

**49th Fighter or Fighter-Interceptor Squadron**, 14th Fighter Group. October 24-26, 1997, in Oklahoma City, Okla. **Contact:** Sheril D. Huff, 3200 Chetwood Dr., Del City, OK 73115-1933. Phone: (405) 677-2683.

**P-51 Mustang Pilots Ass'n**. October 23-27, 1997, in San Diego, Calif. **Contact:** R. W. Fox, 89 Liberty St., Middleton, MA 01949. Phone: (508) 774-9801.

**B-58 Hustler**. October 24-31, 1997. **Contact:** Patsy McCullah, 24031 El Toro Rd., Laguna Hills, CA 92653. Phone: (800) 992-1333 or (714) 472-2740.

**Pilot Class 68-A** (Webb AFB, Tex.). September 26-27, 1997, at the Ramada Emily Morgan Hotel in San Antonio, Tex. **Contact:** Larry Bowers, 120 Old South High St., Harrisonburg, VA 22801. Phone: (540) 434-4032 or (540) 828-4858 (evenings).

**76th Troop Carrier Squadron** (World War II). September 25-29, 1997, at the Best Western Hanalei Hotel in San Diego, Calif. Other squadrons of the 435th Troop Carrier Group are welcome. **Contact:** Al A. Forbes, 1614-B Berwick Ct., Palm Harbor, FL 34684. Phone: (813) 785-6075.

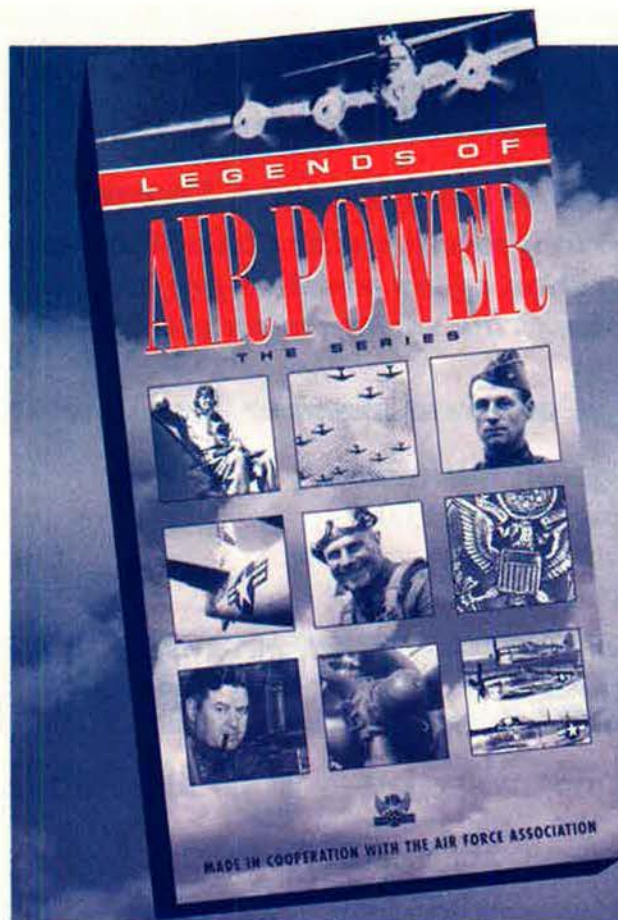
**78th Fighter Squadron**. October 17-19, 1997, at the Aladdin Hotel & Casino in Las Vegas, Nev. **Contact:** G. T. Alexander, Jr., 11141 Wychwood Dr., Mechanicsville, VA 23116. Phone: (804) 550-3415.

**79th Fighter Group**, including the 85th, 86th, and 87th Fighter Squadrons. September 3-7, 1997, at the Radisson Hotel San Diego in San Diego, Calif. **Contact:** Edwin Newbould, 1206 S. E. 27th Terrace, Cape Coral, FL 33904. Phone: (941) 574-7098.

**82d Fighter Group**, including the 95th, 96th, and 97th Fighter Squadrons. October 15-19, 1997, in Scottsdale, Ariz. **Contacts:** Del Ryland, 13829 E. Kalil Dr., Scottsdale, AZ 85259. Phone: (602) 661-8844 or (602) 840-1361 (Lute Thompson).

**94th Bomb Group**, 8th Air Force. October 7-12, 1997, at the Hilton Hotel in Cherry Hill, N. J. **Contact:** Wade C. Wilson, 1941 Harris Ave., San Jose, CA 95124-1017. Phone: (408) 377-4787.

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**302d Tactical Reconnaissance Squadron.** October 2, 1997, in Fort Walton Beach, Fla. **Contact:** Roger S. Wilkes, 1341 N. 3175 E., Layton, UT 84040. Phone: (801) 546-2258.

**303d Aerospace Rescue and Recovery Squadron** (1953-85), Long Beach MAP and March AFB, Calif. October 3-5, 1997, at Arizona Charlie's in Las Vegas, Nev. **Contact:** Herb Spencer, P. O. Box 8339, Green Valley Lake, CA 92341-8339. Phone: (909) 867-3061.

**303d Bomb Group,** RAF Molesworth, UK (World War II). September 4-8, 1997, at The Westin William Penn in Pittsburgh, Pa. **Contact:** Eddie Deerfield, 3552 Landmark Trail, Palm Harbor, FL 34684-5016. Phone: (813) 787-0332.

**312th Bomb Group.** October 9-12, 1997, at the Henlopen Hotel in Rehoboth Beach, Del. **Contact:** Paul M. Stickel, 1136 Gray Ave., Greenville, OH 45331. Phone: (513) 548-5767.

**314th Fighter Squadron** (World War II). October 8-11, 1997, in Jefferson City, Mo. **Contact:** Mark E. Mellinger, 45 Kenwood Dr., Massapequa, NY 11758.

**320th Bomb Group** (World War II). September 4-6, 1997, in Tempe, Ariz. **Contact:** Stu Rowan, 108 Aspen St., Hereford, TX 79045.

**330th Bomb Group Ass'n.** October 16-19, 1997, at the Holiday Inn in Fort Walton Beach, Fla. **Contact:** Robert C. Flischel, 413 E. Center St., Germantown, OH 45327. Phone: (513) 855-7946.

**358th Fighter Group** and attached units. October 2-4, 1997, in Montgomery, Ala. **Contact:** Lubbertus H. Lok, Jr., 19070 Maple Rd., Effort, PA 18330. Phone: (717) 629-3488.

**405th Fighter Group Ass'n.** November 8-12, 1997, at the Wyndham Palm Springs in Palm Springs, Calif. **Contact:** Arlie J. Blood, 23316 Gray Fox Dr., Canyon Lake, CA 92587-7533. Phone: (909) 244-5994 or (619) 341-3210 (Dick Parker).

**436th Fighter Squadron,** 479th Fighter Group, 8th Air Force (World War II). October 16-21, 1997, at the Holiday Inn Midtown in Savannah, Ga. **Contact:** Ralph Helms, 1103 Pinecroft Dr., West Columbia, SC 29170. Phone: (803) 796-6471.

**440th Fighter-Interceptor Squadron.** October 23-26, 1997, in Tampa, Fla. **Contact:** 440th Fighter-Interceptor Squadron, 11375 Pinellas Bayway, Suite 38, Tierra Verde, FL 33715. Phone: (813) 867-6475.

**454th Bomb Group Ass'n,** Italy (World War II). October 14-19, 1997, in Branson, Mo. **Contact:** Ralph Branstetter, P. O. Box 678, Wheat Ridge, CO 80034-0678. Phone: (303) 422-6740.

**459th Fighter Squadron.** October 9-12, 1997, in Dallas, Tex. **Contact:** Wayne Sneddon, P. O. Box 117, Pilot Hill, CA 95664-0117.

**463d Bomb Group** and support squadrons. September 3-6, 1997, in Bloomington, Minn. **Contact:** Arthur W. Teel, 9581 Morris Cir., Bloomington, MN 55437-2124. Phone: (612) 831-2840.

**483d Bomb Group Ass'n and 566th Air Engineers** (World War II). September 3-7, 1997, in Atlanta, Ga. **Contact:** J. Adair McCord, 3102 Stewart Ave., Hapeville, GA 30354. Phone: (404) 767-1546 or fax: (404) 767-1588.

**487th Bomb Group,** 8th Air Force (World War II). October 21-25, in Savannah, Ga. **Contact:** Henry Hughy, 1529 Delia Dr., Decatur, GA 30033. Phone: (404) 939-2462.

**582d Air Resupply Group,** RAF Molesworth, UK. October 2-5, 1997. **Contact:** Orle Straley, 90 Columbus Ave., Holyoke, MA 01040-1811. Phone: (413) 532-0847.

**585th Bomb Squadron.** October 20-22, at the Clarion Suites Resort in Pensacola Beach, Fla. **Contact:** Tom O'Brien, 1907 Rio Vista Dr., Ft. Pierce, FL 34949. Phone: (561) 465-7974.

**684th/3565th Air Force Band** (1950-57), stationed at James Connally AFB, Tex. September 25-27, 1997, in San Antonio, Tex. **Contact:** Hank Weber, 4370 Craigdarragh Ave., Spring Hill, FL 34606-6924. Phone: (352) 496-8483.

**3080th Aviation Depot Group,** military and civilian personnel. October 14-17, 1997, at the Hope Hotel and Conference Center at Wright-Patterson AFB, Ohio. **Contact:** Robert J. Wicke, 5223 Jomar Dr., Concord, CA 94521-2341. Phone: (510) 676-2528.

**6911th Radio Group Mobile/6916th Security Squadron,** US Air Force Security Service, and 7406th Support Squadron. Reunion on August 31, 1997. Memorial dedication for flight crew of C-130 #60528 on September 2, 1997, at Ft. Meade, Md. **Contacts:** Larry Tart, 562 Brittany Dr., State College, PA 16803 (reunion). Phone: (814) 238-7067. SMSgt. Frederick Ferrer, USAF, 694th Intelligence Group, Air Intelligence Agency, Ft. Meade, MD 20755 (memorial dedication). Phone: (410) 859-6021 (work) or (410) 859-1791 (home).

Seeking contact with members of **Pilot Class 48-B** for fiftieth-anniversary planning. **Contact:** Burt Rowen, 125 Thomas Edison Dr., Schertz, TX 78154. Phone: (210) 658-9802.

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# Bulletin Board

Seeking contact with **Neil Jorgenson, Al Kus, and Martin Raber**, crew of 91st Bomb Group's B-17 *Outhouse Mouse*. **Contact:** George H. Odenwaller, 5 Forest Dr., Hillsdale, NJ 07642-1351.

Seeking contact with members of the **397th Bomb Wing**, Dow AFB, Me. Also seeking pre-1970 base guides of Hanscom AFB, Mass., then Laurence G. Hanscom Field. **Contact:** Andrew S. Briscoe, 3659 W. Ridge Dr., Post Falls, ID 83854.

Seeking **ejection seat survival kits** to fit Weber B-52D upward and downward firing seats and personnel familiar with them. **Contact:** Christopher T. Carey, Aeolus Aerospace, 5960 S. Land Park Dr. #341, Sacramento, CA 95822.

Seeking contact with **2d Air Postal Squadron** members stationed at Rhein-Main AB, West Germany, 1952-55. **Contact:** James F. Davis, 600 Sumac Lane, Wilburn, AR 72179-9761.

Seeking contact with **Maj. Donald T. Rosenfeld**, from Iowa, who was stationed near Ashford, UK, in 1944. He was living in Los Angeles, Calif., in 1946. **Contact:** Janet Lang Bridger, Casa Catuna, Falacho, Silves 8300, Portugal.

Seeking information on or contact with **Arnold Knight** from Maryland and **Robert and Joan Parker** from South Carolina, who were stationed in Winterberg, West Germany, 1956-57. **Contact:** Jill Allain, 202 23d Ave. W., Bradenton, FL 34205.

Seeking contact with **Sgt. Charles Baggerley**, aircraft mechanic stationed in Lima, Peru, 1948-50. **Contact:** Isacco "Isy" Franco, 2689 Sabal Springs Cir., #K-204, Clearwater, FL 34621-3162.

Seeking information on **Capt. James J. Barrett**, stationed in Texas 1942-44. **Contact:** MSgt. Thomas Barrett Ulam, USAF (Ret.), 716 10th Ave. S., Surfside Beach, SC 29575-3217.

Seeking contact with anyone involved in **Project Stay Behind** in the early 1950s. **Contact:** Col. C. V. Glines, USAF (Ret.), 1531 San Rafael Dr., Dallas, TX 75128-4444.

Seeking contact with **Amn. Jack Wilke**, stationed at Castle AFB, Calif., 1958-62. He later worked for Boeing Aircraft at Castle. **Contact:** Joseph J. Kropel, 11101 S. Ave. L, Chicago, IL 60617-6916.

Seeking contact with members of **311th Troop Carrier Squadron** who were on Okinawa, August-September 1945. **Contact:** John H. Crouch, 609 Parkwood Dr., Long Beach, MS 39560.

Seeking contact with and memorabilia from USAF personnel who were stationed at **Sampson AFB**, N. Y., 1950-56. **Contact:** Sampson AFB Veterans Association, P. O. Box 299, Interlaken, NY 14847-0299.

Seeking contact with **SSgt. Elliot Zimmerly**, an instructor gunner from the 20th Bomb Squadron. **Contact:** Trevor L. Williams, 27 Park Rd., Coventry CV1 2LE, UK.

Seeking members of the first B-29 bomb squadron to land on Saipan on September 19, 1944. Possible names are **Gaston, Foraiar, Wall, Bellatete**. **Contact:** Charles G. Meadows, 1603 Tommy Armour Ct., Belen, NM 87002.

Seeking the whereabouts of **Sgt. Peter Dohanos**, who worked on a classified project with the 4th Fighter-Interceptor Wing, in 1953. **Contact:** John

Henderson, 1015 Horizon Dr., Ventura, CA 93003-1416.

Seeking information on **Lt. Laverne Parker**, reported missing in action while flying a T-6 reconnaissance aircraft over Korea during the Korean War. **Contact:** Carl V. Parker, 6212 Baker N. E., Albuquerque, NM 87109-2742.

Seeking contact with or information on **Lt. William Y. Spears and Sgt. Cosmo C. Lombardo**, 643d Bomb Squadron, 409th Bomb Group, 9th Air Force, 1944-45. **Contact:** Richard Kelly, 207 Summit Ave., Phillipsburg, NJ 08865.

Seeking contact with anyone who served at **Manaus, Brazil**, with photomapping units during World War II. **Contact:** John J. Callahan, 4203 Eaglehurst Rd., Sylvania, OH 43560-3410.

For a museum exhibit, seeking a **Norden bomb-sight**. **Contact:** John C. Rucigay, 14 Ashley Dr., Ballston Lake, NY 12019-1534.

Seeking information on an **aircraft (probably a B-17) that crashed** in the western part of Ireland in 1943. Its passengers included Brigadier General Barnes, Maj. Gen. Edward Brooks, and Lt. Gen. Jacob L. Devers. Crew included Sgt. L. E. Dennis, Maj. E. L. Harmel, and Capt. T. M. Hurlings. **Contact:** James B. O'Hagan, 11520 Nassau Dr. N. E., Albuquerque, NM 87111-2744.

Seeking contact with **Lt. Charles Merritt**, who was in a 9th Air Force squadron based in Wantage, UK, during World War II. He was originally from Kansas, spent V-E Day in London, and was stationed at Ruislip, UK, in 1959. **Contact:** Daphne V. Bradley, 108 Sherringham Ave., Tattenham, London N17 9RP, UK.

Seeking information on **Maj. Donald McLeod and Lt. Robert McIntosh**, 84th Fighter Squadron, 78th Fighter Group, who were shot down over Normandy, France, on June 10, 1944. **Contact:** Lt. Col. Tom Hunt, USAF (Ret.), 75 Townhouse Lane, Corpus Christi, TX 78412.

Seeking to contact USAF personnel of the **32d Tactical Fighter/Fighter-Interceptor Squadron** who were stationed at Soesterberg AB, the Netherlands, and are interested in joining the 32d TFS Association. **Contact:** Jan-Peter "Coke" van Viegen, Burgwal 9, 3931 HL Woudenberg, the Netherlands.

Seeking contact with or information on pilots and weapon system officers with the 34th Tactical Fighter Squadron during the Vietnam War, including **Kenneth T. Blank, Cecil H. Brunson, Charles D. Barton, Gordon L. Clouser, Richard E. Coe, and David B. Waldrop**. **Contact:** Capt. David Thole, 34th Fighter Squadron, 2057 N. 1800 E., Layton, UT 84040.

Seeking patch and unit history yearbook of the **56th Fighter-Interceptor Squadron**, Wright-Patterson AFB, Ohio. **Contact:** Tom Grabowski, 3276 Fenceline Rd., Franksville, WI 53126.

Seeking a copy of **The Long Haul: The Story of the 497th Bomb Group**, edited by Pat E. Goforth, published in 1946. **Contact:** Thomas M. Bromley, 273 E. Wheat Rd., Vineland, NJ 08360.

Seeking to trade 43 military aviation patches for **1960s-70s G. I. Joe** action figure, preferably clothed and in good condition. **Contact:** Johnny Signor, 714 Atlantis Rd. S. E., Palm Bay, FL 32909-4811.

Seeking contact with or information on "**Casey**,"

an 8th Air Force lieutenant from Boston, Mass., and B-17 pilot in the UK from early 1944, who knew Kathryn McBride Bawden and Margaret McBride in Salt Lake City, Utah. **Contact:** Christie Bawden Foster, 2440 W. Peralta Cir., Mesa, AZ 85202.

Seeking photos of and contact with personnel from the radar-gunsight section of the Armament Shop, **527th Fighter-Bomber Squadron**, 86th Fighter-Bomber Group, June 1951 to June 1954. Also seeking pictures of Neubiberg and Landstuhl ABs, Germany. **Contact:** Gilbert McNaughton, 1025 Becklee Rd., Glendora, CA 91741.

Seeking a copy of **Texas Airfields: A History of Army Air Corps Bases in Texas During World War II** and other books about Texas bases during that period. **Contact:** Joe Detrick, 5829 Westcreek Dr., Fort Worth, TX 76133.

Air Force historian seeks contact with members of the **4402d Women's Airforce Service Pilots Squadron**, assigned to the Headquarters Squadron, 514th Air Base Group, at Mitchel AFB, N. Y., 1951-52. **Contact:** TSgt. David G. Stroebel, 514th Air Mobility Wing, 2217 W. Arnold Ave., McGuire AFB, NJ 08641-5218.

Seeking contact with P-38 fighter pilot **Col. Robert Pierson Montgomery** from Bethlehem, Pa., who was with the 20th Fighter Group and was shot down over France. **Contact:** Andrew W. Salter, Jr., 3943 E. Monterosa St., Phoenix, AZ 85018-4820.

Seeking former personnel of **Gunfighter Village Enlisted Compound**, from March 1971 to March 1972. **Contact:** Albert Akers, 4223 Pacific Ave., Box 405, Stockton, CA 95207.

Seeking information on or contact with **Kathleen Marie Miller**, whose father was a sergeant at Eielson AFB, Alaska, 1981-82. **Contact:** Ric Brown, 5 Nutmeg Knoll Ct., Apt. F, Cockeysville, MD 21030.

Seeking contact with former flight and maintenance crew members of **KB-50s**; histories and patches for tactical control squadrons, groups, and wings from the Korean War; and insignia and memorabilia from the **420th, 421st, 427th, 429th, 431st, and 622d Air Refueling Squadrons, and the 4505th Consolidated Aircraft Maintenance Wing**. **Contact:** Chuck Monka, 8701 Kolb Rd., #5-264, Tucson, AZ 85706-9607.

Seeking contact with or information on retired officer **Wayne P. Green**, who was in Moses Lake, Wash., 1970-73. **Contact:** Lt. Michael J. Delaney, USAF, 109 Spur Dr., Cottonwood, AZ 86326.

Seeking copies of **Air Force Magazine** from between February 1971 and January 1986. **Contact:** Ralph E. Dula, 335 15th St., New Cumberland, PA 17070-1312.

Seeking a copy of the audio tape "**Roger Wilco Four**," including the song "Wild Blue Yonder," and Vietnam War-era songs. **Contact:** Lt. Col. Michael R. Foor, USAF, PSC 47, Box 1677, APO AE 09470-5000.

Seeking **Ronald and Ranette Craft**, stationed at Wilford Hall USAF Medical Center, Lackland AFB, Tex., between 1977 and 1979. **Contact:** SSgt. David B. Bardell, USAF (Ret.), 2501 Merrimac Ct., College Station, TX 77845.

Seeking authors and researchers interested in the **Army Air Forces and RAF Burtonwood 1st Air Depot**, UK, 1943-46. **Contact:** John P. Daly, 10 Annbar Dr., Old Town, ME 04468-2150. ■



# Books

Compiled by Wendy Alexis Peddrick, Editorial Associate

**Baldwin, R. E., and Thomas W. McGarry.** *Last Hope: The Blood Chit Story.* Schiffer Publishing Ltd., 77 Lower Valley Rd., Atglen, PA 19310, 1997. Including photos, appendices, glossary, notes, bibliography, and index, 219 pages. \$49.95.

**Bolger, Daniel P.** *The Battle for Hunger Hill: The 1st Battalion, 327th Infantry Regiment, at the Joint Readiness Training Center.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340, 1997. Including photos, appendices, and index, 363 pages. \$24.95.

**Boyne, Col. Walter J., USAF (Ret.).** *Beyond the Wild Blue: A History of the US Air Force, 1947-97.* St. Martin's Press, 175 Fifth Ave., New York, NY 10010, 1997. Including photos, appendices, bibliography, chronology, and index, 442 pages. \$29.95.

**Braverman, Jordan.** *To Hasten the Homecoming: How Americans Fought World War II Through the Media.* Madison Books, 4720 Boston Way, Lanham, MD 20706, 1996. Including illustrations, bibliography, and index, 286 pages. \$24.95.

**Breuer, William B.** *Unexplained Mysteries of World War II.* John Wiley and Sons, Inc., 605 Third Ave., New York, NY 10158-0012, 1997. Including photos, notes, bibliography, and index, 238 pages. \$24.95.

**Cragg, Dan.** *Guide to Military Installations,* 5th ed. Stackpole Books, 5067 Ritter Rd., Mechanicsburg, PA 17055, 1997. Including photos, maps, appendices, and index, 392 pages. \$19.95.

**Dierikx, Marc.** *Fokker: A Transatlantic Biography.* Smithsonian Institution Press, 470 L'Enfant Plaza, Suite 7100, Washington, DC 20560, 1997. Including photos, notes, bibliography, and index, 250 pages. \$35.00.

**Donahue, James C.** *Mobile Guerrilla Force: With the Special Forces in War Zone D.* St. Martin's Press, 175 Fifth Ave., New York, NY 10010, 1996. Including photos, appendix, and index, 285 pages. \$5.99.

**Edwards, John C.** *Airmen Without Portfolio: US Mercenaries in*

*Civil War Spain.* Greenwood Publishing Group, Inc., 88 Post Rd. W., Box 5007, Westport, CT 06881, 1997. Including photos, appendices, bibliography, and index, 150 pages. \$49.95.

**Falconer, Jonathan.** *RAF Bomber Command in Fact, Film, and Fiction.* Books International, Inc., P. O. Box 605, Herndon, VA 20172-0605, 1996. Including photos, bibliography, and index, 153 pages. \$35.95.

**Flanagan, Lt. Gen. E. M., Jr., USA (Ret.).** *The Rakkasans: The Combat History of the 187th Airborne Infantry.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340, 1997. Including photos, bibliography, and index, 392 pages. \$27.95.

**Forman, Wallace R.** *B-17 Nose Art Name Directory: Includes Group, Squadron, and Aircraft Serial Numbers and Photo Availability.* Specialty Press Publishers and Wholesalers, 11481 Kost Dam Rd., North Branch, MN 55056, 1996. Including photos, 94 pages. \$14.95.

**Fugate, Bryan I., and Lev Dvoretzky.** *Thunder on the Dnepr: Zhukov-Stalin and the Defeat of Hitler's Blitzkrieg.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340, 1997. Including maps, photos, appendices, notes, and index, 415 pages. \$27.95.

**Gaskill, William M.** *Fighter Pilot: World War II in the South Pacific.* Sunflower University Press, 1531 Yuma, P. O. Box 1009, Manhattan, KS 66505-1009, 1997. Including photos and index, 186 pages. \$22.95.

**Hayward, Roger.** *The Fleet Air Arm in Camera: Archive Photographs From the Public Record Office and the Fleet Air Arm Museum, 1912-96.* Books International, Inc., P. O. Box 605, Herndon, VA 20172-0605, 1996. Including photos and index, 180 pages. \$33.95.

**Hynes, Samuel.** *The Soldiers' Tale: Bearing Witness to Modern War.* Penguin Group, Penguin Books USA, 375 Hudson St., New York, NY, 10014, 1997. Including notes, bibliography, and index, 318 pages. \$24.95.

**Jensen, Marvin.** *Strike Swiftly! The 70th Tank Battalion From North Africa to Normandy to Germany.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340, 1997. Including photos, maps, notes, bibliography, and index, 350 pages. \$24.95.

**Keefer, Louis E.** *From Maine to Mexico: With America's Private Pilots in the Fight Against Nazi U-Boats.* Order from: COTU Publishing, P. O. Box 2160, Reston, VA 20195-0160, 1997. Including photos, bibliography, and index, 535 pages. \$32.95.

**Keen, Patricia Fussell.** *Eyes of the Eighth: A Story of the 7th Photographic Reconnaissance Group, 1942-45.* Order from: CAVU Publishers, LLC, 16810 Boswell Blvd., Sun City, AZ 85351-1270, 1996. Including photos, appendices, and index, 378 pages. \$49.00.

**Logan, Don.** *Republic's A-10 Thunderbolt II: A Pictorial History.* Schiffer Publishing Ltd., 77 Lower Valley Rd., Atglen, PA 19310, 1997. Including photos and diagrams, 239 pages. \$49.95.

**Logsdon, John M., ed.,** with Dwayne A. Day and Roger D. Launius. *Exploring the Unknown: Selected Documents in the History of the US Civil Space Program, Volume II: External Relationships.* Government Printing Office, Superintendent of Documents, P. O. Box 371954, Pittsburgh, PA 15250-7954, 1996. Including glossary, appendices, and index, 636 pages. \$40.00.

**Mersky, Peter B.** *Israeli Fighter Aces: The Definitive History.* Specialty Press Publishers and Wholesalers, 11481 Kost Dam Rd., North Branch, MN 55056, 1997. Including photos, appendices, maps, and index, 128 pages. \$24.95.

**O'Grady, Capt. Scott,** with Michael French. *Basher Five-Two: The True Story of F-16 Fighter Pilot Capt. Scott O'Grady.* Bantam Doubleday Dell Publishing Group, Inc., 1540 Broadway, New York, NY 10036, 1997. Including photos, 133 pages. \$16.95.

**Prodger, Mick J.** *Luftwaffe vs. RAF: Flying Clothing of the Air*

*War, 1939-45.* Schiffer Publishing Ltd., 77 Lower Valley Rd., Atglen, PA 19310, 1997. Including photos, appendices, bibliography, and index, 158 pages. \$49.95.

**Russo, Carolyn.** *Women and Flight: Portraits of Contemporary Women Pilots.* Bulfinch Press, 1271 Avenue of the Americas, New York, NY 10020, 1997. Including photos, 192 pages. \$40.00.

**Ryle, E. Brown, and Malcolm Laing.** *Walk Around Fw-190D.* Squadron/Signal Publications, Inc., 1115 Crowley Dr., Carrollton, TX 75011-5010, 1997. Including photos, 80 pages. \$14.95.

**Seamans, Robert C., Jr.** *Aiming at Targets: The Autobiography of Robert C. Seamans, Jr.* Government Printing Office, Superintendent of Documents, P. O. Box 371954, Pittsburgh, PA 15250-7954, 1996. Including photos, appendices, map, and index, 291 pages. \$25.00.

**Severe, Errol D.** *The Last of a Breed: Aviation Cadet, 1918-61.* Order from: Lighthouse Productions, Inc., 542 CR 2073, Eureka Springs, AR 72632, 1997. Including photos and bibliography, 366 pages. \$39.95.

**Smith, Michael C.** *Essex Class Carriers in Action.* Squadron/Signal Publications, Inc., 1115 Crowley Dr., Carrollton, TX 75011-5010, 1997. Including photos and sources, 49 pages. \$7.95.

**Steidl, Franz.** *Lost Battalions: Going for Broke in the Vosges Autumn 1944.* Presidio Press, 505 B San Marin Dr., Suite 300, Novato, CA 94945-1340, 1997. Including maps, photos, appendix, notes, and index, 226 pages. \$21.95.

**Todorov, Tzvetan.** *Facing the Extreme: Moral Life in the Concentration Camps.* Henry Holt and Company, Inc., 115 West 18th St., New York, NY 10011, 1997. Including sources and index, 307 pages. \$14.95.

**Walker, Charles, and Robert Taylor.** *Robert Taylor Air Combat Paintings: Volume III.* Howell Press, 1147 River Rd., Suite 2, Charlottesville, VA 22901, 1996. Including illustrations, 128 pages. \$65.00. ■

# Pieces of History

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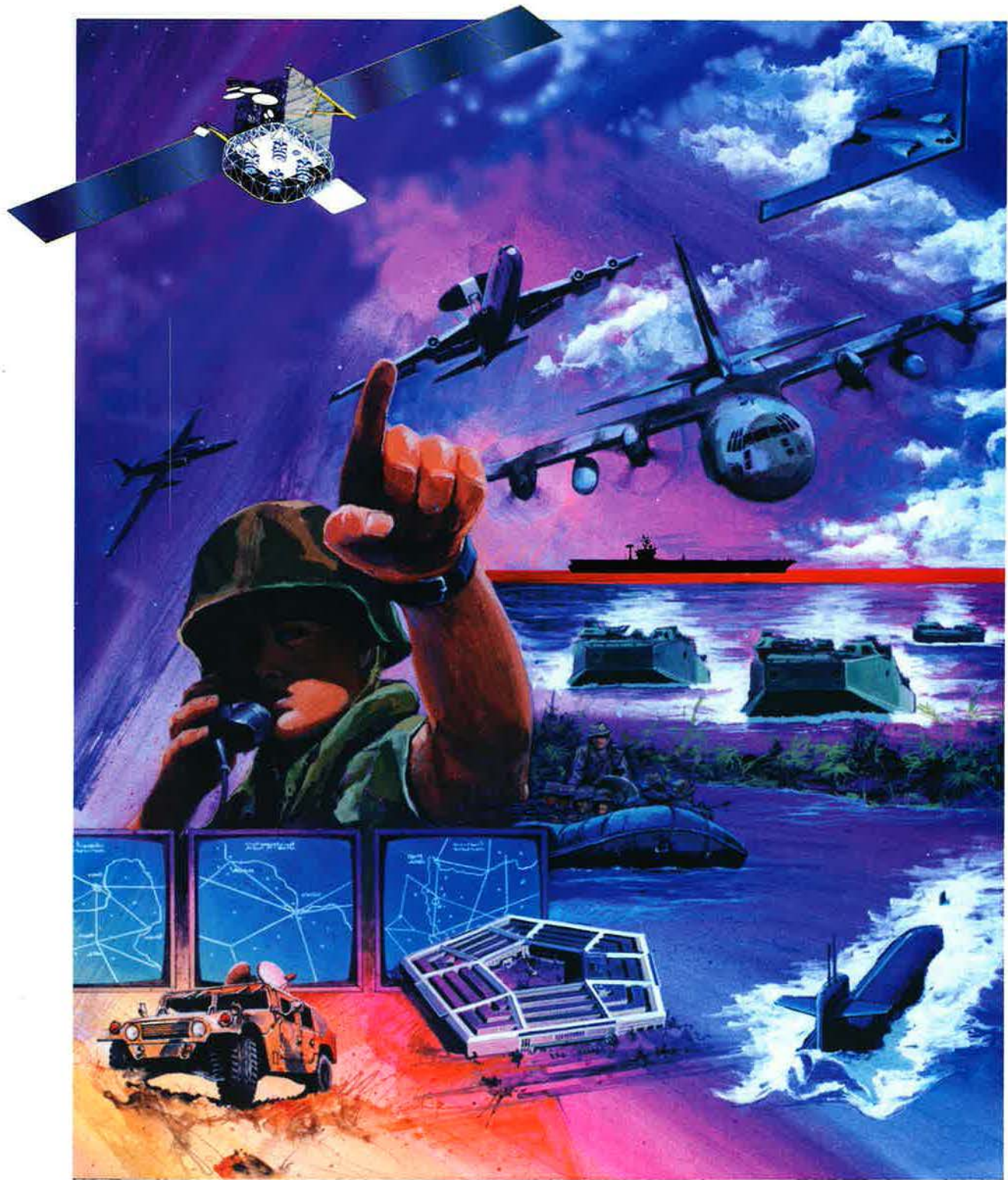
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