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MAGAZINE



Space Almanac 2007

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JOURNAL OF THE AIR FORCE ASSOCIATION MAGAZINE

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By Robert S. Dudley, Editor in Chief

War Budgets, Then and Now

TESTIFYING as US forces were about to enter Iraq in March 2003, Treasury Secretary John W. Snow airily claimed, "The cost of the war will be small." We recall Snow's words today as a textbook case of fiscal miscalculation.

Whatever else it might be, Operation Iraqi Freedom isn't cheap. The tab through 2007 equals \$450 billion, says the Congressional Research Service in a June 28 report. With costs now running \$10 billion a month, the amount will grow swiftly. Worse, the bill lands at a bad time—with the US needing to spend vast amounts to make war in Afghanistan, and bolster domestic defenses, not to mention replace thousands of decrepit aircraft, warships, and tanks.

For all that, though, Washington isn't stirred. Traditional responses to high-cost wars—social program cuts, bond drives, tax increases—are not even discussed. It's as if Snow was right. One could say that we are living in a post-9/11 world, but with a pre-9/11 fiscal policy.

Actually, somebody *has* said that—in those exact words. He is Robert D. Hormats, the managing director of Goldman Sachs and former national security and foreign affairs official under Nixon, Ford, Carter, and Reagan. His new book, *The Price of Liberty: Paying for America's Wars*, does a useful thing: It recounts the seriousness with which Washington once financed its wars. In so doing, he casts a cold eye on the present.

Hormats argues that, six years into the Global War on Terror, neither the White House nor Congress has pushed for fiscal changes to ensure sustainable funding of US might. Instead, Washington chose to put the war on its credit card (deficit spending).

It was not always so. When Hormats surveyed earlier US wars, he found that most presidents tried to cover a large part of wartime costs by means other than borrowing. In the Civil War, Abraham Lincoln urged "every person of small means" to buy war bonds and pushed through the nation's first personal income tax. World War I president Woodrow Wilson also imposed sacrifices.

In its peak years, World War II consumed nearly 40 percent of America's gross domestic product. To help pay for it, President Franklin D. Roosevelt took

draconian steps that slashed New Deal programs and raised the number of taxpayers from four million to 42 million.

President Harry S. Truman, during the Korean War, raised the top marginal tax rates to 91 percent for individuals and 70 percent for corporations. The Vietnam War forced similar steps on Lyndon B. Johnson. In 1968, he and Congress cut Great Society programs and enacted a tax increase.

Americans still borrowed heavily, but they paid off debt as fast as possible. It was, says Hormats, "a compulsion."

Today's political leaders have been reluctant to confront the public with the need for any sacrifice.

Hormats criticizes President Bush's June 2001 tax cut, which took a huge bite out of a projected \$3.1 trillion surplus. He notes that, rather than rethinking the cut in light of post-9/11 needs, the Administration doubled down. In January

Today's political leaders have been reluctant to confront the public with the need for any sacrifice.

2003, Bush proposed, and Congress agreed, to speed up implementation of the 2001 tax cuts.

Nor, writes Hormats, did Washington lift a finger to rein in spending. Indeed, the opposite happened. Federal outlays expanded dramatically as a result of richer education and transportation programs, higher jobless benefits, bigger farm subsidies, and a Medicare prescription drug benefit.

The result was predictable. In 2000, the US ran a surplus equal to 2.4 percent of GDP; by 2004, it was in deficit to the tune of 3.6 percent of GDP. This was the biggest swing in 50 years.

"Congress had never before increased nonsecurity spending and cut taxes while also appropriating large sums to fight a war," writes Hormats. He added, "By supporting and signing expensive spending and tax legislation, [Bush] broke with a tradition that had extended from Madison through Lincoln, Wilson, Franklin Roosevelt, Truman, and eventually, Johnson and Reagan [at the height of the Cold War]."

The war against terrorists resembles the Cold War, in that it will be long, expensive, and punctuated by crises. The financial basis must be strong.

As Hormats sees it, the path to sustainable financing entails a number of steps—none new, all painful. These include harsh curbs on popular programs, taxes that raise more revenue, and "matching payouts under entitlement programs more closely to the money flowing in."

The latter point refers to Social Security and Medicare, whose costs will mushroom when 79 million baby boomers retire and draw benefits. Social Security alone is projected to run a shortfall of \$250 billion a year by 2030.

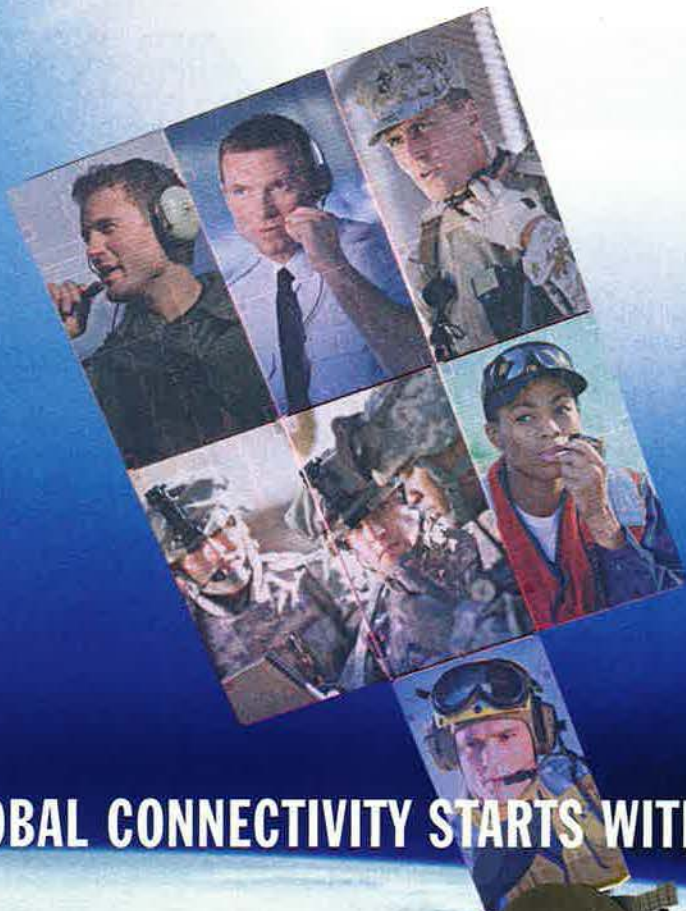
As Hormats makes plain, the Air Force and the other services have a huge stake. Unchecked, he said, entitlements are sure to "crowd out" defense spending. Unchecked, the piling up of national debt—\$9 trillion today—could limit US power to borrow for truly urgent security needs. This could be especially dangerous in event of another terrorist attack. We should not forget that, when al Qaeda struck on 9/11, the US budget was in surplus. That provided a cushion to help get over the economic shock.

The Bush Administration maintains that, unlike periods in the past, the government can use cheap capital to finance the deficit. Moreover, they point out that the tax cuts have created new wealth (and with it, tax revenue), and that, by such expedients, the US will in time "grow" out of its deficits.

Here, there is room for honest disagreement. Hormats, for his part, argues that this is irresponsible. We are not prepared to go that far.

We note, however, that all prior wartime presidents found it wise to cut domestic spending and raise taxes to free up resources for defense, and then pay down war-related debt. Moreover, real cuts in entitlements probably aren't politically feasible except as part of a grand compromise accepting some form of tax increase, too.

The President has chosen a different path. We hope he is proved right. However, we should recognize his decision for what it is—a gamble—and start looking into fallback plans. ■



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Waste of Money?

With all due respect to our leaders in Washington, I think Operation Noble Eagle has run its course [*"The Years of Noble Eagle," June, p. 50*]. I can see them wanting to keep our cities safe, but, to me, it has been a waste of money that could have been better spent to inspect the cargo that comes into our ports.

I think that the next terrorist attack will be with a "dirty bomb" and in the same two cities that got hit on 9/11. I hope that I'm wrong, but it would be my worst nightmare if it does happen, as I've got three of my kids who work in Manhattan and in high target places.

Fred Cavaiuolo
Las Vegas

Project Paperclip

Your article proved once again that some of our shameful acceptances after WWII of Nazis (and, please, don't insult my intelligence by trying to claim that Wernher von Braun and his crew were not Nazis) were justified because of the communist insurgence in Eastern and Southern Europe [*"Project Paperclip," June, p. 70*]. As someone who served in USAF during the heyday of Curtis LeMay and Strategic Air Command (as the major deterrent during the Cold War and especially the 1950s), as a member of LeMay's personal intelligence team (PIT) at Offutt AFB [Neb.], I saw how many of these "former" Nazis were lauded beyond words.

Hermann Goering's Luftwaffe (G-2 section) had a number of [its] men captured, brought to this country, and later, during the Korean War years, used as "interrogators" by our Air Force training center located at Stead Air Force Base (Survival Training Center), Nev., where all aircrews were sent prior to embarking for Korea.

These men, in order to establish their "creds," all claimed that they were not Nazis. Be that as it may, I went through that center and was exposed to the same kind of attitude that I am sure many of our WWII people faced.

But what impressed me the most is that Gen. George Patton got into incredible hot water when he said that he was using "ex-Nazis" as part of the postwar rebuilding of Austria and Germany. Yet, these other Nazis were used gladly by us.

So, if you think that sugar-coating von Braun is OK, then I suggest that you think about the nearly 30 million human beings killed and slaughtered by his fellow Nazis.

Von Braun was brilliant, no one doubted that. But he was a Nazi through and through whom we saved because we felt he was needed. But think about this: We built a functional atomic bomb. We developed the delivery system. We were already working on jet engine capability. Do you honestly believe that we could not have entered the jet age without Von Braun?

Norman Ross
Tucson, Ariz.

A Toll Too High?

So now the Air Force lets it all hang out. Sadly, the news [of personnel cuts to pay for equipment recapitalization] has a very familiar theme [*"Aerospace World: Readiness Falling, Keys Reports," June, p. 14*; *"For the Air Force, the Bill Comes Due," April, p. 28*; and *"The Risk Goes Up," April, p. 34*]. We have been there before—the old "yes, sir, we can do more with less" lie. Sooner or later, no matter how many people you cut—even if you get to a point when just the aircrews and maintenance people are left and they are performing all other tasks as "additional duties"—you can't generate enough money from the people cuts to pay for the refurbishing of the older aircraft and the purchase of the new aircraft and other things that are needed.

More than a quarter-century ago, after many rounds of cuts, it was found we couldn't do it that way. Ultimately, for all the services, the toll of the higher

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operations tempo our forces are now in without sufficient equipment and people to back them up will prove costly. You can't expect those who are serving to be able to do everything the larger force did before the cuts—except that is the mentality that will prevail from the top down. Result: Even more personnel losses will occur as members of the force left after the cuts realize they are being abused and leave when their commitments are up—patriotism, service loyalty, and career desires only go so far.

What is really being hidden by our national leaders in the White House and Congress, and even the military, is a failure to adequately fund new equipment purchases, maintenance, and a force of people in uniform, both active and reserve, of sufficient size to meet the military tasks we have taken on; they think that wouldn't sit well with the voters.

Sadly, most of the American public doesn't realize or care that we are in a very real global war against militant Islam that goes back long before the current Bush or previous Clinton Administration policies and responses and, that instead of contracting, we need to expand and shape our military both in personnel and equipment to meet that threat.

But, I'm just an old retired guy who

hasn't worn the blue suit in a quarter-century, so I probably have it all wrong vis-a-vis the thinking of those in the Puzzle Palace on the Potomac, the Hill, and the White House.

Lt. Col. John G. Terino,
USAF (Ret.)
Fairfax, Va.

Forty-Eighth Is First

In your June 2007 edition of *Air Force Magazine* you have an article on p. 17 titled "Little Rock Gains Squadron" [*"Aerospace World"*]. There is one error in the article. It states, "The 41st is the first active duty squadron to fly the new C-130J Hercules."

The first active duty squadron to fly the C-130J actually is the 48th Airlift Squadron assigned to the 314th Airlift Wing (AETC), also based at Little Rock AFB. The 48th AS stood up on Dec. 5, 2003 and has seven C-130Js assigned. The mission of the 48th AS is C-130J training for DOD and some allied nations.

Col. Rudolph T. Byrne
Commander, 314th Operations
Group
Little Rock AFB, Ark.

Classics

I enjoy your "Airpower Classics" series and have a correction for your A-1 feature in June.

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Capt. Walter F. Draeger Jr. was left off your list of Air Force Cross recipients who flew the A-1. He was shot down in North Vietnam on April 4, 1965 while flying RESCAP for a downed VNAF flight leader and protecting a duck-butt. Walt was, I believe, the first Air Force Cross recipient of the Vietnam War.

Col. Ray Jones,
USAF (Ret.)
Lancaster, Calif.

More on "Old Shaky"

I read your article about "Old Shaky" and this brought back some memories [*"Letters," June, p. 9, and "Airpower Classics: C-124 Globemaster II," February, p. 96*]. I was with the 1st SSS (SAC), Biggs AFB. The aircraft was tail No. 5095. We went to Thule, Greenland, to pick up a KC-97 TDY group and bring them back to Missouri. Everything went well on the trip up to Thule, but the return was another [story]. Our flight plan called for us to [fly to] Ernest Harmon AFB, Newfoundland, then on to Missouri. We left with a p.m. crew time. The six months of darkness had set in and that was a strange sight. [It was] dark all day. We left and on the way there it was time for an engine check. I went downstairs, opened the hatch to No. 3 and 4 engines. I climbed out on the catwalk and opened the door to No.3 then on to No. 4. I went back out the hatch to check 1 and 2.

I opened the hatch and smoke belled out and filled the lower compartment. I radioed the pilot that we were on fire. No. 2 engine had a broken pushrod from an exhaust stack. Oil was causing smoke throughout the aircraft. I got on the catwalk over the main gear and through the hatch. The pilot made sure I was clear, then hit No. 2 with the CO2 bottles. No. 2 was feathered. We were over the Arctic Ocean. We then lost No. 4 and feathered it. We had a heavy load of engines and troops.

We finally made it to Newfoundland, secured the aircraft, and caught some sleep. First thing in the morning we went to the flight line to assess the damage. Low and behold the KC-97 crew proceeded to remove the cowl-ing themselves. I will never forget this, although I never received any recognition for my actions, but then this was my job.

I thank God every day I checked those engines and we did not end up in the Arctic Ocean. Thanks for the memories.

Mark Mulik
Goodyear, Ariz.

I read [retired] Col. Bob Straughan's account of a C-124 double loaded with PSP, in the June 2007 issue of *Air Force Magazine* [*"Letters: Old Shaky," p. 9*], with a nostalgic tear in my eye. I

recall a similar happening in a C-130A. Unfortunately (or fortunately for those responsible) such record-breaking accomplishments are not found in the official record books.

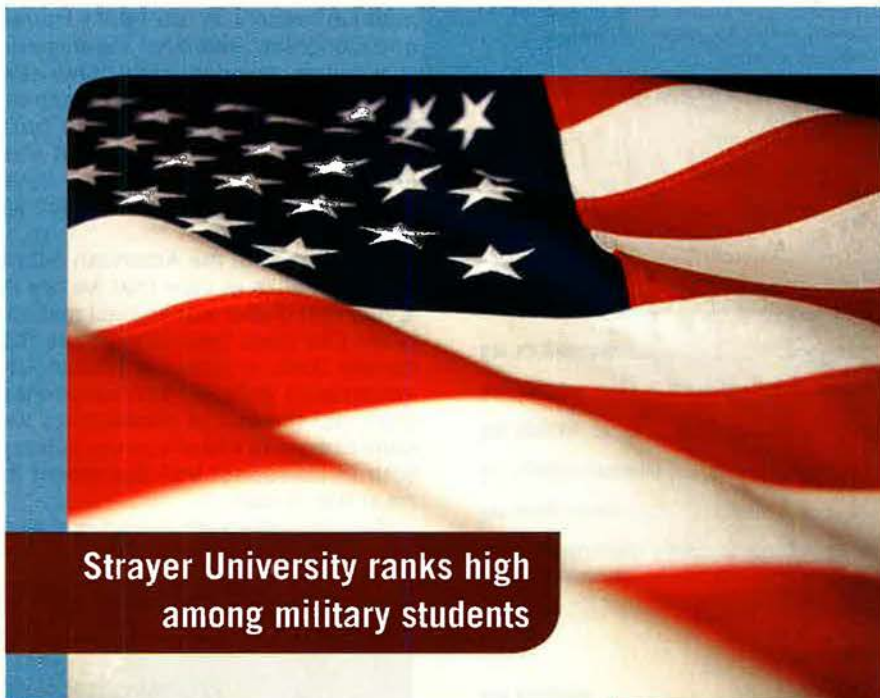
Circa 1970, a C-130A being flown by someone based somewhere in Southeast Asia, and flying from somewhere in Southeast Asia to somewhere else in Southeast Asia, was double loaded with "hard rice" during a loading crew shift change. The result was a new unofficial lifting record for the A model of 50,000 pounds, and a new unofficial

takeoff gross weight record of 150,000 pounds, as opposed to the normal max TOGW of 124,200 pounds.

As I recall, the crew somehow got the machine off the ground and flew it around the pattern at max power (bleeds off) to a new unofficial A model landing GW record.

Such "thank you, Mr. Lockheed" stories are still being written—and will be for some time to come.

Lt. Col. Dave Harmon,
USAF (Ret.)
Greendale, Wis.



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I served in the 85th ATS with Dick Rutan. I take strong exception to the letter referring to Dick Rutan "riding" in a C-124. Old Shaky had a lot of seats because it took the concerted efforts of all the crew members to safely and efficiently complete the mission. I crossed the pond in Old Shaky many times and it struck me that the "riders" were the pilots just waiting for the next position report from the navigator so they would have something to do.

Maj. Walt Drowns,
USAF (Ret.)
Universal City, Tex.

USAFE's NATO Command

In *Air Force Magazine's* May 2007 USAF Almanac, the organization charts on p. 103, showing USAFE's NATO command relationships and sub-units, should have presented the following information:

At the top is Supreme HQ Allied Powers Europe (SHAPE), Mons, Belgium. Next down is JFC Brunssum, in Brunssum, Netherlands; followed by the Commander, Allied Air Component (CC-Air) Gen. William T. Hobbins, USAF, Ramstein, Germany. Under General Hobbins are the following combined air operations centers: CAOC 1, Finderup, Denmark; CAOC 2, Uedem, Germany; below CAOC 2 is the Interim Deployable CAOC, Ramstein, Germany; CAOC 3, Reitan, Norway; CAOC 4, Messtetten, Germany; and CAOC 9, High Wycombe, UK.

A second wire chart to the right should have depicted the Supreme Allied Command Transformation, Norfolk, Va.; below SACT is the Director, Joint Air Power Competence Center, Gen. William T. Hobbins, USAF, Kalkar AB, Germany.

Gen. William T. Hobbins,
Commander
US Air Forces in Europe
Ramstein AB,
Germany

Airplane Commander vs. Pilot

I was very interested in your June article on Medal of Honor recipient Henry Erwin ["A Brave Man at the Right Time," p. 62], especially since my father was a radar observer in a B-29 from the 39th Bomb Group, "Double Trouble," which made the longest nonstop combat mission of the war (23:00 hours), as recorded in my father's diary he was not supposed to be keeping (he "hid" mission data in his New Testament).

Since I am a Marine reservist who visited Iwo Jima in 1995 for the battle's 50th commemoration, I was also interested to know that Staff Sergeant Erwin received care on Iwo.

I question, however, the article's

generic listing of B-29 crew members, stating that it had a pilot and copilot. According to William Wolf's superb, definitive book on B-29s (*Boeing B-29 Superfortress, The Ultimate Look: From Drawing Board to VJ-Day*), the officer we know as the pilot (left seat) was in fact called, in B-29s, the "airplane commander," while the officer we know as the co-pilot (right seat) was called the "pilot." This terminology is why one often sees "A/C" painted just before the airplane commander's name on the fuselage just under his window. In any event, I regret

this true hero, Staff Sergeant Erwin, is no longer with us.

Col. Charles A. Jones,
USMCR
Norfolk, Va.

■ Colonel Jones is right about the official designation of the aircrew positions. However, the terms "pilot" and "copilot" also continued in everyday use. The senior aviators on B-29s sometimes referred to themselves as airplane commanders, sometimes as pilots.—JOHN T. CORRELL

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Washington Watch

By John A. Tirpak, Executive Editor

Roads To “Acceptable Risk”; Cyber Groundwork; Spartan Victory

USAF Maps Its Course

The Air Force in midsummer put the finishing touches on a series of “roadmaps” meant to guide its long-range plans, whether they concern development of a new bomber, the revision of airman specialties as the force draws down, or any other significant service initiative.

The expectation was that the roadmaps would be unveiled soon, perhaps as early as this month. Taken together, they will underpin USAF budget plans for years.

That, at least, is the expectation of Gen. T. Michael Moseley, USAF Chief of Staff, who told reporters that he has “re-energized” the roadmap process because the Air Force has to face up to two facts. The first, he said, is that money is tight. Second, it takes far too long to field new systems.

The roadmaps are meant to answer the question “How do we—US Air Force and [DOD]—stay in that game and provide the combatant commanders with what they need?”



Moseley wants USAF to identify “acceptable risk.”

Moseley said. He hopes to speed up the process by which USAF gets new hardware into the field.

The Chief tasked Lt. Gen. Raymond E. Johns Jr., deputy chief of staff for strategic plans and programs, to round up all combatant commander requirements and define a “planning force.” It, along with a “program force” of everything the Air Force thinks it needs to meet its obligations, will bound USAF spending.

Between the two, USAF will identify an investment program with “acceptable risk,” Moseley said.

The roadmaps will include a detailed briefing on USAF’s plans for intelligence-surveillance-reconnaissance, airlift, space, and other mission areas by major command, specialty code, and system.

“We have to somehow lay this in and begin to put money against it,” he said. In turn, the roadmaps will establish what is needed in terms of “basing [and] ... manpower decisions” and define roles for active, Guard, and Reserve forces.

The roadmaps, when joined together, will function something like a spreadsheet; changing some data in one place will automatically cause changes in other places. This, in the view of the Chief of Staff, will allow the Air Force to be “quicker and more agile and more adaptive [in response to new threats and needs] than we have [been] in the past.”

In the specific mission area of space, Moseley said, USAF will take planning guidance directly from US Strategic Command, which has operational control of space systems.

The Chief said he has tasked Gen. Kevin P. Chilton, commander of Air Force Space Command, to find out what STRATCOM leadership thinks the service should be doing in various mission areas.

Cyber Command in the Shadows

The Air Force has put in place all of the building blocks needed for a new “cyber command,” and it should appear soon, said Lt. Gen. Robert J. Elder, Jr., the officer charged with bringing this new major command into being.

Elder is commander of 8th Air Force, headquartered at Barksdale AFB, La. He was given the job of laying the groundwork for the new command, and, on a June visit to Washington, D.C., he had a bit to say about progress thus far.

“My piece of this [Air Force Cyber Command] is in place now,” Elder told reporters. He said he created the organizational structure, shaped the means for defining resource needs, and built a recruiting scheme and a career path for those who work in cyber operations.

In fact, the apparatus is in place and performing the mission already, Elder said. With the filling of some staff slots and designation of a headquarters—expected by summer’s end—the new MAJCOM should be ready to go.

Elder said the official command stand-up will come “when the Secretary and the Chief decide the timing is right.”

The first priority will be to protect USAF’s systems from enemy information and network attack. This is needed to preserve the Air Force’s existing “asymmetric” advantages in global reach and strike capabilities, Elder said.

The command will have the ability to attack the networks



Elder (r) meets with Gen. James Cartwright of USSTRATCOM.

of other countries, but that will always be a lesser consideration, he added.

"If we have an adversary that can ... take away our domination of cyberspace, then ... for the Air Force it means taking away speed, range, and the flexibility that we offer to the joint force commander."

He continued, "What you lose ... is not only freedom of action in the cyber domain; you [also] lose freedom of action in every domain." The priority must be to "control the domain" of cyberspace just as the Air Force controls air and space. Without the communications ability to talk back and forth to satellites, aircraft, and command centers, "we can't do our mission."

Substantial work has been done to identify the schooling and capabilities the Air Force will want from its cyber-warriors, and it has established a clear career path that he believes will be attractive to those skilled in computers, networks, and electrical engineering.

Elder said Cyber Command seeks to make service members mindful of ways they can inadvertently compromise security. He called special attention to "social engineering" attacks, in which individuals bring in compromised "free" software discs that then provide ways for enemies to get past firewalls.

The new command will be set up, to the degree possible, like a weapon system. Operators will not be trained or expected to be able to perform the full range of cyber defense and attacks, but will instead function like "a production line" with interchangeable individuals. They will be "expert on doing their part," for which they will receive less than six months' training, and they will expand their repertoire as they mature and gain experience.

The career path for cyber operators is so well developed, said Elder, that recruiters will begin looking for brand-new cyber enlistees this fall. The Air Force will seek out people who have "a natural capability to do this, and then try to funnel them into areas that take advantage of it."

Elder said Air Force members must resist hoarding information, which has become hard-to-break habit. The creators of intelligence tend to regard it as "intellectual property" and don't want to share it.

"This information—even though you created it—really belongs to the nation," said Elder. "You really ought to share it." He said, "Everyone agrees with this," but, in practice, the story is different.

Elder noted that most nations are involved to some degree in scanning US military networks and looking for weaknesses, naming China as the top threat in this area.

China does little to cover its tracks, and it is almost as if "they want us to know ... what they're doing," he observed.

The Spartan Choice

The Joint Cargo Aircraft program took a big step in June when the Air Force and Army chose the C-27J Spartan to fill the requirement. However, the program has been a lightning rod for interservice quarrels and may be the catalyst for a fresh shakeout of

some roles and missions.

A team led by L-3 Communications received a \$1.5 billion contract to start work on the program, which funds 40 airplanes through 2011, an Air Force spokesperson said.

Plans call for production of at least 78 Spartans—24 for the Air Force and 54 for the Army. That may be just the start, though. Army Brig. Gen. Stephen D. Mundt, head of Army aviation, said at a press conference that he would be "surprised" if the ultimate buy was lower than 145 aircraft, split almost evenly between the two services.

The aircraft can carry a payload of about 25,000 pounds and can be configured for regular troops, paratroops, or small wheeled vehicles. It can also carry 36 stretchers.

The JCA would replace the Army's old C-23 Sherpa and C-12 Huron light cargo airplanes. For the Air Force, JCA would fill a new niche: supporting ground forces served only by the most rudimentary airstrips, or on missions where the larger C-130 is too big for the job.



Will the C-27 be a source of discord?

The Air Force joined the Army's program several years ago, when Gen. John P. Jumper, who was then the USAF Chief of Staff, argued for fielding a modern equivalent of the Vietnam-era C-7 Caribou, used to support special operations teams.

The Air Force's ultimate buy will depend on the results of an intratheater lift analysis, which is to be completed by the end of this year. Moreover, the House 2008 defense authorization bill mandated completion of several lift studies before it would allow JCA production spending.

Italy's Alenia designed the C-27J. Finmeccanica—the parent of Alenia—and Boeing are also on L-3's team. Boeing is to build the airplane in the US, with planned production rates going as high as 27 airplanes per year.

However, a week after the contract award, Raytheon, whose team offered the nonselected European Aeronautic Defense and Space Co. C-295, filed a protest with the Government Accountability Office. The Raytheon team, which also includes CASA North America, did not immediately explain the reason it protested. The GAO should issue a finding before next month as to whether the protest has merit.

The Air Force and Army have rarely seen eye-to-eye on the JCA, and harmonizing their requirements has been a challenge.

The Senate has taken a dim view of the service infighting over the size, mission, and funding of the JCA. In its 2008 authorization bill language, the Senate said it wanted the services to focus on their "core missions," adding that the Air Force alone should have the duty for fixed-wing airlift.

Complicating the issue is that the Army needs a replacement aircraft right away, whereas the Air Force doesn't need new aircraft until about 2012.

The C-27J would be a significant new program for the Air National Guard. The Air Force views the aircraft as well suited to domestic disaster relief missions such as those flown after Hurricane Katrina in 2005. The aircraft might also restore a flying mission to Guard units that lost one in the last round of base realignments and closures.

Gen. T. Michael Moseley said the program also offers opportunities for the Air Force to build coalitions and "partner" with foreign air forces that don't have the wherewithal to buy fighters or big transports.

"If a country can't afford the big ... airlifters or even C-130s, the ... C-27 sure seems to be a reasonable way to look at partnering in a mobility game," Moseley told reporters in June. He has sent out letters to foreign air chiefs suggesting this idea, and Bruce S. Lemkin, deputy undersecretary for international affairs, is hosting a series of meetings with foreign representatives about the idea.

Moseley also said the JCA might be "a good opening round as far as an Air Force contribution to AFRICOM," the fledgling regional command for Africa.

China Plans for Pre-Emption?

If China fights a protracted conflict with the US over Taiwan, it would suffer profound economic damage. That may be why China appears to be developing a pre-emptive capability to seize Taiwan in the future, according to the Pentagon.

In its annual report to Congress on Chinese military power, released in June, the Defense Department said China is developing a strategy of pre-emption to blunt some of the negatives in a military campaign to seize Taiwan, which Beijing considers to be a breakaway province.



The J-10 could help China go first.

It is shifting from a military marked by massive numbers of ground troops to "a more modern force with long-range precision strike assets," and other forces that could enable "military pre-emption (including surprise attack) along its periphery."

Of most concern is the piling up of more than 900 short-range ballistic missiles along the Chinese coast opposite Taiwan. Beijing has bolstered its air force and is producing an indigenous fighter, the J-10.

The People's Liberation Army has collectively made information warfare, computer network attack, and electronic warfare centerpieces of its modernization, openly discussing that these are the tools to offset the "asymmetric" advantages of a well-armed superpower such as the US.

Moreover, PLA strategists "describe pre-emption as necessary and logical when confronting a more powerful enemy," the Defense Department noted. The PLA strategists note that they can't easily repel a massive conventional attack, and that China plans to keep an enemy off balance "by seizing the initiative with offensive strikes." Chinese doctrine calls for destroying enemy assets "on enemy territory before they can be employed," the Pentagon study pointed out.

Taking into account China's advances in submarines, unmanned aircraft, airborne command and control systems, precision guided weapons, and cruise missiles, the Pentagon concluded that the PLA is "generating a greater capacity for military pre-emption." Its training focuses on "no notice" long-range strike and coordinated air and naval strikes on enemy vessels.

Just as the US has sought to integrate the efforts of the Defense, State, Justice, and Commerce departments in pursuing its war on terrorism, China is likewise putting forth a "multidimensional view of warfare," the Pentagon said, incorporating economic, financial, and legal means to hamper adversaries, as well as "psychological instruments."

In a Taiwan conflict, the Pentagon said, it would expect an intensive Chinese effort to "to portray third-party intervention as illegitimate under international law." Beijing has already embarked on a campaign to "shape international opinion in favor of a distorted interpretation" of international laws regarding freedom of navigation. China is trying to extend sovereignty "over the 200 nautical mile exclusive economic zone, the airspace above it, and possibly outer space," the Defense Department concluded. ■



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Aerospace World

By Marc V. Schanz, Associate Editor

USAF Awards Combat Medals

Gen. T. Michael Moseley on June 12 presented the first six Air Force Combat Action Medals at a ceremony at the Air Force Memorial in Arlington, Va.

The Chief of Staff noted that the number of airmen engaging an enemy directly has sharply increased since 2001, and the award will serve as a "visible reminder" that combat is a "fundamental part" of being an airman.

The six first recipients were chosen to reflect the varied ways in which USAF is engaged in combat. They were: Maj. Steven A. Raspet, an A-10 pilot; Capt. Allison K. Black, an AC-130H navigator; SMSgt. Ramon Colon-Lopez, a para-rescueman; MSgt. Charlie Peterson, a vehicle operator; MSgt. Byron P. Allen, a MH-53 Pave Low gunner; and SSgt. Daniel L. Paxton, an aeromedical evacuation technician.

Mitchell Family at Ceremony

The new award was created to recognize USAF personnel who engaged in air or ground combat off base in a combat zone, or who came under direct hostile fire. It is an Air Force counterpart to the Army's Combat Infantryman Badge.

The award was patterned after the

USAF photo by A1C Christopher Griffin



Alaskan Aggressors. Airmen at Eielson AFB, Alaska, prep an F-15 Aggressor fighter for July 9 action. F-15s shown here, with their distinctive markings, belong to the 65th Aggressor Squadron, Nellis AFB, Nev., and deployed to the Far North for the latest Red Flag-Alaska exercise.

insignia on Gen. Billy Mitchell's World War I airplane.

Members of Mitchell's family were present for the awards ceremony, as was the medal's designer, Susan Gamble.

Hayden Praises ISR Reforms

The Air Force did the right thing in overhauling the structure of its intelligence-surveillance-reconnaissance organization, since ISR can't be considered a "support function" any longer, the head of the CIA said in June.

Gen. Michael V. Hayden, a career Air Force intelligence officer, told a Washington symposium that he approves of making a three-star general the overseer of the Air Force's myriad ISR functions, and that the move was necessary in light of real-world needs.

Airmen in the intelligence field fall into two categories, Hayden noted: those who create intelligence and those who apply it. The wars in Southwest Asia have seen emphasis put on the application of intelligence, and not its creation, he said. While airmen in combined air operations centers around the world excel at using and disseminating intelligence, the means to create it has slipped, Hayden said.

The Air Force's intelligence operations used to be under a two-star general. It was necessary to give the entire field a higher profile, Hayden said.

During the Cold War, targets were easy to spot but tough to kill. Today, "the enemy is easy to finish, but hard to find," he observed.

Hayden said Lt. Gen. David A. Deptula, the Air Force's ISR chief, is putting the correct emphasis on strengthening the means to collect information, and that this initiative is behind the service's push to become the Pentagon's executive agent for high-flying unmanned aerial vehicles. However, he didn't offer an opinion as to whether the Air Force should get the job.

Virginia ANG Moves to F-22

The Virginia Air National Guard's 192nd Fighter Wing flew its last F-16 mission on June 20, beginning an era when the unit will fly the new F-22 Raptor as an associate unit of the 1st Fighter Wing at Langley AFB, Va.

The wing had flown the F-16 since 1991 and is now the first ANG unit to fly the F-22. More than 20 pilots of the 192nd have qualified to fly the Raptor, and technicians from the unit have been working on the stealth fighter for months, alongside their active duty counterparts.

At Langley, the 192nd FW will associate with the Raptor mission, the 480th Intelligence Wing's Distributed Ground Station imagery analysis mission, and the Combat Air Force Logistic Support Center. The effort is part of the Air Force's Total Force Integration initiative, which is designed to bring together active duty and reserve component capabilities and personnel.

Troop Cut Limit: 40,000

The Air Force won't reduce its ranks by more than the already planned 40,000 full-time equivalent positions, and it may



Transport Tradeout. A new C-12J Huron (left in photo) arrives on June 29 at Yokota Air Base, west of Tokyo. Three of the new Huron transports replaced four C-21s, one of which is shown here, ready to depart. The C-12 can carry more and land in more places.

cut fewer as a result of the unexpected expansion of the Army and Marine Corps, according to USAF Secretary Michael W. Wynne.

In a June 15 "Letter to Airmen," Wynne wrote, "There are no plans to extend our restructuring beyond the current 40,000 reduction." However, he added that the reduction is subject to change as the Air Force has a chance to consider the effect that more ground forces will have on USAF requirements.

"Land component growth may require our Total Force drawdown to level off, while the size of specific elements within our Air Force might actually need to grow as well," Wynne wrote.

Chief of Staff Gen. T. Michael Moseley said the Air Force could be called on to provide as many as 1,000 additional battlefield airmen to match increases in the land forces.

Wynne added that the Air Force will continue force shaping efforts that move the right number of personnel to critical career fields.

"America's AOC" Opens at Tyndall

A new air and space operations center opened at Tyndall AFB, Fla., in June. The facility will support North American Aerospace Defense Command and US Northern Command with planning, direction, and assessment of air and space operations. The center, run by 1st Air Force, will manage Noble Eagle air sovereignty operations and direct disaster relief efforts in the continental US.

The newest AOC among the Air Force's 16 such centers, the facility boasts a two-story, 16-screen "data wall" that collects information from a variety

of platforms and sensors in space, in the air, and on the ground, and presents it so that the joint force air component commander can have a constant picture of unfolding regional action. The AOC also has systems allowing the JFACC to communicate with and redirect all USAF assets under his command.

JASSM Project Hits Rocks

The Air Force may look at alternatives to the Joint Air-to-Surface Standoff Missile if test problems can't be fixed, Air Force acquisition chief Sue C. Payton said in June.

The stealth missile, made by Lockheed Martin, has been troubled by testing problems. While 39 missiles have worked as planned, 25 have failed. The causes range from loose bolts to electronic glitches, pointing to quality issues rather than a design problem. The missile's reliability is in question, she said.

Payton spoke at a press conference to discuss Nunn-McCurdy breaches on several programs. When a program's cost goes up more than 25 percent or its schedule is delayed substantially, the service must either abandon the program or certify that it meets an essential need and can't be terminated. Payton said the Air Force was not yet ready to make such a certification. "We're not certain that the management structure is adequate" at Lockheed Martin's program office, she said.

If reliability can't be improved, and production of the JASSM is terminated, USAF will consider alternatives, such as the Navy's SLAM-ER (Standoff Land Attack Missile-Expanded Response) and air-launched versions of the Tomahawk cruise missile, Payton said. The

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Seven Airmen Die in Southwest Asia

Seven airmen died in Southwest Asia in late May and early June in combat incidents, a crash, and of natural causes.

Two agents from the Air Force Office of Special Investigations were killed on June 5 in Kirkuk, Iraq, when their convoy struck an improvised explosive device. TSgt. Ryan A. Balmer, 33, was from Mishawaka, Ind., and was stationed at Hill AFB, Utah. SSgt. Matthew J. Kuglics, 25, was from North Canton, Ohio, and was stationed at Lackland AFB, Tex. Both airmen were deployed as part of OSI's Expeditionary Det. 2410 in Iraq.

On June 7, SrA. William N. Newman, an explosive ordnance disposal airman with Hickam AFB, Hawaii's, 15th Civil Engineer Squadron, was killed while attempting to disarm an IED south of Balad AB, Iraq. Newman, 23, was a native of Kingston Springs, Tenn., and was deployed to the 332nd Expeditionary Civil Engineer Squadron's Explosive Ordnance Disposal Flight at Balad.

A1C Eric M. Barnes, 20, of Lorain, Ohio, died June 10 when his convoy was hit by an IED about 100 miles south of Baghdad. Barnes was assigned to the 90th Logistics Readiness Squadron at F.E. Warren AFB, Wyo., and was deployed with the 586th Air Expeditionary Group.

Lt. Col. Glade L. Felix, 52, of Lake Park, Ga., died June 11 at Al Udeid AB, Qatar. Felix was a Reservist assigned to the 622nd Aeromedical Staging Squadron at Robins AFB, Ga. Air Force officials reported that his death was not combat related, and a preliminary report listed heart complications as the cause of death.

Maj. Kevin H. Sonnenberg, 42, of McClure, Ohio, died June 15 when his F-16 crashed five miles north of Balad AB, Iraq. Sonnenberg was an Air National Guardsman assigned to the 112th Fighter Squadron from Toledo, Ohio. The crash is under investigation.

On June 23, A1C Jason D. Nathan, 22, of Macon, Ga., died of wounds suffered from an IED detonation near his vehicle while he was performing gunner duties on patrol. Nathan was assigned to the 48th Security Forces Squadron at RAF Lakenheath, England, and was deployed with the 732nd Expeditionary Security Forces Squadron at Camp Speicher, Iraq.

Air Force plans to buy nearly 5,000 JASSM and JASSM-ER, or Extended Range.

C-130 Modernization Reduced

Rising costs have obliged the Air Force to cut the number of C-130s to get an avionics upgrade, from some 300 airframes to 220, service acquisition chief Sue Payton said in June.

Explaining a Nunn-McCurdy breach on the C-130 Avionics Modernization Program (see item above), Payton said that, aside from cost, the program is doing well and will continue.

The cut reflects a desire to create a program with the lowest risk and most mature design that focuses solely on combat delivery aircraft, according to Diane Wright, representing the Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics. Some aircraft are too old or worn out to upgrade, and the Air Force has decided to make up for the cost increase by foregoing the upgrade of about 80 airplanes.

The AMP program had gone 21 percent over expected costs, some of which was blamed on labor rates and mission support expenses.

Keys To Retire, Corley To ACC ...

Gen. Ronald E. Keys, the head of Air Combat Command, will retire from the Air Force this fall, the service an-

nounced in June. Keys took over ACC in May 2005.

During his tenure, Keys was able to bring the F-22 to operational status, oversaw its first deployments, and led the effort to set requirements for the Air Force's next bomber. He also raised the alarm about decaying capabilities in the USAF's old combat aircraft fleet.

President Bush nominated Gen. John D.W. Corley, today's vice chief of staff, to take over the ACC commander's position. Corley served as the director of the combined air operations center early in Operation Enduring Freedom, director of Air Force Global Power Programs, and USAF representative on the Joint Requirements Oversight Council.

... McNabb for Vice Chief, Lichte for AMC

President Bush has nominated Gen. Duncan J. McNabb, currently the head of Air Mobility Command, Scott AFB, Ill., to become USAF vice chief of staff. He would replace Gen. John D.W. Corley, who is moving to take the head job at Air Combat Command.

Nominated to replace McNabb was Lt. Gen. Arthur J. Lichte, assistant vice chief of staff. In that position, Lichte has headed up the Air Staff in Washington, D.C.

Last U-2 Upgraded

The last U-2 reconnaissance aircraft slated to receive the Block 20 upgrade left Beale AFB, Calif., in early May. After refit at the Palmdale Maintenance Depot, Calif., it will rejoin the fleet next year.

The upgrade marks the completion of a fleetwide effort begun in April 2002 aimed at reducing maintenance costs and updating key components. The cockpit of the venerable reconnaissance aircraft now features a digital cockpit with touch-glass screen and a more ergonomic layout.

The Air Force plans to retain about 20 U-2s until they are replaced by the Global Hawk unmanned aircraft sometime after 2012.

Boeing Extends C-17 Line—Again

Boeing announced in June that it would keep the C-17 line going on its own nickel, in hopes of securing new orders from the Air Force and other countries.

The company said it would extend production of the C-17 at its Long Beach, Calif., plant for six months. The line had been scheduled for closure by mid-2009, since DOD's budget request for Fiscal 2008 did not include any more orders for the cargo aircraft.

Last year, Boeing said that, without a commitment for more orders, it would begin closing off long-lead item production for the C-17 in March—and it proceeded to do so.

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Gary Pfingston, Former Chief Master Sergeant of the Air Force

Retired CMSAF Gary R. Pfingston, the 10th Chief Master Sergeant of the Air Force, died of cancer June 23 in San Antonio. He was 67.

Pfingston held the top USAF enlisted job from August 1990 to October 1994, during Operation Desert Storm and the sharp drawdown period that followed. He was the top enlisted advisor to Chief of Staff Gen. Merrill A. McPeak.

Pfingston was born in Evansville, Ind., in 1940. After a stint playing minor league baseball, he enlisted in 1962 as an aircraft mechanic. After basic training and technical school, he served as a crew member at Castle AFB, Calif., until 1968. He then worked as a crew chief on B-52s and KC-135s at Plattsburgh AFB, N.Y.

After service in Thailand at U Tapao Air Base, Pfingston became a training instructor at Lackland in 1973, and in 1979, he became commandant of the Military Training Instructor School there.

In 1982, Pfingston became a first sergeant, and from 1984 to 1990 he was senior enlisted advisor at George AFB, Calif., Bergstrom AFB, Tex., and finally at Pacific Air Forces Headquarters, Hickam AFB, Hawaii.

After becoming the Chief Master Sergeant of the Air Force in 1990, Pfingston's tenure was dominated by the large post-Cold War drawdown of USAF manpower and budget. He wanted to avoid forcing anyone out of the service and worked to get the Voluntary Separation Initiative and the Special Separation Bonus programs started. He pushed to expand enlisted training programs and mandatory in-residence professional military education schools. He also advised the expansion of Air Force specialties open to women and introduced new senior NCO stripes.

Retiring to San Antonio in 1994, he remained active in Air Force life, speaking at academy graduations and NCO academy panels.

"Gary's life was a shining example of service to our nation and we will miss him greatly," CMSAF Rodney J. McKinley said.

McPeak said that Pfingston's start as an aircraft mechanic served his career well in many ways.

"He didn't just fix it when it broke; he kept things from breaking," he said, noting that Pfingston's leadership helped keep the enlisted force intact during the difficult 1990s drawdown.

"The Air Force may have gotten smaller, but it also got better and became a tougher, sharper instrument for protecting the country," McPeak added.

However, an expansion of the Army and Marine Corps, coupled with cost increases on a C-5 upgrade, have given Boeing reason to think USAF may expand its C-17 fleet beyond 190 aircraft. The company now plans to keep the line open until 2010. Shuttering the line and restarting it later would cost upward of \$500 million, according to company officials.

Air Force Secretary Michael W. Wynne, who has complained of Boeing forcing the issue of additional C-17 production at a time when USAF had no money to buy more, told reporters at the Paris Air Show in June that the company's self-financed extension is "a very good gesture on their part."

Pave Low Training Ends

The 551st Special Operations Squadron, which has trained aircrews to fly the MH-53 Pave Low helicopter at Kirtland AFB, N.M., since 1989, ceased operations in April, as the Air Force makes way for the new CV-22 Osprey.

Most of the squadron members will continue to serve at the 58th Special Operations Wing at Kirtland. Many of the flight engineers will transition to the CV-22, while aerial gunners will go to the HH-60 Pave Hawk. Most of the pilots will retire or move to leadership positions.

One Pave Low will remain at Kirtland, on display at the base's air park. The Pave Low, carrying special operations forces, was one of the first US aircraft to enter Iraq at the outset of Operation Desert Storm in 1991.

More NCO Academies To Close

More schools for enlisted personnel will be closing, due to budget cuts and a personnel drawdown.

The Noncommissioned Officer Academy at McGuire AFB, N.J., closed in May. Following suit will be NCO academies at Kirtland AFB, N.M., Robins AFB, Ga., and Goodfellow AFB, Tex.

The Robins and Goodfellow academies will close next year, and Kirtland's will close in 2009. The four closures should save the Air Force about \$5 million in manpower costs annually.

The moves are the result of USAF's efforts to reduce to a level of 316,000 active duty personnel by 2009. The cut of 40,000 airmen is intended to save money that can be applied to modernization programs.

AFSOC Gets Predators

In what Air Force Chief of Staff Gen. T. Michael Moseley described as a "patch change," Air Combat Command gave 21 of its MQ-1 Predator unmanned aerial vehicles and associated support equip-



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ment to Air Force Special Operations Command in May, boosting AFSOC's Predator complement to six "orbits."

An additional seven aircraft were delivered in June to the 3rd Special Operations Squadron at Nellis AFB, Nev., giving a total of 28 UAVs to the squadron first set up at the base by AFSOC in 2005. The new personnel and equipment will accelerate the squadron's ability to perform 24-hour Predator patrols—as the squadron currently flies Predators in support of both Operation Iraqi Freedom and Operation Enduring Freedom.

The 3rd SOS is currently the sole armed remotely piloted aircraft squadron in AFSOC.

WWII MIAs Now Listed Online

An electronic database listing names of service members still missing from World War II is now available, according to the Department of Defense POW/Missing Personnel Office.

The database will help researchers and analysts still searching for remains. It is the first comprehensive list of the missing from World War II, totaling nearly 78,000 names. The list, created over the last three years, was compiled from grave registration documents from the National Archives and other records from World War II. Computer programs were used to cross-check the documents and identify discrepancies.

New names and information will be added as new documents and files are located. The names of servicemen whose remains are recovered and identified in the future will be removed.

The new database, along with databases from the Korean War, Cold War, Vietnam War, and Gulf War are available on the DPMO's Web site, <http://www.dtic.mil/dpmo>.

AEF Prep Squadron Opens

The Air Force formally reactivated the 561st Joint Tactics Squadron at Nellis

Getting Troops Off the Roads

The Air Force is making a huge contribution to holding down casualties in Iraq and Afghanistan, by keeping US troops clear of the enemy's favorite weapon, the improvised explosive device.

So said Gen. T. Michael Moseley, Chief of Staff, in a June meeting with reporters. He said the Air Force is doing its utmost to fly people and materiel to the places they're needed, rather than send them by convoys vulnerable to ambush.

"We're [working] very, very ... hard on getting people off those roads," Moseley said.

"The staff tells me we've flown 100 percent of everything that the Marines can put inside a C-130 or C-17, [and] got it off the roads, since September [2006]. Same with the Army," Moseley reported an average of 4,500 ground troops being ferried around Iraq or Afghanistan per month, "but some months we're flying up to eight or nine thousand people."

He described it as a demonstration of airpower's flexibility "to be able to fly stuff and get it off the surface and get it out of harm's way." American casualty rates due to IEDs dropped sharply several years ago, after the Air Force began taking on some of the transport missions that had been run by convoy, and the Air Force has steadily increased the amount it hauls since.

The Air Force is also heavily tasked in attacking the IED problem directly, Moseley said.

"When you find an IED, a ... preponderance ... of the people who go out there and work that problem are Air Force and Navy [explosive] ordnance disposal guys," he noted.

It's extremely dangerous work, and that's why, Moseley said, there has been a "spike" in Air Force losses in the EOD field, relative to other specialties.

Moseley also said his staff has been huddled with the Army to make sure that ground vehicles now in development for the Army's Future Combat System will be compatible with the airlifters in USAF's inventory, so they can be flown to where they're needed.

The Army has not always respected the physical dimensions of the inside of C-17s and C-130s in designing gear, and most Army vehicles today require some modifications before they can be loaded for transport.

However, Moseley said the Army is fully aware of "the box size of the C-130 and ... C-17" and is now thinking about "what this looks like ... beyond the Stryker" vehicle. He said there's "good news" in the cooperation between the two services in making sure the next generation of vehicles is air-transportable. It hasn't happened previously, he added, because there have been some "significant" changes in the technology the Army can put into its new combat systems in recent years.

—John A. Tirpak

AFB, Nev., in June. Its new mission will be to help other units get ready for deployments. The unit had been inactive for a decade.

Air Combat Command leaders have

chartered the unit to make sure that air and space expeditionary forces (AEFs) have up-to-the-minute information on the places to which they deploy, and to keep the "lessons learned" process fresh and integrated with predeployment "spin-up" training. The deploying AEFs will therefore be effective as soon as they arrive in theater.

The squadron is equipped with experts from across the combat air forces—covering all weapons systems, command and control processes, battlefield airmen, mobility, space, and intelligence assets. It has been provisionally operational since October 2006.

Space Program Advice Wanted

The Air Force wants to create a permanent blue-ribbon panel of seasoned experts to provide a running reality check on the service's space projects, Lt. Gen. Michael A. Hamel said in June.

Mackay Trophy to A-10 Pilot

An A-10 pilot who saved the lives of a Special Forces team in Afghanistan has been selected by the National Aeronautic Association to receive the Mackay Trophy for 2006.

Capt. Scott L. Markle of the 81st Fighter Squadron at Spangdahlem AB, Germany, responded to a call for help on June 16, 2006, when a 15-man special ops team was engaged in close-quarters combat after being ambushed by Taliban fighters. Unable to use weapons, Markle flew perilously low and dispensed flares. The "show of force" maneuver was effective in stopping enemy fire, and, urged on by a ground controller, Markle flew three more such passes, giving the team a chance to pull back from the fight. They escaped with no casualties.

Markle then used his A-10's 30 mm cannon to destroy three machine gun nests and killed Taliban fighters. The ground commander and his team personally thanked Markle, crediting him with saving their lives.

The Mackay Trophy was created in 1912. Markle will receive a gold medal at an award presentation in October.

Senior Staff Changes

RETIREMENTS: Maj. Gen. Joseph E. Kelley.

NOMINATIONS: To be Brigadier General: Mark A. Atkinson, Mark A. Barrett, Brian T. Bishop, Michael R. Boera, Norman J. Brozenick Jr., Cathy C. Clothier, David A. Cotton, Sharon K.G. Dunbar, Barbara J. Faulkenberry, Larry K. Grundhauser, Garrett Harencak, James M. Holmes, Dave C. Howe, James J. Jones, Michael A. Keltz, Frederick H. Martin, Wendy M. Masiello, Robert P. Otto, Leonard A. Patrick, Bradley R. Pray, Lori J. Robinson, Anthony J. Rock, Jay G. Santee, Rowayne A. Schatz Jr., Steven J. Spano, Thomas L. Tinsley, Jack Weinstein, Stephen W. Wilson, Margaret H. Woodward. **To be ANG Major General:** Michael D. Akey, Michael G. Brandt, Richard H. Clevenger, Cynthia N. Kirkland, Duane J. Lodrige, Patrick J. Moisio, Charles A. Morgan III, Daniel B. O'Hollaren, Peter S. Pawling, William M. Schuessler, Haywood R. Starling Jr., Raymond L. Webster. **To be ANG Brigadier General:** Maurice T. Brock, Jim C. Chow, Michael G. Colangelo, Barry K. Coin, Steven A. Cray, James D. Demeritt, Matthew J. Dzialo, Trulan A. Eyre, Jon F. Fago, William S. Hadaway III, Samuel C. Heady, John P. Hughes, Mark R. Johnson, Patrick L. Martin, Richard A. Mitchell, John F. Nichols, Grady L. Patterson III, George E. Pigeon, William N. Reddell III, Harold E. Reed, Leon S. Rice, Alphonse J. Stephenson, Eric W. Vollmecke, Eric G. Weller.

CHANGES: Brig. Gen. (sel.) Norman J. Brozenick Jr., from Cmdr., 1st SOW, AFSOC, Hurlburt Field, Fla., to Dep. Dir., Studies & Analyses, Assessments, & Lessons Learned, USAF, Pentagon ... Maj. Gen. Roger W. Burg, from Dir., Strat. Security, DCS, Air, Space, & Info. Ops., P&R, USAF, Pentagon, to Cmdr., 20th AF, AFSPC, F.E. Warren AFB, Wyo. ... Maj. Gen. Thomas F. Deppe, from Cmdr., 20th AF, AFSPC, F.E. Warren AFB, Wyo., to Vice Cmdr., AFSPC, Peterson AFB, Colo. ... Brig. Gen. David S. Fadok, from Dep. Dir., Studies & Analyses, Assessments, & Lessons Learned, USAF, Pentagon, to Dir., Warfighter Systems Integration & Deployment, Office of Warfighting Integration and CIO, OSAF, Pentagon ... Brig. Gen. Mark W. Graper, from Dir., Standing Jt. Force Hq-North, NORTHCOM, Peterson AFB, Colo., to Cmdr., 354th FW, PACAF, Eielson AFB, Alaska ... Brig. Gen. Jimmie C. Jackson Jr., from Dep. Cmdr., CAOC 7, Component Command-Air Izmir, Allied Command Ops (NATO), Larissa, Greece, to Commandant, ACSC, AU, AETC, Maxwell AFB, Ala. ... Brig. Gen. Jay H. Lindell, from Commandant, ACSC, AU, AETC, Maxwell AFB, Ala., to Cmdr., Coalition AF Transition Team, Multinational Security Transition Command-Afghanistan, Kabul, Afghanistan ... Brig. Gen. David J. Scott, from Cmdr., 354th FW, PACAF, Eielson AFB, Alaska, to Dep. Cmdr., CAOC 7, Component Command-Air Izmir, Allied Command Ops (NATO), Larissa, Greece ... Maj. Gen. Thomas W. Travis, from Command Surgeon, ACC, Langley AFB, Va., to Cmdr., 59th Medical Wg (Wilford Hall Med. Ctr.), AETC, Lackland AFB, Tex. ... Maj. Gen. Mark A. Welsh III, from Dep. Cmdr., Jt. Functional Component Command for ISR, STRATCOM, Bolling AFB, D.C., to Vice Cmdr., AETC, Randolph AFB, Tex. ... Brig. Gen. James A. Whitmore, from Dir., Warfighter Systems Integration & Deployment, Office of Warfighting Integration & CIO, OSAF, Pentagon, to Dep. Cmdr., Jt. Functional Component Command for ISR, STRATCOM, Bolling AFB, D.C.

Hamel, who heads USAF space acquisitions as commander of the Space and Missile Systems Center, told the *Wall Street Journal* that he wants the outside experts to come from government and industry and to offer advice on new programs as well as ways to make old systems work with new ones. Specifically, they would offer advice on requirements and hardware.

The panel would be like experts on retainer and would not be reconstituted for every new issue encountered, but remain routinely on top of USAF space efforts.

The advice is needed because USAF allowed its own space system integration expertise to atrophy during the 1990s and early 2000s, when it pursued a philosophy of letting contractors call the shots in development efforts. The Air Force is rebuilding its own in-house expertise.

The panel would be distinct from another group, mandated by Congress, that will look exclusively at military and intelligence satellite projects. That group is to offer recommendations on funding and acquisition policies and broader space issues.

Mishap Mars Red Flag-Alaska

A midair collision marred the closing

days of Red Flag-Alaska 07-2, which concluded on June 15.

On June 11, an F-15C from Langley AFB, Va., collided with an F-16C from the 64th Aggressor Squadron from Nellis AFB, Nev. The F-15 pilot ejected, while the F-16 pilot was able to land his aircraft at nearby Eielson AFB, Alaska. Neither pilot was seriously injured, and an investigation of the mishap is under way.

The exercise, the second of the year, is sponsored by Pacific Air Forces. It provides joint offensive counterair, interdiction, close air support, and large force employment training over the Pacific Alaskan Range Complex. More than 1,400 military personnel from USAF, the Marine Corps, Singapore, and Australia participated.

Elmendorf Gets First C-17

Elmendorf AFB, Alaska, received its first C-17 airlifter in June. The base is the second in the Pacific Theater to operate with the high-demand aircraft; Hickam AFB, Hawaii, is the other.

The transport is the first of eight destined for the 517th Airlift Squadron and the Alaska Air National Guard's 249th Airlift Squadron. The last of the eight cargo airplanes is scheduled to arrive in November. The first aircraft was dubbed *Spirit of Denali*.

The C-17 replaces the C-130s in the



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USAF photo by SrA. Tabitha Keywendill

An Air Force Academy cadet exits a life raft during survival, evasion, resistance, and escape training conducted in June by specialists of the 1st Operations Support Squadron at Langley AFB, Va. The SERE technicians hold two sessions each month in the summer for cadets entering pilot training.

517th AS and is a new aircraft for the Guard. The units will work closely with the Army, supporting Ft. Richardson and its Stryker brigade. New facilities such as hangars, simulators, and a survival equipment shop are either completed or under way to support the new aircraft.

Outstanding Airmen Named

Air Force leaders in June selected the 12 Outstanding Airmen of the Year for 2007. A selection board at the Air Force Personnel Center chose the 12 from among 33 nominees representing major commands, direct reporting units, field operating agencies, and Air Staff agencies based on leadership, performance, and personal achievement.

All 33 nominees may wear the Outstanding Airman of the Year ribbon; the top 12 wear the ribbon with the bronze service star device. The 12 also wear the Outstanding Airman of the Year badge for one year.

The dozen selected airmen will be honored during the Air Force Association's Air and Space Conference and Technology Exposition in Washington, D.C., this September.

The 12 airmen are SMSgt. Ronald A. Colaninno, McGuire AFB, N.J.; SMSgt. Tammy L. Brancard-Hern, Randolph AFB, Tex.; MSgt. Lawrence B. Taylor, Kingsley Field, Oregon; TSgt. Jeremy L. Griffin, Patrick AFB, Fla.; TSgt. Sachiko D. Jones, RAF Alconbury, Britain; SSgt. Matthew J. Hefti, Hill AFB, Utah; SSgt. Jonathan C. McCoy, Pope AFB, N.C.; SSgt. David Orvosh, Pope AFB, N.C.; SSgt. Richard W. Rose Jr., Charleston AFB, S.C.; SSgt. Geoffrey M. Welsh, Seymour Johnson AFB, N.C.; SrA. Linn

Aubrey, Lackland AFB, Tex.; and SrA. Matthew C. Hulsman, Elmendorf AFB, Alaska.

"Checkmate" Back in the Game

"Checkmate"—the organization that once provided senior Air Force leaders with an intellectual foil or "Red Team" at

the operational level of planning—has been reactivated by Chief of Staff Gen. T. Michael Moseley, this time as an independent analysis shop studying issues at the strategic level.

The group is to serve as a "focal point" for interacting with Washington, D.C., think tanks and interagency,

Robin Olds, "MiG Sweep" Fighter Pilot

Retired Brig. Gen. Robin Olds—Air Force tactician, airpower advocate, and the only fighter ace to score victories in both World War II and Vietnam—died June 14. He was nearly 85.

Chief of Staff Gen. T. Michael Moseley described him as "one of our 'great captains' and ... an inspiration to our nation and our Air Force."

Olds was born in 1922 and graduated from West Point in 1943. He became a fighter pilot, went to Europe, and on only his second mission, became an ace. First in the P-38 Lightning and then in the P-51 Mustang, Olds flew 107 combat missions, achieving 12 aerial victories.

After World War II, Olds was among the first to fly the Air Force's first operational jet fighter, the P-80. He was also a member of USAF's first jet aircraft aerial demonstration team.

After Korea, when the Air Force became focused on the nuclear mission, Olds preached loudly about the need to continue teaching fighter pilots the skills of dogfighting, strafing, and low-altitude bombing.

In interviews, Olds later related that he was upbraided for advocating tactical capabilities. In 1962, his two-star boss told him that conventional wars were a thing of the past.

Four years later, flying in an F-4 over Vietnam, Olds told his backseater not to worry about their iron bomb mission or the MiGs they would dogfight that day. "I have it on good authority," Olds said, "that this is not happening."

During the war, Olds commanded the 8th Tactical Fighter Wing at Ubon AB, Thailand. He wangled permission to conduct Operation Bolo in 1967, which became one of the most successful missions of the air war.

Pretending to be bomb-laden F-105s, Olds and a group of missile-armed F-4s set an ambush for MiG-21s, whose airfields they were forbidden to attack. In one day, seven of the 16 MiG-21s known to be in theater were destroyed.

Olds flew 152 combat missions during Vietnam and scored four victories.

After the war, Olds served as commandant of the Air Force Academy and ended his active service as USAF's director of safety.

Olds' advocacy laid the foundation for the "war-winning air-to-air tactics and doctrine of surgical precision bombing we use today," Moseley said.

A funeral service was held at the Air Force Academy on June 30.

The War on Terrorism

Operation Iraqi Freedom—Iraq

Casualties

By July 12, a total of 3,611 Americans had died during Operation Iraqi Freedom in Iraq. The total comprises 3,604 uniformed troops and seven Department of Defense civilians. Of these deaths, 2,967 died in action while 644 died in noncombat incidents.

There have been 26,695 troops wounded in action during OIF. This number includes 14,681 who returned to duty within 72 hours and 12,014 who were unable to return to duty quickly.

USAF Supports Arrowhead Ripper

The Air Force supported Arrowhead Ripper in June, a large-scale operation aimed at destroying al Qaeda fighters and leadership around Baqubah, Iraq. It involved more than 10,000 US and Iraqi troops, Strykers and Bradley fighting vehicles, and attack helicopters.

On June 19, Air Force F-16s dropped GBU-38 Joint Direct Attack Munitions and GBU-12 laser guided bombs on houses being used as firing positions by insurgents, as well as on buildings where improvised explosive devices were stored.

The following day, F-16s employed GBU-38s on IEDs embedded near a road. Another F-16 dropped a JDAM and LGB on insurgent safe houses and a vehicle during the day's operations; video confirmed direct hits.

On June 21, a B-1B released JDAMs on more IED facilities and a roadblock near Baqubah. An F-16 released a JDAM and an LGB on a weapons cache in a palm grove nearby.

Three days later, F-16s dropped munitions on houses in Baqubah suspected of containing IEDs. In the same operation, another F-16 released a GBU-38 on a facility suspected of containing an IED. A nearby joint terminal attack controller reported that the weapon hit the intended target.

Operation Enduring Freedom—Afghanistan

Casualties

By July 12, a total of 407 Americans had died in Operation Enduring Freedom. The total includes 406 troops and one Department of Defense civilian. Of these deaths, 227 were killed in action with the enemy while 180 died in noncombat incidents.

There have been 1,380 troops wounded in action during OEF. This number includes 551 who were wounded and returned to duty within 72 hours and 829 who were unable to return to duty quickly.

More ISR Needed for Afghanistan

NATO forces are short four brigades of troops, plus helicopters and intelligence-surveillance-reconnaissance assets, Army Gen. B. John Craddock, chief of US European Command and the Supreme Allied Commander Europe, said in late May.

The helicopters and ISR systems are critical, he said, because mobility can make the most of the troops that NATO does have, and ISR can steer them to where they can best be used.

Specifically, Craddock wants more of the full-motion video—and the ability to process it—now mainly provided by the Air Force's Predator fleet at Kandahar, Afghanistan.

Air Strike Claims Militants and Civilians

US and coalition aircraft performed an air strike on a compound suspected of housing al Qaeda and Taliban militants in eastern Afghanistan on June 17.

In an operation backed by Afghan troops, US forces called in an air strike on a compound that contained a mosque and a religious school. Coalition forces confirmed enemy activity occurring at the site before getting approval for the strike, US Central Command officials said. Following the strike, residents of the compound confirmed the presence of al Qaeda fighters. In total, several militants and seven civilians—children ages 10 to 16—were killed. Two more militants were detained afterward.

The following day, CENTCOM officials apologized for the loss of civilian life and reported that children who survived the attack told Afghan authorities they were held inside the building throughout the day, beyond the sight of coalition observers. The children who attempted to leave were beaten and pushed away.

joint, and research organizations. It is also to serve as an incubator of fresh thinking and future strategists for the Air Force.

The group will comprise 15 to 20 military and civilian USAF personnel with a mix of expertise ranging from defense to airpower, space, and cyberspace operations. The group will be closely linked to existing air staff functions, including strategic planning, communications, public affairs, legislative efforts, and analysis.

Scramjet Project Passes Review

Boeing's X-51A scramjet engine demonstrator fired its engine for the first time and completed a critical design review in late May, putting it on track to a test flight in 2009.

The "WaveRider" program will demonstrate the feasibility of hypersonic flight. It's managed by the Air Force Research Laboratory's propulsion unit and is a collaboration of the Air Force, DARPA, NASA, Boeing, and Pratt & Whitney Rocketdyne.

In the review, government and industry officials validated the vehicle's design, assembly, integration, and flight-test plan. Manufacturing and assembly processes were established as well. During the engine test, engineers used a digital engine controller to simulate flight conditions at Mach 5.

The ground test program for the X-51 is being conducted at NASA's Langley Research Center in Hampton, Va.

Battlelab Closes

A battlelab at Langley AFB, Va., closed up shop on June 14, as a cost-cutting measure. The Command and Control, Intelligence, Surveillance, and Reconnaissance Battlelab was established in 1997 to quickly field hardware that could improve the C2ISR mission. It boasted 40 completed initiatives, among which was the Air Tasking Order Visualization and Assessment tool.

The Air Force plans to close all of its battlelabs by Oct. 1.

Col. Jack A. Sims, Doolittle Raider

Col. Jack Ahren Sims, one of the "Doolittle Raiders" that launched the first US attack on Japan in World War II, died June 9 in Naples, Fla. He was 88.

Four months after the Japanese attack on Pearl Harbor, Hawaii, Lt. Col. James H. Doolittle's second in command—Maj. John Hilger—picked Sims as his copilot for the famous raid on the Japanese home islands. Sims, then a second lieutenant, was one of 80 volunteers for the mission, in which 16 B-25 bombers launched from the deck of USS *Hornet*. Thirteen Doolittle Raiders survive. ■

News Notes

■ Lt. Col. Peter Byrne received the Koren Kolligian Jr. Trophy in June at a Pentagon ceremony. The top USAF individual safety award was given to Byrne because he managed to land his aircraft safely after suffering a stroke during a mission. Byrne was flying his F-16C on a training flight over Colorado in June 2006 when blood flow to his brain was interrupted, causing severe vertigo, loss of motor skills, and impaired vision. Despite his condition, Byrne turned on autopilot and got help from other pilots in his flight. He held a pattern for 90 minutes, bleeding off fuel. As his symptoms subsided, he chose to land and flew a perfect approach to Buckley AFB, Colo., despite a nearly 23 mph tailwind. Byrne is stationed at Buckley and has been selected for promotion and assignment as vice commander of the 140th Wing.

■ The Air Force is correcting flaws in its physical training uniform. The PT garb became mandatory for wear in fall 2006. The USAF uniform board reported nearly 500 "inputs" from airmen in June with suggestions on ways to improve the outfit. The uniform—which resembles a warmup suit—was criticized for having a too-tight lining, forcing airmen to buy the garment two sizes bigger. Another common complaint was that the weather-resistant finish made the outfit heavy and caused a loud "swishing" sound during exercise. The board decided to introduce other optional PT items within a year, including shorts for long-distance runners, a long-sleeve T-shirt, and a medium-weight sweatshirt.

■ The C-17 airlifter is to be certified to use synthetic fuel of a type already tested on B-52 bombers. The Air Force began the second phase of testing on the alternate fuel program program July 1. It plans to acquire 300,000 gallons of the fuel, derived from a mix generated by the Fischer-Tropsch process. Every aircraft in USAF's fleet—from fighters to transports—is to be certified to use the fuel by 2010, according to William C. Anderson, assistant secretary of the Air Force for installations, environment and logistics.

■ Japan Air Self-Defense Force F-2s dropped live ordnance during Exercise Cope North on June 13 on a range northeast of Andersen AFB, Guam. It was the first deployment of the F-2s, which are similar to USAF F-16s, and the first time they dropped live bombs, as there is no live ordnance range in Japan. About 228 JASDF personnel from Misawa Air Base and Fuchu AS, Japan, took part. Cope North focuses on the security and defense of Japan through air operations.

■ A "screamer"—an airlifter-dropped,

GPS-steerable cargo payload—was used in Southwest Asia by a C-17 for the first time in May. The Joint Precision Airdrop System delivered food, water, and ammunition to US forces in two remote locations in Afghanistan, using 14 steerable parachutes. JPADS has been operational on C-130s and C-17s for more than nine months, but the "screamer" bundle allows the C-17 to drop on multiple locations with different delivery systems. The new bundle uses the JPADS mission software to process GPS coordinates that steer actuators on the parachute. The initial 100 mph descent is slowed by a smaller parachute, after which the main chute opens to further slow descent and guide the package to a precision touchdown.

■ Some NATO medals are now authorized for wear by deployed Air Force military and civilian personnel, the Air Force announced in June. Those who served in a NATO unit for 30 continuous or accumulated days, and were listed on a Combined Joint Statement of Requirements, may wear the NATO medal for Operation Eagle Assist, Operation Active Endeavor, or International Security Assistance Force in Afghanistan or in the Balkans. USAF personnel who deployed in support of Operation Enduring Freedom aren't eligible unless they performed certain duties for ISAF in theater for the required time. Base personnel units can provide specific eligibility requirements.

■ Officials broke ground at Edwards AFB, Calif., in June to replace Runway 22. The airstrip is 53 years old and deteriorating, causing a foreign object damage threat to aircraft. A temporary runway will be constructed between the ramp and the main runway, to allow work on the worst sections of Runway 22. The temporary strip will be completed this year, and work on the permanent runway is to be under way early next year. The project is expected to cost \$103 million.

■ Australian and US forces conducted Exercise Talisman Saber 2007 at Hickam AFB, Hawaii, in May. The two-part exercise is held every two years to reinforce good relations between US and Australian forces in the Pacific. Part one focused on planning and executing contingency missions, such as disaster relief, from the air operations center at Hickam. The second part of the exercise was held in June in Australia and played out operational aspects of the exercise.

■ Gen. Duncan J. McNabb, head of Air Mobility Command, delivered the first factory-fresh C-17 airlifter destined for Dover AFB, Del., in late May. The combined flight crew, from the active duty 436th Airlift Wing and the Reserve's 512th

Airlift Wing, picked up the aircraft from Boeing's Long Beach, Calif., plant. The aircraft has been given the name *Spirit of the Constitution*, as Delaware was the first state to sign the document.

■ Health screening and treatment was provided to more than 1,000 men, women, and children in the Kenyan villages of Shimbir and Balich in May, thanks to airmen assigned to Combined Joint Task Force-Horn of Africa. The humanitarian mission was undertaken in cooperation with the Kenyan Red Cross and Kenya's Department of Defense. The airmen were with the 350th Civil Affairs Command functional speciality team, joined by Army civil affairs troops and personnel of the US Agency for International Development.

■ A new training center and adjacent road at Hurlburt Field, Fla., were dedicated in the names of four special operations airmen killed in Southwest Asia operations. The 50,000-square-foot Crate Advanced Skills Training Center was formally dedicated to SSgt. Casey Crate, who was killed in a May 30, 2005 aircraft crash in Iraq. The facility's auditorium and aquatic facilities were dedicated to Capt. Jeremy Fresques and Capt. Derek Argel, respectively, both of whom were also aboard the aircraft. The street adjacent to the facility was named Servais Way, in honor of SrA. Adam Servais, a combat controller who was killed Aug. 19, 2006 by enemy fighters in Afghanistan. All of the airmen were among the first graduates of the Advanced Skills Training curriculum, a concept that was aimed at revitalizing the special tactics fields in the Air Force back in the late 1990s.

■ Quickly converting a captured enemy air base to USAF use was the subject of an exercise at the former Castle AFB, Calif., in June. Members of the 615th Contingency Response Wing at Travis AFB, Calif., conducted Operation Hydra, which involved three different types of aircraft and over 250 personnel. They practiced field assessment, command and control setup, and launching and receiving aircraft. The operation also involved several sites in Northern California.

■ Air Force and Republic of Korea F-16s teamed up in a June exercise at Kunsan AB, South Korea. Pilots and F-16s from both air forces practiced repelling attacks on the base. Airmen of the 8th Fighter Wing at Kunsan flew alongside ROKAF's 111th Fighter Squadron. They were aided by two F-16s from the 35th Fighter Squadron as well as airmen and maintainers from Osan. Future such exercises will involve larger, offensive missions. ■

The Chart Page

By Tamar A. Mehuron and Heather Lewis

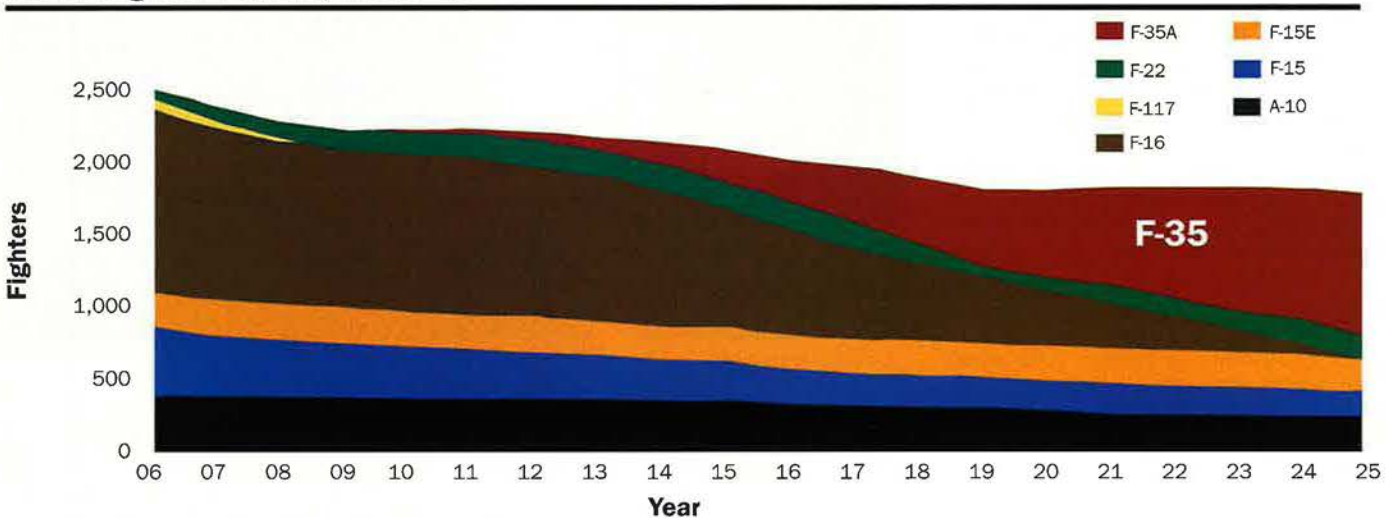
How Critical Is the F-35?

Fighters are key elements in three of the nation's four armed services—the Air Force, Navy, and Marine Corps. In a sense, each has bet the farm on the F-35 Joint Strike Fighter, a fact dramatized in these charts of future force structure. The F-35 is intended to equip the services with similar but distinct variants. USAF's F-35A would replace the F-16. The figure below depicts today's funded USAF fighter program,

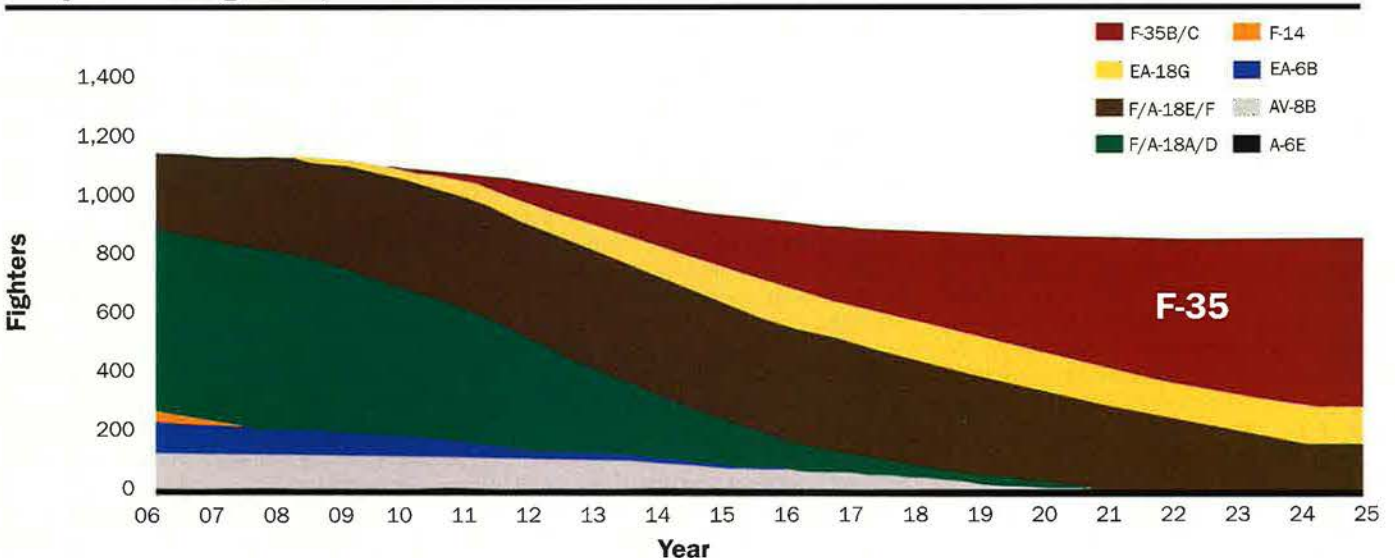
which assumes a full purchase of 1,763 F-35As. The total inventory will decrease from 2,500 to 1,800 fighters, and the F-35A would account for about half the fleet. In the maritime forces, the story is much the same. The Navy's carrier-capable F-35C will replace old F/A-18C/Ds, and USMC's F-35B, a short takeoff and vertical landing model, would supplant USMC AV-8Bs and F/A-18s. The two services combined would

buy 695 fighters, which will comprise nearly two-thirds of the naval fighter inventory. With the F-35 providing such a huge part of the forces, any major reduction or delay could cause serious disruption.

USAF Fighter Forces, 2006-25



Navy-USMC Fighters, 2006-25



Source: Government Accountability Office.

Action in Congress

By Tom Philpott, Contributing Editor

“Wounded Warrior” Reform; Specific VA Advances; Better Mental Health Care

Help for Disabled Warriors

Certain injured US veterans would have their disability ratings reviewed and perhaps upgraded as part of a comprehensive set of “Wounded Warrior” reforms endorsed in June by the Senate Armed Services Committee.

The reform applies to those vets who have retired for disabilities since September 2001 and were given severance pay rather than retired pay when they separated from service.

The House had passed its own packet of Wounded Warrior initiatives a month earlier, focusing on steps to improve support services for members and families.

The two sets of initiatives must be reconciled before enactment, producing either a stand-alone bill, which could be enacted quickly, or becoming part of a final 2008 defense authorization bill.

The Senate committee’s bill (S 1606) is more ambitious and seeks to address a wider range of issues including disparities across the services in setting disability ratings and severance payments.

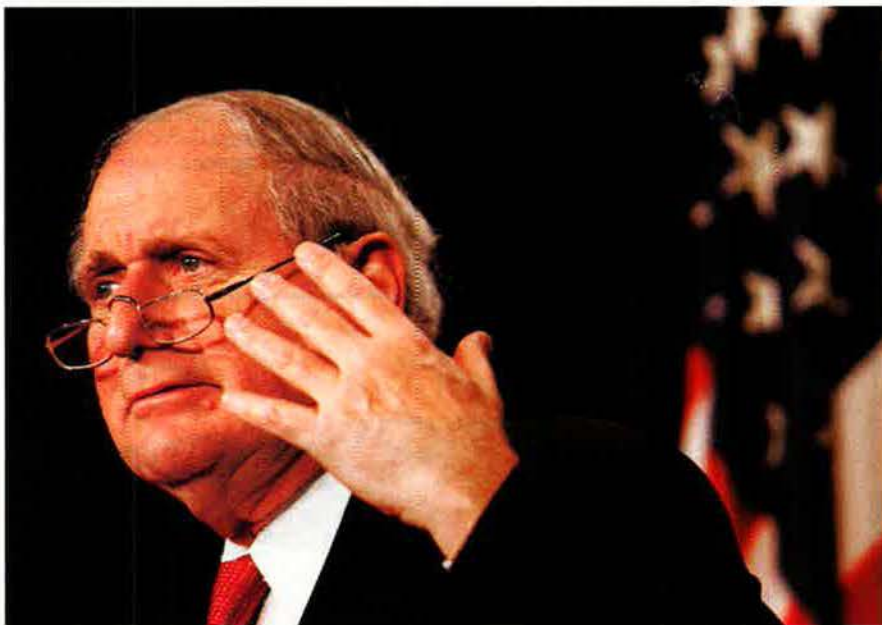
From 2000 through 2006, the Army awarded ratings of 30 percent or higher only to 13 percent of disabled soldiers being separated, the lowest rate among service branches. The Air Force’s proportion was twice as high.

Fixing Major Veteran Problems

The Dignified Treatment of Wounded Warriors Act, said Sen. Carl Levin (D-Mich.), chairman of the Armed Services Committee, would address not only problems with “inconsistent application of disability standards” but with substandard health facilities, less-than-seamless transition to VA care, inadequate levels of severance pay, and gaps in caring for traumatic brain injuries and post-traumatic stress.

More specifically, the bill would:

- Require the services to use VA standards for rating disabilities.
- Direct the Secretary of Defense to establish a board to review and, where appropriate, correct disability



Levin wants a big fix for veterans health care.

determinations of 20 percent or less for members separated as medically unfit for duty after the Sept. 11, 2001 start of the war or terror sm. Members would gain a chance to correct unwarranted or low ratings to ensure fairness.

■ Require the services to use the same statutory presumptions that VA uses when determining whether a disability resulted from service or existed before signing up. The military now presumes an ailment or injury results from service if the member has been in eight or more years. The Senate bill would lower that threshold to six months’ active duty, barring some other compelling evidence the condition existed prior to service.

■ Mandate two pilot programs to test the viability of using the VA to assess disability ratings for the Department of Defense.

■ Increase minimum severance payments to a year’s worth of basic pay for disabilities incurred in a combat zone, and to six months for all others. Current payments vary by length of service. A member with two years’ service, for example, receives only four months

of basic pay as severance. Also, severance pay is deducted from any VA disability compensation later received. The bill would end this offset.

The bill had 30 co-sponsors even before it cleared the Armed Services Committee. Other prominent backers include Sen. Daniel K. Akaka (D-Hawaii), the Veterans’ Affairs Committee chairman, Sen. John McCain (Ariz.), ranking Republican on armed services, and Sen. John W. Warner (R-Va.), former committee chairman.

Mental Health: Gaps and Solutions

The Department of Defense Task Force on Mental Health, reporting the results of a year-long study forced by Congress, urged a rapid and aggressive plan of action to address deficiencies in mental health services for service members and veterans affected by deployments to Iraq and Afghanistan.

Lawmakers mandated creation of the 14-member task force. Its work began in May 2006.

“Everyone realizes that the programs we now have are not adequate

AP photo by Haraz N. Ghanbari

in terms of the number of providers, the amount of care that we need to give, and to whom we need to give it," said Vice Adm. Donald C. Arthur, Navy surgeon general and co-chairman of the task force.

The report describes current mental health care staffing as "woefully inadequate" but doesn't recommend specific increases in providers or mental health spending.

"We didn't try to quantify the personnel or financial resources that would be required," Arthur said, because that must vary by service.

"An infantry unit may need more services than, say, a logistics unit that's farther rearward from the ... battle. So we have asked the services to determine what their needs are," Arthur said.

Data from post-deployment health reassessments completed by service members 90 to 120 days after deployment indicate that 38 percent of soldiers and 31 percent of Marine Corps personnel have symptoms of psychological illness. Other studies the task force cited show 17 percent of soldiers who deployed with brigade combat teams are at risk for developing "clinically significant symptoms" of post-traumatic stress disorder, major depression, or anxiety. And the task force suggests that's a conservative estimate. Families are impacted, too, with post-deployment divorce plans rising among married members.

DOD's 95 Recommendations

Defense Secretary Robert M. Gates said a plan is being formulated to address the many problems identified in the rising population of service members afflicted by post-combat stress disorder and traumatic brain injury, two signature conditions of current conflicts.

The report makes 95 recommendations. One urges relief from the stigma of mental health care pervasive in the military. Gates promised swift action to remove a question on past mental health care found on security clearance applications, a signal to members that careers are at risk if they seek the counseling that so many need.

"This is something that we can, must, and will get fixed," Gates told a group of Pentagon reporters soon after the report's release.

The task force's mental health experts, six of whom still serve in the military, delivered a blunt assessment of the psychological health threat facing US fighting forces, their families, and survivors.

"A single finding underpinning all others," the report said, is that the

military health system lacks sufficient money and fully trained personnel to support a psychological health mission in peacetime, much less the enhanced requirements imposed by war. The health system "must be restructured" to become more adept at preparing warriors for psychological trauma, at preventing and assessing mental illness and brain-related injuries, at early health care intervention, and at building an "easily accessible continuum of treatment" both for members and families whether active duty or with reserve components.

Defense officials have six months to develop a plan to implement the recommendations.

Tricare Savings Claim Inflated

Congressional auditors have confirmed what critics have contended since December 2005, when defense officials unveiled their plan for hefty increases in Tricare fees for retirees under age 65: The projected cost savings of \$9.8 billion over five years is clearly too high.

The savings still would be "significant," said the Government Accountability Office in a 44-page report requested by the Armed Services Committees. But only \$2.3 billion of the five-year saving estimate is solid. Much of the rest relied on a shaky assumption that 500,000 retirees and dependents under 65 would either leave Tricare or choose not to enroll. It was also wrongly assumed that these "avoided users" would save Tricare an amount equal to what a typical current beneficiary now costs.

But in fact, GAO said, "older and sicker individuals" are less likely to drop Tricare, and that's a population with above average health expenses.

GAO also called "unlikely" the department's projection of \$1.5 billion saved in pharmacy costs over five years, from raising beneficiary co-payments for Tricare's retail pharmacy option. Data used to calculate that estimate came from the experience of non-DOD employer-sponsored insurance programs, which was "not analogous to DOD's situation," GAO reported. Far fewer military beneficiaries would stop using the retail network if co-payments were raised from \$9 for a 30-day supply up to \$22.

VA System, Payments Criticized

The Veterans' Disability Benefits Commission, another creation of Congress, received two reports in June that could shape their recommendations this fall on issues important to disabled veterans.

The first report from Institute of Medicine (IOM), which Congress es-

tablished to advise the government on medical issues, says the current VA disability ratings and compensation schedule, devised following World War II, is outdated now and in need of reform. They don't reflect advances in medicine or the storehouse of knowledge gained over the decades on how specific disabilities or medical conditions affect the body.

The IOM report calls for an updated rating schedule with regular adjustments as required. It urges VA and DOD to move to a combined and comprehensive medical and vocational evaluation of separating members. It says disability compensation should take account of the impact on quality of life and not just earning capacity, the sole yardstick for current payments.

A second report prepared for the commission finds a generational imbalance in current levels of VA disability compensation because that lost-earnings-capacity yardstick is based on averages among recipients. Payments now don't differentiate between the relative earnings loss of a younger veteran returned from war and that of an aged veteran whose working life is over when he or she applies for benefits.

This report, prepared by CNA Corp., a research and analysis firm, found that disability compensation for veterans severely wounded in Iraq and Afghanistan is set too low, creating a lifetime earnings gap with their nondisabled peers. The same study found disability pay probably is set too high for veterans who first begin drawing payments at age 65 or older, having already retired from post-service careers.

CNA also examined how well disability pay levels reflect the "implied intention" of Congress that payments also compensate veterans in some way for their decline in quality of life as a result of service-connection disabilities. Not at all, CNA concluded. Basic VA payments do not recognize diminished quality of life, a fault also identified by the IOM study.

But when age is considered, veterans disabled at a younger age don't receive enough VA compensation even to replace lost earning capacity, which deepens the decline in quality of life compared with nondisabled peers.

CNA noted, for example, that a 25-year-old veteran who returned from war 100 percent disabled from physical wounds and rated as unemployable by the VA, received \$28,352 a year in disability compensation, using 2005 rates. That was more than \$11,000 short of the \$39,447 needed to keep average income even with nondisabled peers. ■

It's time to stop wondering if China is a military danger. Its build-up answers that question for anyone who had an honest doubt.

China Stands



People's Liberation Army recruits sound off at a military academy in Hefei, in eastern China.

Sun Tzu would be pleased. Some 2,500 years ago, the great Chinese strategist wrote: "The art of war is of vital importance to the state." Today, communist China, with a rapidly if unevenly expanding economy, has turned to building a world-class military force and mastering the art of modern war, all part of its quest to become the predominant power in Asia.

The country's very name—"Chung Kuo"—means the "Middle Kingdom,"

a concept holding that China is superior to all other nations. That principle endured even as Mongols, Manchus, and Westerners successively overran China. More than 40 years ago, John King Fairbank, among the most prominent scholars of modern China studies in the United States, foresaw the emergence of a new Middle Kingdom. China's communist rulers, he said, "are the heirs of the imperial tradition of the Middle Kingdom."

Beijing's rulers intend to acquire

unequaled political, diplomatic, economic, and military power—what the Chinese call "comprehensive national power." They seek to become so strong that no other Asian nation can contemplate any major step without first gaining China's consent, a contemporary form of tribute that China's emperors once demanded of vassal states.

China's most recent white paper on national defense, published in December, laid out China's strategic objectives more clearly than had its

Up

By Richard Halloran

previous biennial reports. At times, it did this with subtlety, at other times with stark clarity.

The white paper said the world is “moving toward multipolarity”—away from superpower dominance of the United States. The paper obliquely asserted that some nations (read, US) have accelerated the acquisition of “high-tech weaponry to gain military superiority” and that “hegemonism and power politics remain key factors undermining international security.”

Directly, the white paper said: “The United States is accelerating its re-alignment of military deployment to enhance its military capability in the Asia-Pacific region.” Moreover, it went on, “The United States and Japan are strengthening their military alliance in pursuit of operational integration,” and Japan’s “military posture is becoming more external-oriented.”

Chinese leaders have complained repeatedly that those moves and others by Southeast Asians, South Asians, and Europeans are intended to “contain China.”

In response, Beijing is moving to expand its security sphere. The Office of Naval Intelligence (ONI) says China is pushing its defense perimeter outward from what it calls the “first island chain”—along a line running from the Kurile Islands southward through Japan, Taiwan, and the Philippines to Indonesia—to a “second island chain.” This second chain lies some 1,800 miles east of China’s coast and runs from Japan through the Marianas and Guam to the South Pacific.

These lines are conceptual; they establish a planning objective. If realized, the second island chain would push China’s defense perimeter well east. China seeks to acquire sufficient air- and sea power to deny US forces access to the area behind that line. Su-

perquiet US submarines could penetrate it, but land-based aircraft from Guam and Okinawa would have to fight their way in, and surface warships such as aircraft carriers would have even more difficulty.

China’s modernization seeks to build a powerful and fortified national defense establishment. The nation intends to “lay a solid foundation” by 2010, to “make major progress” by 2020, and to be able to win high-tech wars by midcentury.

The People’s Liberation Army (the PLA comprises all of China’s armed forces) is aggressively pursuing power-projection capabilities. Specifically:

- The Air Force intends to accelerate its “transition from territorial air defense to both offensive and defensive operations.”

- The Navy aims for “gradual extension of the strategic depth for offshore defense operations.”

- The Army aims to move from regional defense to “transregional mobility,” featuring long distance maneuvers, rapid assaults, and special operations.

- The so-called “Second Artillery,” which commands China’s nuclear arms, plans to acquire additional missiles, both nuclear and conventional.

The Chief of Staff of China’s forces, Gen. Liang Guanglie, reinforced those points in a March address. Liang set out several objectives: “From start to finish, keep the protection of national

sovereignty and national security in first place. Step up the effort to prepare for military struggle. Put great effort into building up combat forces, personnel development, and battlefield construction.”

Intelligence officers in the Pentagon have analyzed the white paper, Liang’s speech, and other Chinese pronouncements and asserted that China’s publicly stated intentions are vague. The Pentagon’s annual report on China’s military power, released in May, said its vagueness “may reflect a deliberate effort to conceal strategic planning, as well as uncertainties, disagreements, and debates that China’s leaders themselves have about their own long-term goals.”

Military Spending Puzzle

The report, however, quoted the *Liberation Army Daily* newspaper as saying the PLA is striving “to construct a military force that is commensurate with China’s status.”

The most opaque element is defense spending. The official Chinese figure for 2006 is \$36 billion. Beijing, moreover, has announced that the 2007 budget will rise by 18 percent.

Outside of China, however, few if any accept the official figure. Unofficial estimates vary wildly. Defense Intelligence Agency analysts put Chinese military spending between \$85 billion and \$125 billion. The International Institute for Strategic Studies in London comes in

SinoDefence.com photo



Chinese Air Force pilots assemble before the new single-engine J-10, the first significant designed-in-China fighter.

at \$75 billion, while the Stockholm International Peace Research Institute estimates \$140 billion when adjusted for purchasing power parity, which measures actual local costs. Using the same method, John J. Tkacik Jr. of the Heritage Foundation in Washington asserts that China spends \$430 billion.

It is clear from every statement out of Beijing that the immediate target for China's new might is Taiwan, the island off the southeastern coast that Beijing considers a breakaway province. Beijing has vowed to stop any Taiwanese move for formal independence, with military force if necessary. This threat has generated much speculation on how China would do this.

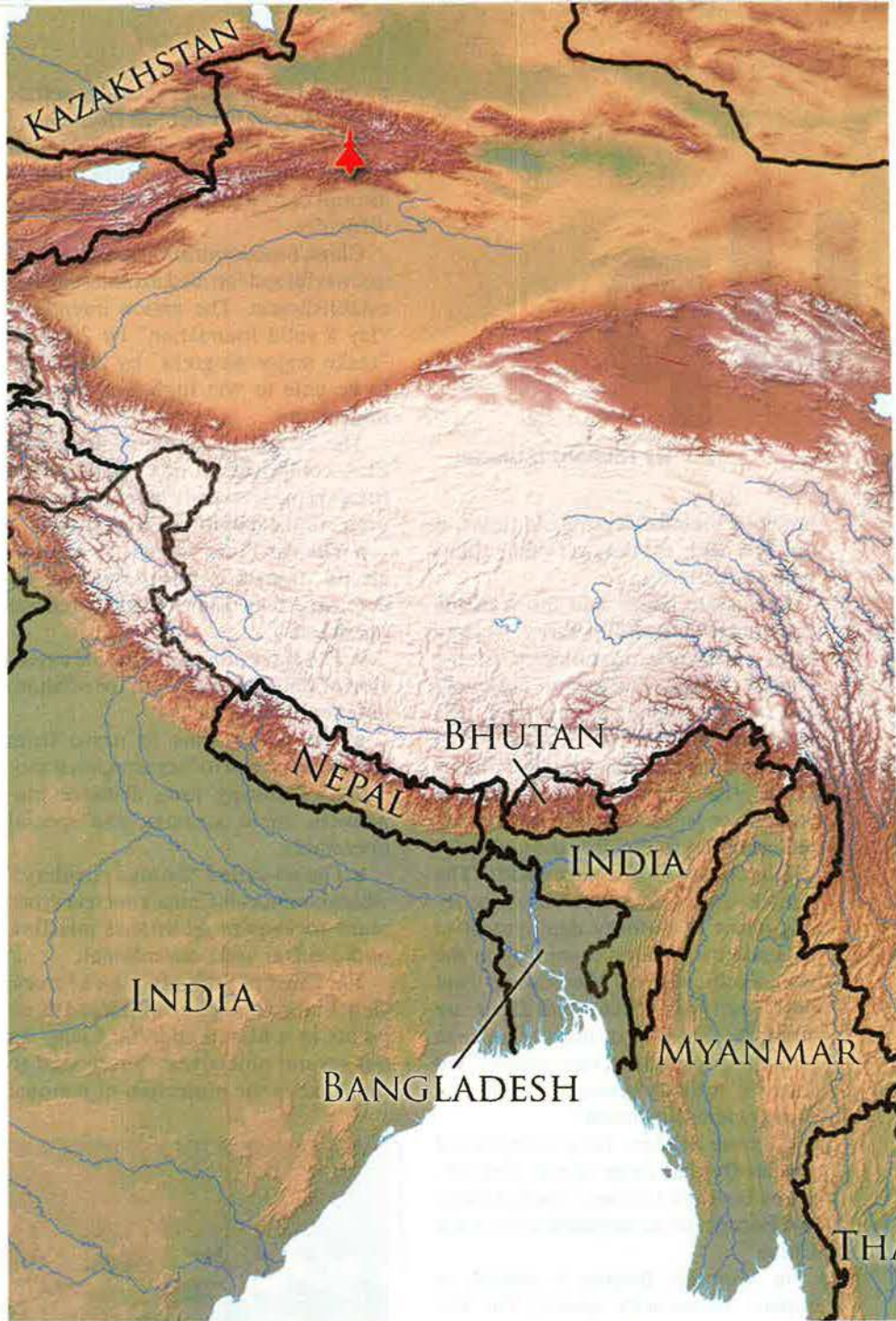
A missile attack combined with a naval blockade is the most likely scenario. That might be followed with a combined airborne and amphibious assault, but China today lacks sufficient air transport and amphibious shipping for assured success.

The threat of Chinese attack on Taiwan also shapes up as the most likely source of hostilities between China and the United States. The Taiwan Relations Act of 1979, adopted by Congress after President Jimmy Carter switched US diplomatic recognition from Nationalist China (Taiwan) to communist China, governs American policy on Taiwan.

The act all but obligates the US to help defend Taiwan, saying the US would "consider any effort to determine the future of Taiwan by other than peaceful means" to be of "grave concern." The act requires the US "to provide Taiwan with arms of a defensive character" and "to maintain the capacity of the United States" to resist the use of force or "other forms of coercion that would jeopardize the security, or the social or economic system, of the people on Taiwan."

US war plans are secret, but heavy bombers and submarines operating out of Guam, fighters and other warplanes from Okinawa, and aircraft carriers in the Western Pacific are the most likely first responders to a crisis in the Taiwan Strait.

Though Taiwan is the current focus, China is assembling a force able to project air and naval power into what it calls the "Blue Frontier," the deep Pacific that is now the domain of the United States Air Force and United States Navy. To the south, China is preparing forces to operate in the South China Sea, whose waters and islands are claimed as Chinese territory. The PLA Navy is also assembling the capabilities needed to



protect China's freedom of action in the Malacca Strait, through which passes 80 percent of China's imported oil.

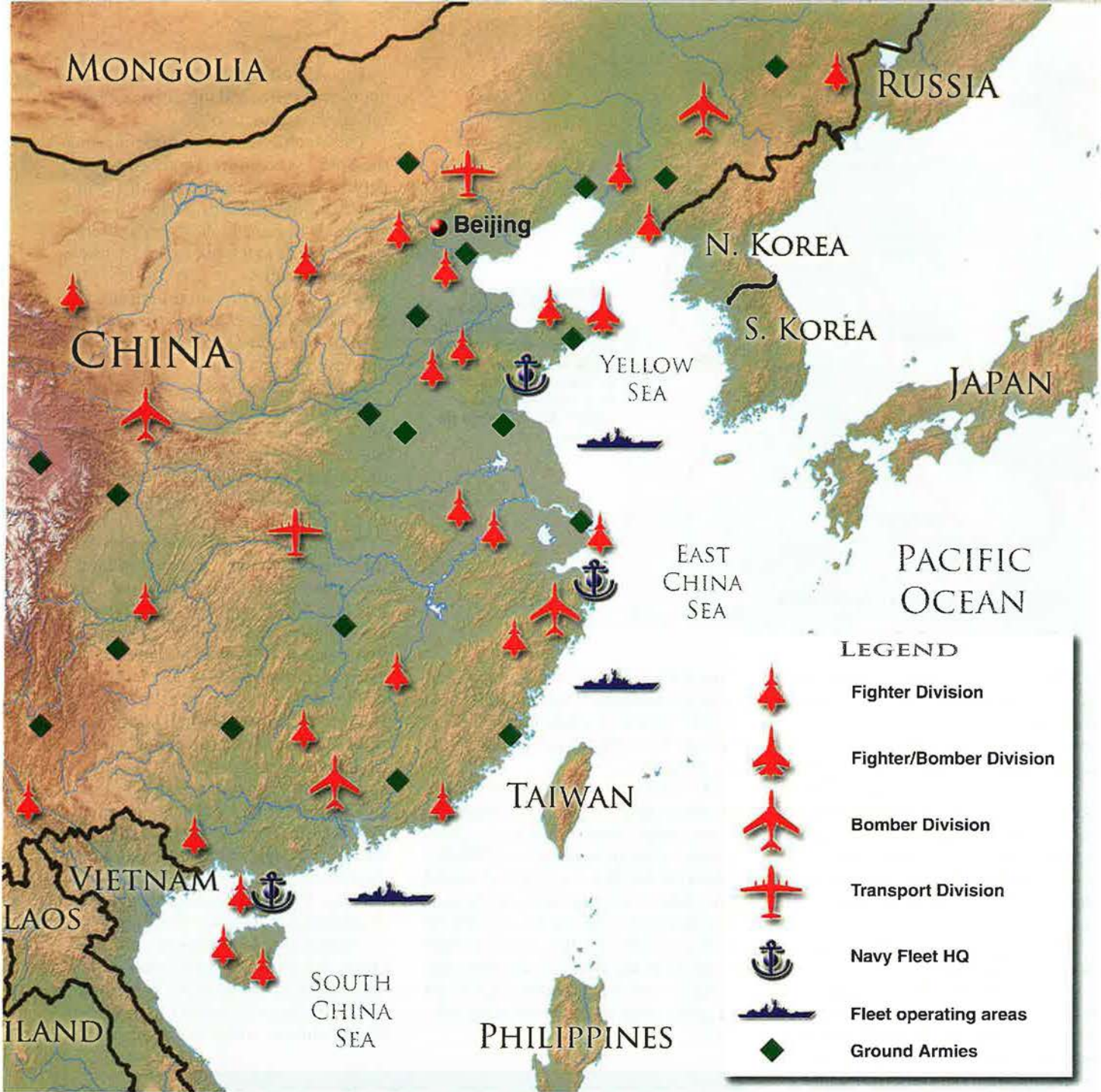
China has no shortage of possible flash points around its periphery, either.

The nation's relations with Vietnam to the south have been testy for more than one thousand years; in 1979, the two fought a brief war, with China suffering an embarrassing bloody nose. China fought a border war with India in 1962, and Beijing still views India as a rival for influence in Asia.

To the north lies China's long border

with Russia, the control of which has caused occasional armed clashes. In the northeastern province of Heilongjiang, or Manchuria, the PLA has deployed a large force to keep North Korean refugees from flooding into the country as a possible result of war on the Korean Peninsula. In the East China Sea, China has a dispute with Japan over several uninhabited, but possibly oil-bearing, islands.

To meet its perceived security needs, the PLA has been undergoing a broad-based buildup, reducing ground forces in favor of airpower, naval vessels, and



Data from DOD, but other sources say forces clustered near Taiwan. Does not show tactical ballistic missiles.

a wide range of missiles, space assets, and tools for information warfare.

2.3 Million Strong

In 1985, 1997, and 2003, China announced it would cut the size of the PLA by one million, 500,000, and 200,000 troops, respectively. By the end of 2005, stated the white paper, China had completed reducing the PLA by 200,000 troops. It added that the military currently has 2.3 million in the force.

China has made progress, the paper claimed, “towards the goal of being

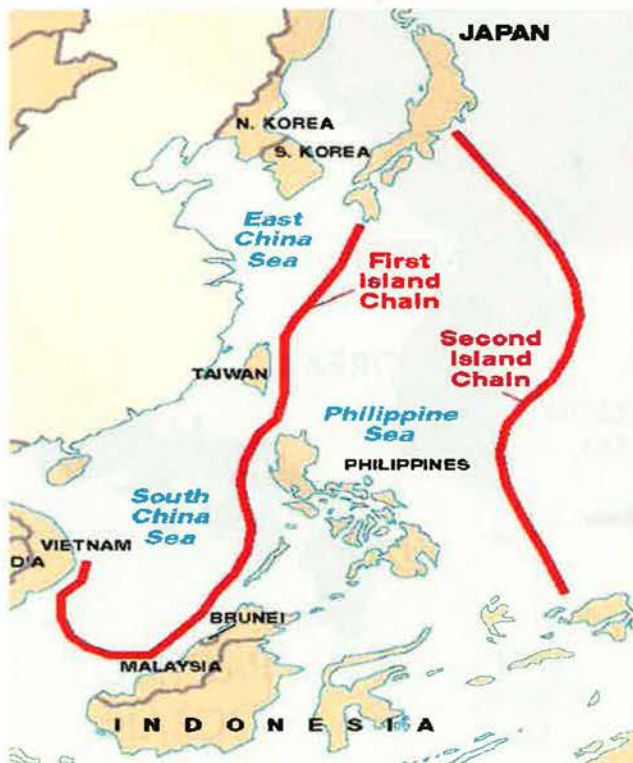
proper in size, optimal in structure, streamlined in organization, swift and flexible in command, and powerful in fighting capacity.”

US intelligence officers say that the PLA Air Force and PLA Navy aviation have 2,300 operational combat aircraft, plus 450 transport aircraft, 90 reconnaissance airplanes, and 470 older systems in flight schools and research units.

Some are capable of aerial refueling, and China is working on airborne warning and control system aircraft along the lines of the USAF E-3 AWACS.

Recently, Gen. T. Michael Moseley, the US Air Force Chief of Staff, reported that China is now operating indigenous tanker aircraft.

The Chinese have organized an interlocking defense of aircraft, 100 surface-to-air missile sites, and 16,000 anti-aircraft guns. The SAMs include three batteries of modern SA-10s imported from Russia, each missile possessing a range of 60 miles. Older SA-2 SAMs produced by China from a Russian design have a range of 30 miles. Some 220,000 troops are assigned to anti-aircraft duty.



Beijing bristles at any sign of "containment." It is pushing its defense perimeter outward from what it calls a "first island chain" to a "second island chain" farther from its shores.

"PLA air defense has shifted from point defense of key military, industrial, and political targets to a new ... modern, integrated air defense system and offensive and defensive counterair operations," DOD reported. "These operations extend beyond the defense of Chinese airspace to include strikes against an adversary's bases (including aircraft carriers) and logistics to degrade the adversary's ability to conduct air operations."

The unnamed adversary is clearly the United States.

In training, says an American pilot with access to the relevant intelligence reporting, "the Chinese are flying more now than they used to but are still not up to the standards of the US or Japan."

To build up its anti-access defenses, China has steadily modernized with 400 Sukhoi Su-27, Su-30, and Su-33 fighters, bought from Russia. The Su-27 is a twin-engine fighter designed in Russia in the late 1970s to counter the US Air Force F-15 and US Navy F-14. The Chinese have one-seat and two-seat versions; Su-27s are also built in China under license as the J-11.

The Su-27, which can fly at Mach 2.35, is the first Chinese fighter capable of competing with Western fighters. In US-Russian mock battles, according to Sinodefence, a private Web site in Britain, the Su-27 outperformed the F-15C Eagle.

The Su-27, however, was designed

principally for air-to-air combat and could perform attack missions only with "dumb" bombs. It is this deficiency that has led China to purchase the multirole Su-30 fighter.

The two-seat, twin-engine Su-30, the most capable fighter possessed by China today, began arriving in 2000. Another order brought 24 Su-30MKK2 fighters to the PLA Navy, which would send them from land bases to fly anti-ship missions. The Su-30 can deliver Russian-made guided air-to-ground weapons in all kinds of weather, day or night, and has advanced air-to-air weapons such as radar-homing missiles.

The aircraft is fitted with electronic countermeasures and surveillance suites for target acquisition.

The Mach 2 Su-30 was derived from the Su-27. The aircraft has two sets of flight and weapon controls and a combat radius of 960 miles. Refueled from the Russian Il-78 tanker, the fighter's radius can be extended to 1,560 miles with one refueling, or 2,100 miles with another. Thus, with two refuelings, an Su-30 based inland could strike Guam or into the Indian Ocean, or loiter over the South China Sea.

Citing Russian sources, Sinodefence reported that China has bought up to 50 Su-33 fighters, another variant of the Su-27, to begin delivery this year to the Chinese Navy. The first two Su-33s will be tested on an airfield and then on a carrier.

Perhaps the greatest leap forward in Chinese airpower occurred in January, when the PLA unveiled the first made-in-China fighter, the Jian-10, also known as J-10, and announced that it was now ready for combat. It is a single-engine, all-weather, multirole fighter developed by the 611 Aircraft Design Institute in Chengdu, under tight security. The prototype made its first flight in mid-1996, but it was not successful. Engineers redesigned it.

The J-10 is fitted with Chinese-made Doppler fire-control radar capable of tracking 10 targets simultaneously while the aircraft attacks four targets simultaneously. The maximum detecting range is estimated at 70 miles. The fighter has 11 hardpoints for weapons and drop tanks, including a Chinese-made radar-homing air-to-air missile. For ground attack, the aircraft can carry laser guided bombs and has rocket launcher pods.



A Chinese H-6 aerial tanker refuels a J-8D fighter. Refueling capability marks a major advance in China's airpower.

SinoDefence.com photo

Informationization Warfare

Running through most pronouncements on China's military is an awkward term, "informationization."

The PLA is "taking mechanization as the foundation and informationization as the driving force," behind improved firepower, more effective assaults, and increased mobility, according to China's most recent defense white paper.

The PLA is speeding up its own revolution in military affairs with Chinese features, the paper said, and is "enhancing in an all-around way its capabilities of defensive operations under conditions of informationization."

The *Liberation Army Daily* stated that "to get the upper hand of the enemy in a war under conditions of informationization" requires that China be "capable of using various means to obtain information and of ensuring the effective circulation of information." Conversely, effective information war also requires that China be "capable of applying effective means to weaken the enemy side's information superiority and lower the operational efficiency of enemy information equipment."

Pentagon analysts believe the PLA is investing in electronic countermeasures, defenses against electronic attack (e.g., electronic and infrared decoys, angle reflectors, and false target generators), and computer network operations. DOD's new China report stated that in 2005, the PLA began to incorporate offensive computer network operations into its exercises, "primarily in first strikes against enemy networks."

With Chinese attention focused on multimission fighters, bombers appear to have less priority. The most advanced ground attack aircraft are probably 40 to 50 JH-7 two-seat fighter-bombers. The PLA has also resumed production of the 40-year-old H-6 medium bomber because it lacked a suitable successor aircraft.

Six Missions

For transport, China has 14 Russian-made Il-76 aircraft and approximately 250 Y-8 and Y-7 Chinese-made turbo-prop airlifters.

The PLA has three divisions of paratroopers, with 10,000 troops each, belonging to the Air Force. PLA ground forces do, however, operate roughly 550 helicopters, the most significant being 200 Russian-made Mi-17 transports and about 225 Chinese-made Z-9 multipurpose helicopters.

At sea, the PLA Navy is expanding with made-in-China warships and submarines and is buying from Russia.

The PLA "appears engaged in a sustained effort to develop the capability to interdict, at long ranges, aircraft carrier and expeditionary strike groups that might deploy to the Western Pacific," the Pentagon believes. China seeks precision strike capabilities that could hold at risk critical US air bases, ports, and surface combatants arrayed in the western Pacific.

ONI has identified six missions for China's Navy: Blockade, attacking sea lines of communication, land attack with missiles, anti-ship campaigns, protecting China's sea transport, and defending China's naval bases. The Navy has 70 destroyers and frigates, 50 amphibious ships, and 45 coastal

patrol craft—but the heart of naval operations is the submarine.

The PLA Navy has been phasing out Russian-built diesel-electric attack submarines. By 2010, estimates Global Security, a research organization, China will have 35 diesel-electric 2,000-ton submarines of the Ming, Song, and Yuan classes built in China, plus eight Russian Kilo submarines.

China is building nuclear-powered attack submarines with four 6,500-ton Shang boats to be added to five 5,000-ton Han boats by 2010. (The backbone of the US attack submarine force is the 7,000-ton Los Angeles-class boat.)

An intriguing question: When will China's Navy acquire an aircraft carrier? Speculation has been churning for 25 years, or ever since Adm. Liu Huaqing was Chief of the Chinese Navy. "To modernize our national defense and build a perfect weaponry and equipment system," the Chinese

admiral once wrote, "we cannot but consider the development of aircraft carriers."

China wants a carrier for international prestige and actual power projection capabilities. It would not, however, need a carrier to attack Taiwan. Land-based aircraft and missiles would carry the brunt of any such assault, as the island sits just 100 miles off mainland China's coast.

Chinese missiles cover the spectrum from conventional short-range missiles to nuclear tipped intercontinental ballistic missiles. The Second Artillery has command over most of the missiles, and nuclear and conventional weapons are often deployed side by side to complicate US target planning.

US intelligence says China has 900 conventional missiles with a range of 600 miles deployed opposite Taiwan, with that force growing by 100 missiles a year. Moreover, the PLA has begun acquiring conventional medium-range ballistic missiles, apparently to increase to 1,800 miles the range at which China can strike with precision against US warships and bases.

Further, China is developing land-attack and anti-ship cruise missiles and precision munitions for artillery. The Pentagon report said, "China is believed to have a small number of [air-to-surface munitions] ... and is pursuing foreign and domestic acquisitions to improve airborne anti-ship capabilities."

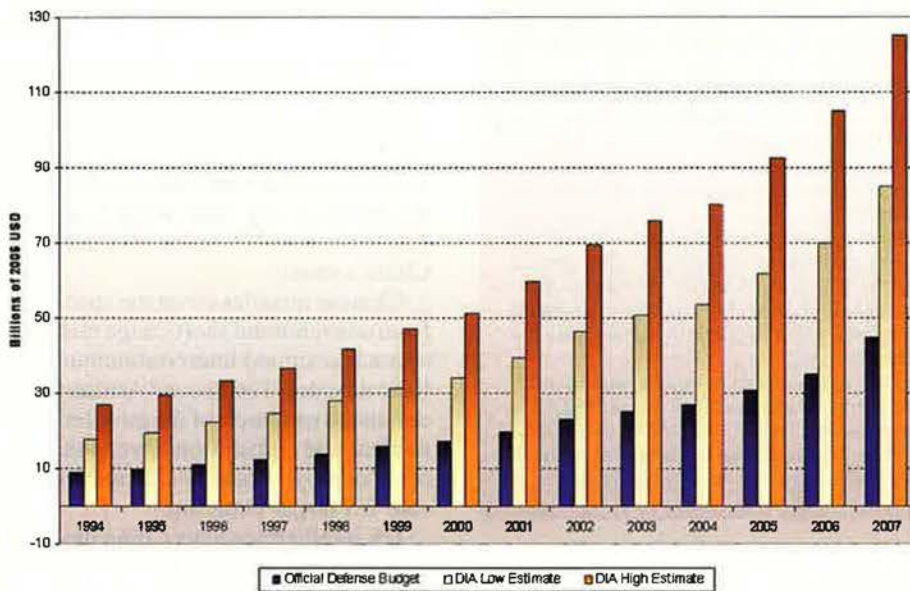
In China's nuclear missile inventory are 20 silo-based CSS-4s with a range of 8,000 miles and 16 to 24 older CSS-3s with a range of 3,300 miles. The CSS-4s have the range to hit the continental United States. Newer missiles are the solid-fuel, mobile DF-31 with a range



The Chinese Navy's Jiangwei-II-class frigate Yichang fires an anti-ship missile during a recent exercise.

SinoDefence.com photo

Military Spending: Three Estimates



of 4,350 miles and the DF-31A with a range of 6,760 miles.

Also being developed is the JL-2 submarine-launched ballistic missile, to be deployed aboard the nuclear-powered Jin boat. In addition, China possesses about 325 CSS-6 missiles with a range of 360 miles and 600 CSS-7s with a range of 180 miles.

Sputnik II

In January, China fired a missile to destroy an old Chinese weather satellite. This watershed event punctuated the nation's ambitions in space; Moseley described it as a "strategically dislocating event" on a par with the launch of Sputnik in October 1957. The Chinese have pursued an aggressive space program as an element of comprehensive national power, as a source of pride in self-reliance, and for both commercial and military use.

Beijing late last year published a space report that made little mention of military activities. The military newspaper *Jiefangjun Bao* noted in April, however, that the US had relied on 52 satellites in the Gulf War, 86 satellites in Kosovo, and more than 100 in the second Iraq War. Another article reported that Chinese leaders knew that US forces in Iraq relied on satellites for 100 percent of navigation, 95 percent of reconnaissance, and 90 percent of communications.

China has thus shown it is keenly aware of the US reliance on satellites for military communications and intelligence. The January anti-satellite shot served notice that, in the event of Sino-US hostilities, China could seek

DOD photo by SSgt. D. Myres Cullen



China's Su-27s, bought from Russia, are the first Chinese fighter aircraft capable of competing with Western front-line warplanes.

to damage or even cripple America's on-orbit systems.

Chinese leaders have laid out a large-scale space plan for the next five years. It calls for improving the reliability of "Long March" rockets, starting a high-resolution Earth observation system, and developing a remote-sensing ground system. The plan includes putting satellites into geostationary orbit, improving "BeiDou" navigation satellites, and launching new scientific and technology-testing satellites.

China's military prowess is clearly on the rise, yet, despite the planning,

training, and money invested in the PLA, US leaders contend that China does not yet constitute a peer threat to US armed forces. Secretary of Defense Robert M. Gates claims the United States is "simply watching to see what they're doing."

In the words of the recent Pentagon assessment, China will "take until the end of this decade or later to produce a modern force capable of defeating a moderate-size adversary." China's leaders emphasize "asymmetric strategies" to gain greatest leverage from China's advantages.

The Pentagon's report cautioned, however, that as PLA modernization progresses, "twin misperceptions could lead to miscalculation or crisis."

First, other countries could underesti-

mate the extent to which Chinese forces and capabilities have improved.

Second, China's leaders may overestimate the proficiency of their forces by assuming that new systems are "fully operational, adeptly operated, adequately maintained, and well integrated with existing or other new capabilities."

The US holds a definitive military advantage over China in the near term. But one cannot rule out new Chinese assertiveness or old regional tensions leading to a military miscalculation, involving a rising power, in a region packed with US allies and interests. ■

Richard Halloran, formerly with The New York Times as a foreign correspondent in Asia and military correspondent in Washington, D.C., is a freelance writer based in Honolulu.



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EXPERTISE. ANSWERS. RESULTS.



Great Expectat

The 2018 bomber—stealthy and bristling with weapons—will be designed to “penetrate and persist.”

By Adam J. Hebert, Executive Editor

Today's Air Force boasts a bulging portfolio of attack capabilities. However, when service leaders take a closer look at what's inside it, they find some deficiencies mixed up with the considerable strengths. Examples:

The stealthy B-2 bomber has long range and a big weapon-carrying capacity, but only fights at night and thus cannot prosecute critical daytime targets.

B-52s also offer range and payload but are extremely vulnerable to air defenses and must attack well-defended targets with missiles from a great distance, giving the enemy time to react.

The B-1B, though supersonic, lacks stealth or standoff weapons.

F-22 fighters can get to and destroy heavily defended targets in high-threat environments; but they can carry only two medium-size bombs and cannot

strike unrefueled from long range.

What's missing, say officials, is an aircraft that can strike from a great distance, survive in a dangerous environment, carry a heavy bomb load, and operate effectively around the clock, in good weather or bad.

The new “2018 bomber” is supposed to be that aircraft.

Air Combat Command recently conducted an analysis of alternatives for such an aircraft, and the Air Force has decided which capabilities it will seek in its next generation long-range strike system. The study evaluated “midterm” requirements, the state of technology, and the need to have a fully operational aircraft on the ramp in 2018.

The results were, in some cases, quite surprising.

“Our analysis shows that the best value, and the one that meets the re-

quirement that we see in ... the 2018 time frame, would in fact be for a new-concept bomber,” said Maj. Gen. Mark T. Matthews, head of ACC plans and programs.

The term “new-concept bomber” immediately conjures up the notion of a “B-3”-type system, which would rule out reopening the cold B-2 production line, creating a cargo-airplane-based “arsenal aircraft,” or modifying B-1s with new avionics and more powerful engines.

Matthews had another declaration. “Our belief is that the bomber should be manned,” he said at a May 1 Air Force Association-sponsored event in Washington, D.C. There had been considerable speculation in recent years that the next long-range strike system might be unmanned or optionally manned.

While taking the pilot out of the

The 2018 bomber is meant to be long-range, stealthy, nimble, and lethal. At left is a Northrop Grumman illustration of the notional aircraft.

cockpit is a possibility for the future, he said, the aircraft that goes operational in 2018 definitely will have a pilot on board.

As Matthews tells it, an airman in the cockpit can respond to adaptable enemies hiding in the fog of war, better integrate the onboard systems, and make spot decisions about when and how to launch weapons. "In the 2018 time frame, we haven't obviated yet the need to have [a] man in the cockpit," he said, "so that's going to be a large part of the requirement."

USAF officials expect the new bomber to have top-notch low-observable "stealth" characteristics. A key need is the ability to loiter in or near heavily defended airspace. B-1 bombers have been invaluable against targets in Iraq

however, which cannot be assumed in the future as advanced fighters and air defenses spread.

The next bomber must be able to get through air defense systems that would blunt attacks from today's B-1s and B-52s. In a nutshell, the need is to "penetrate and persist," said Maj. Gen. David E. Clary, ACC vice commander.

Advanced sensors and avionics are also expected. The aircraft will link up with future networks and must track and destroy targets that are on the move and difficult to detect.

The bomber will be subsonic, as are today's B-2 and B-52 aircraft. That puts an end to the question of whether a practical hypersonic jet aircraft could be built within the next decade. Even a B-1-style supersonic jet aircraft was deemed too expensive.

Variable Speed

The 2018 deadline was set by the 2006 Quadrennial Defense Review, and ACC's analysts weighed cost and capability trade-offs such as supersonic speed vs. subsonic speed. The requirements are based on "best effectiveness for the cost," said Lt. Col. Kevin Shorb, AOA director at Langley AFB, Va.

Marginal improvements at great cost are not necessarily desirable. Major defense contractors certainly have the ability to build a supersonic stealth bomber, but USAF leaders simply deemed the cost of doing so too high.

Matthews cited the explanation voiced

by Gen. Ronald E. Keys, the ACC commander: If a hypersonic weapon "can get me to the target 40 percent faster, but the enemy is still gone by the time the weapon reaches it, why would I spend money on it? ... It's 100 percent ineffective."

Supersonic speed adds considerable complexity and cost to a design, and is not the be-all and end-all for strike aircraft. A case in point is the B-52, which first flew in 1952, has a top speed of 0.86 Mach, and remains a vital part of the nation's air fleet. In the meantime, the B-58 Hustler and FB-111—each capable of flying at twice the speed of sound—have come and gone.

"We anticipate the aircraft would have the capacity to ... carry in the range of [14,000] to 28,000 pounds of ordnance, and would have to have a range in excess of 2,000 miles," without refueling, said Matthews.

This next generation system may be in the medium-bomber class, as today's heavy bombers feature about twice the minimum range and double the weapons load as this proposal. The 2018 bomber's payload specs and minimum range are in the same class as the FB-111, today's F-15E Strike Eagle, and even the notional FB-22.

Matthews quickly noted, however, that "we haven't come to hard determinations of exactly what those numbers would be." The winning mix of weapons, aircraft performance, and sensors will reflect issues of cost and producibility.

ions

and Afghanistan, where they have operated as "roving linebackers" in the air, ready to deliver large weapons loads on short notice. Those two areas have benign air defense environments,



An airman transports a AGM-86C cruise missile to a B-52 at RAF Fairford, Britain.

USAF photo by SSgt. Jim Howard



One of USAF's 21 B-2 bombers takes off on a Red Flag 2007 mission. All 21 will receive a stealth coating upgrade, among other improvements.

In May, the proposed bomber requirements had been approved by the Air Force requirements council, but were awaiting blessing by the Joint Staff.

To be a real candidate, a particular technical capability needs to be at Technology Readiness Level 6 (meaning that a system model or a prototype has been demonstrated in a relevant environment) by 2009. The assumption is that the Air Force "can take where we are in 2009 and put it on the ramp in 2018," explained Clary.

The Air Force still has an interest in less-mature technologies such as hypersonic speed, but those kinds of advanced development efforts will be directed toward a follow-on system scheduled to appear around 2034, when the existing fleet of bombers may be on its last legs, structurally speaking.

The required number of aircraft was not studied in the analysis. Officials refused to speculate on the possible size of the inventory. The QDR, however, directed the Air Force to increase "long-range strike capabilities by 50 percent and the penetrating component ... by a factor of five by 2025."

A new system will be able to incorporate all the advances that have occurred since work began on the B-2 in the late 1970s and go beyond the upgrades that are being retrofitted onto today's bombers.

On the surface, the new requirements seem similar to what is in use today, but stealth technology has been around for more than three decades. In the interim, it has come a long way, most especially in its ease of maintenance.

The new bomber campaign marks

something of a turnaround in USAF's thinking. Eight years ago, the Air Force determined that its existing bomber fleet could persevere for decades. The controversial 1999 bomber roadmap proposed delaying the start of a new acquisition program until 2019 and not fielding that bomber until 2037.

This would have greatly extended what airpower analyst Rebecca Grant now refers to as a "bomber gap." In a recent study for AFA's Eaker Institute, "Return of the Bomber," she argued that such a gap emerged in 1997 with delivery of the last of 21 B-2 bombers. She noted that, for 80 years, "from 1917 until 1997, America's airmen always had a bomber either in development, in design, or in test." But for a decade now, this has not been the case.

Retired Air Force Gen. Richard E. Hawley, former commander of US Air Forces in Europe and Air Combat Command, also expressed concern about the lag in bomber production. He noted at AFA's May 1 bomber forum that an old aircraft's ability to keep flying does not necessarily mean it will be effective in combat.

This distinction is significant, because the Air Force's most recent estimates are that the B-1 will remain structurally sound until 2038, the B-52 until 2044, and the B-2 until 2058. Therefore, if the Air Force waits for the existing bombers to fall apart, it will be waiting for a very long time.

But the Air Force has traditionally "not replaced airplanes because they started falling apart," Hawley noted. "We've replaced fleets ... because the environment in which they operate

had changed and we needed a new capability."

Maj. Gen. David M. Edgington, now air component coordinator for the Multinational Force-Iraq, said that the 2006 QDR selected a target year of 2018 partly because of intelligence estimates about likely future threats.

The Air Force has stepped up the required fielding date for a next generation bomber several times since 1999 and now embraces a three-stage approach for bomber modernization.

The first stage features improvements to the existing fleet. The second stage features the platform to be fielded in 2018. In the third stage, USAF proposes to field a revolutionary system, using technology deemed too immature to count on by 2018.

This system may feature capabilities such as directed energy (lasers), advanced engine technology, or hypersonic speed.

The Air Force has a comprehensive upgrade program in place for each of the three existing bombers, which it considers Phase I of its long-range strike modernization program. For example, the B-2 wing at Whiteman AFB, Mo., now has eight jet aircraft that have received the Advanced High Frequency Materials (AHFM) upgrade, a significant LO enhancement over the original design. Three bombers get the modification per year, as they go through depot maintenance in Palmdale, Calif.








AHFM replaces the original tapes and caulks used to seal access panels and fasteners on the B-2 with a "spray on" coating that is applied much more quickly. The "cure time" before the bomber is ready to return to action is also much faster.

90-Minute Fix

Whiteman officials demonstrated the difference at a Red Flag exercise earlier this year. An AHFM-equipped B-2 needed a flight-control part replaced. Maintainers did so, and an hour-and-a-half later, the B-2 had "the same low observable signature it had prior to the repair," officials explained. A non-AHFM aircraft receiving the same repair would have been out of service for three days.

The B-2 is getting other sustainment and capability upgrades as well. The radar is a "secondary user" on its frequency, which can interfere with commercial users, and it will be replaced by a new active electronically scanned array. New weapons computers, nuclear-survivable

Selected Strike Options

	 MQ-9	 F-15E	 FB-22 (notional)	 B-3(notional)	 B-1B	 B-2	 B-52
Approx. Combat Radius	1,800 mi.	1,000 mi.	1,800 mi.	2,000+ mi.	4,000 mi.	3,500 mi.	4,400 mi.
Weapons Load	3,750 lbs	23,000 lbs	15,000 internal 30,000 total	14,000- 28,000 internal	48,000 lbs	40,000 lbs	70,000 lbs
Top Speed	slow	Mach 2.5	supersonic	subsonic	supersonic	subsonic	subsonic
Stealth	No	No	Yes	Yes	No	Yes	No

communications, and low-maintenance windshields are also desired.

The B-1B has for years had a broad range of upgrades in the works, as it transitioned from a nuclear-only bomber to a conventional-only platform. But many of the advances the B-1 has gone through in recent years have been done in an ad-hoc manner instead of a coordinated fashion.

"It is time to gather up all these Rube Goldberg additions and integrate them" on the B-1, said Clary.

Modern glass cockpits will be more sustainable, and new data links will allow for dynamic retargeting faster and more accurately. A priority for the B-1 is to add targeting pods, which have already been used to great effect by B-52s. "A man standing out in a field next to a mud hut is not going to be seen on radar, but I can see that on a targeting pod," said Lt. Col. Craig Campbell, deputy chief of ACC's combat aircraft division.

In a B-1, "I can sit over Afghanistan for eight to 10 hours" and reach any point in the country in about 20 minutes, he noted. The Sniper targeting pods will become operational in the summer of 2008, if everything goes according to plan on an aggressive schedule.

"The potential exists for the B-1, in three to four years, to be considered a B-1C," added Campbell.

The Air Force's oldest bomber is also its most reliable, but currently has excess capacity. USAF has proposed drawing down the B-52 fleet to 56 aircraft, 32 of which would be combat coded.

The 2007 National Defense Authorization Act orders the service to maintain a fleet of 44 combat-coded aircraft. Pending legislation instructs the Air Force to keep an overall fleet of 74 B-

52s, but Keys said even a requirement for 44 combat tails could be met with an overall fleet of 56.

Additional aircraft come at a price, however.

When it comes to maintaining old airplanes, the cost curve is "not linear," noted Clary. It is accelerating. In the case of the B-52, the average operating cost per aircraft has increased from \$5.5 million in Fiscal 1996 to \$13.6 million in FY06 (in then-year dollars, not adjusted for inflation). Officials said taking the fleet down to 56 B-52s would save taxpayers roughly \$200 million per year.

US Strategic Command requirements are always a part of the equation for figuring out how many B-52s the Air Force needs, and demand for nuclear cruise missiles has declined as well.

The Air Force currently maintains an arsenal of 1,140 AGM-86 Air Launched Cruise Missiles and 460 newer and stealthy AGM-129 Advanced Cruise Missiles. The B-52 is the only platform for these missiles.

Recent plans call for USAF to retire all of its ACMs and cut the ALCM fleet by more than 500 missiles, leaving 528 nuclear cruise missiles. Maj. Gen. Roger W. Burg, director of strategic security, said the ALCM force would be consolidated at Minot AFB, N.D., and all excess cruise missile bodies would be destroyed.

"These cruise missile force structure changes are part of a balanced force reduction that supports both Presidential direction" and the Moscow Treaty requirement to get below 2,200 deployed nuclear weapons by 2012, he said.

Burg explained that the ACM was singled out for elimination partly because it has reliability issues and higher maintenance costs.

The B-52 is also USAF's primary conventional cruise missile delivery platform. The Air Force has a "very limited number" of CALCMs, said Campbell, which "in some scenarios will go very quickly," but current cruise missile inventories meet operations plan requirements.

The option of converting decommissioned ALCMs to non-nuclear CALCMs "will be evaluated," said Burg, but "we're talking about technology that is 25 years old." Furthermore, additional conversions are not in the budget.

The prospective CALCM successor, the Joint-Air-to-Surface Standoff Missile, has run into serious reliability problems, however, and JASSM's future is far from certain.

The Air Force has already received about 600 of the conventionally armed JASSMs, but they have only worked about 60 percent of the time in flight tests. Sue C. Payton, Air Force acquisition executive, described that reliability rate as "not acceptable."

Regardless of how the cruise missile issues shake out, Col. James A. Firth, ACC's combat aircraft division chief, noted that a fleet of 44—or even 32—combat-coded B-52s meets all projected wartime requirements.

Unmanned systems have also been in flux. The Air Force has abandoned the Joint Unmanned Combat Air System, and its 2018 bomber will be manned, but that does not mean unmanned strike is dead. The more readily attainable systems—namely, Predators and Reapers—are being purchased and deployed as quickly as possible.

The Air Force has a wide array of alternatives available to improve the nation's long-range strike capabilities, and the service intends to make the most of these options. ■

What will it take to get some stability into the Air Force program?

The Air Force Starts Over

By John A. Tirpak, Executive Editor

Just a year ago, the Air Force had a program plan that it thought would stick. It had weathered various strategy and system reviews and had sorted out issues of base realignment and future end strength. It had faced and made many major decisions.

The resulting overall program, although far from what the service really needed, at least seemed to offer the promise of stability. After nearly two decades of turbulence, the prospect of clarity and resolution was welcome.

However, external pressures now have twisted even this latest Air Force program out of shape, virtually obliging USAF to start over in developing its future plans.

The Air Force will likely have to add more airmen and keep more old aircraft than it had planned. It will be able to buy far fewer new fighters than it needs and will be forced to keep old ones longer. It could well end up postponing acquisition of a new bomber. To cut costs, USAF is slashing the size of its nuclear weapons inventory. Meanwhile, it is “burning up” transports and fighters in combat at a high rate. The service also faces a looming huge bill to extend the lives of aircraft it believes are or will soon be too tired or obsolete for combat.

Air Force Chief of Staff Gen. T. Michael Moseley told Congress early this year that big changes in the US military, announced near the end of 2006 and at the 11th hour of the budget process, practically voided “plus-two million man-hours” of labor in crafting USAF’s 2008 spending proposal. The plan had been carefully balanced, he said, so that the service could live within its topline, albeit with a degree of risk.

However, the big changes were made so late in the cycle, he said, that there wasn’t enough time to work them into the plan before the budget deadline. A new, financially and structurally



Illustration by Erik Simonson

rebalanced program won’t be ready until late this fall, when the service puts the wraps on its 2009 funding request.

A big monkey wrench in USAF’s plans was the White House’s decision last fall to increase the size of the ground forces—Army and Marine Corps—by 92,000 people over the next few years. The boost is intended to relieve the stress on ground troops making multiple return tours to Iraq and Afghanistan. However, the action will have a ripple effect seemingly not taken into account; namely, the Air Force will need more people and equipment to support the ground force expansion. It wasn’t funded to do so.

The cost to the Army and Marine Corps of adding those troops is expected to be around \$60 billion, a figure that ignores any costs the Air Force now must bear to support them.

Besides needing more airlifters to get larger numbers of ground forces and their gear to battle, USAF will require more tactical air controllers and other battlefield airmen to integrate with the expanded ground branches. Moseley tasked Gen. Duncan J. McNabb, chief of Air Mobility Command, and Gen. Ronald E. Keys, head of Air Combat Command, to develop estimates of what the ground force expansion will require in terms of airlifters and battlefield airmen, respectively.

McNabb’s result—a highly con-

denser version of a Mobility Requirements Study—determined that if all 92,000 new ground troops fit out combat brigades, it will take 335 strategic airlifters to move them around—about 35 more than the Air Force’s plans call for, Moseley said in June. If, however, some are put into support organizations, USAF’s airlift burden will be less.

Needed: 1,000 Airmen

Again, assuming that all the new ground forces are applied to combat units, Keys determined that USAF will have to supply about 1,000 battlefield airmen to embed with them.

The airlifters would cost upward of \$7 billion, while the airmen would cost more than \$100 million per year.

“We are still waiting to hear” from the Army and Marine Corps exactly how they will bring on the new ground troops, and therefore what resources USAF will have to apply to support them. Moseley said in June. However, in April, he said, “There is no money inside the Air Force program right now” to acquire more airlifters or airmen.

“I will resist” funding such a program by cutting any of the Air Force’s top priorities, Moseley said in April. He said he expects to announce new “roadmaps” for every aspect of Air Force planning—organizations and programs—by the end of this month, and he said they will be released to the public.



Photo by Eddy Asolo



Priorities: New space systems (illustration far left); more battlefield airmen, such as SrA. Rob Curry and SSgt. Elijah Edwards (above); and the F-35 fighter (left).

The Air Force has long been thwarted in its attempts to manage its “own inventory” and retire those older aircraft that are increasingly costly to fly and maintain. Although giving a little on older C-130Es, Congress has balked at retiring KC-135Es or B-52s until their replacements start to enter the inventory. This process will take at least four years for tankers and at least 10 for bombers. The Air Force wants to retire old airplanes and plow the saved operating costs into new systems that will be more effective and less pricey to run.

“Operation and maintenance costs have gone up close to 180 percent over the last 10 years operating these old aircraft,” Moseley told defense reporters in April. The cost surge mainly has to do with repairing or “remanufacturing” aircraft that are stress-fatigued, and finding or fabricating parts that haven’t been made in decades.

Another ravenous consumer of USAF funds is personnel. Moseley noted that personnel costs have risen 57 percent in the last 10 years.

In May, the White House’s Office of Management and Budget pleaded with Congress to temper its zeal to provide ever-more-generous compensation to uniformed personnel. It pointed out that adding a half-percent boost to the Administration’s requested 3.0 per-

The Air Force’s acquisition priorities, in order of importance, are:

- 1) the KC-X, a new tanker to replace the KC-135E
- 2) CSAR-X, a new combat search and rescue helicopter
- 3) space systems
- 4) F-35 fighters
- 5) a new bomber, to be deployed by 2018

Other disruptions have played havoc with the Air Force program. Record high—and climbing—fuel costs pushed the service to cut flying hours by 10 percent, to be offset by simulator time. That didn’t set well with Congress, and after grilling from unhappy members of both houses, Moseley admitted that

he, too, was having misgivings about the idea. Still, for every \$10 per barrel climb in the cost of fuel, the Air Force must find another \$616 million annually to pay for it. Moseley said he doesn’t believe the cost of fuel will come down, either.

In its 2008 authorization bill, the House voted to add \$403 million to increase all the services’ flying hours, but the amount wasn’t enough to get the Air Force’s mission capable rates to the service goal of 80 percent. Instead, MC rates will hover at or below 75 percent for at least another year. Across the board, USAF readiness rates have declined by 17 percent over five years.



USAF A1C Nathan Doza

SrA. Gil Alicea removes panels from an F-16 wing during a phase dock inspection. Maintainers inspect all internal F-16 parts every 400 flying hours.

cent military pay raise would cost the Defense Department about \$7 billion over five years. Growth in health care costs for all the services, coupled with Congressional denial of Pentagon plans to get military personnel to bear some additional co-pays and other fees, will take another \$16 billion chunk out of the budget. Together, those items could pay for tankers and USAF fighters over the same period.

The Air Force's end strength request for 2008 was 328,600 active duty personnel, and Moseley said the service's financial plans hinge on getting down to 316,000. Air Force Secretary Michael W. Wynne has explained that the service can get by with that number of people, but only if USAF is allowed to buy new equipment that requires fewer support personnel.

The 316,000 figure, however, was determined before the Army and Marine Corps were expanded.

Nothing Left To Cut

The Air Force volunteered to cut 40,000 active duty equivalents from its ranks in order to pay for modernization programs. There was no place else to cut: In wartime, readiness accounts are off limits and infrastructure had already been decided by the Base Realignment and Closure process. That left only people to cut to find more money for programs.

Other issues are eating into the Air Force's buying power. There has been above-average cost inflation in building materials and aerospace metals, on which the Air Force is dependent. A growing shortage in the availability of titanium, for example, has directly led

to delays in delivering F-22 fighters and other aircraft.

Moseley told reporters that the Air Force-specific portion of the 2008 budget adds up to \$110 billion. However, adding in an "unfunded priorities list" of items the service needs but was denied Pentagon permission to request, along with the service's 2007 supplemental request, brings the actual required amount to \$145 billion.

"That tells you the magnitude of the problem" in funding, he said. Moseley has said the service needs an extra \$20 billion annually, just to tread water.

The No. 1 priority for the Air Force is to replace its oldest aerial tankers, which date back to the 1950s. The entire ability of the Air Force to project power and conduct operations a world away hinges on tankers, but the service has been blocked from getting them for six years, due to an aborted leasing plan and fallout from the Darleen A. Druyun scandal.

Early this year, USAF released its final request for proposals for the KC-X, and is expected to choose a winner this fall. The Boeing KC-767 and the European Aeronautic Defense and Space Co. (EADS) KC-30 are the two contenders for the program. The Air Force wants to buy 179 KC-X aircraft, in a first batch of 80 and a second of 99. Although it originally thought it might buy two types of aircraft, the service has decided to stick with just one, to reduce logistics costs. It may also use the selected aircraft as the basis of a next generation fleet of intelligence-surveillance-reconnaissance aircraft. The Air Force has budgeted \$13 billion to buy KC-Xs through 2013.

If the program doesn't deliver on time—if, as top service leaders predict, the program will be delayed by protests by the losing team—USAF will face a formidable bill to keep KC-135Es going. Already, the fleet is in need of a \$1.4 billion strut repair or will face grounding.

The service's second priority is the CSAR-X replacement for the HH-60 Pave Hawk search and rescue helicopter fleet, which is worn out from heavy use and which has never really been large enough to meet requirements. Moseley has called it a "moral imperative" to invest adequately in a system to retrieve airmen shot down in battle, and USAF plans to buy 140 aircraft for the mission.

However, the CSAR-X program can't seem to get airborne. The Air Force selected Boeing's HH-47 Chinook helicopter last year, but losing bidders protested to the Government Accountability Office that USAF failed to follow its own rules and common sense in evaluating costs and value. The GAO upheld some of the protesters' arguments.

Top service officials predict lengthy litigation is still to come. Moseley lamented that the program had become more "about lawyers" than about picking up downed airmen, who would pay the price for the program's delay.

Many of the Air Force's key space systems have suffered delays and explosive cost growth over the last decade. It's a problem that Air Force Undersecretary Ronald M. Sega has chalked up to unrealistic initial cost estimates as well as an Air Force acquisition system that has bled away its competency to manage large, complex space programs. However, Sega reported that there has been success in arresting cost growth on most systems, chiefly by imposing discipline on the habit of constantly adding new requirements. Stability, Sega said, will help USAF space more than anything else.

The test of a Chinese anti-satellite weapon earlier this year also prompted the Air Force to boost its efforts in developing space situational awareness programs, a move that Congress supported. Moseley said he had tasked Air Force Space Command chief Gen. Kevin P. Chilton to "take a look at the post-ASAT shot" and determine where the service needs to bolster its space capabilities. However, Moseley stopped short of urging that an American ASAT program be launched.

“Anything beyond defensive counterspace now requires a policy discussion and a set of decisions at a higher level than Air Force Space Command or the Department of the Air Force,” Moseley told reporters in April.

The Senate, in its 2008 defense authorization bill, determined that the Space Radar, a high-profile program that could provide the ability to maintain persistent surveillance over world hot spots, should proceed only with greater interagency cooperation.

Moseley said in June that he will also put new emphasis on “responsive space” efforts—namely, to obtain the ability to loft satellites into orbit on very short notice.

The Air Force has just two manned combat aircraft programs in production: the F-22 and the F-35 fighters. Both aircraft are stealthy, “fifth generation” fighters exploiting the most advanced technology available. The F-22 is being delivered at the rate of 20 per year. The official “program of record” is for 183 of the fighters, but this figure has always been a budgetary accommodation and not based on the requirement, which is for 381 aircraft. Under current plans, the F-22 program will start shutting down in 2010, but the service has the option to keep F-22s in production if there are delays with the F-35 fighter, which has just entered low-rate production of initial test aircraft.

Under last year’s Quadrennial Defense Review, the Defense Department leadership agreed that there should be no interruption in building fifth generation fighters, opening the way to buys of more F-22s. However, to reach USAF’s goal, it would take 10 more years to bring the buy up to USAF’s stated requirement of 381. Wynne has said that he expects USAF will want to go beyond the 183 on order, with at least another 20 likely for the 2011 budget.

So far, the Air Force has not backed away from its long-held objective of buying 1,763 F-35s, which are to replace the F-16, A-10, and some F-117 aircraft. However, while the service planned to buy 110 of the aircraft annually, its latest plan calls for buying only 80 per year at maximum, meaning that USAF’s numeric goal would not be reached until 2034.

The F-35 is tracking well to the schedule and cost set for it two years ago and has had a largely problem-free early flight-test program. The Air

Force is expected to achieve a limited initial operational capability with the F-35 in 2013.

“We should be buying the Joint Strike Fighters at 80 to 100” per year, Moseley asserted. “We should be buying these ... in economic order quantities that allow the manufacturers to get at the best delivery price and to get us to recapitalize faster,” but the planned budgets won’t allow it, he said.

The Air Force plans to keep about 178 F-15s indefinitely, since it won’t be getting about 200 of the F-22s it needs. The aircraft retained will be the most “healthy” of today’s fleet, and they will get improvements to their radars, avionics, and weapon systems.

Shorter Life Expectancy

The F-16 fleet is in the process of receiving both structural life extension and system improvements, but heavy use in Iraq and Afghanistan has sharply eroded the fleet’s life expectancy, which is expected to be about 25 percent less than was anticipated for normal wear and tear. This fact pushed the F-35 to the fourth most urgently needed priority on the Air Force’s list.

The Air Force has about 1,300 F-16s today, but that number will drop to about 1,100 by 2013 and will decline by about 100 per year afterward. If the F-35 is severely delayed, or if the Air Force can’t keep the annual procurement in the 80 per year range, then the F-16 will have to undergo a life extension program beyond measures already being taken. The improvements would be expensive and add no new combat capability to the force.

Hard use also compelled the Air Force to undertake a broad rehabilitation of the A-10 Warthog. Most of the A-10 fleet will receive all-new wings, because cracks were discovered in many of the airframes. The type will also get a precision engagement upgrade, allowing it to use the latest weapons, as well as a modern cockpit. About 223 A-10s, so modified, are now expected to remain in USAF’s inventory through 2028 or beyond.

The Air Force expects to phase out the last of its F-117 stealth attack aircraft next year. Its mission will be taken over by the F-22 and F-35.

A new bomber is in the planning stages, but has yet to get under way. Although senior USAF officials have long speculated the aircraft would be supersonic, hypersonic, or unmanned, the service has zeroed in on buying a subsonic, manned bomber with extreme stealthiness. It will have an unrefueled combat radius of at least 2,000 miles and be able to carry up to 28,000 pounds of ordnance.

In yet another move to lower its costs, the Air Force announced earlier this year that it will slash the size of its nuclear arsenal, trimming away all 460 of its AGM-129 Advanced Cruise Missiles. The stealthy missiles, which can only be carried on B-52Hs, were costly to maintain and represented a system unlikely to be used, Wynne reported. The Air Force also said it would further reduce its inventory of nuclear AGM-86B Air Launched Cruise Missiles—again, to save money. The service will investigate converting some of the missiles into conventional



An MQ-9 Reaper unmanned aerial vehicle from the 42nd Attack Squadron taxis into place at Creech AFB, Nev.



In this artist's conception, a new tanker refuels a B-2 bomber. The tanker is USAF's top priority.

weapons, but offered no concrete plan to do so.

Also in the nuclear arena, USAF decided it will confine its intercontinental ballistic missile fleet of Minuteman IIIs to 450 missiles. Another 50 will be taken out of service and used as fleet reliability test articles. All 500 are slated to receive a suite of upgrades to improve their maintainability and navigation accuracy.

Supplementing both fighters and bombers in the attack role will be Predator and Reaper unmanned aerial vehicles, described by USAF as a "killer scout" and "hunter-killer" aircraft, respectively. The Air Force plans to buy about 250 Predators and about 80 of the larger Reapers, which can carry a range of air-to-air and air-to-ground ordnance.

Likewise, the Air Force is continuing development and production of the Global Hawk high-flying intelligence-surveillance-reconnaissance UAV, of which a fleet of 60 is planned. However, USAF has so far not figured out a plan to replace its major ISR aircraft, the E-3 AWACS, E-8 Joint STARS, and RC-135 Rivet Joint. The E-10 multi-role command and control aircraft was canceled in the FY07 budget, and no successor has yet been named.

A new radar that was to equip the E-10, the multiplatform radar technology insertion program, or MP-RTIP, will likely be fitted to Joint STARS, with Congress' blessing. The E-8 is also likely to receive a badly needed re-engining to improve its climb, persistence, and electrical generation power.

The manned U-2 reconnaissance aircraft will remain in the Air Force inventory until about 2012, or until its

unique signals intelligence function can be duplicated by its chosen successor, the Global Hawk. Moseley said he will not retire the U-2 until his field commanders are comfortable doing so.

The Airlift Question

Airlift continues to be one of the Air Force's toughest programmatic problems. Last year, following the QDR—which incorporated a limited mobility study—the service decided it could manage with 180 C-17s and about 110 C-5As and Bs for strategic lift, provided the C-5s received both a structural and re-engining upgrade as well as an avionics upgrade to a new configuration, C-5M.

Congress added 10 C-17s to the Air Force's program last year, though, because the type has been highly successful in a range of operations but is being used at an extremely high tempo. Also, the Pentagon's last major mobility study had left many unanswered questions about future requirements, just as Boeing was preparing to shut down the production line.

The Air Force believes it has at least another year to figure out what to do in strategic lift before the C-17 line is closed beyond the point of economic return. It has stated since the QDR that it wants to get the results from testing the C-5M upgrade before deciding its path ahead in strategic lift.

However, when costs began to rise on the C-5 upgrade in the spring—threatening a Nunn-McCurdy cost cap breach—the Air Force began to float the idea of buying another 30 C-17s and reducing the size of the C-5M program. Senior leaders also complained that it didn't look like the Galaxy would achieve the promised 75 percent mission capability

rate that made the upgrade worthwhile in the first place.

Since then, Lockheed Martin, which is performing the C-5 re-engining, has said it will offer a fixed price contract on the program, and match or better the Air Force's MC goals.

Rising costs likewise compelled the Air Force to reduce the scope of the C-130 Avionics Modernization Program, being performed by Boeing. To pay for the increases, USAF cut the number of transports to be so modified, by 118 aircraft. The Air Force continues to buy new C-130J aircraft, but not at a rate that will allow it to replace its oldest C-130Es—which have wing box cracks—in a timely manner.

The Air Force is also trying to decide how a new aircraft will fit into its overall mobility strategy, and this, too, has put USAF plans in abeyance. The Air Force is partnered with the Army on the Joint Cargo Aircraft, a small transport designed to support far-flung ground troops and operate from very small airstrips. Just how much the JCA will absorb some of the mission of the C-130 is not yet clear, but the Air Force supports the program because it had been running some C-130 missions in Southwest Asia half empty.

Moseley said in June that he also envisions the JCA as being a platform around which coalitions can be built. Much as the F-16 is used by many coalition partners, Moseley sees the JCA as a way for cash-strapped countries to participate in joint activities. He also sees it as a principal Air Force contribution to the nascent Africa Command.

In mid-June, the Army and Air Force selected L-3 Communications to provide the C-27J Spartan as the JCA. A contract awarded at the time specified that the two services will buy at least 78 of the small cargo aircraft, which will replace the Army's C-23 Sherpa and some C-12 Huron aircraft.

The joint arrangement, however, didn't sit well with the Senate Armed Services Committee, which said in its 2008 defense authorization bill markup that the Air Force should be given responsibility for the fixed-wing cargo mission.

Moseley said that if the Air Force can get a procurement raise of \$20 billion a year, the service can do everything it has to do, but with little room to spare. Without it, though, all accounts will be short, capabilities will diminish, and so will the nation's "sovereign options." ■



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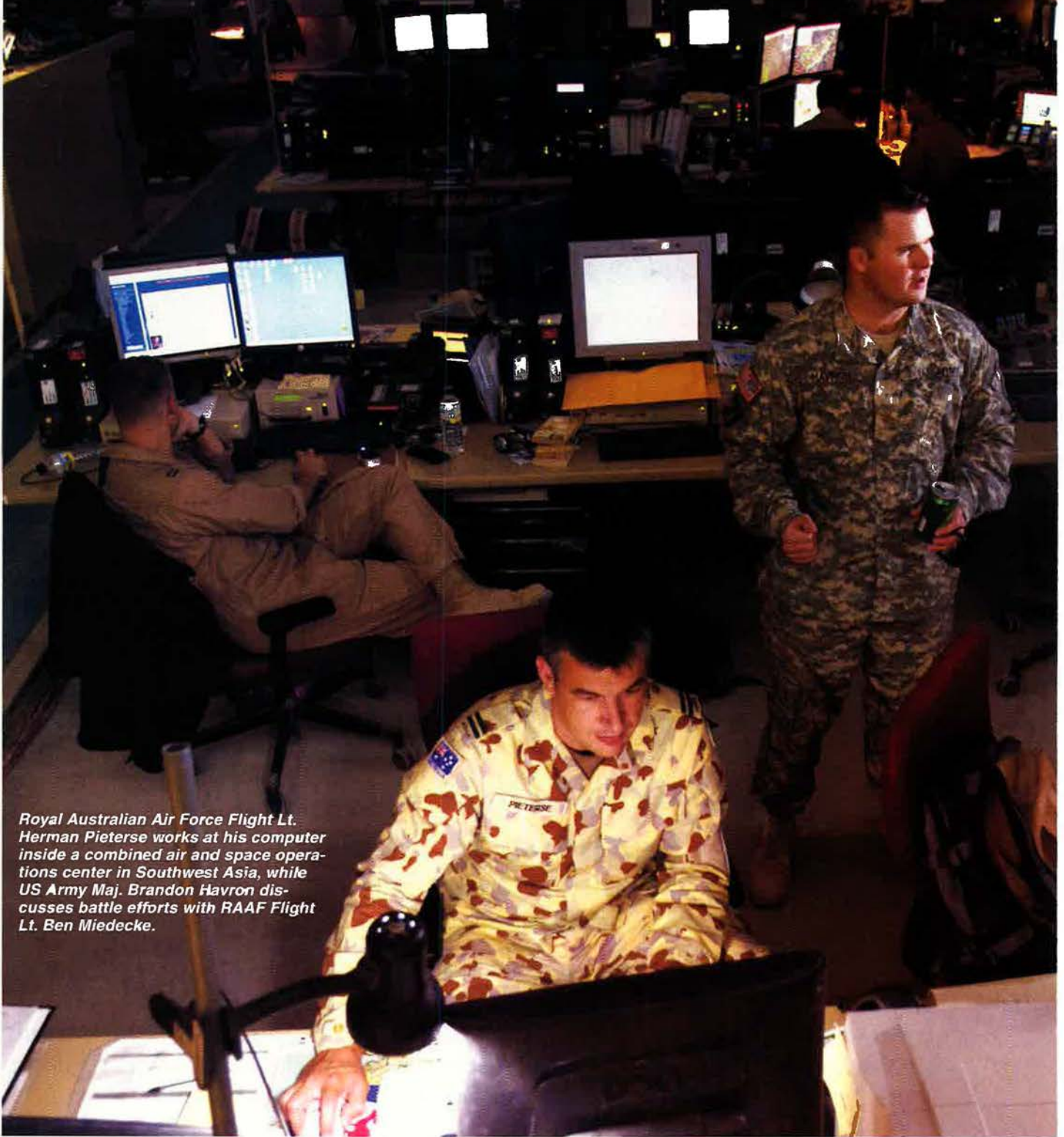
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Room With a Vi



Royal Australian Air Force Flight Lt. Herman Pieterse works at his computer inside a combined air and space operations center in Southwest Asia, while US Army Maj. Brandon Havron discusses battle efforts with RAAF Flight Lt. Ben Miedecke.

USAF photo by S/A Brian Ferguson



It's just a nondescript building in a Gulf country, but, inside, you get a superb look at the war on terror.

By Marc V. Schanz, Associate Editor

Driving past US Central Command's combined air and space operations center—the "CAOC"—a casual observer would never guess that this inconspicuous building in the middle of a Persian Gulf air base is the heart, brain, and nervous system of an air operation spanning three continents.

Yet that's exactly what it is. Inside what looks like a generic warehouse, some 1,300 CAOC personnel bend to the task of tracking, planning, and executing the air war in real time.

The CAOC resides on a coalition air base in an allied country (operational security rules bar identifying its location by name). Rows of uniformed personnel sit among computers, telephones, encryptors, and banks of command and control gear. Flashing data play across four massive video screens. Blue dots represent the many types of coalition aircraft, radar feed overviews, and current operations updates.

On the right side of one screen is a display of activity in Afghanistan. The system highlights Helmand Province, home of both the Kajaki Dam complex and the Sangin Valley. In those areas, NATO's International Security Assistance Force has conducted several recent operations against Taliban fighters.

Next to the satellite feed and radar readouts of southern Afghanistan, one section of the screen shows an update from Overlord 97—the mission of an armed Predator unmanned aerial vehicle monitoring a firefight in southern Afghanistan.

The CAOC operators refer to this event as a TIC, denoting "troops in contact." There were reports that some enemy fighters were fleeing the firefight. CAOC personnel confirmed that a departing truck was indeed filled with bad guys. The Predator keeps a bead on this truck, with CAOC person-

nel instructing the Predator operator to ready one of the UAV's Hellfire missiles.

Moments later, the vehicle stops not far from a cave entrance, and several men approach it. The Predator operator can see that the vehicle in question is packed with arms and explosives. Taliban fighters clearly are about to unload them and store them in a hiding place. CAOC officials give the all clear to the UAV operator to eliminate the target.

Seconds on the feed go by before a quick black burst blots out the space where the truck once stood. When the smoke clears away after a few seconds, the ISR cell gets visual confirmation that the Predator has scored a direct hit. Multiple secondary explosions rock the area as other munitions cook off.

This is one of many similar scenes that play out on any given day in Afghanistan and Iraq. For Air Commodore Ian L. Dugmore, the Royal Air Force officer who is CAOC director, the Predator strike shows how flexible and responsive air planners have to be in today's fluid, quick-reaction fights.

"Once you get into the execution of it, then you just go with the events as they crop up," Dugmore said.

The CAOC is the main theater command and control facility for air assets. Its staff and officers are continuously planning, directing, and monitoring sortie execution, time-sensitive targeting, battlefield coordination, and countless other tasks.

Across the CAOC complex, personnel responsible for every imaginable aspect of the fight are arrayed in cubicles, offices, and open rows of equipment. They range from legal advisors and coalition liaison officers, to signals intelligence deconfliction cells and subject matter experts. They are housed in adjoining rooms configured to allow easy feedback and consulta-

tion among the battle directors on the floor—the officers who determine what type of aircraft or effect is needed in a particular situation.

Constant Updates

Army soldiers who staff the Battlefield Coordination Detachment element in the facility provide valuable assistance when it comes to converting field commander requests for air support into actual missions. Air planners at the facility are constantly updating and revising a 72-hour air tasking order—the sequence of air-power events across CENTCOM's 6.5 million square miles.

Many rapid responses will also occur within a cycle of taskings. "We can be infinitely flexible with the assets we've got," Dugmore said.

Upstairs in the CAOC sits Lt. Gen. Gary L. North, commander of US Central Command Air Forces and the combined force air component commander. He pulls back the blinds on the window overlooking the operations center floor from his office, offering a high-level view of the action below. Hundreds of sorties, thousands of tons of cargo, and millions of gallons of fuel would not get to where they are needed most without the actions swirling around the CAOC, according to North.

The CAOC personnel are guiding a massive movement of machinery,

The Daily Coalition Brief

The results of the previous day's air tasking order are gathered and coordinated by late afternoon. The next morning, the staff conducts two briefings for senior leadership—one top secret for the combined force air component commander and a second, later in the morning, for coalition officers.

At 11 a.m., the jam-packed conference room down the hall from Lt. Gen. Gary L. North's offices has the feel of an end-of-day meeting. Arrayed around the long oval are representatives from most of the allied nations operating in Iraq or Afghanistan, including Qatar, Japan, Canada, Singapore, France, and Australia.

Air Commodore Ian Dugmore strides in with his briefing folder, the crowd stands at attention, and then is seated. The daily coalition briefing is under way.

The weather across the theater is reported, from Iraq to NATO locations in Afghanistan and Kyrgyzstan, and several other countries with coalition aircraft.

The operations report follows with a simple picture—the previous day was another deadly day in Iraq. There were 11 instances of troops in contact with the enemy, a number of coalition troops killed in firefights, and several more wounded.

The NATO representative gives a quick report of the previous day's events—seven improvised explosive device "events" in country, including an attack that wounded a US service member, and five battles including a rocket attack and firefight with enemy forces in the eastern portion of Afghanistan.

Across the theater, 42 close air support requests were filed in the previous day—with CAS strikes performed by A-10s, F/A-18s, and F-15Es in both Iraq and Afghanistan.

The briefing winds down with an update on ISR efforts, U-2 rotations, and the movements of Global Hawk UAVs.

In less than 20 minutes, the briefing is over. In 24 hours, it will be on again.

personnel, and cargo in combat. On any given day, more than 200 aircraft come under the CFACC's authority. These aircraft may be hauling nearly three million pounds of fuel, 1,000 tons of freight, and 3,000 people, which can be delivered anywhere from Djibouti to Kyrgyzstan.

The center is the "operational nerve center of the air war and how we control it," North said.

Everything on display is releasable to coalition partners, North noted. Nearby is the "battle cab" on the floor, where commanders execute the air war.

On a typical day late this spring, the board is dominated by a large collection of blue dots crossing its map image of Iraq. These are symbols for Predator UAVs with call signs such as "Conan" and "Judge," which intermittently display their video feeds to the personnel on the floor even as the UAV operators themselves converse via black box chat rooms about requirements, weather, mission progress, and so forth.

Officials can look at the entire globe or zoom in where needed. Occasionally, the displays zoom, switch, or disappear as activity peaks in one sector and dies down in another. "It's kind of like 'Hollywood Squares,'" quipped North. "You could have 16 large screens displaying whatever we want to see."

The current operations center is only a few years old, having started as a backup facility to a CAOC in Saudi Arabia during the months after the US launched its 2001 attack on the Taliban in Afghanistan. DOD officials later decided to close down the CAOC at the Saudi Prince Sultan Air Base after the initial phase of Operation Iraqi Freedom.

About \$60 million was spent on the new center, which qualifies as the most advanced operations center in history,



USAF photo by MSgt. Scott Wagners

Marine Corps Capt. Jason Torbensen communicates with a USAF tanker to set up a refueling for an AV-8B Harrier over Iraq.

in the estimation of CENTAF officials. It came online on Feb. 18, 2003, and, by late summer of that year, the facility was handling most of the air taskings for the theater.

Back on the floor, Maj. Brent Gillespie walks in between the rows of CAOC personnel, carefully explaining what each person is doing in relation to the huge concentration of information just a few feet away on the wall.

Gillespie is deputy director of the combat operations division at the CAOC. Just six hours before the beginning of the 24-hour air tasking order, the daily plan is kicked down to the various cells on the floor to be examined and amended. With about 2,000 sorties running across the theater on any given day, the workload is daunting.

"Each one of these officers is keeping track of their platform," he nodded down one of the rows. "If someone develops a problem, that officer has to keep track of that aircraft—if we need to change it out or call it back."

With about 200 air assets in flight every day, liaisons have a lot of iron to monitor. With unmanned assets operating in the same airspace as civilian traffic, helicopters, and strike missions, the task presented to the CAOC is challenging.

Massive Jigsaw

"It's nothing short of managing a three dimensional jigsaw puzzle," said Dugmore. "It's really quite incredible we make all this work every day."

Lt. Col. Cloyce Adams, an F-15E weapons systems officer, serves as

USAF photo by MSGt. John DeGroot



An F-15E fighter from the 355th Fighter Squadron takes off from a forward base in Southwest Asia.

director of combat plans division. Adams' staff plans sorties based on fuel capacity, facilities, and combat characteristics of a particular aircraft, among other things. He must also work with ground commanders to maintain squadrons on alert in places such as Balad AB, Iraq, and Bagram AB, Afghanistan—so that airpower is ready when troops need it.

Above combat plans is the strategy division—personnel who make advance plans for commanders. The strategy shop collaborates directly with the regional commanders to meet their battlefield needs. Eventually, the assembled plan winds up on the CAOC

floor with the combat operations cell, which executes the daily strike force tasking order.

The CAOC's air mobility division oversees the movement of people, fuel, and equipment. This covers all kinds of missions—from refueling to aeromedical evacuations and two-pallet airdrops at remote Afghan firebases. "Just in time" supply delivery is the division's stock in trade.

"You can imagine how much equipment we move through here to sustain 150,000 people in combat operations," North said.

Tracking missions are planned in the intelligence-surveillance-reconnaissance division. It is the scene of much air and space detective work.

"We can stare, we can attack, we can hand off information to ground forces," North observed. "We can literally follow people for days using several UAVs." Each day, upward of 40 percent of all voice and data communications across CENTCOM passes through the facility.

Directing air operations from afar has come a long way just since Desert Storm in 1991. New tactics and methods are constantly used and evaluated in real time, with close coordination fostered by the CAOC.

"Since counterinsurgency is a changing game, we try to be inventive on how we use the airplanes," Dugmore said. "You can bet your life that, if there's a need, some captain or airman in the field has come up with some new way of getting it done." ■



USAF photo

USAF and coalition forces coordinated Operation Southern Watch and Operation Iraqi Freedom's early phase from this CAOC in Saudi Arabia.

One hundred years ago this month, the Army Signal Corps created a small division that grew into the US Air Force.

The First of the Force

By John T. Correll

The US Air Force traces its origin to the establishment, on Aug. 1, 1907, of the Aeronautical Division of the Army Signal Corps. It was a small organization—three people, no airplanes—and it bore no sign of its great destiny.

Capt. Charles deForest Chandler, an experienced Signal Corps officer and balloonist, was detailed to be in charge of the division, with two enlisted men assigned to assist him. However, Pfc. Joseph E. Barrett promptly deserted, leaving Cpl. Edward Ward alone as the first enlisted airman.



The Aeronautical Division's charter was to take charge of "all matters pertaining to military ballooning, air machines, and all kindred subjects."

The Army had employed balloons sporadically for observation and other purposes since the Civil War. New prospects for aeronautics beckoned after the success of the Wright Flyer

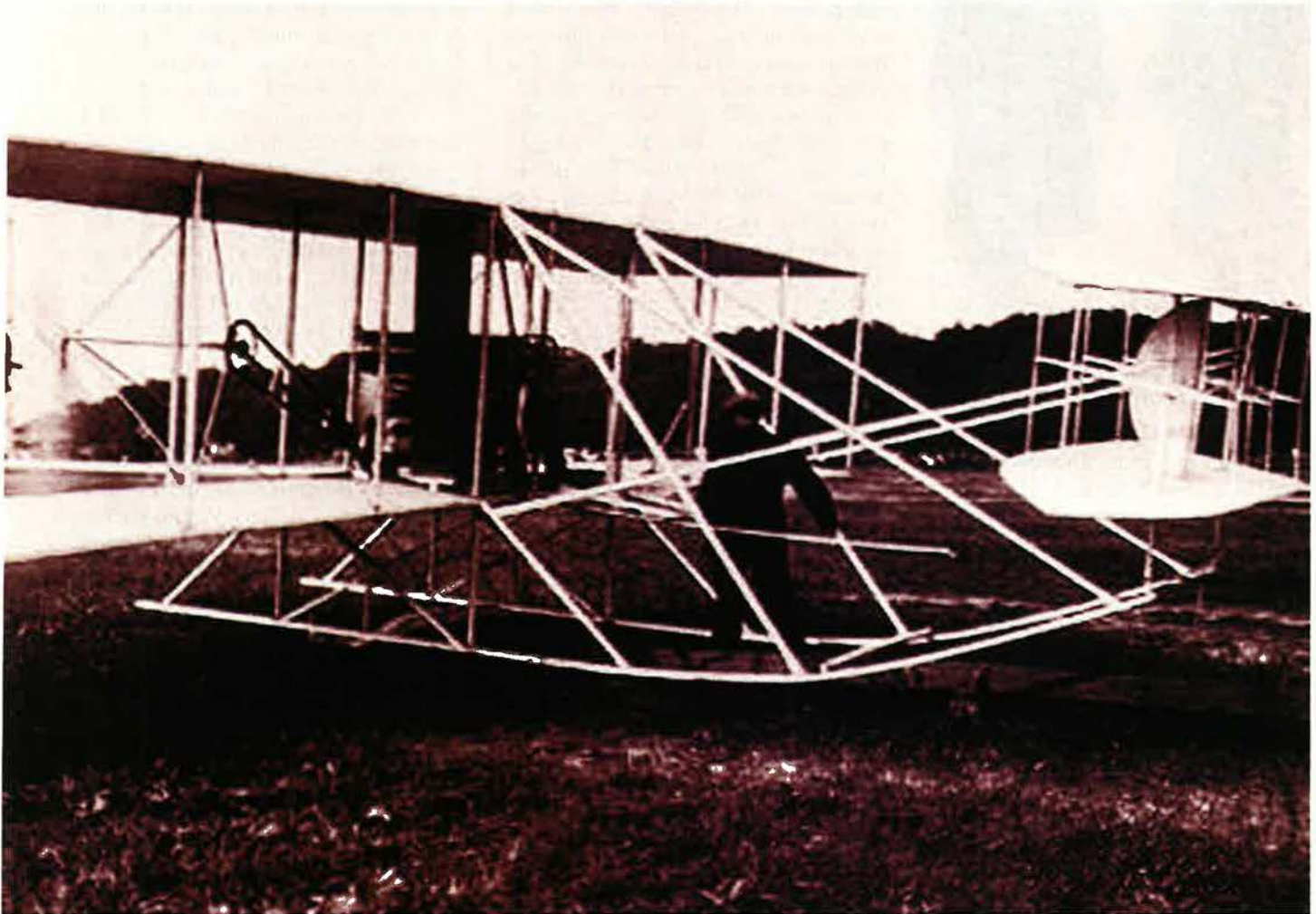
Capt. Charles deForest Chandler (holding Lewis gun) was the first commissioned airman. His pilot is 1st Lt. Roy Kirtland. Above: Signal Corps No. 1, the first US military airplane, was purchased in 1909 for \$30,000. Right: Cpl. Edward Ward, the first enlisted airman.

at Kitty Hawk in 1903. There had also been considerable progress with dirigibles—balloons that could be steered.

In 1907, the Signal Corps had a few balloons, but the Aeronautical Division

was a year old before it got its first powered flying vehicles. In fact, it took a push from President Theodore Roosevelt to get the Army to call for bids, leading to the purchase of an

Spanish-American War. In 1901, he was commissioned in the field as a second lieutenant of infantry during the Philippine insurrection. Foulois had a hot temper and a quick tongue.



airplane from the Wright brothers and a powered dirigible from Thomas S. Baldwin, a prominent balloonist and inventor. Three candidate pilots, all first lieutenants, were assigned to the Signal Corps on detached duty.

Thomas E. Selfridge, a field artillery officer, was a West Pointer with a strong interest in aviation. In the first part of 1908, he designed and flew aircraft for the Aerial Experiment Association.

Frank P. Lahm, also a West Pointer, came from the cavalry. He got his license as a balloon pilot in 1905 from the Federation Aeronautique Internationale (FAI) and, in 1906, won the International Balloon Race across the English Channel.

The most colorful of the three was Benjamin D. Foulois. He dropped out of high school, enlisted in the Army in 1898, and served in the

He said whatever was on his mind and made enemies easily.

At the Signal Corps school in 1907, Foulois wrote a thesis, "The Tactical and Strategic Value of Dirigible Balloons and Aerodynamical Flying Machines." He predicted that airplanes would replace horse cavalry for reconnaissance. The faculty sent his paper to Signal Corps headquarters and Foulois was assigned to the Aeronautical Division.

Face-Off at Ft. Myer

The site for testing the two craft ordered by the Army was the parade ground at Ft. Myer, Va., adjacent to Arlington National Cemetery. The Baldwin dirigible arrived first, in July 1908, and was accepted by the Army the next month.

Baldwin taught Foulois, Selfridge,



Maj. Benjamin Foulois (l) and Gen. John Pershing in France. Foulois, one of the first three military pilots, taught himself how to fly.

and Lahm to fly the airship. Foulois went first and is officially credited as being the first military dirigible pilot. Once Foulois saw the Wright Flyer, though, he never flew a dirigible again. He recommended that the Army forget about dirigibles and concentrate on airplanes. The Signal Corps, with balloon officers in positions of responsibility, was not pleased.

Orville Wright brought his aircraft to Ft. Myer in August 1908. It was a variation of the 1905 Wright Flyer, modified to carry two persons. It had skids instead of wheels and was launched from a monorail starting track. The aircraft was powered along the monorail by the propellers, augmented by a catapult on days when there was no wind. When the Flyer reached takeoff speed, the pilot pulled back on the elevator lever and the airplane rose into the air.

The airplane made several demonstration flights without incident, but on a test flight Sept. 17, a propeller failed. It crashed, killing Selfridge, who was flying as the observer, and injuring Orville Wright.

The Wrights returned to Ft. Myer in June 1909 with a new airplane. It was similar to the 1908 aircraft but had a number of structural and safety improvements. There were no instruments other than an eight-inch piece of string tied to the crossbar between the two skids. The direction the string was blown in flight served as a crude turn-and-bank indicator.

On July 30, 1909, Foulois flew as navigator-observer with Orville

Wright on the final qualifying flight, which was a speed test. The Army let the Wrights choose the observer, and they picked Benny. Foulois said he was chosen partly because of his size. He stood 5-foot-6 and weighed 126 pounds. The Wrights would earn a 10 percent bonus for every mile per hour in excess of the required 40. The lighter the observer was, the better.

A crowd of 7,000 gathered at the parade ground to watch. From Ft. Myer, the airplane flew south five miles to Shooter's Hill in Alexandria, Va., rounded it, and came back, reaching an altitude of 400 feet and averaging 42.5 mph. The Army accepted the airplane and paid the Wrights \$25,000, plus a bonus of \$5,000 for the extra two mph in the speed test.

The aircraft, a Wright A Flyer, was designated Signal Corps No. 1, or S.C. No. 1, and was generally known as the Wright Military Flyer.

The acceptance tests finished, the flying program had to go elsewhere. The Ft. Myer commander wanted his parade ground back, and besides, it was too small for the safe instruction of beginners. The new location was 3.5 miles northeast of Washington D.C., a field at College Park, Md., near the Maryland Agricultural College (now the University of Maryland). The training program resumed there Oct. 8, 1909.

The Army contracted with the Wright brothers to train two officers as pilots. Foulois and Lahm were selected, but before Foulois could be trained, he was sent as the US delegate to the International Congress of Aeronautics in France. He learned later that loss of

his place as a pilot training candidate was punishment by the Signal Corps staff for his earlier remarks about the dirigible.

Second Lt. Frederick E. Humphreys from the Corps of Engineers was chosen as the substitute for Foulois. On Oct. 26, Humphreys became the first Army officer to solo. A few minutes later, Lahm became the second. Foulois returned from France but had not yet soloed when the next mishap occurred.

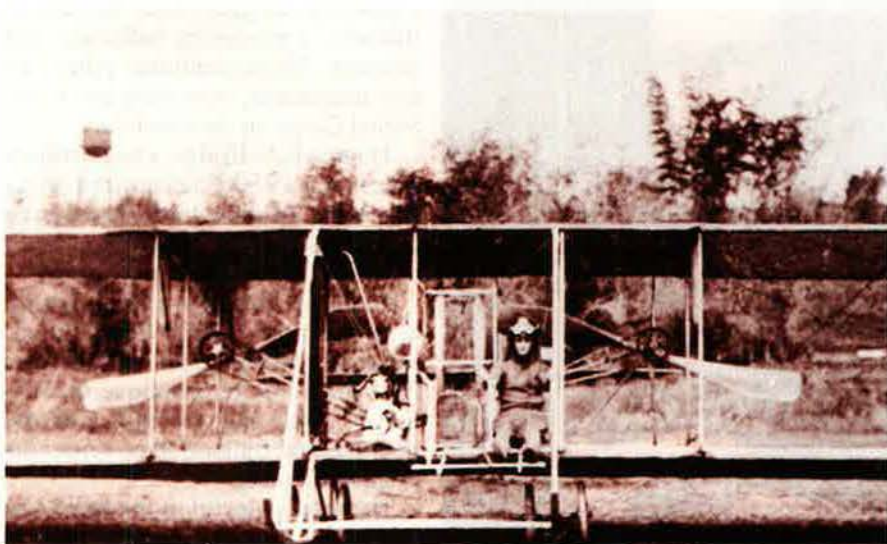
On the morning of Nov. 5, Humphreys and Lahm were flying together, Lahm at the controls, when a wing caught the ground in a low turn. The aircraft cartwheeled and crashed. Neither of the airmen was hurt, but the skids and the right wing had to be replaced.

"Teach Yourself to Fly"

The Wright brothers insisted on paying the cost to repair Signal Corps No. 1, but before parts arrived from the factory in Dayton, Ohio, the weather turned cold and blustery. Wilbur Wright was wary of the high winds, and the cold prevented further operations that year at College Park. The Wright Flyer had no cockpit.

The Wrights, having fulfilled their obligation to train two pilots, went home. Lahm and Humphreys returned to their branches. They had qualified as pilots but had not served as such.

That left only Benny Foulois—who had flown in the second seat of the Flyer but who had only 54 minutes of actual training from Wilbur Wright. The Army decided to move the program to winter quarters in Texas, where the weather would be easier on both the machine and the men. In December 1909, Foulois



Cpl. Vernon Burge, a mechanic on the S.C. No. 1, learned to fly and became the Army's first enlisted pilot.



Second Lt. Hap Arnold (r) prepares for a Nov. 2, 1912 flight at Ft. Riley, Kan. Observer is 2nd Lt. Follett Bradley, who became a pilot in 1916.

was told to take the airplane and plenty of spare parts to Ft. Sam Houston at San Antonio and “teach yourself to fly.”

The Wright Military Flyer was shipped to San Antonio in 17 wooden boxes and reassembled by eight enlisted men working under supervision from Foulois. In 1910, they built a small hangar on the post near a drill ground used by the cavalry. “On March 2, I



Col. Frederick Humphreys. As a second lieutenant on Oct. 26, 1909, Humphreys became the first military pilot to fly solo.

made my first solo, landing, takeoff, and crash,” Foulois said.

The airplane was in the repair shop for a week, but Foulois flew five times on March 12. Takeoffs and flying went better than landings, which frequently concluded in a crash. Foulois got coaching and suggestions from the Wright brothers by mail. “When in trouble in the air, put the nose down,” Wilbur Wright advised.

From November 1909 to April 1911, Foulois was the only pilot, navigator, instructor, observer, and commander in the Army’s heavier-than-air division. Once, while landing in gusty winds, Foulois was nearly thrown out of the airplane. He obtained a strap from the saddlery shop and began use of the aircraft seat belt.

Foulois asked for money to put wheels on S.C. No. 1 and was told not to “fool around” with the airplane. Undeterred, Foulois and his mechanics bolted three wheels from a farm cultivator onto the airplane in August 1910. The wheels worked well and were the first tricycle landing gear for an Army flying machine.

The Army air fleet tripled in size in April 1911 with the delivery of two more airplanes. One, a Curtiss 1911 Model D Type IV, was designated S.C. No. 2, and the other, a Wright B Flyer, was S.C. No. 3. Both of them had wheels rather than skids.

Student pilots were taught by the “grass cutting” or “short hop” method. After the student learned to handle the controls, the next step was to taxi up and down the field, eventually reaching 15 mph. The instructor stood off to

the side. The first flight, 10 feet above the ground, was the solo. The pilot worked up gradually to higher altitudes and turns.

The foremost flier of the Curtiss airplane was 1st Lt. Paul W. Beck, who came from the infantry. He was the senior pilot in military rank at Ft. Sam, and in April 1911, he was named commander of the Provisional Aero Company. On May 10, Lt. George E.M. Kelly was killed on landing in S.C. No. 2. Foulois believed that improper maintenance had been a factor in the crash and said so. He also questioned Beck’s ability to command the Provisional Aero Company and said so. The investigating board disagreed. Beck was promoted to captain and Foulois was sent to a desk job in Washington.

The Ft. Sam commander wanted no more flying at his post, and with the weather warm again, Beck and his mechanics moved the operation back to College Park. They took S.C. No. 2—which had to be rebuilt—and S.C. No. 3 with them. S.C. No. 1, the Wright Military Flyer, was worn out. It was retired and given to the Smithsonian Institution.

At College Park, the Army took delivery of its next three airplanes. S.C. No. 4 was a Wright Flyer. No. 5 was a Burgess-Wright, and No. 6 was another Curtiss.



One of the first three military pilots, 1st Lt. Thomas Selfridge was the first military man to die in an airplane crash.



Second Lt. Thomas Milling, a cavalryman, arrived for pilot training in June 1911, along with Hap Arnold. Milling and Arnold went to Dayton and learned to fly from the Wright brothers.

In June 1911, two more pilots—2nd Lt. Henry H. “Hap” Arnold (infantry) and 2nd Lt. Thomas DeWitt Milling (cavalry)—arrived for duty. Other than Beck, they were the only two pilots then on flying duty with the Army. In his memoirs, Arnold described Beck’s status as a pilot as “doubtful,” but that was a matter of Arnold’s opinion of the Curtiss “short hop” training methods.

Arnold and Milling had gone to Dayton and learned to fly with the Wright brothers. Their training lasted 11 days. It would have been over in 10 days except that the Wrights did not believe in flying on Sunday.

One of Arnold’s first duties at College Park was to teach flying to Charles Chandler, back for his second tour as head of the Aeronautical Division. Arnold also introduced flying goggles—which became standard equipment for open cockpit aviators—after he got a bug in his eye while landing.

In the early days of Army flying, accreditation of pilots was informal. An officer was a pilot when the Wright brothers or Glenn Curtiss said he was. In 1912, the Army established formal standards for the award of the military aviator rating. Five officers qualified in July 1912 and were recognized as pilots in the Army Register. First on the list was Hap Arnold, followed by Chandler, Milling, Beck, and Foulois.

In 1912, the Army sent one airplane

(a Wright B Flyer, S.C. No. 7) to the Philippines, where Lahm, who was on duty with the 7th Cavalry, established a flying school. Lahm taught Cpl. Vernon L. Burge, a “mechanician” who had gone to the Philippines with

the airplane, to fly. He became in June 1912 the Army’s first enlisted aviator, and earned his FAI certificate.

Eddie Ward, the first airman and previously Burge’s boss on a balloon handling crew, was then in the Philippines as well, but Lahm did not teach him to fly or bring him to the cadre of the flying school. In a study for the Air Force Sergeants Association, George E. Hicks said there was “bad blood” between Lahm and Ward.

The Army’s first tactical air unit, the 1st Provisional Aero Squadron, was organized in March 1913. Foulois had wangled his way back onto flying status and was the commander. In 1916, he took the squadron and its Curtiss JN-2 airplanes to Mexico to help Gen. John J. Pershing in his pursuit of Pancho Villa.

The Aviation Section

On July 18, 1914, Congress created the Aviation Section of the Signal Corps, which gave the air arm a status defined in law. Up to then, pilots were on temporary detail from their branches and could not choose military aeronautics as a career.

The Aviation Section was authorized 60 aviation officers plus 260 enlisted men, but its actual strength was considerably less than that. The original or-



As a first lieutenant, Frank Lahm, also a cavalryman, became one of the first two Army pilots trained to fly an airplane, and the second to solo. He later taught Vernon Burge how to fly.



Lt. Col. Paul Beck. He came to Ft. Sam Houston, Tex., as an infantryman and became the third man to qualify as a military aviator. He later commanded the Provisional Aero Company.

ganization, the Aeronautical Division, continued to exist as the Washington office of the Aviation Section. The air arm remained a part of the Signal Corps until establishment of the Army Air Service in May 1918.

As for the original airmen who got the project under way:

■ Charles Chandler, who had been the first chief of the Aeronautical Division, retired from the Army as a colonel in 1920. He continued his interest in ballooning as a civilian.

■ Eddie Ward, the first enlisted man in the Aeronautical Division, was commissioned in World War I. He earned his FAI certificate as a balloon pilot in 1921 and retired as a captain in 1930.

■ Pfc. Joseph Barrett, who deserted the Aeronautical Division in 1907, was a strange case. At some later point, he joined the Navy, in which he had served before, and retired honorably after 20 years of service.

■ Frank Lahm became assistant chief of the Air Corps in 1926 and retired in 1941 as a brigadier general. He and Chandler wrote a book, *How Our Army Grew Wings*, which was published in 1943.

■ Frederick Humphreys, who had been first to solo, resigned from the Army in 1910. He remained in the National Guard and was called to active duty for the Pancho Villa expedition and for World War I. He ran the fam-

ily business, a homeopathic medicine firm, and retired from the Guard as a brigadier general in 1939.

■ Paul Beck returned to duty with the infantry and rose to the grade of lieutenant colonel. In 1922, while commander of the airfield at Ft. Sill, Okla., he was shot and killed in a domestic dispute.

■ Vernon Burge, the first enlisted pilot, was commissioned in 1917. As a captain in 1922, he was on the Army board that investigated the shooting death of Paul Beck. Burge served as an Air Corps pilot until his retirement as a colonel in 1942.

■ Thomas Milling was chief of staff to Brig. Gen. Billy Mitchell in World War I and retired in 1933. He returned to active duty as a staff officer during World War II and retired again in 1946. He was promoted to brigadier general on the retired list.

■ Hap Arnold won the MacKay Trophy for outstanding flight two times. He narrowly avoided court-martial in the 1920s for his aggressive support of Billy Mitchell. He was the wartime Chief of the Army Air Forces and founding father of the US Air Force. He is the only person ever promoted to five-star rank in two services: General

of the Army in 1944 and in 1949, the first (and only) five-star General of the Air Force.

■ Benny Foulois was temporarily promoted to brigadier general and sent to France in World War I as chief of Air Service for the American Expeditionary Forces. Billy Mitchell, Air Service commander for the Zone of the Advance, was already there and well established as the air combat leader. Foulois and Mitchell took an instant and lifelong dislike to each other and quarreled constantly. Gen. John Pershing installed Maj. Gen. Mason M. Patrick above both of them with orders to settle them down. When Foulois wrote his memoirs, he heaped disdain on "Mitchell and his worshippers."

As it turned out Foulois outlasted all of the others. He reverted to the grade of major after World War I but reached major general in 1931 and was made Chief of the Air Corps. In that capacity, he managed to antagonize and alienate the War Department, the Army General Staff, the White House, and Congress. When he retired in 1935, there was no ceremony, no farewell messages, and nobody from the War Department came to say goodbye. He refused an offer of return to active duty in World War II because he did not want a desk job.

By the 1960s, Foulois had outlived his adversaries, but he was not too old to make new ones. Air Force historian John F. Shiner recalled the incident in *Makers of the US Air Force*:

"President Lyndon Johnson, who was running against Sen. Barry Goldwater in the 1964 Presidential campaign, was persuaded that a special medal should be struck for the 85-year-old warrior," Shiner said. "A ceremony was held in the East Room of the White House, complete with distinguished guests, speeches honoring Foulois, and presentation of the medal by President Johnson. Foulois responded with a few remarks on the state of the nation and the world, then pointing to the paneled entrance said: 'I hope to see President Barry Goldwater walk through that door next year.' There were no late departures from the ceremony."

Foulois died in 1967, full of fire and determination to the end. ■

John T. Correll was editor in chief of Air Force Magazine for 18 years and is now a contributing editor. His most recent article, "A Brush With the Air Force" appeared in the July issue.

Rommel could not be allowed to mass his forces at Normandy. Eisenhower took a gamble—and won.

The War on the

Halt US and British bomber attacks on German strategic targets. ... Divert these airplanes to strike railways and bridges in occupied but allied France. ... Accept in the process up to 160,000 French casualties. ...

That, in the spring of 1944, was what Gen. Dwight D. Eisenhower, Supreme Commander Allied Expeditionary Force in Europe, chose to do.

Eisenhower's verdict was epic in its consequences. Except for Truman's resolve to strike Hiroshima, no World

War II air war decision was more complex or caused more bitterness than Ike's move to attack the French railway system in advance of the June 6, 1944 Allied landings in Normandy.

Top Allied leaders called it simply "the transportation plan." Because both attacker and defender were in a race against time, the outcome of the Normandy invasion hinged upon it.

Across the English Channel in France waited Field Marshal Erwin Rommel, nicknamed "Desert Fox." Hitler personally put him in charge of Army Group

B, with orders to push the Allies back into the sea should they manage to put forces ashore.

After years of war with Soviet forces in the east, German forces comprised only 59 divisions in the west. Many of them were of inferior quality, but a few—notably, the Panzer divisions—were filled with Eastern Front veterans and were fearsome. They were the key to German planning; with his forces spread out across France, Rommel had no choice but to stake everything on a quick counterattack with his best units.



Rails

By Rebecca Grant

Contrary to popular belief, Eisenhower saw no problem in getting his forces ashore. Even the German generals acknowledged this would be manageable. The so-called “impregnable” Atlantic Wall fortifications of German propaganda were “sheer humbug,” according to Field Marshal Karl R. Gerd von Rundstedt, who was commander in chief in the west and Rommel’s putative superior.

The real test would come with Rommel’s counterattack, and Eisenhower wanted to stop it before it even got started.

In this, airpower was the key. Eisenhower’s whole premise for Normandy

called for defeating Germany’s air force and then using Allied airpower to hinder transportation so that Rommel could not maneuver rapidly and get his forces in position to oppose the landing in strength.

Ike and his deputy, RAF Air Marshal Arthur W. Tedder, formulated plans in which Allied fighters and bombers would pick off German forces moving by road toward the Normandy area. Of course, those forces wouldn’t move until Hitler

ordered his generals to concentrate to oppose the invasion. That done, the Germans would move swiftly, so the Allies’ reaction time was sure to be limited.

Since February 1943, the air offensive in Europe had been focused on pushing back the German Luftwaffe. Air superiority remained everyone’s top goal. However, as 1944 began, the new question was this: What else could the air forces do before the landings to ensure the success of the Normandy invasion?

Enter one Solly Zuckerman with his plan for attacking France’s railway system.

Zuckerman was an unlikely architect of airpower. One contemporary described him as “a small, mysterious man in an unpressed tweed suit.” In 1943, this 39-year-old South African-born Oxford professor of zoology was best known for his book *The Social Life of Monkeys and Apes*. Some, like RAF Air Marshal Arthur T. Harris, never warmed to Zuckerman, whom he derided as “a civilian professor whose peacetime forte is the study of the sexual aberrations of the higher apes.”

Tedder had a different view. He saw real insight in Zuckerman’s detailed analyses. Trained as an anatomist, Zuckerman first worked with colleagues on assessing air raid casualties in London and then moved on to evaluating air operations in North Africa. There he won both Tedder’s confidence and the Cambridge-educated airman’s friendship as the two bonded over arcane discussions of history.

Next, Zuckerman helped Tedder prepare and execute coordinated attacks on the rail and road lines of commu-



Success at Normandy depended on hampering a German counterattack by cutting road and rail links. Opposite, Allied bombers wrecked this bridge over the Rhone River near Toulon, France. Rommel, at left, was counting on railways to rapidly deploy his limited high-quality forces against the Allied invasion. Above, Eisenhower offers encouragement to paratroopers before D-Day.



American bombers such as the B-17G shown here bombed rail centers, repair yards, and tunnels, while fighters attacked rolling stock and repair crews.

nication crisscrossing the key island of Pantelleria, which the Allies during mid-1943 took in preparation for the invasion of Sicily.

Despite the professor's quirks, Tedder had complete confidence in his knowledge and judgment, which he put to good use.

Unique Knowledge

In January 1944, Tedder sent Zuckerman home to London to join in the secret Overlord planning work that was then under way at Norfolk House in the British capital. "His knowledge of bomb damage gathered in North Africa and Italy was unique and was occasionally to confuse those who imagined that they alone could know anything of bomb damage," said RAF Air Vice Marshal E.J. Kingston-McCloughry, who was already at work on D-Day air plans when Zuckerman arrived.

Making the debate on air plans all the more urgent were lessons learned from many bloody setbacks at the Anzio beachhead during the Italian campaign. On Jan. 22, 1944, Allied forces landed north of the German lines at Anzio. At first they met only light resistance. The Mediterranean Army Air Forces had bombed rail lines steadily, producing the impression that rail traffic was stopped and the battle area could be sealed off.

Those impressions could not have been more wrong. "The air forces reported that their preliminary bombings had disrupted all rail and road communications in central Italy," wrote naval historian Samuel E. Morison after the war, "but they had not done so." Soon, 14 divisions from as far away as Yugoslavia and southern France were closing off the Anzio beachhead. On Feb. 16, 1944, German Field Marshal Albert Kesselring

launched a massive counterattack. He attacked with 125,000 troops, compared to the Allies' 100,000.

Kesselring's assault nearly worked. Two German counterattacks pushed salients deeply into Allied-held territory, but the Allies hung grimly on. At length, Allied soldiers—supported by intense air attacks and naval gunfire—succeeded in pushing back the Germans.

It was a close call. Everyone knew that, at Normandy in a few months, the Allies would have to do much better. Heeding the lessons of North Africa and Italy, Eisenhower and Tedder crafted a sophisticated plan of attack, taking into consideration the shocks and surprises of those earlier campaigns.

First, they reshuffled their priorities. The Germans already had fuel and sup-

plies in the Normandy area, so there was no point in targeting that. What Eisenhower and Tedder wanted this time was to choke down the rail transport and force the German forces onto the roads. This would leave them exposed and vulnerable; hundreds of Allied fighters and bombers would rove the skies above the main highways, breaking up German maneuvers with timely and unexpected attacks. The idea was to make sure that Rommel, unlike Kesselring, would never get the chance to concentrate and then counterattack with numerically superior forces.

By early 1944, France's rail system was a ripe target. It was already suffering from the effects of four years of German occupation and neglect. Investment was minimal, and Germany had taken a third of the locomotives and rolling stock out of France for use elsewhere in Europe.

Targeting methodology for the rail attacks was selective. The unique aspect of Zuckerman's plan was that it sought to knock out only specific, high-value railway centers and heavy repair facilities in order to achieve maximum effect. "Only in special circumstances," noted Tedder, "was it thought worthwhile to bomb tunnels or isolated stretches of railway line." That is because it was easy to rebuild tracks. Moreover, attacks on rolling stock, while valuable, were time-consuming and dangerous. When it came to bridges, the story was much the same.



RAF Air Marshal Arthur Tedder (right), shown here with Marshal of the RAF Hugh Trenchard, got Ike to back his proposed campaign against rail rather than Lt. Gen. "Tooey" Spaatz's plan to target German oil supplies as a first priority. It worked: German rail traffic slowed to a near-standstill.

The final plan specified rail center targets across the length and breadth of France, Belgium, and western Germany. Initial attacks began in early March.

Few were as enthusiastic about the transportation plan as Eisenhower and Tedder. As the clock began ticking in February and March, Lt. Gen. Carl A. "Tooney" Spaatz, commander of US Strategic Air Forces in Europe, feared that attacks on the transport system would not bring up the German fighters, whereas "we believe they will defend oil to their last fighter plane."

Eisenhower was well aware of the controversy among his commanders. He was determined not to let their squabbles stand in the way of the two things he had to have: command of all air assets for the invasion and an immediate start to the transport plan.

Eisenhower was so adamant about it that he wrote, on March 22, 1944, that if a satisfactory agreement were not reached in a meeting three days off, he would "take drastic action and inform the Combined Chiefs of Staff that, unless the matter is settled at once, I will request relief from this command."

Eisenhower faced many problems in that tense period, but only one made him threaten to quit.

When the fateful meeting came, Eisenhower let Tedder be first to speak. Tedder presented a case in favor of chopping all air assets to Supreme Headquarters Allied Expeditionary Force (SHAEP) and starting a campaign against the French transportation system. Spaatz countered with the oil plan and his view that attacking rail yards and marshaling depots would not have a decisive effect within any measurable length of time.

Eisenhower had no objection to the oil plan but rail targets had to come first. The Germans already had 12 Panzer divisions in the west and Eisenhower reminded the group that the success of the whole plan was "conditioned on [there being] no more than 12," with three near the landing areas.

Air attacks beginning in April could reduce overall efficiency, "canalize" rail traffic and strain the whole system. To Eisenhower, "delaying of the arrival of one division would be worthwhile." He even conceded that "some reduction in traffic, however small," would justify adoption of the transport plan.

Eisenhower won his point with the military commanders. His next obstacle was British Prime Minister Winston Churchill. Churchill, who also served as Minister of Defense, was known for



Bridges, such as this one over the Loire River in Tours, were not part of the original attack plan. Air superiority, however, made them vulnerable.

delving deeply into minute details of the war. He often formed opinions with an eye on postwar outcomes. This was no exception. Churchill balked at the idea of risking so many French lives, which he warned could conceivably drive postwar France into the arms of the Soviet Union.

Eventually, Churchill acquiesced to the plan. However, even after the bombing began in earnest, Churchill continued to complain about collateral damage. Continued hand-holding was a must. "We must never forget that one of the fundamental factors leading to the decision for undertaking Overlord was the conviction that our overpowering Air Force would make feasible an operation which might otherwise be considered extremely hazardous, if not foolhardy," Eisenhower told Churchill on April 22, 1944.

When Churchill again wavered in May, none other than President Franklin Roosevelt weighed in. Roosevelt told Churchill that "however regrettable the attendant loss of civilian lives," he, the American leader, would not constrain his commanders from doing whatever it took for Operation Overlord to succeed.

Nor did France flinch at the plan. French railway personnel quickly relayed bomb damage assessments back via the resistance and intelligence networks, according to Tedder. "No one has a greater stake in the success of that operation than the French," Eisenhower pointed out.

By then, intensive operations were under way. They had started up with Ike's April 17 directive moving rail centers

to No. 2 priority. As always, Luftwaffe targets came first.

Ninth Air Force, Twelfth Air Force, and RAF Bomber Command attacked targets. Spaatz swung Eighth Air Force into the fight on April 19. Fifteenth Air Force added its might. By the end of April, rail targets in France, Belgium, and Germany had absorbed the explosive force of more than 30,000 tons of Allied bombs.

The German forces felt the effects of this bombing right away. Long lines of railcars backed up, unable to move. Von Rundstedt pulled 18,000 workers off construction of defenses on the Atlantic Wall and set them to work repairing railways.

Rommel Smells a Rat

Military train capacity in the northern region fell from about 58,000 tons a day in early March to barely 25,000 tons per day in early May. Over the same period, track available in the north plummeted from about 236,000 miles to just over 62,000 miles. Von Rundstedt transferred 10,000 more workers to the rails in May, to no avail.

Churchill pinged Tedder on May 29 with a memo asking if the rail attacks had exceeded the 10,000 casualty limit yet.

However, the Allied transportation plan carried a risk bigger than Churchill's wrath: What if the pattern of bombings revealed too much about the real landing site? Elaborate deception operations kept most German leaders focused on the Pas de Calais area as a possible entry point.

However, one man—Rommel—wasn't fooled. Rommel won his "Desert Fox" nickname in North Africa, and there he also learned stern lessons about the impact of Allied airpower. Like Eisenhower, Rommel believed that everything depended on swift movement of his mobile reserves. He wrote in late April that, "failing the early engagement of all our mobile forces in the battle for the coast, victory will be in grave doubt."

Rommel seemed to be in no doubt about the meaning of the sudden increase in railway attacks. He knew that the Allies would land at Normandy. By May 9, according to biographer Samuel W. Mitcham, he was touring the Cotentin peninsula, convinced it would be the focal point of the invasion.

Here Rommel's instincts almost upset Eisenhower's plans. Rommel began moving forces into the Normandy area in response to the rail bombings. He transferred seven mainly battalion-strength units during May. One unit, the 352nd Infantry Division, went undetected by Allied intelligence and put up the fierce D-Day resistance that almost repulsed the attack on Omaha Beach. On the coast, Rommel stepped up defenses. His tours to the lines bolstered German morale. Yet unless he could quickly move in reinforcements and organize for a counterattack, it would all be for naught, Rommel knew.

As D-Day approached, Tedder unleashed fighters and bombers on rolling stock and rail bridges. On May 21, one mission featured more than 1,200 fighters on sweeps against trains in northern France.

Allied airmen also began systematically dropping every bridge on the Seine between Paris and the sea. Bridges were not part of Zuckerman's original vision. He considered them "uneconomical and difficult targets." With a blanket of air superiority, however, airmen proved he was wrong.

On May 7, eight P-47s each dropped two 1,000-pound bombs on a 650-foot-long steel rail bridge over the Seine at Vernon. The bridge was demolished. Now, even the sharpest critics of bridge-bombing held their tongues. As May drew to a close, more low-level attacks by P-47s, B-26s, and other attack aircraft dropped bridge after bridge.

When the Germans attempted repairs, pilots strafed the workers and bombed the bridges again. This was a tremendous testament to precision bombing. Given the right tactics and the right condi-

tions, airmen in 1944 could be precise indeed. They did it with a surprisingly low tonnage count, too. Dropping the Seine bridges and others marked on the system took a total of 4,400 tons of weapons. Not one train ran on those routes after the end of May. Harris' night bombers also scored highly precise attacks, knocking out several rail centers in just a single attack.

In total, 51 of the 80 northern rail centers met the highest bomb damage assessment criteria—with damage to the point where no re-attacks were needed. All but four of the remainder met the second-highest damage level criteria.

Across northern France, German military dislocation and paralysis set in. Rail traffic after May 19 fell to 38 percent of what it had been in February. By D-Day the French National Railway was operating at only 10 percent capacity, and Normandy was, "for all practical purposes, a strategic island," concluded Rommel biographer Mitcham.

Frozen in Place

Of the three Panzer divisions in the Normandy area, just one, the 21st, engaged late in the afternoon on D-Day. The tanks blocked the move on Caen, and cut the British line, but then withdrew for lack of support. Two others, 12th SS Panzers and Panzer Lehr, closed on the 7th but were mauled by fighters. Panzer Lehr did not get into the fight until June 9, three days after the first landings.

Rommel's forces put up fierce defensive resistance, holding out in some locations for weeks, but he needed reinforcements to hold defensive lines so he could pull out his Panzers and mass for counterattack. Those reinforcements did not come in time. As later noted by Harris, "When they did percolate through to the front, they found themselves operating in conditions of extreme disadvantage." Not only were the Nazi units fighting "under the shadow of overwhelming Allied air supremacy," he said, "they were attempting to hold a front behind which, for three or four hundred miles, the vital rail system was in a state of wreckage and complete confusion."

By June 12, Rommel had only 12

divisions totaling about 120,000 men. More than 326,000 American and British soldiers were already ashore.

To get to the battle, the 2nd Panzer division had to travel 160 miles and did not arrive until June 13. It took another week to prepare the road-weary unit for battle. The 17th Panzer grenadiers division made it to the fight on June 17. Another division, the 2nd SS Panzers, did not show up until June 26. It was July 1 before Rommel at last had four Panzer divisions ready for a counterattack. The attack advanced only a few miles before petering out.

"Katastrophal," von Rundstedt later wrote to his superiors.

Within days, von Rundstedt had been replaced. By mid-July 1944, Rommel was gone too, severely wounded in a strafing attack. The transport attacks, however, only expanded after the invasion. Germany was the next target. Under Tedder's guidance, the Allies attacked rail targets throughout fall 1944. Heavy attacks in the Ruhr in October 1944 slowed coal deliveries.

Oil vs. rail arguments continued as attacks on both target sets increased. In fact, from an operational perspective, bombing rail marshaling yards was a good tactical use of the mass bomber formations when weather prohibited precision bombing of oil plants.

As Tedder pointed out, the Germans could build underground factories, but "their lifelines remained on the surface." The more the Nazis dispersed, the more they depended on rail and other lines of communication.

The best evidence of success once again emerged from the deteriorating Wehrmacht. Air attacks on the German transport system led to a 40 percent drop in marshaling capacity by the end of 1944. The effect was profound: German factories manufactured 2,199 tanks from September to November 1944. Less than half ever reached German forces.

Eisenhower had said he'd judge the rail plan worthwhile if it delayed even one division. Instead, the combined effects of the campaign delayed them all in the crucial days after June 6, 1944. The results reverberated throughout the remainder of World War II in Europe, and, indeed, still do. ■

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The Air Force sees a strong need for a new breed of combat systems officers.



Versatile, Ready, and Rated

By Otto Kreisher

The future US Air Force almost certainly will have far fewer aircraft needing rated officers other than pilots—that is, navigators, electronic warfare officers, and weapon systems officers. Air Education and Training Command therefore has begun transforming its training programs to ensure that officers in those fields are more highly skilled and versatile.

They are now known as combat systems officers, or CSOs, and in the future they will all be trained at NAS Pensacola, Fla., alongside their Navy and Marine Corps counterparts. The Air Force already merged most of the nav and EWO training, leaving just one month of the six-month program separate.

The concept for the CSO is to have an airman skilled in all areas of naviga-

tion and missions. “He is someone who can put it all together,” said Lt. Col. Peter Deitschel, operations officer at the 562nd Flying Training Squadron, Randolph AFB, Tex. The 562nd trains most of the officers who will become CSOs.

AETC trains them in all aspects of air missions. “They may go to B-52s or might go to C-130s, but they go through training side by side,” Deitschel said. The formerly specialized officers will “know a good portion of what the other guy is doing” through the exposure.

The transition from today’s parallel tracks to the pure CSO training will start in 2009 and will be completed in April 2010, when the last class will graduate from Randolph and all training moves to Pensacola. The Air Force is building

two new facilities for the CSO training in Florida.

The CSO program will try to give all the nonpilot rated officers a better background, so they “will be more proficient on the different systems, throughout multiple airframes,” said Lt. Col. Samuel Lightfoot, CSO career field manager on the Air Staff.

The airmen will be “more useful and can be utilized in a broader sense” because of their broad-based expertise, Lightfoot added.

The Air Force has had nonpilot flying officers for much of its history. Most of them have specialized in a particular skill, such as long-range navigation, or weapons delivery as bombardiers and radar-intercept officers, or as electronic warfare officers to counter the threat of radar guided weapons.



Two F-15Es from the 494th Fighter Squadron on a training flight.

ated in 2001 by Gen. John P. Jumper, then Air Force Chief of Staff. Jumper wanted “a more relevant aviator for our evolving missions,” said Lt. Col. Brent Bigger, commander of the 562nd, “an aviator who is more savvy in advanced electronic warfare, navigation, and mission—of the overall airspace in the area of operations.”

Although Jumper wanted to improve command and promotion opportunities for the nonpilot aviators, career advancement can still be somewhat limited.

“We’d like to say that navs are on equal footing with pilots, but that’s not the case,” said Lightfoot.

Part of the problem is “the sheer numbers,” he said. The Air Force has about three times as many pilots as CSOs. Furthermore, many aircraft do not have a navigator position, limiting the number of squadrons that a navigator could realistically command. The career field is contracting, but it is not entirely without command opportunities.

New Opportunities

“There are plenty of opportunities out there,” Lightfoot said, citing about 90 squadron commander and deputy wing commander positions and about 60 operations officers slots available for navigator-EWOs.

Navigators have also been filling many staff positions that offer leadership potential, owing to a longstanding shortage of midgrade pilots available to fill those spots. At least five of the Air Force’s current two-star generals rose through the ranks as navigators.

The transition will become effective in Fiscal 2010. That is when the Air Force consolidates its CSO training with naval flight officer production. The three service programs will be collocated at NAS Pensacola—a move ordered by the 2005 Base Realignment and Closure commission.

The move is possible because, of 179 training days, only 37 require something unique for the various specialties. A main issue now is that the Air Force has yet to come up with an Air Force specialty code for CSOs. “They’re still handling it as navigator and EWO,” Deitschel said.

The training at Randolph and NAS Pensacola, where F-15E and B-1B weapon systems officers learn their basic skills, is already joint. Air Force and naval students share classrooms, and the services trade command of the training units, Bigger said.

The Air Force had a retention problem with navigators and EWOs in the late 1990s and offered a bonus to encourage them to stay in uniform.

But “right now, we have plenty of navs, CSOs to fill the current jobs,” Lightfoot said. “We have a slight surplus, which was intentionally designed to help offset the shortage in pilots that we had a couple years ago.” Many navigators are now performing staff jobs normally held by pilots.

The community, however, is still affected by its own “bathtub,” or shortage, in midgrade navigators. Similar to what had happened with pilots, this nav and EWO shortage emerged in the early 1990s when the Air Force downsized following the collapse of the Soviet Union, noted Tom Winslow, aircrew analyst on the Air Staff.

“For a couple of years, there was essentially zero production of navigators and EWOs,” Winslow said. The effects of that shutdown will stay with the Air Force for 20 to 25 years, as officers work their way through the service. It will be a while before the service is completely out of the navigator and EWO bathtub.

The demand is changing, however. Stand-alone navigators are “a dying breed with the advent of GPS,” Lightfoot said, and in many of the fighters the electronic suites are so advanced that “a lot of the things that the second person would be doing are automated.”

There were a total of 4,453 navigators and EWOs in the Air Force as of April 30. The service already slightly reduced CSO production, “in anticipation that the need for CSOs will not be as great in the out-years,” Lightfoot said. The yearly requirement for new CSOs has been cut from 360 to 310 for Fiscal 2008.

In terms of supply and demand, however, the numbers now are a much better match than they were, and the retention bonus has been terminated, Lightfoot added.

The F-15Es, B-1s, and B-52s are going to be in service for years to come, and Special Operations Command’s C-130 missions “are very complex, and they like to keep an extra person in those.”

Lightfoot also noted that EWOs are helping to counter deadly improvised explosive devices in Iraq, creating what is in essence a new mission for electronic warfare officers.

And with Air Force Cyber Command coming onboard soon “with all the electronic warfare officers being labeled

A standard B-52 crew, for example, has a “panel navigator” responsible for getting the BUFF to its target and back, a radar navigator or bombardier to find and hit the target, and an EWO to protect the bomber.

But technology now can handle most of the navigation and can make it easier for one person to handle multiple tasks.

As a result, USAF’s B-1B Lancers have one “offensive” and one “defensive” officer assisting the pilots. Newer B-2 stealth bombers, and C-5 and C-17 strategic airlifters, perform their globe-spanning missions with no navigators or EWOs whatsoever.

The impact of technology, and the Air Force’s need to save money by reducing personnel, required a change.

The concept of the CSO was initi-



At left, Capt. Jonathan Laatch, a WSO, performs a preflight check on his station in a USAF F-15. Below, Capt. Michael Brazda, a WSO aboard a B-1B, works at his console.



Photo by Ted Carlson

as cyber-warriors, that's another area of expertise where the navs and CSOs can be used," he said.

Although the demographics may look bleak, the Air Force in the future will still need mission commanders with CSO skills, Bigger said.

"We will always need those folks."

At Randolph, the 562nd today gets most of its Air Force students fresh from commissioning. But before they start instruction with the squadron, they complete a 60-day initial flight screening program that gives them the basics of aeronautics and 20 hours of flight time in light aircraft. Most of that training is done in six private flight schools in the San Antonio area.

Primary Phase

All the Navy and USAF trainees start with a primary phase, which includes nine flights in T-43s (modified 737-200 airliners), 12 sessions in the 24 T-45 simulators, and two check flights.

There is "a lot less" curriculum devoted to time-consuming log keeping and paperwork, Bigger explained, and students no longer learn celestial navigation.

The intermediate phase that comes next is much changed, Bigger said. It includes "operationally relevant profiles," such as air refueling, timing to an operational area, loitering, search and rescue, and diverting to a different airfield, which requires replanning in flight.

The operational elements were added in late 2005.

Next is the operations phase in which the students receive a classroom introduction to electronic warfare, with the help of instructors from the 563rd Flying Training Squadron, located across the street.

At that point, the current training syllabus splits. One track is for students who will become electronic warfare specialists. Those who will serve as navigators in bombers or E-3 AWACS aircraft, tankers, or special mission variants of the C-135 and C-130s have their own program.

Graduates of the WSO program who are heading for B-1s, and some of the future F-15E backseaters, also go through the EWO training at the 563rd, after completing the 220-training-day course in Pensacola, Deitschel said.

EWO trainees learn to identify and counter electronic threats in two T-43 flights and multiple sessions in the 563rd's advanced EW simulators. Navigators are getting two flights and 12 simulator missions, learning basic low-level navigation, runs over

a target, maneuvering around threats, and problem solving skills.

Then everyone comes back together for the integration phase, which "culminates in a capstone briefing," similar to what an air operations center staff would give the joint air component commander prior to a multi-aircraft mission, Bigger said.

All the students then go through the final T-1 phase at the 99th Flying Training Squadron, also at Randolph. There they will fly three sorties in the T-1 Jayhawk and one in a simulator to learn the crew coordination and teamwork needed in operational squadrons.

About 13 percent of the students fail to complete the program, with most of those eliminated for "not holding to standards. We have increased the standards here quite a bit," Deitschel said. Many seemingly qualified aviators "just can't do the mission."

Surprisingly, despite the consolidation at the Navy's Pensacola air station, future training will not be more joint.

"Our training down there is going to be as joint as possible, but it's not going to be side by side," because of different training agendas, Deitschel said.

"We're two separate training units," Bigger added, and the move was mandated by the most recent BRAC commission, which saw an opportunity to "dramatically increase efficiency." ■

Otto Kreisher is a Washington, D.C.-based military affairs reporter and a regular contributor to Air Force Magazine. His most recent article, "The Years of Noble Eagle," appeared in the June issue.

Bush's Brave New World Order

When Iraq invaded Kuwait on Aug. 2, 1990, it didn't take Washington long to bring force to bear. Some US fighters, troops, and warships came onto the scene almost immediately, and more arrived with each passing day. The prompt positioning of forces probably stopped a full-scale Iraqi thrust to the Saudi oilfields.

By mid-September, President George H.W. Bush was able to speak with guarded confidence about US prospects, but he went further, telling Congress that the Gulf crisis offered the opportunity for what he called "a New World Order," a period of international cooperation and peace in which "the rule of law supplants the rule of the jungle."

Four months later, Bush took a major step toward that goal. On Jan. 17, 1991, he launched a powerful US air campaign that went far toward destroying Iraqi forces in Kuwait. But the world of peace was not to be. Eleven years later—to the day—after his speech to Congress, al Qaeda struck in New York and Washington.

We gather tonight, witness to events in the Persian Gulf as significant as they are tragic. In the early morning hours of August 2nd, following negotiations and promises by Iraq's dictator Saddam Hussein not to use force, a powerful Iraqi army invaded its trusting and much weaker neighbor, Kuwait. Within three days, 120,000 Iraqi troops with 850 tanks had poured into Kuwait and moved south to threaten Saudi Arabia. It was then that I decided to act to check that aggression. ...

Our objectives in the Persian Gulf are clear, our goals defined and familiar: Iraq must withdraw from Kuwait completely, immediately, and without condition. Kuwait's legitimate government must be restored. The security and stability of the Persian Gulf must be assured. And American citizens abroad must be protected. These goals are not ours alone. They've been endorsed by the United Nations Security Council five times in as many weeks. Most countries share our concern for principle. And many have a stake in the stability of the Persian Gulf. This is not, as Saddam Hussein would have it, the United States against Iraq. It is Iraq against the world.

As you know, I've just returned from a very productive meeting with Soviet President [Mikhail] Gorbachev. And I am pleased that we are working together to build a new relationship. In Helsinki, our joint statement affirmed to the world our shared resolve to counter Iraq's threat to peace. Let me quote: "We are united in the belief that Iraq's aggression must not be tolerated. No peaceful international order is possible if larger states can devour their smaller neighbors." Clearly, no longer can a dictator count on East-West confrontation to stymie concerted United Nations action against aggression. A new partnership of nations has begun.

We stand today at a unique and extraordinary moment. The crisis in the Persian Gulf, as grave as it is, also offers a rare opportunity to move toward a historic period of cooperation. Out of these troubled times, our fifth objective—a new world order—can emerge: a new era—freer from the threat of terror, stronger in the pursuit of justice, and more secure in the quest for peace. An era in which the nations of the world, East and West, North and South, can prosper and live in harmony. A hundred generations have searched for this elusive path to peace, while a thousand wars raged across the span of human

"Persian Gulf Crisis"

President George H.W. Bush
Address to Joint Session of Congress
Washington, D.C.
Sept. 11, 1990

Find the full text on the
Air Force Association Web site
www.afa.org
Air Force Magazine
"The Keeper File"

endeavor. Today that new world is struggling to be born, a world quite different from the one we've known. A world where the rule of law supplants the rule of the jungle. A world in which nations recognize the shared responsibility for freedom and justice. A world where the strong respect the rights of the weak. This is the vision that I shared with President Gorbachev in Helsinki. He and other leaders from Europe, the Gulf, and around the world understand that how we manage this crisis today could shape the future for generations to come.

The test we face is great, and so are the stakes. This is the first assault on the new world that we seek, the first test of our mettle. Had we not responded to this first provocation with clarity of purpose, if we do not continue to demonstrate our determination, it would be a signal to actual and potential despots around the world. America and the world must defend common vital interests—and we will. America and the world must support the rule of law—and we will. America and the world must stand up to aggression—and we will. And one thing more: In the pursuit of these goals America will not be intimidated. ...

I cannot predict just how long it will take to convince Iraq to withdraw from Kuwait. Sanctions will take time to have their full intended effect. We will continue to review all options with our allies, but let it be clear: We will not let this aggression stand. ...

Let me also make clear that the United States has no quarrel with the Iraqi people. Our quarrel is with Iraq's dictator and with his aggression. Iraq will not be permitted to annex Kuwait. That's not a threat, that's not a boast, that's just the way it's going to be. ■

The DEAD Man's

At Shaw AFB, S.C., airmen of the 20th Fighter Wing train incessantly to “suppress and destroy.”

Photography by Greg Davis



A crew chief of the 77th Fighter Squadron alerts an F-16 pilot to make his preflight checks before the start of an April 5 training mission.

Hand



USAF has been boosting its F-16s with the Common Cockpit Implementation Program, bringing Block 40 and 50 jet aircraft new multifunction displays, on-board oxygen systems, and the Joint Helmet Mounted Cueing Systems. The 20th Fighter Wing at Shaw AFB, S.C., was the first to complete the basic CCIP upgrade, and this spring it took some of its new F-16s out for a spin. Wing F-16CJs and DJs flew from Shaw to the Avon Park range in Florida, where a realistic scenario played out in April. The 77th Fighter Squadron "Gamblers," one of the wing's three flying units, went SAM hunting, proving they can self-designate targets and fulfill the Destruction of Enemy Air Defenses (DEAD) mission.

111 First Lt. Russ Rotan pilots his F-16CJ on an April 4 "Long Rifle" mission. This fighter carries a LANTIRN targeting pod, visible on the right intake cheek mount in place of the HARM Targeting System (HTS) pod usually found there. Rotan wears a Joint Helmet Mounted Cueing System helmet.



121 Fully fueled and equipped, an F-16 readies for its takeoff. 131 An F-16 crew chief snaps a salute as an F-16DJ of the 77th FS taxis out for a training mission. 141 Rotan's F-16CJ breaks over Shaw at the end of a four-hour training mission.

same weight and size. Yet the wing placement—high on the 172 and low on the Comanche—results in differences in the way the pattern is flown, and in how the aircraft reacts in the flare because of the influence of ground effect just prior to touchdown.

Some airplanes are of such different configuration that their pilots must use polar-opposite landing techniques. Example: The contrast between the B-47 bomber and the V-22 tilt-rotor, which are at the two extremes of landing approach style.

The B-47 required a wide pattern, with a long, flat approach; that is because the bomber combined a relatively high approach speed, low drag, bicycle-style landing gear, and slow-to-accelerate engines. Accurate speed computation, based on the aircraft's weight, was vital, and both an approach chute (to allow the engines to maintain a higher rpm) and a brake chute were employed.

Two Extremes

In contrast, the modern tilt-rotor V-22 can fly directly to threshold of the desired landing spot in its conversion mode (nacelles at a 60 degree angle), then increase the nacelle angle to 90 degrees and make a vertical descent to touch down at zero mph forward speed.

Almost every other airplane can be slotted between these two extremes.

The type of aircraft helps to determine the method of the approach, particularly the final phase. In a light airplane, with power reduced to idle, the pilot tries to make contact with the ground just as the forward speed of the aircraft declines to the point that the wing is no longer flying. He is, in effect, allowing the aircraft to settle on its own.

This is a delicate process. Any error in judgment can leave you higher than you wish to be—and perhaps out of airspeed.

In those cases, pilots will hear the stall warning horn sound and probably utter a few expletives as they begin the last few feet of the subsequent rapid descent to the pavement.

In contrast, in heavy aircraft, the pilot's goal is to fly the aircraft, power on, right on to the runway.

This technique requires the use of milestones. One is the 50-foot radar altitude point, where a pilot brings back the power slightly, to gradually decelerate. Then, at the 20-foot

point, he initiates back pressure to continuously cut the rate of descent to a minimum, so that, with perhaps half the power on, the main wheels roll smoothly onto the surface. The nose wheel is brought down gently, and the drag devices (spoilers, slats, etc.) are deployed.

Whatever the approach dictated by the aircraft type, the pilot also has to consider the variables within a given airplane, such as weight, center of gravity, and configuration.

Even in peacetime, some airports have hazards that are not easily perceived and that sometimes reveal themselves to the pilot only on approach. These can include the improperly parked truck, new construction, or obscured runway markings.

Bad landings happen—all the time. To avoid them, the pilot must adhere religiously to the constants of landing an airplane while attending to each of the variables as they occur.

More subtle are runway imperfections to which local fliers may have become accustomed, but that can be startling on a first encounter. These range from sneaky berms that can cleave an undercarriage leg and abrupt drop-offs at either end to dips or rises in the center that alter a pilot's depth perception.

Fundamental runway considerations, though almost always factored into take-off computations, sometimes get short shrift in the landing process. These include the length and slope of the runway, field elevation, and the outside air temperature. Many a pilot has flown from a sea-level airport in the East to a Colorado destination, only to be surprised by the effects of the thinner air on landing.

Weather is often the most important variable in landing. When he breaks out of stormy weather, the pilot almost instantly encounters challenges in landing. The pilot, making a transition to a visual landing process, must immediately integrate several factors: the aircraft's position relative to the runway; the effects of the wind; airspeed; configuration; the possible presence of other air traffic; and the possible need to perform a go-around.

Crosswinds can be nefarious and can affect the airplane in the landing pattern, during the flare, in touchdown, and in rollout. Some conventional-gear aircraft, such as the T-6 or C-45, were particularly vulnerable to crosswinds, even while taxiing. The lightweight Predator UAV is piloted by remote control, but was nonetheless so vulnerable to crosswinds—18 mph was too much—that the Air Force had to build a cross-runway for the UAVs flying from Creech AFB, Nev.

The list of variables goes on and on, but one must also address the psychological considerations involved in a landing. These can range from hubris (“I’ll just tighten the pattern up a bit to show them how a hot pilot lands”) to fear of embarrassment (“If I drop this one in like I did the last one, I’ll run the landing gear up through the wing”).

Even so, most pilots conduct their approaches and landings with a high degree of confidence. The pilot in the cockpit is certain that his or her own experience and technique will result in a smooth touchdown. The good ones remember that, given the almost infinite number of variables, something can always go wrong.

There are many different kinds of approaches to which certain basic constant factors apply. For sake of argument, we will investigate a conventional light aircraft employing the standard 45-degree entry.

Perhaps the ultimate goal in the landing process is to attain a satisfying consistency. The pilot must have long since determined that he or she will fly the airplane—the airplane is not going to fly them. Therefore the pilot should perform each landing in as consistent and as exact a manner as possible. The term “exact” should be interpreted to mean keeping the airspeed, course, and altitude exactly as desired, with any minimum variation being quickly corrected.

On every landing, the pilot should go through the procedures in the same sequence and fly at the same altitudes, airspeeds, and distance from the field. One key to this is continually trimming (relieving control pressures by the use of trim tabs that manipulate the ailerons, elevator, and rudder) so that the aircraft maintains its current course and altitude hands-off. Consistent trimming is one of the keys to consistent landings.

Prior to entering the landing process, the pilot must possess full situational



awareness of the condition of his aircraft, its configuration, the weather, the location of the airfield, the runway currently in use, the local traffic, and any surface activity in the immediate area of the runway.

When it is available, the pilot receives information from ground control and establishes contact with the tower for landing clearance. (Many light aircraft operate from fields without a tower, requiring the pilot to be even more vigilant.)

One of the first constants is the mandatory use of a checklist. To someone with hundreds of hours in an aircraft, this may seem unnecessary—but is not.

Getting Close

Inform the tower that you are entering the pattern. Either before or during your entry onto the 45 degree course to the downwind leg of the pattern, establish the aircraft in level flight at the correct altitude above the field for the type and at traffic pattern airspeed. (Assume for this example that you are going to fly at 1,000 feet above ground level and at 98 mph.)

Trim the aircraft so that it flies hands off, and continue doing this. In the landing pattern with so much happening so quickly, it is easy to forget to trim and instead maintain attitude, altitude, or direction with control pressures.

In the pattern, some new variables may be introduced. If there is a lot of traffic of varied types, you may be urged by the tower to increase your speed or to vary your pattern to accommodate local conditions. Some airfields are so busy that the

instructions from the ground sound like a tobacco auctioneer's spiel, so you must be alert to acknowledge and comply with all instructions.

At the appropriate point for the airplane, begin your turn to the downwind leg, check for other traffic, and align your aircraft the appropriate distance from the runway. A pilot familiar with the aircraft will have already selected some point on the wing or the strut which confirms that the aircraft is at the correct distance.

If traffic permits, the tower will give you clearance to land. All turns should be carefully coordinated with yoke (or stick) and rudder.

Continue to use your checklist, making such adjustments as applying carburetor heat, and extending the first increment of your flaps, perhaps 10 to 15 degrees. Begin your turn to the base leg as you cross a line extended from the approach end of the runway, allowing the nose to drop, and trimming so that you maintain airspeed and a 300 to 500 foot-per-minute rate of descent.

Clear yourself visually during the turns, and remain alert for instructions from the tower. Observe the runway and the projected approach path, looking quickly both in the direction of the runway, and away from it, in order to detect someone making a long straight-in approach.

The wind will dictate where you begin your turn to final approach. Make a descending turn to the final approach, add an additional increment of flaps, and line up with the runway. Compensate for any crosswind, to maintain a straight flight path over the ground to the runway.

On final approach, add the final

increment of flaps, keep your speed at 75 mph, stabilize your flight path and the rate of descent, trim, and quickly check trim for hands-off flight. There are many arguments about whether to use power to control altitude and pitch to control airspeed or vice versa. Probably both need to be used in concert, and if you have properly stabilized and trimmed the aircraft, you'll not be obliged to use much of either.

Even at this point, be prepared to go around if things do not look correct to you. There is no shame in a go-around.

There is considerable shame in not going around when you should have.

Now, on short final, and given that you have flown a smooth, consistent, well-trimmed approach, the whole question of executing a smooth touchdown depends on your quick assimilation of a series of visual cues. You will have already picked your desired touchdown point, well after the numbers, and you can now look ahead at the far end of the runway to establish a field of vision that will permit your depth perception to function.

As the aircraft approaches the runway surface, keep looking down the field and gently bring the nose up and the power off, maintaining a straight flight path using rudder and aileron. Just above the pavement, do as William K. Kershner, the late great king of instructors suggests: Look out about 100 feet ahead of the aircraft and try to keep it flying as long as possible.

As flying speed falls off, the wheels will touch down ever so softly. Keep the stick or the yoke coming back, allowing the nose to slowly fall until the nose wheel gently reaches the ground. Continue to keep the yoke or stick full back, then, if required for a turn-off, selectively use brakes to slow down.

You may then taxi over to the cheering throng of admiring fellow pilots.

Easier said than done. ■

*Walter J. Boyne, a former director of the National Air and Space Museum in Washington, D.C., is a retired Air Force colonel who accumulated more than 5,000 flying hours in various USAF aircraft. He has written more than 40 books about aviation topics, the most recent of which is *Soaring to Glory*. By his own admission, the author says that he has made some of the worst landings in recorded history, and a few good ones too.*

By John T. Correll, Contributing Editor

Sure It Does

"A recent study by Foreign Policy in Focus and the Center for Defense Information found that 90 percent of US security spending is devoted to military purposes, while only 10 percent goes to nonmilitary tools of security such as diplomacy, foreign assistance, and homeland security. This huge imbalance undermines the effectiveness of our defense policy."—**William D. Hartung, World Policy Institute, Washington Post, May 12.**

Armed With Confidence

"Russians need not worry about defense: They can look confidently to the future. We now have new [missile] systems at the strategic as well as theater level. These systems can beat any operational and future missile defenses."—**Russian First Deputy Prime Minister Sergei Ivanov, RIA Novosti, May 30.**

They'll Find Out

"If the people who say we're not having any war on terror ever get elected, they'll sit in the office, the Oval Office, and realize we are in a war on terror. They'll realize there are people that are out plotting and planning. They'll see the complexities of taking on this enemy."—**President Bush, Reuters, May 23.**

Sword and Shield

"All our warriors trust each other with their lives. They count on each member of the joint team to deliver the full range of service-unique effects. Only one of our armed services can provide global surveillance, global command and control, and the requisite range, precision, and payload to strike any target, anywhere, anytime, at the speed of sound or the speed of light. With the nation at war, the Air Force is the nation's premier maneuver force—its sword and shield, guardian and avenger."—**Gen. T. Michael Moseley, Air Force Chief of Staff, The Hill, May 23.**

Only Ground Forces Win

"If you liken Iraq and Afghanistan to a game of Texas Hold 'Em, the United States is 'all in.' There isn't much more land power available for use in Iraq and Afghanistan other than some under-

equipped and marginally ready Army National Guard and Marine Corps Reserve units that would need training time and equipment augmentation to be fully ready for employment. To be sure, Air Force and Navy [units] remain ready but, as has been demonstrated in the latest Israeli-Lebanese episode, airpower and smart weapons have specific characteristics limiting their utility in all known scenarios. And even in those situations in which air can be used, with minor exceptions lethality is the only functional purpose; in a land war, the Air Force and Navy can inflict punishment but they do not close with and defeat the enemy."—**Retired Gen. Gordon R. Sullivan, president of the Association of the US Army, June 3.**

Torture Will Backfire

"The torture methods that Tenet defends have nurtured the recuperative power of the enemy. This war will be won or lost not on the battlefield but in the minds of potential supporters who have not yet thrown in their lot with the enemy. If we forfeit our values by signaling that they are negotiable in situations of grave or imminent danger, we drive those undecideds into the arms of the enemy. This way lies defeat, and we are well down the road to it."—**Retired Marine Corps Gen. Charles C. Krulak and retired Marine Corps Gen. Joseph P. Hoar on justification of torture techniques by former CIA Director George J. Tenet, Washington Post, May 17.**

Iran's Nuclear Progress

"I think that the general view of American intelligence is that they would be in a position to develop a nuclear device, probably sometime in the period 2010, 2011 to 2014 or 2015. There are those who believe that that could happen much sooner, in late 2008 or 2009."—**Secretary of Defense Robert M. Gates, press conference in Singapore, June 2.**

Long Reach of the Corps

"Someone in the Marine Corps needs to exercise a little common sense and put an end to this matter before it turns into a circus."—**Gary Kurpius, national commander of the Veterans of Foreign Wars, on pending Marine Corps**

action against a former corporal, honorably discharged but in standby reserve status, who wore military fatigues with insignia removed at a war protest, Associated Press, June 2.

Usable Weapons

"The concern is that countries are starting to see these weapons as usable, whereas during the Cold War, they were seen as a deterrent."—**Ian Anthony, Stockholm International Peace Research Institute, on nuclear weapons, Associated Press, June 12.**

Navy's Big Thinkers

"There's no obvious reason a Navy guy would be put in charge of CENTCOM, or why we would have two sea service people replacing two other sea service people at the top of the Joint Chiefs [of Staff]. But the reality is that they seem to be able to work with big ideas and big political leaders better than the other services."—**Loren B. Thompson, Lexington Institute, Los Angeles Times, June 10.**

Excess of Pre-emption

"We now have endorsed the concept of pre-emptive war, where we go to war with another nation militarily, even though our own security is not directly threatened, if we want to change the regime there or if we fear that some time in the future our security might be endangered."—**Former President Jimmy Carter, Arkansas Democrat-Gazette, May 19.**

Other Kinds of Wars

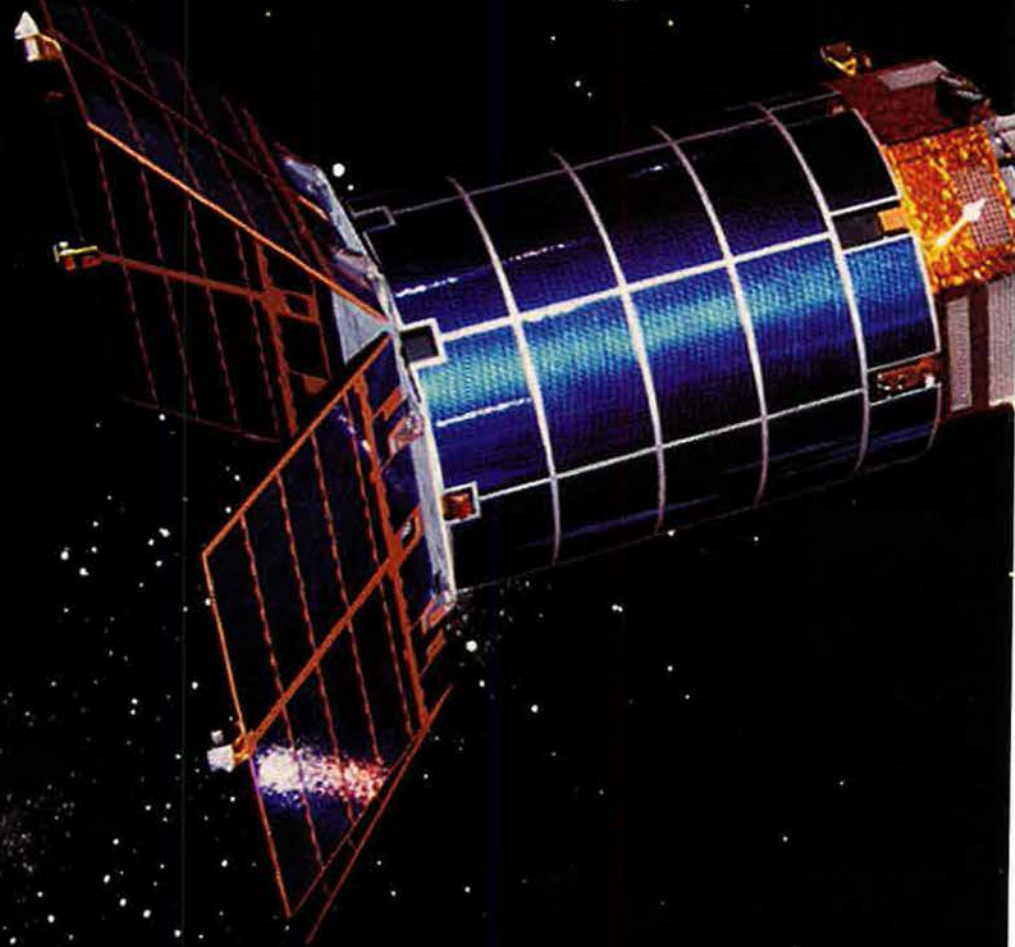
"We have to fight today's war, which means using readiness money for training and recruiting and retention, but you always have to look at tomorrow's threat as well, because every war won't be like Iraq and Afghanistan."—**Gen. Ronald E. Keys, commander of Air Combat Command, Omaha World-Herald, May 15.**

RAF Bans Nose Art

"We have women that fly the planes, women that fix the planes, and it's just not appropriate."—**RAF spokesman on orders to remove silhouettes of pinup persons from the noses of two Harrier jet aircraft, Associated Press, June 5.**

2007 Space Almanac

The US military space operation in facts and figures.



Compiled by **Tamar A. Mehuron**, Associate Editor, and the staff of *Air Force Magazine*



0.05g 60,000 miles

Geosynchronous Earth Orbit 22,300 miles

Hard vacuum 1,000 miles

Medium Earth Orbit begins 300 miles

0.95g 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

Illustration not to scale

US Military Missions in Space

Space Support

Launch of satellites and other high-value payloads into space and operation of those satellites through a worldwide network of ground stations.

Space Force Enhancement

Provide satellite communications, navigation, weather information, missile warning, command and control, and intelligence to the warfighter.

Space Control

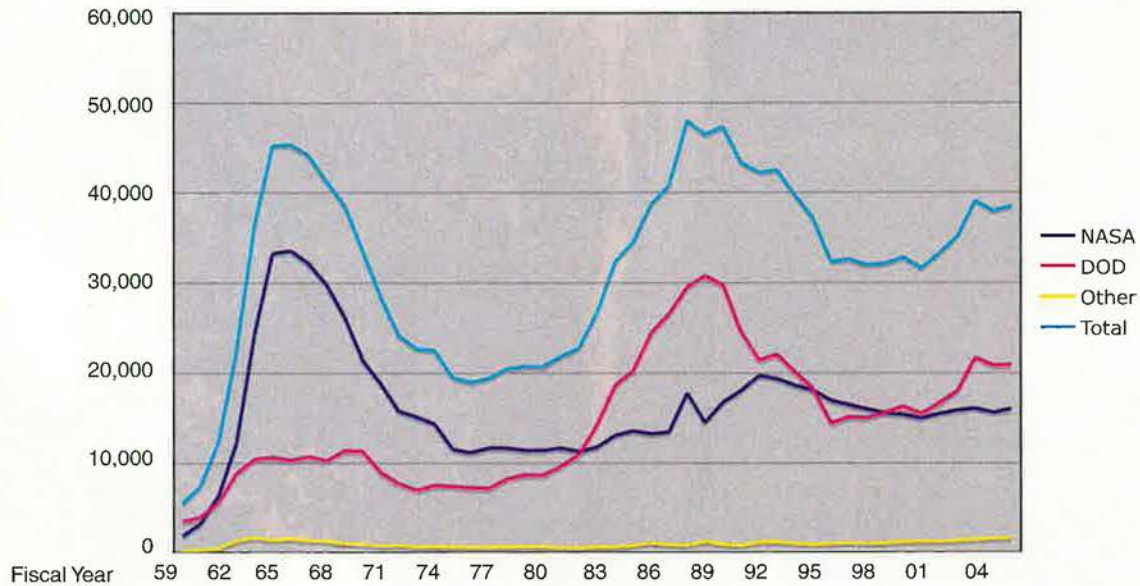
Ensure freedom of action in space for the US and its allies and, when directed, deny an adversary freedom of action in space.

Space Force Application

Provide capabilities for the application of combat operations in, through, and from space to influence the course and outcome of conflict.

US Space Funding

Millions of constant Fiscal 2007 dollars



Fiscal Year	NASA	DOD	Other	Total	Fiscal Year	NASA	DOD	Other	Total
1959	1,841	3,457	240	5,538	1983	13,051	18,601	675	32,327
1960	3,205	3,892	298	7,395	1984	13,561	20,160	781	34,502
1961	6,360	5,591	467	12,418	1985	13,218	24,371	1,114	38,703
1962	12,221	8,827	1,353	22,401	1986	13,421	26,460	893	40,774
1963	24,342	10,406	1,725	36,473	1987	17,735	29,448	842	48,025
1964	33,241	10,597	1,412	45,250	1988	14,454	30,706	1,287	46,447
1965	33,514	10,267	1,572	45,352	1989	16,734	29,675	928	47,337
1966	32,106	10,706	1,357	44,169	1990	18,019	24,554	795	43,369
1967	29,696	10,231	1,310	41,237	1991	19,686	21,399	1,165	42,251
1968	26,139	11,341	1,028	38,508	1992	19,337	22,009	1,169	42,515
1969	21,376	11,258	953	33,587	1993	18,582	20,064	1,040	39,686
1970	18,768	8,879	746	28,393	1994	18,053	18,253	877	37,182
1971	15,717	7,663	821	24,201	1995	16,915	14,354	1,023	32,293
1972	15,082	6,910	655	22,647	1996	16,457	15,075	1,084	32,616
1973	14,303	7,505	681	22,490	1997	15,943	15,009	1,010	31,963
1974	11,494	7,357	658	19,510	1998	15,521	15,569	1,058	32,147
1975	11,131	7,225	602	18,959	1999	15,357	16,274	1,210	32,841
1976	11,640	7,157	607	19,405	2000	14,926	15,426	1,258	31,611
1977	11,658	8,174	656	20,488	2001	15,427	16,612	1,231	33,271
1978	11,411	8,624	712	20,747	2002	15,831	17,965	1,365	35,161
1979	11,404	8,591	702	20,698	2003	16,021	21,631	1,456	39,108
1980	11,668	9,594	576	21,839	2004	15,559	20,765	1,590	37,914
1981	11,284	10,913	530	22,727	2005	16,016	20,846	1,627	38,489
1982	11,766	14,216	666	26,648	2006	16,085	21,724	1,672	39,481
					Total	\$777,280	\$706,332	\$47,478	\$1,531,090

The Year in Space

July 14, 2006

USAF names Maj. Gen. John T. Sheridan to be deputy director of National Reconnaissance Office.

Aug. 24

Specialists from Utah Test and Training Range at Hill AFB, Utah, explode last Titan IV solid rocket motor unit.

Sept. 1

Thirtieth Space Wing operators at Vandenberg AFB, Calif., for the first time launch interceptor missile from Vandenberg Missile Defense Agency silo.

Sept. 14

Air Force Space Command announces plan to move 1st Space Control Squadron, Cheyenne Mountain AFS, Colo., to Vandenberg AFB, Calif.

Sept. 26

US Strategic Command officials stand up Joint Functional Component Command for Space as separate unit.

Oct. 3

Boeing and Lockheed announced approval from Federal Trade Commission to merge their launch services into United Launch Alliance.

Oct. 6

White House unveils new "US National Space Policy," directing Secretary of Defense to pursue "capabilities, plans, and options" for ensuring US freedom of action in space.

Nov. 4

Thirtieth Space Wing, Vandenberg AFB, Calif., launches Boeing Delta IV rocket, carrying DMSP satellite successfully into orbit.

Nov. 9

USAF awards Boeing nearly \$300 million contract to produce fourth satellite in Wideband Global SATCOM program, designed to replace today's old Defense Satellite Communications System.

Nov. 17

Operators at Cape Canaveral AFS, Fla., successfully launch Boeing Delta II carrying Lockheed Martin modernized GPS IIR-16M satellite.

Dec. 16

Orbital Science's Minotaur I, lifting off from Mid-Atlantic Regional Spaceport, places into orbit USAF's experimental TacSat-2 micro satellite.

Dec. 22

Lockheed Martin announces delivery, ahead of schedule, of flight structure for third Advanced Extremely High Frequency satellite.

Jan. 8, 2007

Boeing officials announce that critical design review for Space Based Space Surveillance system has been completed.

Jan. 11

China, using direct-ascent missile, demolishes obsolete Chinese weather satellite, proving its power to threaten US spacecraft. ... Blast produces debris field of 1,600 pieces of space junk.

Jan. 12

Ten airmen at Schriever AFB, Colo., begin training to operate Space Based Infrared System's Highly Elliptical Orbit-1, launched last fall.

Jan. 22

Air Force Chief of Staff Gen. T. Michael Moseley approves newest revision to *Space Operations*, USAF's space doctrine book. ... In its first update since November 2001, the

document focuses on space power operations.

March 8

An Atlas V at Cape Canaveral AFS, Fla., executes USAF's 50th straight successful space launch, putting into orbit six separate payloads.

April

Joint Air Force Space Command-University of Colorado program graduates its first 20 space professionals, all of whom had completed five new technical space courses.

April 23

Los Angeles Times reports that the USAF Chief of Staff, Gen. T. Michael Moseley, has ordered review of vulnerabilities of US military satellites in space, in light of Chinese anti-satellite test.

April 24

Gen. T. Michael Moseley, USAF Chief of Staff, calls China's January ASAT success "a strategically dislocating event," on the order of Russia's October 1957 Sputnik success.

April 26

Air Force Space Command OKs five-year license for SpaceX (Space Exploration Technologies Corp.) to operate out of Space Launch Complex-40 at Cape Canaveral AFS, Fla.

May 16

16th Space Control Squadron, defensive counterspace unit, stands up at Peterson AFB, Colo., using Rapid Attack Identification Detection Reporting System to detect jamming efforts.

June 5

Boeing officials announce completion of "end-to-end" testing of Wideband Global SATCOM payload command and control system. ... Launch of system is slated for August.

Space and Missile Badges

CURRENT



Space Badge



Astronaut



Missile Badge

HISTORICAL



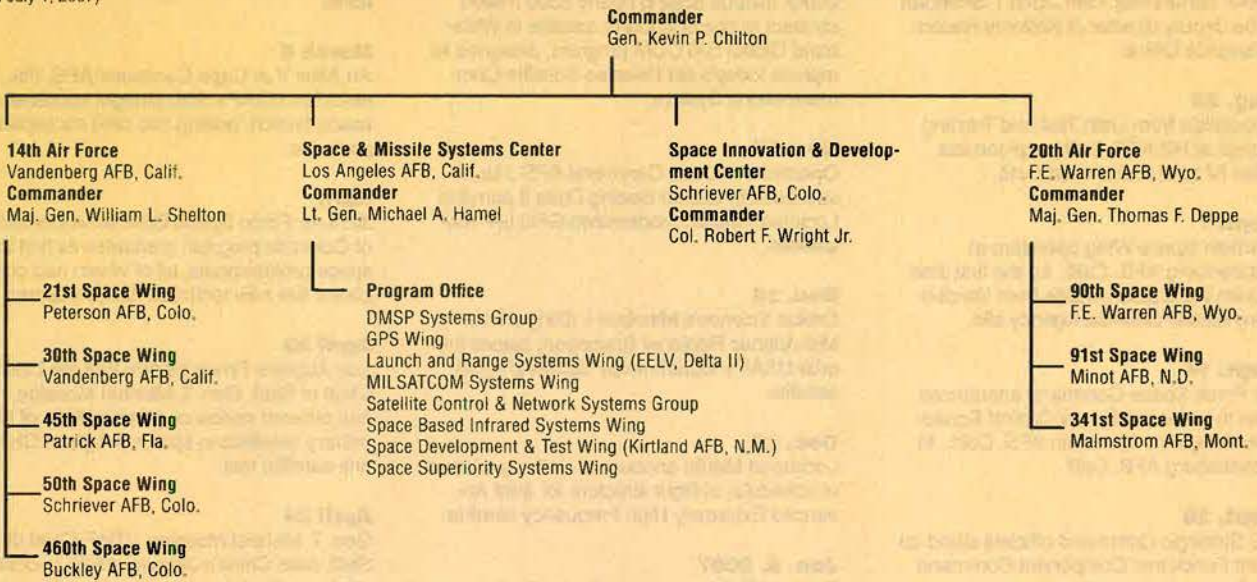
Space/Missile Badge



Missile Badge With Operations Designer

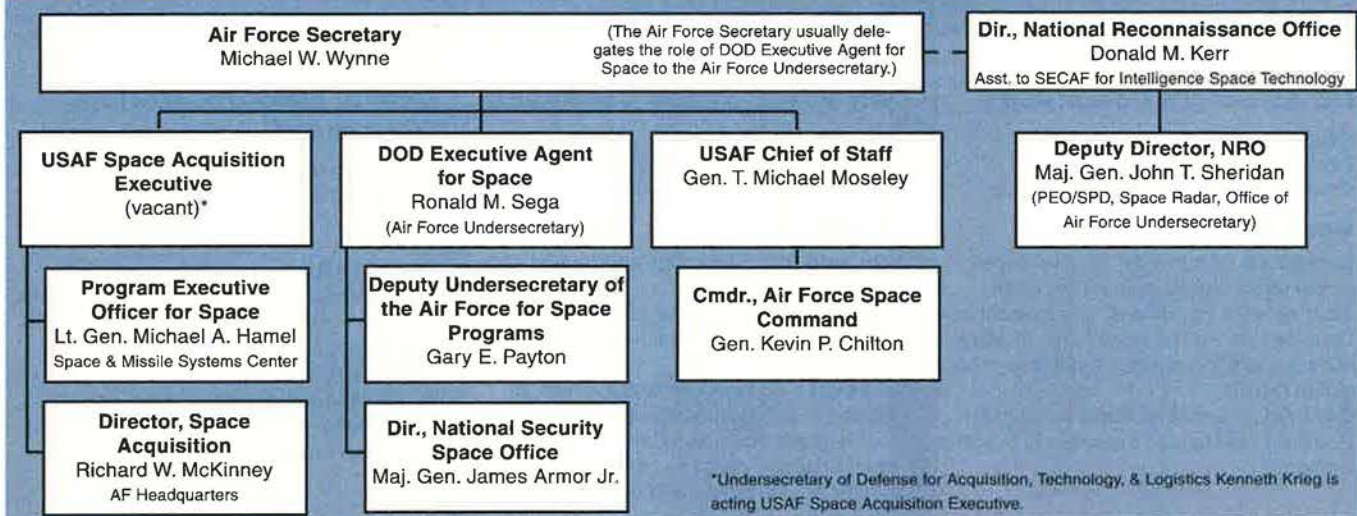
Air Force Space Command, Peterson AFB, Colo.

(As of July 1, 2007)



Staff map by Zaur Eyanbekov

Key USAF Positions in National Security Space



Space Leaders

(As of June 30, 2007. A = Acting)

US Space Command		
Gen. Robert T. Herres	Sept. 23, 1985	Feb. 5, 1987
Gen. John L. Piotrowski	Feb. 6, 1987	March 30, 1990
Gen. Donald J. Kutyna	April 1, 1990	June 30, 1992
Gen. Charles A. Horner	June 30, 1992	Sept. 12, 1994
Gen. Joseph W. Ashy	Sept. 13, 1994	Aug. 26, 1996
Gen. Howell M. Estes III	Aug. 27, 1996	Aug. 13, 1998
Gen. Richard B. Myers	Aug. 14, 1998	Feb. 22, 2000
Gen. Ralph E. Eberhart	Feb. 22, 2000	Oct. 1, 2002

US Strategic Command		
Adm. James O. Ellis Jr.	Oct. 1, 2002	July 9, 2004
Gen. James E. Cartwright, USMC	July 9, 2004	

US Space Command was inactivated Oct. 1, 2002, and its mission transferred to US Strategic Command.

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	March 29, 1990
Lt. Gen. Thomas S. Moorman Jr.	March 29, 1990	March 23, 1992
Gen. Donald J. Kutyna	March 23, 1992	June 30, 1992
Gen. Charles A. Horner	June 30, 1992	Sept. 13, 1994
Gen. Joseph W. Ashy	Sept. 13, 1994	Aug. 26, 1996
Gen. Howell M. Estes III	Aug. 26, 1996	Aug. 14, 1998
Gen. Richard B. Myers	Aug. 14, 1998	Feb. 22, 2000
Gen. Ralph E. Eberhart	Feb. 22, 2000	April 19, 2002
Gen. Lance W. Lord	April 19, 2002	March 3, 2006
Lt. Gen. Frank G. Klotz (A)	March 3, 2006	June 26, 2006
Gen. Kevin P. Chilton	June 26, 2006	

Army Space & Missile Defense Command		
Lt. Gen. John F. Wall	July 1, 1985	May 24, 1988
Brig. Gen. R.L. Stewart (A)	May 24, 1988	July 11, 1988
Lt. Gen. Robert D. Hammond	July 11, 1988	June 30, 1992
B.Gen. W.J. Schumacher (A)	June 30, 1992	July 31, 1992
Lt. Gen. Donald M. Lionetti	Aug. 24, 1992	Sept. 6, 1994
Lt. Gen. Jay M. Garner	Sept. 6, 1994	Oct. 7, 1996
Lt. Gen. Edward G. Anderson III	Oct. 7, 1996	Aug. 6, 1998
Col. Stephen W. Flohr (A)	Aug. 6, 1998	Oct. 1, 1998
Lt. Gen. John Costello	Oct. 1, 1998	March 28, 2001
Brig. Gen. J.M. Urias (A)	March 28, 2001	April 30, 2001
Lt. Gen. J.M. Cosumano Jr.	April 30, 2001	Dec. 16, 2003
Lt. Gen. Larry J. Dodgen	Dec. 16, 2003	Dec. 18, 2006
Lt. Gen. Kevin T. Campbell	Dec. 18, 2006	

Army Space and Missile Defense Command was the Army Strategic Defense Command until August 1992 and the Army Space and Strategic Defense Command until October 1997.

National Reconnaissance Office		
Joseph V. Charyk	Sept. 6, 1961	March 1, 1963
Brockway McMillan	March 1, 1963	Oct. 1, 1965
Alexander H. Flax	Oct. 1, 1965	March 11, 1969
John L. McLucas	March 17, 1969	Dec. 20, 1973
James W. Plummer	Dec. 21, 1973	June 28, 1976
Thomas C. Reed	Aug. 9, 1976	April 7, 1977
Charles W. Cook (A)	April 7, 1977	Aug. 3, 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	March 5, 1993
Jimmie D. Hill (A)	March 5, 1993	May 19, 1994
Jeffrey K. Harris	May 19, 1994	Feb. 26, 1996
Keith R. Hall (A)	Feb. 27, 1996	March 27, 1997
Keith R. Hall	March 28, 1997	Dec. 13, 2001
Peter B. Teets	Dec. 13, 2001	March 25, 2005
Dennis D. Fitzgerald (A)	March 25, 2005	July 22, 2005
Donald M. Kerr	July 22, 2005	

Naval Space Command		
RAdm. Richard H. Truly	Oct. 1, 1983	Feb. 28, 1986
Col. R.L. Phillips, USMC (A)	March 1, 1986	April 30, 1986
RAdm. D. Bruce Cargill	April 30, 1986	Oct. 24, 1986
RAdm. Richard C. Macke	Oct. 24, 1986	March 21, 1988
RAdm. David E. Frost	March 21, 1988	April 2, 1990
Col. C.R. Geiger, USMC (A)	April 2, 1990	May 31, 1990
RAdm. L.E. Allen Jr.	May 31, 1990	Aug. 12, 1991
RAdm. Herbert A. Browne Jr.	Aug. 12, 1991	Oct. 28, 1993
RAdm. Leonard N. Oden	Oct. 28, 1993	Jan. 31, 1994
RAdm. Lyle G. Bien	Jan. 31, 1994	Dec. 13, 1994
RAdm. Phillip S. Anselmo	Dec. 13, 1994	April 18, 1995
RAdm. Katharine L. Laughton	April 18, 1995	Feb. 28, 1997
RAdm. Patrick D. Money maker	Feb. 28, 1997	Sept. 10, 1998
Col. M.M. Henderson, USMC (A)	Sept. 10, 1998	Oct. 1, 1998
RAdm. Thomas E. Zelibor	Oct. 1, 1998	June 8, 2000
RAdm. J.J. Quinn	June 8, 2000	March 31, 2001
RAdm. Richard J. Mauldin	March 31, 2001	Dec. 10, 2001
RAdm. John P. Cryer	Dec. 10, 2001	July 11, 2002

Naval Space Command on July 11, 2002 ceased functioning as the Navy's primary space component. Its functions were transferred to the Naval Network Warfare Command.

Naval Network Warfare Command		
VAdm. Richard Mayo	July 11, 2002	March 26, 2004
VAdm. James D. McArthur Jr.	March 26, 2004	June 15, 2007
VAdm. H. Denby Starling II	June 15, 2007	

Major Military Commands With Space Functions

The Unified Command

US Strategic Command

Headquarters: Offutt AFB, Neb.
Established: June 1, 1992
Cmdr.: Gen. J.E. Cartwright, USMC

MISSIONS

Establish and provide full-spectrum global strike, space operations, computer network operations, Department of Defense information operations, strategic warning, integrated missile defense, and global C4ISR

Combat weapons of mass destruction
Provide specialized expertise to the joint warfighter

The Service Components

Air Force Space Command

Headquarters: Peterson AFB, Colo.
Established: Sept. 1, 1982
Cmdr.: Gen. Kevin P. Chilton

MISSIONS

Defend the US through control and exploitation of space
Provide strategic deterrence by operating, testing, and maintaining ICBM forces for STRATCOM

Operate and employ space forces for strategic and tactical missile warning, battlespace characterization, environmental monitoring, satellite communications, precision navigation and timing, spacelift, and space control

Acquire, launch, and sustain space systems for USAF and DOD

Develop tactics, techniques, and procedures to integrate space capabilities with air, land, and sea forces

Develop space professionals

Naval Network Warfare Command

Headquarters: Norfolk, Va.
Established: July 11, 2002
Cmdr.: Vice Adm. H. Denby Starling II

MISSIONS

Operate and maintain the Navy's space, network, and information operations systems and services

Support warfighting operations and command and control of naval forces

Promote innovative technological solutions to warfighting requirements

US Military Payloads by Mission, 1958-2006

(Orbital only)

Applications	364
Communications	126
Weather	45
Navigation	95
Launch vehicle/spacecraft tests	4
Other military	94
Weapons-Related Activities	46
SDI tests	11
Anti-satellite targets	2
Anti-satellite interceptors	33
Reconnaissance	443
Photographic/radar imaging	253
Electronic intelligence	50
Ocean surveillance	48
Nuclear detection	12
Radar calibration	41
Early warning	39
Total	853

Major US Agencies With Roles in Space

Central Intelligence Agency

Headquarters: McLean, Va.
Established: 1947
Director: Gen. Michael V. Hayden, USAF

Mission

Provide national security intelligence to senior US policy-makers

Direct Space Role

Support the National Reconnaissance Office in designing, building, and operating satellite reconnaissance systems

National Geospatial-Intelligence Agency

Headquarters: Bethesda, Md.
Established: Nov. 24, 2003
Director: Vice Adm. Robert B. Murrett

Mission

Provide geospatial intelligence (analysis and depiction of Earth's physical features and geographic references) to aid national security operations

Formerly National Imagery and Mapping Agency (NIMA).

National Reconnaissance Office

Headquarters: Chantilly, Va.
Established: September 1961
Director: Donald M. Kerr

Mission

Design, build, and operate reconnaissance satellites

Acquire innovative technology

Provide systems engineering

Support monitoring of arms control agreements, military activities, natural disasters, and other worldwide events of interest to the US

National Security Agency

Headquarters: Ft. Meade, Md.
Established: November 1952
Director: Lt. Gen. Keith B. Alexander, USA

Mission

Protect US communications

Produce foreign signals intelligence

Army Space & Missile Defense Command

Headquarters: Huntsville, Ala.
Established: Oct. 1, 1997
Cmdr.: Lt. Gen. Kevin T. Campbell

MISSIONS

Serve as service component command to US Strategic Command
Serve as specified proponent for space and ground-based midcourse missile defense
Serve as Army's operational integrator for global missile defense
Oversee space- and missile-related R&D and acquisition for Army Title 10 responsibilities

AFSPC Personnel Deployed by Unified Command

USCENTCOM	1,124
USEUCOM	27
USJFCOM	0
USNORTHCOM	71
USSOUTHCOM	33
USSOCOM	0
USPACOM	1
USTRANSCOM	0

Total deployed 1,256

By Region

Western and Southern Europe

Germany	11
UK	0
Italy	1
Turkey	3
Spain	1
Other countries	11

East Asia and Pacific

Japan/Okinawa	0
South Korea	0
Other countries	1

Africa, Near East, South Asia

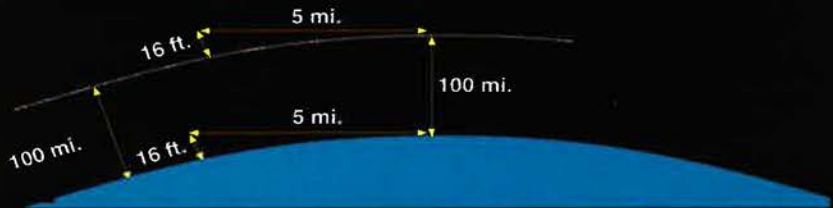
Saudi Arabia	9
Egypt	0
Other countries	1,115

Western hemisphere

Canada	0
Other countries	104

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 16 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 sea level, unless the spacecraft's flight is upset by perturbations, such as solar wind or mechanical anomalies.

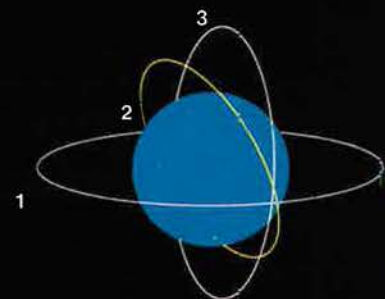
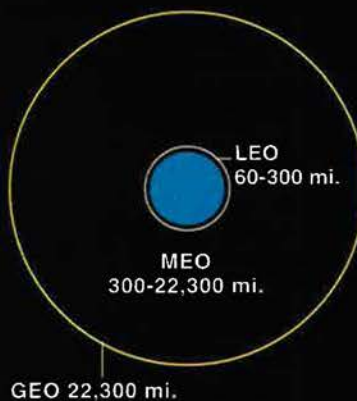


Orbital Altitude

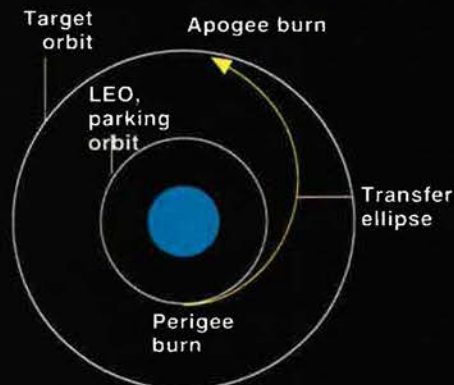
LEO Low Earth orbit
 MEO Medium Earth orbit
 GEO Geosynchronous Earth orbit
 HEO High Earth orbit

Orbital Inclinations

1 Equatorial
 2 Sun synchronous
 3 Polar



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.

US Military/Civil Launches

(As of Dec. 31, 2006)

Year	Military	Civil	Total	Year	Military	Civil	Total	Year	Military	Civil	Total	Year	Military	Civil	Total
1958	0	7	7	1970	18	11	29	1982	6	12	18	1994	11	15	26
1959	6	5	11	1971	16	16	32	1983	8	14	22	1995	9	18	27
1960	11	5	16	1972	14	17	31	1984	11	11	22	1996	11	22	33
1961	19	10	29	1973	11	12	23	1985	4	13	17	1997	9	28	37
1962	32	20	52	1974	8	16	24	1986	4	2	6	1998	5	29	34
1963	25	13	38	1975	9	19	28	1987	6	2	8	1999	7	23	30
1964	33	24	57	1976	11	15	26	1988	8	4	12	2000	11	17	28
1965	34	29	63	1977	10	14	24	1989	11	7	18	2001	7	14	21
1966	35	38	73	1978	14	18	32	1990	11	16	27	2002	1	16	17
1967	29	29	58	1979	8	8	16	1991	6	12	18	2003	11	16	27
1968	23	22	45	1980	8	5	13	1992	11	17	28	2004	5	12	17
1969	17	23	40	1981	7	11	18	1993	12	11	23	2005	6	13	19
												2006	5	14	19

Data changes in prior years reflect recategorization from civil to military launches.

Total 594 745 1,339

Sites for Space Launches, 1957-Present

(As of Dec. 31, 2006)

Launch Site	Operator	Total Launches
Plesetsk	Russia	1,558
Tyuratam/Baikonur, Kazakhstan	Russia	1,257
Vandenberg AFB, Calif.	US	640
Cape Canaveral AFS, Fla.	US	625
Kourou, French Guiana	ESA	183
JFK Space Center, Fla.	US	138
Kapustin Yar	Russia	101
Xichang	China	43
Tanegashima	Japan	42
Shuang Cheng-tsu/Jiuquan	China	39
Kagoshima	Japan	34
Wallops Flight Facility, Va.	US	31
Pacific Ocean Platform	Sea Launch	23
Taiyuan	China	23
Sriharikota	India	21
Edwards AFB, Calif.	US	20
Indian Ocean Platform	US	9
Palmachim	Israel	6
Svobodny	Russia	5
Hammaguir, Algeria	France	4
Woomera, Australia	Australia	4
Alcantara	Brazil	3
Barents Sea	Russia	3
Kwajalein, Marshall Islands	US	2
Dombarovski	Russia	1
Kodiak, Alaska	US	1
Musudan ri	North Korea	1
Tenerife, Canary Islands	US	1
Total		4,818

What's Up There

(As of Dec. 31, 2006)

Country Organization	Payloads in Orbit			Total
	Satellites	Space Probes	Debris	
US	962	58	2,550	3,570
Russia*	1,364	35	2,007	3,406
People's Republic of China	57	0	300	357
France	47	0	210	257
Japan	100	7	32	139
India	31	0	97	128
European Space Agency	37	6	30	73
Intl. Telecom Sat. Org.	62	0	0	62
Globalstar	52	0	0	52
Orbcomm	35	0	0	35
European Telecom Sat. Org.	28	0	0	28
Germany	22	2	1	25
Canada	23	0	1	24
United Kingdom	23	0	0	23
Luxembourg	14	0	0	14
Intl. Maritime Sat. Org.	11	0	0	11
Italy	11	0	0	11
Australia	10	0	0	10
Brazil	10	0	0	10
South Korea	10	0	0	10
Sweden	10	0	0	10
Argentina	9	0	0	9
Indonesia	9	0	0	9
Spain	9	0	0	9
NATO	8	0	0	8
Taiwan	8	0	0	8
Arab Sat. Comm. Org.	7	0	0	7
Mexico	7	0	0	7
Israel	6	0	0	6
Saudi Arabia	6	0	0	6
Thailand	6	0	0	6
Czech Republic	5	0	0	5
Netherlands	5	0	0	5
Turkey	5	0	0	5
Other**	40	3	1	44
Total	3,049	111	5,229	8,389

* Russia includes Commonwealth of Independent States (CIS) and former Soviet Union.

** Other refers to countries or organizations that have placed fewer than five objects in space.

US Satellites Placed in Orbit or Deep Space

(As of Dec. 31, 2006)

Year	Military	Civil*	Total	Year	Military	Civil*	Total	Year	Military	Civil*	Total	Year	Military	Civil*	Total
1958	0	7	7	1970	23	8	31	1982	8	9	17	1994	18	19	37
1959	6	5	11	1971	26	18	44	1983	16	12	28	1995	15	24	39
1960	12	5	17	1972	18	14	32	1984	17	16	33	1996	16	24	40
1961	20	12	32	1973	14	10	24	1985	13	17	30	1997	10	82	92
1962	35	20	55	1974	11	8	19	1986	7	4	11	1998	7	90	97
1963	33	22	55	1975	12	16	28	1987	10	1	11	1999	8	74	82
1964	44	25	69	1976	17	12	29	1988	11	9	20	2000	12	40	52
1965	49	39	88	1977	14	6	20	1989	15	9	24	2001	8	24	32
1966	52	47	99	1978	16	17	33	1990	22	16	38	2002	2	25	27
1967	51	34	85	1979	10	7	17	1991	17	18	35	2003	11	12	23
1968	35	26	61	1980	12	4	16	1992	12	17	29	2004	5	12	17
1969	32	27	59	1981	7	10	17	1993	12	18	30	2005	6	13	19
												2006	14	21	35
												Total	841	1,005	1,846

*Includes some military payloads.

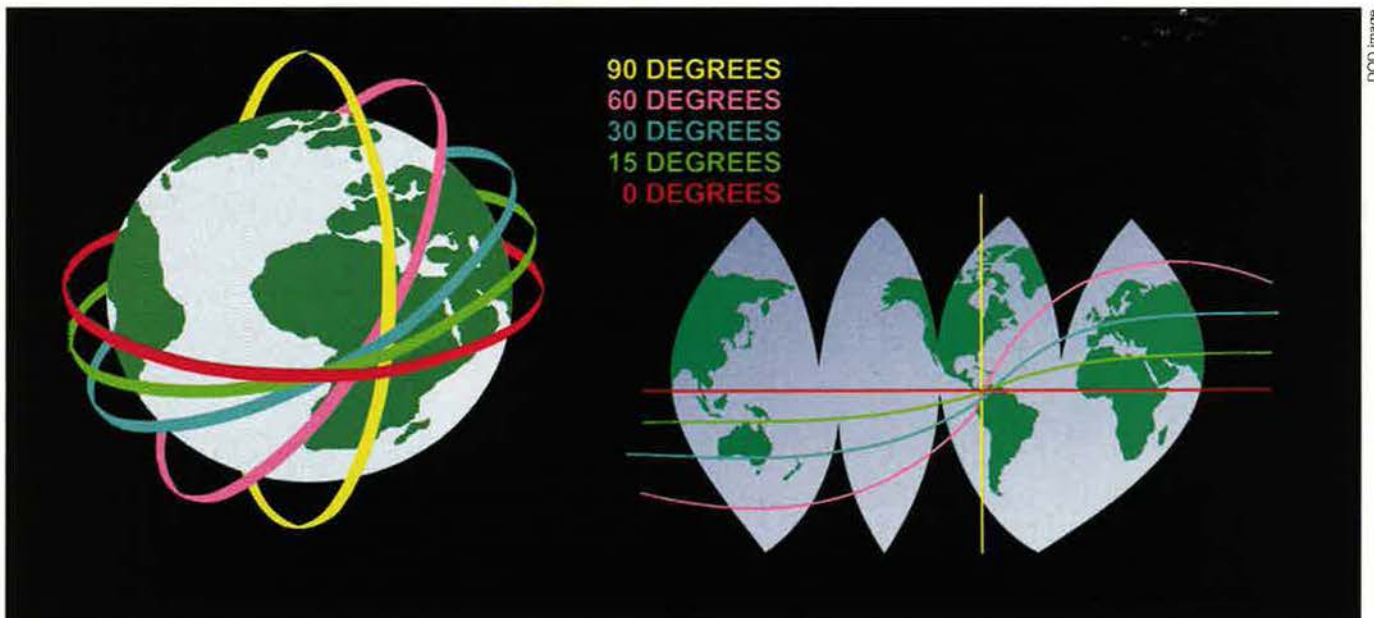
Air Force Personnel in Space

As of Sept. 30, 2006

	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Active Duty Air Force	21,049	19,198	18,201	17,337	17,004	19,064	19,495	19,862	16,758	18,345
Selected Guard and Reserve										
Air National Guard	0	285	285	354	354	519	519	649	653	663
Air Force Reserve Command	435	508	629	699	705	847	987	1,024	1,050	1,379
Total Guard and Reserve	435	793	914	1,053	1,059	1,366	1,506	1,673	1,703	2,042
Direct-hire Civilian	4,740	4,354	4,140	4,351	4,665	6,325	6,333	6,396	6,541	6,534

Satellite Inclination

Inclination is the angle between the Earth's equatorial plane and a satellite's orbital plane. A satellite at the wrong inclination—passing over the wrong spot on Earth—may hinder its ability to perform its mission.



DOO Image

US Space Launch Sites

Alaska Spaceport

Location: 57.5° N, 153° W.
 Type: Commercial.
 Mission/operations: Polar and near-polar launches of communications, remote sensing, and scientific satellites up to 8,000 pounds.
 Operator: Alaska Aerospace Development Corp.
 Launches: 11.
 Launch vehicles: Athena I, suborbital.
 History: Established in 1998; funded through AADC.

Cape Canaveral AFS, Fla.

Location: 28.5° N, 80° W.
 Type: Military, civil, commercial.
 Mission/operations: Geosynchronous launches for civil, military, and commercial missions and military ballistic missile tests.
 Operator: USAF.
 Launches: 625 (from 1957).
 Launch vehicles: Athena I, II; Atlas II, III, V; Delta II, III, IV; Titan IV.
 History: Designated in 1950 Operating Sub-Division #1; changed to Cape Canaveral Auxiliary AFB, then Cape Canaveral Missile Test Annex, Cape Kennedy Air Force Station, Cape Canaveral Air Force Station, Cape Canaveral Air Station, and in 2000, back to Cape Canaveral AFS.

Florida Space Authority

Location: 28.5° N, 80° W.
 Type: Civil, commercial.
 Mission/operations: Florida, through FSA, developed, financed, or owns infrastructure at Launch Complexes 46 and 47 and manages a multiuser launch control facility, space experiments research and processing laboratory, and other facilities.
 Operator: FSA.
 Launches: Five.
 Launch vehicles: Athena I, II; Super Loki; Terrier; Viper.
 History: Established in 1989.

John F. Kennedy Space Center, Fla.

Location: 28° N, 80° W.
 Type: Civil, commercial, military.
 Mission/operations: Primary space shuttle facility.
 Operator: NASA.
 Launches: 138.
 Launch vehicles: Pegasus, space shuttle, Taurus.
 History: NASA acquired land in 1962; by 1967, Complex 39 was operational; modified in 1970s to accommodate space shuttle program.

Mid-Atlantic Regional Spaceport

Location: 38° N, 76° W.
 Type: Civil, commercial.
 Mission/operations: Maryland and Virginia cooperative. Launches to inclined and sun-synchronous orbits; recovery support for ballistic and guided re-entry vehicles; vehicle and payload storage and processing facilities; two commercial pads; suborbital launch rails for civil, commercial, and military scientific missions.
 Operator: Virginia Commercial Spaceflight Authority.
 Launches: 15 (since 1995).
 Launch vehicles: Athena I, II; Black Brant; Falcon; Lockheed Martin HYSR; Minotaur; Orion; Pegasus; Taurus; Terrier.

Sea Launch

Location: Equator, 154° W, Pacific Ocean.
 Type: Commercial.
 Mission/operations: Heavy lift GTO launch services. Owned by an international partnership: Boeing, RSC Energia, Kvaerner ASA, and SDO Yuzhnoye/PO Yuzhmash.
 Operators: Partners listed above.
 Launches: 23.
 Launch vehicles: Zenit-3SL.
 History: Established in April 1995; demonstration launch March 1999.

Spaceport Systems Intl., L.P.

Location: 34.70° N, 120.46° W.
 Type: Commercial, civil, military.
 Mission/operations: Polar and near-polar LEO launches; small to medium launch vehicles up to one million pound thrust; payload processing facility for small and heavy satellites.
 Operator: Spaceport Systems Intl.
 Launches: Five.
 Launch vehicles: Minotaur I and IV.
 History: SSI, a limited partnership formed by ITT and California Commercial Spaceport, Inc., achieved full operational status of the spaceport in May 1999.

Vandenberg AFB, Calif.

Location: 35° N, 121° W.
 Type: Military, civil, commercial.
 Mission/operations: Launches into polar orbits; sole site for test launches of USAF ICBM fleet; basic support for R&D tests for DOD, USAF, and NASA space, ballistic missile, and aeronautical systems; facilities and essential services for more than 60 aerospace contractors.
 Operator: USAF.
 Launches: 640.
 Launch vehicles: Athena I; Atlas II, III, V; Delta II, III, IV; Pegasus; Taurus; Titan II, IV.
 History: Originally Army's Camp Cooke; turned over to USAF 1957; renamed Vandenberg Oct. 4, 1958.

Wallops Flight Facility, Va.

Location: 38° N, 76° W.
 Type: Civil, military, commercial.
 Mission/operations: Suborbital research launch site.
 Operator: NASA
 Launches: 31.
 Launch vehicles: 14 suborbital sounding rockets.
 History: Established in 1945, it is one of world's oldest launch sites.

AFSPC Squadrons by Mission Type

(As of Sept. 30, 2006)

Component	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06
Active force										
ICBM	14	14	14	14	14	14	11	11	10	10
Space operations	10	10	10	8	8	8	8	9	8	8
Space communications	1	1	1	1	1	0	0	6	7	7
Space warning	8	8	8	7	7	8	8	6	6	6
Space surveillance	6	6	6	6	4	3	3	3	0	0
Space launch	5	5	5	3	3	3	4	4	3	3
Range	2	2	2	2	2	2	2	2	2	2
Space control	1	1	1	2	3	3	3	3	5	6
Space aggressor	0	0	0	0	0	0	1	1	1	1
Total active force	47	47	47	43	42	41	40	45	42	43
Reserve forces										
ANG										
Space operations	0	0	0	0	0	1	1	3	4	3
Space warning	0	0	0	0	0	1	1	1	2	1
AFRC										
Space operations	3	3	3	3	4	4	4	4	4	4
Space warning	1	1	1	1	1	1	1	1	1	1
Space aggressor	0	0	0	0	0	0	0	1	1	1
Total reserve forces	4	4	4	4	5	7	7	10	10	10
Total all components	51	51	51	51	48	49	48	50	57	53

The Constellations

Multiple satellites working in groups to perform a single mission can provide greater coverage than a single satellite, enabling global coverage or increasing timeliness of coverage.

Navigation constellations provide simultaneous signals from multiple satellites to a location on the ground.

Communications constellations ensure at least one satellite is in line of sight of both ends of the communications link.

Weather and reconnaissance constellations generally contain both high and low altitude systems.

Some **surveillance** systems need continuous access to areas of interest, calling for high altitude, long dwell time orbits.

The Golden Age of NASA

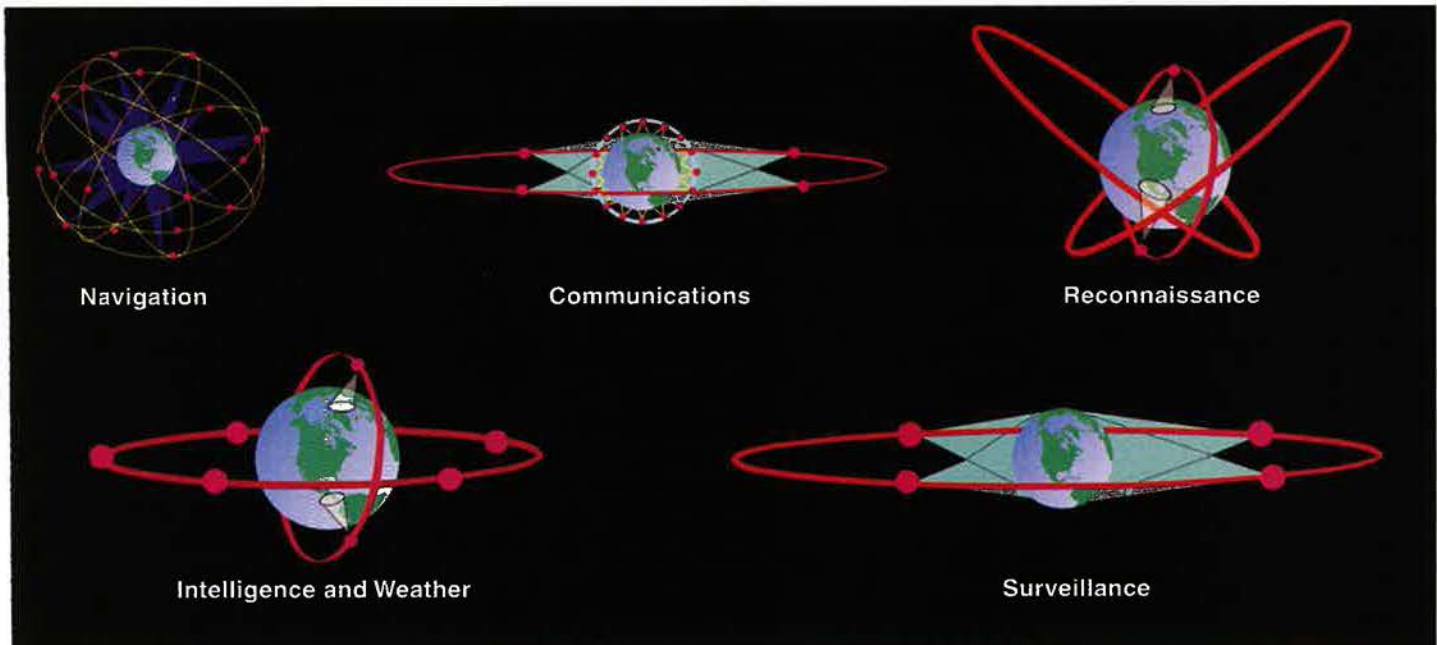
Name Project Mercury
Duration Nov. 3, 1958-May 16, 1963
Cost \$392.1 million (cost figures are in then-year dollars)
Distinction First US manned spaceflight program
Highlight Astronauts are launched into space and returned safely to Earth
Number of flights Six
Key events **May 5, 1961** Lt. Cmdr. Alan B. Shepard Jr. makes first US manned flight, a 15-minute suborbital trip
Feb. 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 Jan. 15, 1962-Nov. 15, 1966
Cost \$1.3 billion
Distinction First program to explore docking, long-duration flight, rendezvous, space walks, and guided re-entry
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 space walk
Aug. 21-29, 1965 Cooper and Lt. Cmdr. Charles "Pete" Conrad Jr. withstand extended weightlessness
March 16, 1966 Neil A. Armstrong and Maj. David R. Scott execute the first space docking
Sept. 15, 1966 Conrad and Richard F. Gordon Jr. make first successful automatic, computer-steered re-entry

Name Project Apollo
Duration July 25, 1960-Dec. 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
Jan. 27, 1967 Lt. Col. Virgil I. "Gus" Grissom, Lt. Cmdr. Roger B. Chaffee, and White die in a command module fire in ground test
Oct. 11-22, 1968 First manned Apollo flight proves "moonworthiness" of spacecraft
Dec. 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
Dec. 7-19, 1972 Final Apollo lunar flight produces sixth manned moon landing

US Manned Spaceflights

Year	Flights	Persons
1961	2	2
1962	3	3
1963	1	1
1964	0	0
1965	5	10
1966	5	10
1967	0	0
1968	2	6
1969	4	12
1970	1	3
1971	2	6
1972	2	6
1973	3	9
1974	0	0
1975	1	3
1976	0	0
1977	0	0
1978	0	0
1979	0	0
1980	0	0
1981	2	4
1982	3	8
1983	4	20
1984	5	28
1985	9	58
1986	1	7
1987	0	0
1988	2	10
1989	5	25
1990	6	32
1991	6	35
1992	8	53
1993	7	42
1994	7	42
1995	7	42
1996	7	43
1997	8	53
1998	5	33
1999	3	19
2000	5	32
2001	6	38
2002	5	34
2003	1	7
2004	0	0
2005	1	7
2006	3	20
Total	147	763



DOD image

**Athena II****Atlas V****Delta II**

Major US Launchers in US Military Use

Athena I

Function: lift low to medium weights.
 First launch: Aug. 22, 1997.
 Launch site: CCAFS, VAFB.
 Contractor: Lockheed Martin.
 Stages: two.
 Propulsion: stage 1 (Thiokol Castor 120 Solid Rocket Motor), 435,000 lb thrust; stage 2 (Pratt & Whitney Orbus 21D SRM), 43,723 lb thrust.
 Dimensions: length 62 ft, max body diameter 7.75 ft.
 Weight: 146,264 lb.
 Payload: 1,750 lb to LEO.

Athena II

Function: lift low to medium weights.
 First launch: Jan. 6, 1998.
 Launch site: CCAFS, VAFB.
 Contractor: Lockheed Martin.
 Stages: three.
 Propulsion: stages 1-2 (Castor 120 SRMs), 435,000 lb thrust; stage 3 (Orbus 21D SRM), 43,723 lb thrust.
 Dimensions: length 93 ft, max body diameter 7.75 ft.
 Weight: 266,000 lb.
 Payload: 4,350 lb to LEO.

Atlas V

Function: lift medium to heavy weights.
 Variants: 400 and 500 series.
 First launch: Aug. 21, 2002.
 Launch site: CCAFS, VAFB.
 Contractor: Lockheed Martin.
 Stages: two.
 Propulsion: (400 and 500 series) stage 1: one RD AMCROSS LLC RD-180 engine with two chambers, 860,200 lb thrust; stage 2: Centaur, one or two Pratt & Whitney RL10A-4-2 engines, 16,500-22,300 lb thrust. Strap-on solid rocket boosters, up to three (400), up to five (500).
 Dimensions: (stage 1) length 106.2 ft, max body diameter 12.5 ft; (stage 2) length 41.6 ft, max body diameter 10 ft.
 Weight: 741,061 lb-1.2 million lb.
 Payload: (400 series) 27,558 lb to LEO, 10,913-17,196 to GTO; (500 series) 22,707-45,238 lb to LEO, 8,752-19,180 lb to GTO. (500 series supports 16.5 ft diameter payload fairing.)

Delta II

Function: lift medium weights.
 First launch: Feb. 14, 1989.
 Launch site: CCAFS, VAFB.
 Contractor: Boeing.
 Stages: up to three.
 Propulsion: stage 1 (Rocketdyne RS-27A), 237,000 lb thrust; stage 2 (Aerojet AJ1C-118K), 9,753 lb thrust; stage 3 (Thiokol STAR 48B SRM), 14,920 lb thrust; nine strap-on SRMs (Alliant Techsystems), 100,270 lb thrust.
 Dimensions: length 125.2 ft, max body diameter 8 ft.
 Weight: 511,190 lb.
 Payload: 5,960-13,440 lb to LEO.

Delta IV

Function: lift medium to heavy weights.
 Variants: Medium, Medium-Plus, and Heavy.
 First launch: Nov. 20, 2002.
 Launch site: CCAFS, VAFB.
 Contractor: Boeing.
 Stages: two.
 Propulsion: stage 1 (Rocketdyne RS-68 (Heavy, two additional core engines), 650,000 lb thrust; stage 2 (Medium), P&W RL10B-2, 1,750 lb thrust.
 Dimensions: (core booster, all versions) length 125 ft, max body diameter 16.7 ft.
 Weight: (Medium) 64,719 lb; (heavy) 196,688 lb.
 Payload: 9,440-22,950 lb to LEO; 9,480-28,620 lb to GTO. (Heavy supports 16.6 ft diameter payload fairing.)

EELV

Function: lift medium to heavy weights.
 Note: Atlas V and Delta IV (see individual entries) are participating in USAF's evolved expendable launch vehicle (EELV) modernization program to cut launch costs by 25 to 50 percent. These systems replaced Atlas II, Titan II, and Titan IV launch vehicles.

USAF photo



Delta IV

Boeing photo



Space Shuttle

USAF photo



Taurus

Pegasus

Function: lift low weights.
 Variants: Standard and XL.
 First launch: (Standard) April 5, 1990; (XL) June 27, 1994.
 Launch site: dropped from L-1011 aircraft.
 Contractor: Orbital Sciences, Alliant.
 Stages: three.
 Propulsion: (XL) (all Alliant Techsystems) stage 1, 109,400 lb thrust; stage 2, 27,600 lb thrust; stage 3, 7,800 lb thrust.
 Dimensions: length 49 ft, wingspan 22 ft, diameter 4.17 ft.
 Weight: 42,000 lb.
 Payload max: (Standard) 850 lb to LEO; (XL) 1,050 lb to GEO.

Space Shuttle

Function: lift heavy weights.
 First launch: April 12, 1981.
 Launch site: KSC.
 Contractor: Boeing (launch).
 Stages: delta-winged orbiter.
 Propulsion: three main engines, 394,000 lb thrust; two SRMs, 3.3 million lb thrust.
 Dimensions: system length 184 ft; span 78 ft.
 Weight: 4.5 million lb (gross).
 Payload max: 55,000 lb to LEO.

Taurus

Function: lift low weights.
 Variants: Standard and XL.
 First launch: March 13, 1994.
 Launch site: CCAFS, Kodiak Launch Complex, VAFB, Wallops Island.
 Contractor: Orbital Sciences.
 Stages: four.
 Propulsion: Castor 120 SRM, 495,400 lb thrust; stage 1, 109,140 lb thrust; stage 2, 26,900 lb thrust; stage 3, 7,200 lb thrust. (Stages 1-3, Alliant Techsystems)
 Dimensions: length 89 ft, max body diameter 7.6 ft.
 Weight: 170,000 lb max.
 Payload max: 3,000 lb to LEO.

Major Military Satellite Systems

Advanced Extremely High Frequency Satellite Communications System

Common name: AEHF
 In brief: successor to Milstar, AEHF will provide assured strategic/tactical, worldwide C2 communications with at least 10 times the capacity of Milstar II but in a smaller package.
 Function: EHF communications.
 Operator: MILSATCOM JPO (acquisition); AFSPC.
 First launch: 2008, planned.
 On orbit: three, planned.
 Orbit altitude: 22,000+ miles.

Defense Meteorological Satellite Program

Common name: DMSP
 In brief: satellites that collect air, land, sea, and space environmental data to support worldwide strategic and tactical military operations. Operational control transferred to NOAA in 1998; backup operation center at Schriever AFB, Colo., manned by Air Force Reserve Command personnel.
 Function: environmental monitoring.
 Operator: NPOESS Integrated Program Office.
 First launch: Aug. 23, 1962.
 On orbit: two (primary).
 Orbit altitude: approx 527 miles.

Defense Satellite Communications System III

Common name: DSCS
 In brief: nuclear-hardened and jam-resistant spacecraft used to transmit high-priority C2 messages to battlefield commanders.
 Function: SHF communications.
 Operator: AFSPC.
 First launch: October 1982.
 On orbit: five (primary).
 Orbit altitude: 22,000+ miles.

Defense Support Program

Common name: DSP
 In brief: early warning spacecraft whose infrared sensors detect heat generated by

Major Military Satellite Systems, Continued

a missile or booster plume.

Function: strategic and tactical missile launch detection.

Operator: AFSPC.

First launch: November 1970.

On orbit: classified.

Orbit altitude: 22,000+ miles.

Enhanced Polar System

Common name: EPS

In brief: next generation polar communications to replace interim polar system (see Interim Polar System, below), which provides polar communications capability required by aircraft, submarines, and other forces operating in the high northern latitudes. Pre-acquisition, system definition, and risk reduction efforts started in Fiscal 2006.

Function: EHF polar communications.

Operator: MILSATCOM JPO (acquisition); AFSPC.

First launch: availability 2013.

On orbit: two, planned.

Orbit altitude: 22,300+ miles.

Global Broadcast System

Common name: GBS

In brief: wideband communications program, initially using leased commercial satellites, then military systems, to provide digital multimedia data directly to theater warfighters.

Function: high-bandwidth data imagery and video.

Operator: Navy.

First launch: March 1998 (Phase 2 payload on UHF Follow-On). Continues on Wideband Global SATCOM (WGS) in 2008.

On orbit: two.

Orbit altitude: 23,230 miles.

Global Positioning System

Common name: GPS

In brief: constellation of satellites used by military and civilians to determine a precise location and time anywhere on Earth. Block IIR began replacing older

GPS spacecraft in mid-1997; first modified Block IIR-M with military signal (M-code) on two channels launched in 2005. Next generation Block IIF with extended design life, faster processors, and new civil signal on third frequency launches in 2008. Generation after next GPS III with advanced anti-jam and higher quality data is slated for initial launch in 2013.

Function: worldwide positioning, navigation, and precise time transfer.

Operator: AFSPC.

First launch: Feb. 22, 1978 (Block I).

On orbit: 30.

Orbit altitude: 10,988 miles.

Interim Polar System

Common name: IPS

In brief: USAF deployed a modified EHF payload on a host polar-orbiting satellite to provide an interim solution to ensure warfighters have protected polar communications capability. Polar 3 slated for launch in 2007.

Function: EHF polar communications.

Operator: Navy.

First launch: 1997.

On orbit: two.

Orbit altitude: 25,300 miles (apogee).

Milstar Satellite Communications System

Common Name: Milstar

In brief: joint communications satellite that provides secure, jam-resistant communications for essential wartime needs.

Function: EHF communications.

Operator: AFSPC.

First launch: Feb. 7, 1994.

On orbit: five.

Orbit altitude: 22,300 miles.

Mobile User Objective System

(also known as Advanced Narrowband System)

Common name: MUOS

In brief: next generation narrowband UHF tactical communications satellite to replace the UHF Follow-On Satellite (see below). Concept study contracts awarded

in 1999; production award to Lockheed Martin in September 2004; initial launch in 2010.

Function: UHF tactical communications.

Operator: Navy.

First launch: 2010, planned.

On orbit: none.

Orbit altitude: 22,300 miles.

Space Based Infrared System High

Common name: SBIRS High

In brief: advanced surveillance system for missile warning, missile defense, battlespace characterization, and technical intelligence. System initially will complement, then replace, Defense Support Program spacecraft (see p. 87).

Function: infrared space surveillance.

Operator: AFSPC.

First launch: 2008, planned.

On orbit: none.

Orbit altitude: 22,300 miles.

Space Based Surveillance

Common name: SBSS

In brief: Will replace the Midcourse Space Experiment/Space Based Visible (MSX/SBV) satellite that performs tracking and optical signature collection on Earth-orbiting objects.

Function: space surveillance.

Operator: AFSPC.

First launch: December 2008, planned.

On orbit: one Pathfinder satellite to be launched in 2008 and four operational satellites are planned for the 2014 timeframe.

Orbit altitude: 528 miles.

Space Radar

Common name: SR

In brief: spaceborne capability, providing deep look, all weather, day and night forward presence and situation awareness for the Intelligence Community and joint warfighters.

Function: track moving ground targets.

Operator: AFSPC.

First launch: 2015, planned.

On orbit: none.

Orbit altitude: LEO.

Space Tracking and Surveillance System (formerly SBIRS Low).

Common name: STSS

In brief: infrared surveillance and tracking satellites to detect and track ballistic missiles from launch to impact. System is sensor component of layered ballistic missile defense system and will work with SBIRS High (see above).

Function: infrared surveillance.

Operator: MDA (acquisition); AFSPC.

First launch: 2007 for R&D, planned.

On orbit: none.

Transformational Satellite Communications System

Common name: TSAT

In brief: protected strategic and tactical survivable SATCOM and unprotected wideband SATCOM connectivity for authorized users. Protected TSAT SATCOM uses anti-jam and low probability of intercept capabilities coupled with defensive information warfare, nuclear survivability,



Artist's conception by Erik Simonsen

Global Positioning System

Major Military Satellite Systems, Continued

resistance to physical destruction, and US control of SATCOM access for assured communications. TSAT represents part of the space backbone of the global information grid supporting Internet-like connectivity, netcentric operations, and warfare (NCOW). It will feature laser crosslink and greatly reduced transmission time to users on the ground. Intended to replace Advanced Extremely High Frequency system (see p. 87), it is slated for launch around 2016. Currently in design and risk-reduction phase.

Function: EHF, Ka-band and laser communications.

Operator: MILSATCOM Systems Wing (acquisition); AFSPC (operations).

First launch: 2016, planned.

On orbit: five and one spare, planned.

Orbit altitude: 22,300 miles.

UHF Follow-On Satellite

Common name: UFO

In brief: new generation satellites providing secure, antijam communications; replaced FLTSATCOM satellites.

Function: UHF and EHF communications.

Operator: Navy.

First launch: March 25, 1993.

Constellation: four primary, four redundant.

On orbit: nine.

Orbit altitude: 22,300 miles.

Wideband Global SATCOM

Common name: WGS

In brief: multiservice program leveraging commercial methods to rapidly design, build, launch, and support a constellation that will augment X-band satellite communications (DSCS) and one-way Ka-band (Global Broadcast Service) while providing

a new two-way Ka-band service (see p. 87 and 88).

Function: wideband communications and point-to-point service (Ka-band and X-band frequencies).

Operator: AFSPC (bus); SMDC/ARSTRAT (payload).

First launch: 2007, planned.

On orbit: five, planned.

Orbit altitude: 22,000+ miles.

Dark and Spooky

A number of intelligence satellites are operated by US agencies in cooperation with the military. The missions and, especially, the capabilities are closely guarded secrets.

Most of the names of satellites, such as White Cloud (ocean reconnaissance), Aquacade (electronic ferret), and Trumpet (Sigint), are essentially open secrets but cannot be confirmed by the Intelligence Community.

Major Civilian Satellites in US Military Use

Geostationary Operational Environmental Satellite

Common name: GOES

In brief: in equatorial orbit to collect weather data for short-term forecasting.

Function: storm monitoring and tracking, meteorological research.

Operator: NOAA.

First launch: Oct. 16, 1975 (GOES-1).

Constellation: two, with on-orbit spare.

Orbit altitude: 22,300 miles.

Globalstar

Common name: Globalstar

In brief: mobile communications with provision for security controls.

Function: communications.

Operator: Globalstar L.P.

First launch: February 1998.

Constellation: 48.

Orbit altitude: 878 miles.

Ikonos

Common name: Ikonos

In brief: one-meter resolution Earth imaging. Slated for shutdown in 2007.

Function: remote sensing.

Operator: Space Imaging, Inc.

First launch: Sept. 24, 1999.

Constellation: one.

Orbit altitude: 423 miles.

Inmarsat

Common name: Inmarsat

In brief: peacetime mobile communications services, primarily by US Navy.

Function: communications.

Operator: International Maritime Satellite Organization.

First launch: February 1982 (first lease), Oct. 30, 1990 (first launch).

Constellation: nine.

Orbit altitude: 22,300 miles.

Intelsat

Common name: Intelsat

In brief: routine communications and distribution of Armed Forces Radio and TV Services network.

Function: communications.

Operator: International Telecommunications Satellite Organization.

First launch: April 6, 1965 (Early Bird).

Constellation: 51.

Orbit altitude: 22,300 miles.

Iridium

Common name: Iridium

In brief: voice, fax, data transmission.

Function: handheld, mobile communications.

Operator: Iridium L.L.C.

First Launch: May 5, 1997.

Constellation: 66 (six on-orbit spares).

Orbit: 485 miles.

Landsat

Common name: Landsat

In brief: imagery use includes mapping and planning for tactical operations.

Function: remote sensing.

Operator: NASA.

First launch: July 23, 1972.

Constellation: one.

Orbit altitude: 438 miles (polar).

National Polar-orbiting Operational Environmental Satellite System

Common name: NPOESS

In brief: advanced joint civil-military polar environmental satellite that provides weather, atmosphere, ocean, land, and near-space data. Managed by tri-agency (DOD, Department of Commerce, and NASA) integrated program office. Designed to replace USAF's DMSP and NOAA's Polar-orbiting Operational Environmental Satellite (POES) (see p. 84).

Function: worldwide environmental forecasting.

Operator: IPO (AFSPC for acquisition and launch; NOAA for operations).

First launch: 2010, planned.

Constellation: three.

On orbit: none.

Orbit altitude: 550 (LEO) miles.

Orbcomm

Common name: Orbcomm

In brief: potential military use under study in Joint Interoperability Warfighter Program.

Function: mobile communications.

Operator: Orbcomm Global L.P.

First launch: April 1995.

Constellation: 30.

Orbit altitude: 500-1,200 miles.

Pan Am Sat

Common name: Pan Am Sat

In brief: routine communications providing telephone, TV, radio, and data.

Function: communications.

Operator: Pan Am Sat.*

Major Civilian Satellites in US Military Use, Continued

First launch: 1983.
Constellation: 21.
Orbit altitude: 22,300 miles.
*Merged with Intelsat 2005-06

Polar-orbiting Operational Environmental Satellite

(also known as NOAA-K, L, and M before launch; NOAA-15, 16, and 17, respectively, once on orbit).

Common name: POES

In brief: two advanced third generation environmental satellites (one morning orbit and one afternoon orbit) provide longer-term weather updates for all areas of the world. Final two spacecraft in this series are NOAA-N (launched in 2005) and N Prime. To be replaced by NPOESS.

Function: extended weather forecasting.

Operator: NOAA (on-orbit); NASA (launch).

First launch: May 13, 1998 (NOAA-15).

Constellation: two.

Orbit altitude: 517 miles.

Quickbird 2

Common name: Quickbird 2

In brief: high-resolution imagery for mapping, military surveillance, weather research, and other uses.

Function: remote sensing.

Operator: DigitalGlobe.

First launch: Oct. 18, 2001.

Constellation: one.

Orbit altitude: 279 miles.

Satellite Pour l'Observation de la Terre

Common name: SPOT

In brief: terrain images used for mission-planning systems, terrain analysis, and mapping.

Function: remote sensing.

Operator: SPOT Image S.A. (France).

First launch: Feb. 22, 1986.

Constellation: three.

Orbit altitude: 509 miles.

Telstar

Common name: Telstar

In brief: commercial satellite-based,

rooftop-to-rooftop communications for US Army and other DOD agencies.

Function: communications.

Operator: Loral Skynet.

First launch: November 1994.

Constellation: three.

Orbit altitude: 22,300 miles.

Tracking and Data Relay Satellite System

Common name: TDRSS

In brief: global network that allows other spacecraft in LEO to communicate with a control center without an elaborate network of ground stations.

Function: communications relay.

Operator: NASA.

First launch: April 1983.

Constellation: seven.

Orbit altitude: 22,300 miles.

Major US Military Ground-Based Space Surveillance Systems

Air Force Space Surveillance System

Common name: Air Force Fence

In brief: continuous wave radars located across the southern US to track man-made objects in Earth orbit.

Function: space surveillance.

Operator: AFSPC.

Operational: March 31, 1959 (US Navy).

Unit location: Dahlgren, Va. (command & control); receivers in Arkansas, California, Georgia, Mississippi, and New Mexico; transmitters in Alabama, Arizona, and Texas.

Components: One command & control center, six receiver sites, and three transmitter sites.

AN/FPS-85 Phased-Array Radar

Common name: Eglin radar

In brief: active phased-array radar used in all weather to track man-made objects in Earth orbit.

Function: space surveillance.

Operator: AFSPC.

Operational: Jan. 29, 1969.

Unit location: Eglin AFB, Fla.

Components: AN/FPS-85 solid-state phased-array radar.

Ballistic Missile Early Warning System

Common name: BMEWS

In brief: phased-array radar used for tactical warning and attack assessment and tracking Earth-orbiting satellites.

Function: ballistic missile attack and space surveillance.

Operator: AFSPC.

Operational: 1959 (Trinidad, British West Indies); July 1, 1961 (Clear AFS, Alaska).

Unit location: Clear AFS, Alaska; RAF Fylingdales, Britain; Thule AB, Greenland.

Components: (Clear AFS) AN/FPS-120

solid-state phased-array radar (SSPAR) with two faces; computers for radar control and data processing.

Ground-based Electro-optical Deep Space Surveillance

Common name: GEODSS

In brief: optical system that tracks objects such as Earth-orbiting satellites in deep space.

Function: space surveillance.

Operator: AFSPC.

Operational: June 30, 1982.

Unit location: Socorro, N.M.; Diego Garcia, Indian Ocean; Maui, Hawaii.

Components: three telescopes, low-light-level EO cameras, and high-speed computers.

Moron Optical Space Surveillance

Common name: MOSS

In brief: optical system that tracks objects such as Earth-orbiting satellites in deep space.

Function: space surveillance.

Operator: AFSPC.

Operational: June 1998.

Unit location: Moron, Spain.

Components: optical telescope and high-speed computers.

Pave Phased-Array Warning System

Common Name: Pave PAWS

In brief: Phased-array radar used to detect and track sea-launched and inter-continental ballistic missiles, as well as Earth-orbiting satellites.

Function: missile warning and space surveillance.

Operator: AFSPC.

Operational: August 1980.

Unit location: Beale AFB, Calif.; Cape Cod AFS, Mass.

Components: AN/FPS-115 phased-array

radar; computers for radar control and data processing.

Perimeter Acquisition Radar Attack Characterization System

Common name: PARCS

In brief: ICBM and SLBM warning and space surveillance of Earth-orbiting satellites in deep space.

Function: ballistic missile warning and space surveillance.

Operator: AFSPC.

Operational: 1977.

Unit location: Cavalier AFS, N.D.

Components: One AN-FPQ-16 single-faced, phased-array radar.



The AN-FPS-115 Pave PAWS phased-array warning system radar.

Raytheon photo

Milestones in Military Space

March 22, 1946. JPL-Ordnance WAC, first US rocket to leave Earth's atmosphere, reaches 50-mile height after launch from White Sands Proving Ground, N.M.

Oct. 4, 1957. USSR launches Sputnik 1, first man-made satellite, into Earth orbit.

Jan. 31, 1958. US launches its first satellite, Explorer 1.

Dec. 18, 1958. Project Score spacecraft conducts first US active communication from space.

Feb. 28, 1959. USAF successfully launches Discoverer 1 (of then-classified Corona program), world's first polar-orbiting satellite, from Vandenberg AFB, Calif.

April 6, 1959. The first military unit to be charged with conducting military satellite operations, USAF's 6594th Test Wing, is established at Palo Alto, Calif.

April 13, 1959. Air Force Thor/Agena A boosts into orbit Discoverer 2 satellite, first satellite to be stabilized in orbit in all three axes, to be maneuvered on command from Earth, to separate a re-entry vehicle on command, and to send its re-entry vehicle back to Earth.

Aug. 7, 1959. Explorer 6 spacecraft transmits first television pictures from space.

June 22, 1960. US launches Galactic Radiation and Background (GRAB) satellite, the nation's first successful reconnaissance spacecraft. It collects electronic intelligence (Elint) from Soviet air defense radars.

Aug. 18, 1960. Discoverer/Corona satellite takes first image of Soviet territory ever snapped from space.

April 12, 1961. Soviet cosmonaut Yuri Gagarin pilots Vostok 1 through nearly one orbit to become first human in space.

May 5, 1961. 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.

Feb. 20, 1962. Project Mercury astronaut Lt. Col. John H. Glenn Jr., aboard Friendship 7 capsule, completes first US

manned orbital flight.

May 15, 1963. USAF Maj. L. Gordon Cooper Jr. makes nearly 22 orbits in spacecraft Faith 7, becoming the first American astronaut to perform an entirely manual re-entry.

Oct. 17, 1963. Vela Hotel satellite performs first space-based detection of nuclear explosion.

March 18, 1965. First space walk conducted by Alexei Leonov from Soviet Voskhod 2.

June 4, 1965. Gemini 4 astronaut USAF Maj. Edward H. White II performs first American space walk.

June 18, 1965. USAF accepts Titan III, first Air Force vehicle specifically designed and developed as a military space booster.

Dec. 15, 1965. Crews of Gemini 6 and Gemini 7 rendezvous in space. Navy Capt. Walter M. Schirra and USAF Maj. Thomas P. Stafford in Gemini 6 maneuver to within a foot of Gemini 7 crew.

Jan. 25, 1967. Soviets complete first successful fractional orbital bombardment system test, deorbiting Kosmos 139 satellite re-entry vehicle to an impact point within Soviet Union.

July 3-4, 1967. Air Force, Army, and Navy conduct first satellite-based tactical communications.

Oct. 20, 1968. Soviet Kosmos 249 spacecraft carries out first co-orbital antisatellite test, exploding Kosmos 248 target satellite into cloud of debris.

July 20, 1969. At 10:56 p.m. EDT, Apollo 11 astronaut Neil A. Armstrong puts his foot on the surface of the moon, becoming the first human to do so.

November 1970. USAF launches first classified Defense Support Program satellite, whose infrared sensors provide space-based early warning of missile launches.

April 19, 1971. First space station, Salyut 1, goes aloft.

Feb. 22, 1978. Atlas booster carries first

Global Positioning System Block I satellite into orbit, paving way for a revolution in civil, commercial, and military navigation.

April 12-14, 1981. Space shuttle performs its first orbital flight and becomes first reusable spacecraft to land back on Earth.

Aug. 30, 1983. USAF Col. Guion S. Bluford Jr. becomes the first African American in space, as a mission specialist aboard *Challenger*.

Sept. 13, 1985. First US antisatellite intercept test destroys Solwind scientific satellite by air-launched weapon.

Jan. 17, 1991. What USAF calls "the first space war," Operation Desert Storm, opens with air attacks.

Jan. 13, 1993. USAF Maj. Susan J. Helms, flying aboard space shuttle *Endeavour*, becomes first US military woman in space.

Feb. 6, 1995. USAF Lt. Col. Eileen M. Collins is first woman to pilot a US spaceship, doing so when *Discovery* and space station Mir perform first US-Russian space rendezvous in 20 years.

May 29, 1998. USAF hands control of DMSP spacecraft to NOAA—the first transfer of a fully operational military space system to civilian agency.

July 23-27, 1999. USAF Col. Eileen M. Collins becomes first woman to command a shuttle mission, *Columbia* (STS-93).

Nov. 21, 2000. For the first time, a single Delta II rocket, lifting off from Vandenberg AFB, Calif., launches two different primary payloads.

April 22, 2003. AFSPC's 14th Air Force activates first-of-its-kind space intelligence squadron, the 614th SIS, to identify and devise means to respond to threats to US space systems.

Jan. 11, 2007. Chinese ASAT destroys orbiting Chinese satellite, making China only the third nation (after the US and Russia) to do so.

Major Space Treaties and Laws

Long Title	Nickname	Entry Into Force
Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water	Nuclear Test Ban	Oct. 10, 1963
Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies	Outer Space Treaty	Oct. 10, 1967
Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space	Rescue Agreement	Dec. 3, 1968
Convention on International Liability for Damage Caused by Space Objects	Liability Convention	Sept. 1, 1972
Convention on Registration of Objects Launched Into Outer Space	Registration Convention	Sept. 15, 1976
Agreement Governing the Activities of States on the Moon and Other Celestial Bodies	Moon Agreement	July 11, 1984

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Space Terms

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

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.

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).

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 and GEO.

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).

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.

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.

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.

Acknowledgements

This almanac was compiled by *Air Force Magazine*, with assistance and information from Steve Garber, NASA History Office; Joseph J. Burger, Space Analysis and Research, Inc.; and US Strategic Command and Air Force Space Command Public Affairs Offices.

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.



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2007-08

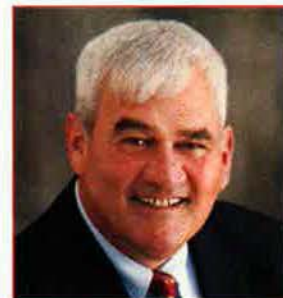
AFA



Largent



Sutter



Buckwalter

The Air Force Association Nominating Committee, which this year consists of the three most recent past National Chairmen of the Board, one representative appointed by the Vice Chairman of the Board for Aerospace Education, and one representative from each of the 14 US regions, met in Dallas on April 27 and selected a slate of candidates for the five national officer positions and three elective positions on the Board of Directors. This slate will be presented to the delegates at the National Convention in Washington, D.C., in September.

Robert E. "Bob" Largent of Harrison, Ark., was nominated for his second one-year term as Chairman of the Board. He has previously served as AFA National President. He is a Life Member and has been active in AFA since 1974. He has served as the Carl Vinson Memorial Chapter Vice President and Vice President for Leadership Development; Georgia State President and Vice President for Awards and Leadership Development; Southeast Region President; and as a member of AFA's Membership Committee, the Long-Range Planning Committee, and the AFA Organizational Review Group. In addition to chapter and state awards, he has received the national Medal of Merit, Exceptional Service Award, and Presidential Citation.

Largent was commissioned through AFROTC in 1968 and served for more than 24 years in various strategic missile operations assignments, including

Minuteman Combat Crew, Squadron Operations Officer, Chief of Wing Training, Chief of Wing Plans, Squadron Commander, and Assistant Deputy Commander for Wing and Group Operations. He has also served in a variety of staff assignments including Special Assistant to the Chief of Staff, USAF; in the Office of the Director, Joint Staff, Joint Chiefs of Staff; Military Assistant to the Commander in Chief Pacific; and Chief, Strategy Division, Headquarters US Pacific Command. Largent retired in 1992 as a colonel and has received, among other awards, the Legion of Merit, Defense Meritorious Service Medal (two times), and the Air Force Meritorious Service Medal (two times).

He currently is the owner and principal of an organizational and leadership development consulting firm with a practice that includes national and international clients. Largent is involved in a variety of local civic and community activities, including Rotary and his local Chamber of Commerce, as well as those of AFA.

Largent graduated from the University of Arkansas with a degree in business administration and has a master's of public administration from the University of Oklahoma. He is also a resident graduate of the Air War College.

He resides in Harrison, Ark., with his wife, Becky.

Joseph E. Sutter of Knoxville, Tenn., is completing his first year as Vice Chairman of the Board for Field Operations and has been nominated

for a second one-year term. He is a Life Member and has been active in AFA since 1987. He has served as a member of the Board of Trustees of the former Aerospace Education Foundation (now a part of AFA) and in AFA at the chapter, state, and national levels. He has served as President of the Gen. Bruce K. Holloway Chapter and as both Chapter and State Vice President for Aerospace Education, and as Tennessee State President. At the national level, he has served as both a member and the Chairman of the AFA Strategic Planning Committee, Chairman of the afa21 Governance Team, and as a National Director. He has received two AFA Presidential Citations, the Exceptional Service Award, Medal of Merit, and was named AFA Tennessee "Volunteer Member of the Year" in 1996 and 2004.

Sutter is active in the civilian community. He is a past President of the Rotary Club of Knoxville, the East Tennessee Military Affairs Council, past Chair of his parish council, and served on the Board of Directors of the United Way of Knoxville. While maintaining active involvement in those organizations he also currently serves as member of the Board of Directors of a major Knoxville health care system.

He served on active duty for 28 years at various USAF locations: Minot AFB, N.D.; Vandenberg AFB, Calif.; the Pentagon; Offutt AFB, Neb.; Whiteman AFB, Mo.; University of Tennessee, Knoxville. His primary military duties were in ICBM

Nominees



Schlitt



Church



Lundgren

operations, where he commanded an ICBM squadron, operations group, and missile wing. Other military duties included Staff Officer assignments at the Pentagon, including two years in Air Force Legislative Liaison, Hq. Strategic Air Command, Chief of the Advanced ICBM Requirements Division, and Senior Controller, SAC Command Center. He graduated from the Naval War College, College of Command and Staff with Highest Distinction, and from the Industrial College of the Armed Forces as a Distinguished Graduate.

His decorations include the Legion of Merit with two Oak Leaf Clusters; Meritorious Service Medal with four OLCs; Air Force Commendation Medal with one OLC; and the Air Force Achievement Medal.

Sutter graduated from the University of Florida with a bachelor's degree in civil engineering and from the University of Southern California with a master of science degree in systems management. He works as a consultant on national security matters, serving USAF and other clients in the Washington, D.C., area.

He lives in Knoxville with his wife, Geri (who is currently serving as the Tennessee State Secretary). They have three grown children and three grandchildren.

The Nominating Committee is submitting two names—David T. Buckwalter and S. Sanford Schlitt—for consideration for a one-year term as Vice Chairman of the Board for Aerospace Education.

David T. "Buck" Buckwalter was nominated for his first term as Vice Chairman of the Board for Aerospace Education. He is a Life Member and has been active in AFA since 1972. He has served in the AFA field as a Chapter, State, and Region President and also as a Trustee for the former AEF. He has served on the Strategic Planning Committee and was head of the afa21 Task Force Tax Status Team. As Chairman of the Constitution Committee, he was charged with providing implementing language for all the afa21 Task Force recommendations, including merging AFA and AEF, which required convention-delegate-approved changes to both the AFA Constitution and the AFA Operations and Procedures Manual. He is currently serving as a National Director, Chairman of the Constitution Committee, and as a member of the Strategic Planning and Executive Committees. He is also currently Vice Chairman of the Aerospace Education Council. In addition to a Chairman's Citation for his work on afa21 issues, he has received national AFA individual awards, including the Medal of Merit, the Exceptional Service Award, and the Presidential Citation.

Buckwalter entered active duty through Officer Training School in 1972 at Lackland AFB, Tex., and served for 27 years in various positions, including Weapons System Officer and Flight Commander in the RF-4C; Maintenance Squadron and Logistics Group Commander; and Senior Air

Force Advisor to the Naval War College President. Other military duties included various squadron- to wing-level positions and as the Executive Officer to the Director of Operations, Headquarters US Air Forces in Europe. His decorations include the Legion of Merit, Defense Meritorious Service Medal, Meritorious Service Medal, and Air Medal. Since his retirement from the Air Force in 1999, he has served as a Professor of National Security Affairs at the Naval War College. He has accumulated more than 14 years of experience in the professional military education classroom, teaching graduate-level strategic leadership, management, and decision making.

Buckwalter is a graduate of the Rensselaer Polytechnic Institute and holds advanced degrees from Troy State University, the Naval War College, and Salve Regina University. He is a member of the Naval War College Foundation, the Rhode Island Employer Support of the Guard and Reserve, the Military Order of Foreign Wars, and the Reserve Officers Association. He has done volunteer work for each of these organizations, but his principal contributions have been to AFA.

He resides in Portsmouth, R.I., with his wife, Mary. They have two children and five grandchildren. In July, he retired from his position at the Naval War College and plans to move to Seabrook, Tex., in November.

S. Sanford "Sandy" Schlitt was nominated for his first term as Vice



2007-08 AFA Nominees



Dierlam



Garland



Emond



Faiferlick



Price



White

Chairman of the Board for Aerospace Education. He is a member of AFA and was active in the former AEF since 2002, serving first as a member of the AEF Board of Trustees and, after the organizations merged in 2006, as a member of the AFA Board of Directors. In that capacity, he was active in the afa21 process as a member of the Governance Team and was a principal architect of the Aerospace Education and Field Councils as part of AFA's new, combined governance structure. He has also served on the AEF Nominating and Program Committees, the AFA Strategic Planning Committee, the AFA Constitution Committee, as Chair of the AEF Audit Committee, and Co-Chair of the AFA/AEF Audit Committee.

Schlitt is a graduate of The American University in Washington, D.C., was

commissioned into the West Virginia Air National Guard in 1967, and later transferred to the Reserves. He served for more than 34 years in a variety of assignments, principally in the contracts management and acquisition fields. He served as Chief of Staff for a Defense Contract Administrative Services Region; Deputy Commander (and Individual Mobilization Assistant) of the Defense Contract Management Command, Defense Logistics Agency; the Mobilization Assistant to the Deputy Assistant Secretary for Contracting, Assistant Secretary of the Air Force for Acquisition; and the Mobilization Assistant to the Principal Deputy, Office of the Assistant Secretary of the Air Force for Acquisition. After 10 years at the Pentagon, Schlitt retired in 2001 as a brigadier general and has

received, among other awards, the Distinguished Service Medal, Legion of Merit, and Defense Meritorious Service Medal (with two Oak Leaf Clusters). He attended SOS, ACSC, AWC, and the Leadership Institute at Eckerd College.

He has established or purchased and then sold or successfully liquidated several businesses. He has served as Chairman of the Board of one company and member of the Board of another, a NASDAQ listed public company, and on various associated committees including those on compensation, governance, and audit. Schlitt served as a member of the Advisory Board to the College of Business and Information Technology for Argosy University. He also served on the Senate staffs of Sen. Hubert H. Humphrey and Sen. Walter

Mondale. In 1980 he was a candidate for the United States Congress. Schlitt continues as the Senior Managing Director of a mortgage investment trust and has a daily involvement in financial portfolio management.

Schlitt has served as the elected President of his community association and as Vice President for Finance and board member for his temple and is a fundraiser for local charities. He has been a member of the New York Friars Club and Chapter President and Vice President-Air for the Reserve Officers Association.

He and his wife, Patricia, reside in Sarasota, Fla. They have two children.

Judy K. Church of Lenexa, Kan., is completing her first year as National Secretary and has been nominated for a second one-year term. She is a Life Member and has been active in AFA since 1987. Her involvement with the association began through her late husband, National Treasurer Charles H. Church Jr. She was active at the chapter level and also gained national experience as she traveled with him to national meetings and events throughout the country.

She has served AFA in appointed and elected positions at all levels. She held the position of Chapter Treasurer of the Harry S. Truman Chapter and has served as Midwest Region President, Missouri State President, Vice President, and Vice President for Communications. At the national level, she serves as a member of the Constitution Committee and has served as both a member and Chairman of the Credentials Committee.

She has also maintained a full commitment to other volunteer work through service on many civic boards. She is a current member of the NE Johnson County Kansas Republican Women's Board, past member of the Kansas City Symphony Board, and past member of the University of Missouri Kansas City Women's Council Board.

She was named the 2003 Midwest Member of the Year and was made a Charles H. Church Jr. Fellow by the state of Missouri. At the national level, she has received the Medal of Merit and Exceptional Service Medal and in 2006 was awarded a Presidential Citation.

Church graduated from Southland Girl's High School, Invercargill, New Zealand. She attended Otago Univer-

sity in Dunedin, New Zealand, and has a diploma in early childhood education. She lives in Lenexa, Kan., and has two children.

Steven R. Lundgren of Fairbanks, Alaska, was nominated for his third one-year term as National Treasurer. He has been an AFA member for 25 years, having begun as a Community Partner. He has served AFA in many leadership positions, including Chapter, State, and Region President. He currently chairs the National Finance Committee. Lundgren has received an Exceptional Service Award and the national Presidential Citation.

Lundgren is a member of the Alaskan Command Civilian Advisory Board, Vice Chairman of the Alaska State Committee for Employer Support of the Guard and Reserve (ESGR), and a member of the Greater Fairbanks Chamber of Commerce Military Affairs Committee. He is also active as a leader in other civic organizations, serving as Chairman of Fairbanks Economic Development Corp. and on the Board of Directors of the Greater Fairbanks Chamber of Commerce. Lundgren has also served as a Director of the Interior Alaska Builders Association and the United Way of the Tanana Valley as well as President of the Fairbanks Sunrisers Rotary Club. His service has been recognized by numerous awards, including the 2004 ESGR Spirit of Volunteerism Award, and he was honored with the 2006 Annual Honorary Iceman Award from Eielson AFB, Alaska.

Lundgren's entire 29-year professional career has been in the financial services industry. He is currently Senior Vice President and member of the Senior Management Committee for a large community bank in the Fairbanks area.

He graduated from Oregon State University with a bachelor's degree in business administration and has completed graduate studies at Portland State University and the University of Alaska. He completed the American Bankers Association National Commercial Lending School in 1991 and the ABA Graduate Commercial Lending School at the University of Oklahoma in 1992.

He resides in Fairbanks, Alaska, with his wife, Susan, and three children.

The AFA Constitution directs that one-third of the nine elected Directors be elected at the National

Convention each year. At the 2007 National Convention, two Director positions will be elected at large by the delegates to the National Convention and a Central Region Director will be elected.

The Nominating Committee is submitting two names—Mark Dierlam and Edward W. Garland—for consideration for the office of National Director to be elected from the Central geographic area:

Mark Dierlam, Alabama. Former Montgomery Chapter President, Vice President, Secretary, Vice President for Government Relations, and Vice President for Community Partners. Six years of service to AFA at the national level on the AFA Finance Committee. Currently serving on that committee and as Alabama State President.

Edward W. Garland, Texas. Former Alamo Chapter President and AFA Texas State President. Current Texas Vice President for Leadership Development. Past member AFA Membership and Constitution Committees and Civilian Advisory Council. Past member afa21 ORG Field Team. Currently serving as Region President Texoma.

The Nominating Committee is submitting four names—Louis Emond, Justin Faiferlick, Joseph Price, and Jerry E. White—for consideration for the office of National Director to be elected at-large. Two will be elected.

Louis Emond, New Hampshire. Former Chapter Vice President for Community Partners and symposium Chairman. Currently serving as Chapter President.

Justin Faiferlick, Iowa. Former State Vice President, former Chapter President, Vice President, and Vice President for Community Partners. Currently serving as Chapter Secretary. Currently serving as State President.

Joseph Price, Virginia. Former member of the AEF Board of Trustees, National Director for Leadership Development, State Vice President, and Chapter President. Currently serving as National Director, Region Vice President, State Treasurer, and Chapter Vice President.

Jerry E. White, Colorado. Former member of the AEF Board of Trustees, Co-Chairman of the AEF Development Committee, and member of the afa21 Tax Status Team as part of the afa21 Task Force. Currently an appointed AFA Board member. ■

By Frances McKenney, Assistant Managing Editor

Living Legends

A Flying Tiger, a Tuskegee Airman, a B-24 pilot, and a historian related stories of airpower in World War II, during a seminar co-hosted by the **Donald W. Steele Sr. Memorial Chapter (Va.)** at the Pentagon in May.

The panel discussion inaugurated the chapter's summer-long series called "Living Legends."

More than 100 guests—including many junior officers and enlisted personnel—crowded into a conference room to hear retired Maj. Gen. John R. Alison, who was a Flying Tiger with Claire Chennault. Alison shot down at least two enemy aircraft in his first air combat mission and later became an ace. In the course of several successful civilian careers, he also held the top leadership positions at AFA.

A second presenter, retired Col. Charles E. McGee, graduated in Class 43-F at Tuskegee, Ala., and flew in three wars: 136 missions in World War II Europe, 100 missions in Korea, and 173 in Vietnam. Retired Col. William Taylor III spoke about moving the first B-24 group to England.

As Air Force historian from 1991 to 2002, panelist Richard P. Hallion lent perspective to the experiences of his fellow living legends. He has written and edited books on aviation and military subjects ranging from the Wright brothers to the space shuttle and often appears on History Channel TV programs.

The second panel discussion in the Legends series took place in June and covered "The Jet Age: Korea, Vietnam, and the Cold War." The Air Force career of panelist Hal M. Hornburg, a retired four-star, began with the Vietnam



AFA Board Chairman Bob Largent (right) and retired CMSAF James McCoy (left) present the academic achievement award to MSgt. Eric Bobo at the Senior NCO Academy Graduation in Montgomery, Ala.

War—where he was a forward air controller—and culminated as head of Air Combat Command.

Retired Air Vice Marshal Paddy Harbison described how the RAF became interested in airpower tactics used in the Korean War and sent him as an exchange pilot to fight in "the first jet war" as part of USAF's 4th Fighter Group. Retired Maj. Gen. James E. McInerney Jr.'s comments covered his leadership experiences gained in Korea and Vietnam. He was director of programs in the Air Force's Programs and Analysis Office before retiring in 1980.

Panelist Thomas J. Hanton, an F-4

navigator in Vietnam and retired lieutenant colonel, recalled his year in the 'Hanoi Hilton' and in "the Zoo," as a POW. "We were warriors," he said of the POWs. "We didn't give up the fight just because we weren't in the air."

The third Legends panel was scheduled for July, and planning is under way for a culminating Living Legends Salute at the Air Force Memorial. The series was organized by the Steele Chapter's Lt. Col. Michelle R. Ryan, in conjunction with the Air Force 60th Anniversary Task Force and the Air-ift/Tanker Association.

Flight Camp

When the University of Oklahoma stopped offering its flight camp for youngsters in Enid, Okla., last year, the local AFA chapter stepped in to fill the gap.

The first annual **AFA Enid Chapter Flight Camp** in summer 2006 brought out only seven students. Chapter President James J. Jacobs said his group learned some lessons from that. "First thing we did this year," he said, "was move the camp forward one full week—as last year, everyone was already going on vacation."

AFA Conventions

Aug. 8	Michigan State Convention , Mount Pleasant, Mich.
Aug. 11	Georgia State Convention , Warner Robins, Ga.
Aug. 11	Massachusetts State Convention , Boston
Aug. 18	Indiana State Convention , Indianapolis
Aug. 25	North Carolina State Convention , Raleigh, N.C.
Sept. 22-23	AFA National Convention , Washington, D.C.
Sept. 24-26	Air and Space Conference , Washington, D.C.

Indeed, this June, 21 schoolchildren attended the chapter's second annual flight camp. Furthermore, an earlier start date meant that the kids were still in the routine of getting up and going to school, Jacobs pointed out.

The first four days of camp took place at Glenwood Elementary School, where teachers Susan Jacobs and Jan Martin and the school's principal, Mary Beth Light, conducted classes. They geared aviation topics to match capabilities of their third-to-sixth grade students: The younger children built kites and learned about gravity, lift, thrust, and drag, while the older group tackled the building of an anemometer and studied such subjects as weather, wind speed, and other elements affecting flight.

As a culminating activity, the campers went to Enid Woodring Regional Airport, where Terry J. Cox, who is the Oklahoma state president, and AFAers Kenneth W. Sumpter and Ronald Hazlett were among those who flew the school kids in several general aviation aircraft. The Enid Chapter paid for the cost of the fuel for these flights.

"We are so excited to be able to teach young people about flight," Jacobs wrote.

Who, Me?

During the annual awards ceremony at Keshequa Middle School in Nunda, N.Y., **Genesee Valley Chapter** President Alfred E. Smith called teacher Shawn Bielicki up to the stage.

Making his way up front, Bielicki jokingly told Smith that he'd already graduated from middle school, so he was pretty sure he wasn't eligible for any award that evening.

He was wrong. Smith—who drove more than 120 miles round-trip to attend this awards program—first explained to the audience about the AFA Educator Grant that Bielicki received. Then Smith announced that the computer instructor had been selected as the chapter's Teacher of the Year.

Bielicki said afterward that he was floored—and more so when Smith whispered to him that he was not done yet. The chapter president then announced that Bielicki, who teaches seventh-, eighth-, and ninth-graders, had also been selected as the New York State Teacher of the Year.

"It was one of the happiest moments of my life," Bielicki said later.

AFA Educator Grants provide up to \$250 each academic year to support education programs and activities in schools where no other support is available. Bielicki's grant allowed his



Photo by Eric Dailing

Savannah Chapter President Edward Wexler speaks at a chapter ceremony honoring Vietnam War veterans, held at the Vietnam Memorial "Traveling Wall" exhibit in Savannah in June. A 165th Airlift Wing (ANG) honor guard (right) posted the colors at this scale replica of the Washington, D.C., monument.

students to explore aerospace technology careers.

Utah's Best

AFA Utah's Aerospace Education

Foundation recognized the best aerospace educators in the state with a Teacher of the Year banquet in May. Four instructors received honors from the **Northern Utah Chapter**, the **Ute-**

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Rocky Mountain Chapter, and the **Salt Lake Chapter**, host of the dinner held at the Salt Lake Community College Student Center.

The teachers were: Scott Lewis from Granger High School in Salt Lake City, who was named State Teacher of the Year; Peggy Robinson, from Edgemont Elementary School in Sandy, who is the Salt Lake Chapter's TOY; Carolyn Bushman from Wendover High School in Wendover, TOY for the Northern Utah Chapter; and Lynette Ethridge from Payson Junior High School in Payson, the Ute-Rocky Mountain Chapter's TOY.

Former astronaut Charles J. Precourt, a retired USAF colonel, was guest speaker. Precourt went into space for both the first space shuttle mission to dock with the Russian space station Mir (1995) and for the ninth and last such shuttle-Mir mission (1998). He showed "some amazing pictures of views of the Earth from space," reported Dennis J. Guymon, a banquet organizer.

The Teacher of the Year banquet received support from local Industrial Associates, the chambers of commerce, and corporate sponsors. Local TV personality—and chapter member—Sterling Paulson was master of ceremonies for the event.

F-16 Fly-In

The **Flying Yankees/Gen. George C. Kenney Chapter** joined the Connecticut Air National Guard and Pratt & Whitney in sponsoring an F-16 fly in at Bradley Arpt., Conn., in May.

Lt. Col. Scott Stratton and Maj. Ray Siegfried, ANG pilots from Oklahoma, landed at the airport to help showcase their F-16s, recently upgraded with P&W F100 engines. Siegfried addressed the crowd of more than 200 visitors, talking about his combat experiences in the aircraft.

Those taking an up-close look at the pair of Fighting Falcons and a Connecticut ANG A-10 Warthog on static display included military and aerospace industry representatives and AFROTC, AFJROTC, and CAP cadets.

As part of the day's events, Chapter President William Forthofer, ANG Brig. Gen. Daniel L. Peabody, and P&W VP Warren Boley presented a framed Keith Ferris painting to the two F-16 pilots.

Fisher House Fund-Raiser

The **Richmond Chapter** in Virginia sponsored the 2007 Airpower Open Golf Tournament to raise funds to help those wounded in the Global War on Terrorism.

Golfers at the May tournament—or-



Ray and Carole Turczynski are enjoying benefits for life!

As active members of the Air Force Association, they decided to take advantage of an opportunity to support the legacy of AFA while ensuring a life income for themselves and reducing their appreciated assets. They are doing this through a **Charitable Remainder Unitrust**.

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Promoting Air Force AIRPOWER.

ganized by chapter government relations VP Fred Williamson—raised \$1,500 for two causes: a local Fisher House and also the Families of the Wounded Fund.

According to chapter leadership VP Thomas C. Moran, Richmond's 427-bed Department of Veterans Affairs Medical Center now takes head and spinal cord injury cases sent directly from the war in Southwest Asia. This in turn means an increase in the number of family members who come to Richmond. Fisher Houses enable

these family members to stay close to the military person who is hospitalized. The first Fisher House opened in 1991 at the National Naval Medical Center in Bethesda, Md. Moran reported that the Richmond Fisher House is the 43rd to be built, the fifth new location this year.

Williamson and David Ellis, the chapter's veterans affairs VP, attended the groundbreaking ceremony in June for this Fisher House. They presented the donations to Fisher House Foundation official Jim Wieskopf and to Paul

USAF photo by SrA. Cole Presley



SrA. Frank Castillo of the 614th Space Intelligence Squadron at Vandenberg AFB, Calif., receives an AFA Pitsenbarger Award from Goddard Chapter President David Richardson. See "Pitsenbarger-Plus."

Galanta, director of the Families of the Wounded Fund. The fund, based south of Richmond, raises money to help families and caregivers in central Virginia who are caring for military patients undergoing treatment.

Pitsenbarger-Plus

The **Robert H. Goddard Chapter** in California awarded Pitsenbarger Awards—and some extras—to three top graduates of the Community College of the Air Force at Vandenberg AFB, Calif.

Chapter President David Richardson made the presentations to SSgt. Jesse Carter of the 576th Flight Test Squadron; SSgt. Jason Wentz of the 533rd Training Squadron; and SrA. Frank Castillo of the 614th Space Intelligence Squadron.

AFA Pitsenbarger Awards are \$500 grants given to top active duty, Guard, or Reserve enlisted personnel graduating from the CCAF who are going on to pursue a bachelor's degree. In this case, the Goddard Chapter added on another \$100 to each grant, plus a year of AFA membership and an AFA certificate.

Richardson reported that the local CCAF advisor said the Pitsenbarger Awards were important to the graduation ceremony, helping to make it "first rate."

"Good Public Relations"

The **Thomas W. Anthony Chapter (Md.)** set up two exhibit tables at the Joint Service Open House in May at Andrews AFB, Md.

Among those manning the tables during the open house over Memorial Day weekend were Charles X. Suraci Jr., chapter president; Natalie Desmond, chapter secretary; William Thomas, communications VP; and Ron Perkins, leadership VP. Their exhibit tables

featured copies of *Air Force Magazine* and a photo display showing highlights of the chapter's activities.

The open house information brochure gave space to a description of the chapter's work on behalf of the Andrews personnel. It noted that the chapter sponsors a breakfast that is part of a mandatory-attendance safety briefing for each organization that takes part in the open house's air show.

Suraci said manning the chapter's tables for three days was hard work with long hours, "but it is good public relations."

Cadets

The **Cape Fear Chapter** in North Carolina held a chapter dinner in June to spotlight cadets in the Wilmington area. USMC Col. John T. Rahm was the guest speaker.

Rahm, a safety officer in 2nd Marine Aircraft Wing at Marine Corps Air Station Cherry Point, spoke about his recent experiences in Iraq.

Among the special guests that evening were young Civil Air Patrol cadets Melody Brittingham, Christopher Brittingham, Andrew Dahms, Robert Dahms, Eron Neill, Nina Neill, and a soon-to-be AFROTC cadet, Kelsey Hall.

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Hall begins aerospace engineering studies at North Carolina State College this fall on a full AFROTC scholarship. She and fellow E.A. Laney High School cadet Brian Lienhop had earlier received AFA awards from the Cape Fear Chapter at their school's AFJROTC honors and awards night in May.

Parents of the cadets at the chapter meeting were invited to attend these quarterly gatherings to give a progress report on their children's activities. This is part of a membership drive that Chapter President Glenn W. Drew initiated as a way of encouraging cadet parents to join AFA.

More AFA News

■ At the Gateway Institute of Technology High School's 22nd annual awards banquet and dining-out in Missouri, Stephen E. Cain from the **Scott Memorial Chapter (III.)** presented an AFA Bronze Medal to AFJROTC cadet Brandon M. Bolden. AFA Bronze Medals go to outstanding junior-year AFJROTC cadets and are accompanied by a ribbon and certificate. The AFA Bronze Medal is the top award given to the cadets at Gateway, and Cain said, "It means a lot to them." Cain, a retired lieutenant colonel, is the senior aerospace science instructor at the school. The dining-out took place at the St. Louis University's Student Center in May and was attended by more than 200 guests.

■ **Tarheel Chapter VP** Lewis Feuerstein attended 10 such AFA Bronze Medal and three AFA Silver Medal (AFROTC) awards presentations at high schools and universities in the Raleigh area of North Carolina. Over a six-week period this spring, he put more than 450 miles on his car's odometer, traveling to the schools. Chapter aerospace education VP Eldon Allen and chapter member Rocky Lane pitched in, too, but there still remained one high school that none of them were able to cover. "The units are eager to have presenters, so the students can have a connection with the Air Force, and any cross-generation contact with them is meaningful," wrote Joyce Feuerstein, North Carolina state president.

Have AFA News?

Contributions to "AFA National Report" should be sent to *Air Force Magazine*, 1501 Lee Highway, Arlington, VA 22209-1198. Phone: (703) 247-5828. Fax: (703) 247-5855. E-mail: natrep@afa.org. Digital images submitted for consideration should have a minimum pixel count of 900 by 1,500 pixels.

■ Representing the **Brig. Gen. Pete Everest Chapter** in West Virginia, Steve Thompson, chapter president, attended Senior Recognition Night at East Fairmont High School to award a scholarship to Daniel Wes Talbott.

The chapter selected Talbott for the \$1,000 award because, among other reasons, he had been an AFJROTC cadet for all four years of high school. He will begin studies this fall at West Virginia University. ■

Unit Reunions

reunions@afa.org

32nd FIS, USAFE, Camp New Amsterdam, Netherlands. Sept. 30-Oct. 1 at the Antlers Hotel in Colorado Springs, CO. **Contacts:** Lowell Bell, 7095 Baker Rd., Colorado Springs, CO 80908 (719-495-4754) (lowellbell@aol.com) or John Cary, 5680 Sonnet Ridge Pt., Colorado Springs, CO 80918 (719-598-4134) (jfcary1@msn.com).

39th FS and 40th and 41st Sqs, 35th FG. Sept. 19-22 in Boise, ID. **Contact:** Roger Rehn (530-644-7346) (rolo7346@sbcglobal.net).

48th FS, FIS, & FTS. Sept. 12-16 in Ontario, CA. **Contact:** Joe Onesty, 455 Galleon Way, Seal Beach, CA 90740-5937 (562-431-2901) (jonesty2@roadrunner.com).

61st TCS. Sept. 19-22 at the Hope Hotel in Dayton, OH. **Contact:** Joe Noah (434-374-2781) (noahbjr@kerrlake.com).

71st and 341st Air Refueling Sqs, 4060th ARW, Dow AFB, ME. Sept. 13-16 at the Hope Hotel in Dayton, OH. **Contact:** Dick Chipman (937-845-5992) (dickchipman@sbcglobal.net).

76th Troop Carrier Sq (WWII), including the **435th TCG, 75th, 77th, and 78th TCS**. Sept. 26-29 at the Marriott Hotel in Albuquerque, N.M. **Contact:** Al Forbes, 1614-B Berwick Ct., Palm Harbor, FL 34684 (727-785-6075) (for76tcs@aol.com).

303rd BG Assn. Sept. 20-23 at the Sheraton National Hotel in Arlington, VA. **Contact:** William Cox (707-448-0571) (pilotrb36@aol.com).

361st FG. Oct. 1-4 at the Doubletree Downtown Hotel in Dayton, OH. **Contact:** Jim Olmstead, 1818 Belltower Cir., Batavia, OH 45103 (513-797-1213) (jlo1@fuse.net).

362nd FG (WWII), Ninth AF, Europe. Oct. 18-21 in Portland, OR. **Contacts:** Jim Ashford, 724 Cessna St., Independence, OR 97351 (503-508-2839) or Fern Mann, 5001 Scheibler Rd. #B-1, Memphis, TN 38128 (901-388-4477) (cmann1525@aol.com).

363rd/161st FG. Sept. 27-30 in Columbus, OH. **Contacts:** Arthur Mimler, 3086 Hwy 140, Catheys Valley, CA 95306 (209-966-2713) (parkerboze@yahoo.com) or Carol Quinn, 4502 Holt Rd., Wentzville, MO 63385 (636-398-4163) (events@centurytel.net).

384th ARS. Oct. 4-7 at the Short Stay Navy Outdoor Recreation Area in Moncks Corner, SC. **Contact:** Kenneth Godstrey, 12018 Maycheck Ln., Bowie, MD 20715-1551 (301-464-1150/301-792-2017) (kengodstrey@comcast.net).

450th BG. Oct. 3-7 at the Radisson Hotel in Branson, MO. **Contact:** Al Goodman, 2 Portside Ct., Grayslake, IL 60030 (847-543-8381) (gobaral@aol.com).

600/601 Photo AAVS. Sept. 20-22 in Orlando, FL. **Contact:** Ron Marshall (505-254-7984) (rromarshall@aol.com).

601st Tactical Control Wg. Sept. 20-24 in Alamogordo, N.M. **Contact:** Hap Haggard, 601st Tactical Control Assn., 6860 E. Rosewood Cir., Tucson, AZ 85710 (520-298-8208) (haphagg@aol.com).

906th ARS (1958-present). Sept. 13-16 in Dallas. **Contact:** Kemp Martin, 806 Oak Valley Dr., Houston, TX 77024-3123 (713-467-5435) (kmartin1@pdg.net).

AF Postal & Courier Assn. Sept. 21-24 at the Radisson Hotel in Rapid City, SD. **Contact:** Jim Foshee, 3509 Deer Trl., Temple, TX 76504 (254-774-7303) (jimfoshee@sbcglobal.net).

AFROTC Det. 650. Sept. 21-22 at Ohio University in Athens, OH. **Contact:** Amy Troiano (740-593-1343) (afrotc650@ohio.edu).

Ashiya 815th TCS (1954-58). Oct. 1-4 at Circus Circus in Las Vegas. **Contacts:** Rae Grosvenor or Ed Rachanski (702-564-6214) (sunpac1625@embarqmail.com).

Jake, Bird Dog, and Togo FACs and ground crews, Quang Ngai and Tam Ky, Vietnam (1963-71). Sept. 22-27 in Orlando, FL. **Contact:** Chuck McCalip (218-751-2711) (mccalip@paulbunyan.net).

Pilot Class 53-F. Sept. 27-Oct. 1 in Branson, MO. **Contact:** Frits Forrer (850-916-7566) (fforrer@bellsouth.net).

Seeking **Jolly crew members** involved in the rescue of Misty crews or in rescue missions coordinated by Misty FACs June 1967 to May 1970 for a reunion in October. **Contact:** Rich Blackwell (928-717-2732) (helorich@cablone.net). ■

E-mail unit reunion notices four months ahead of the event to reunions@afa.org, or mail notices to "Unit Reunions," *Air Force Magazine*, 1501 Lee Highway, Arlington, VA 22209-1198. Please designate the unit holding the reunion, time, location, and a contact for more information. We reserve the right to condense notices.

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Airpower Classics

Artwork by Zaur Eylanbekov

B-47 Stratojet



The B-47 Stratojet made Strategic Air Command the most powerful war instrument in history. The B-47's wartime mission was nuclear attack of the Soviet Union. It was fast, powerful, and numerous. Essentially there were two sets of B-47s, with two sets of crews. One comprised aircraft and crews optimized for delivering atomic weapons. The second was made up of reconnaissance, electronic jamming, and weather types. The latter group would troll Soviet air defenses, SAMs, and airborne intercept radars, trying to provoke a response. Two were shot down.

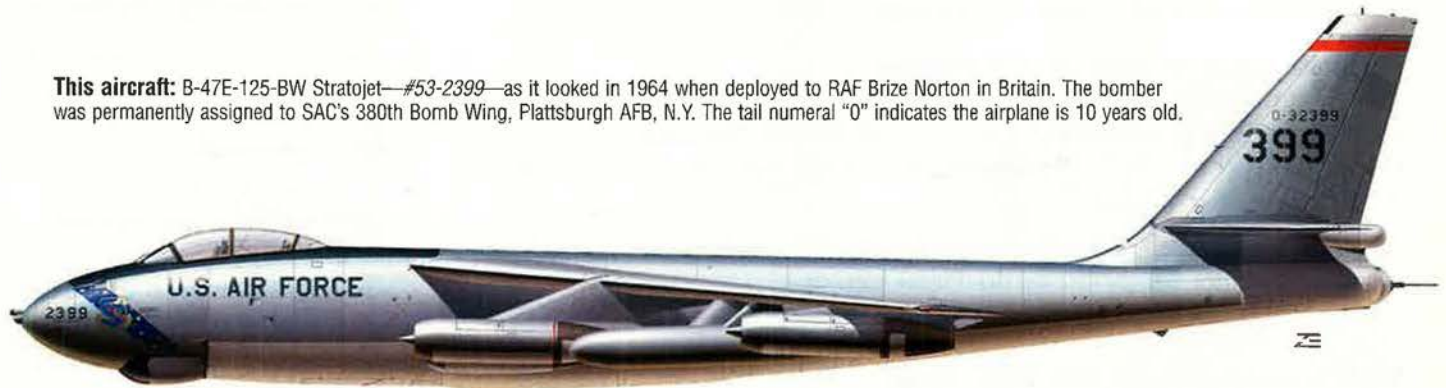
Jet engines were new when design work began in 1943. A turning point came in 1945; Boeing aerodynamicist George Schairer, having gained access to German plans and engineers, advised using swept wings in Boeing's design. The sleek, beautiful outcome was highly advanced but also temperamental. It did not become operational until 1951. With its 35-degree-swept wings, six

jet engines, drag and brake chutes, anti-skid brakes, and bicycle landing gear, the B-47 was far superior to its predecessors. In-flight refueling gave it intercontinental range. Its high cruise speed made Soviet fighter interception difficult. Flying the B-47 was a demanding task, and many were lost in landing or take-off accidents.

Beginning in 1953, B-47 wings rotated through bases in the Pacific, North Africa, and Britain. As Soviet defenses improved, USAF created new B-47 tactics, including the Low Altitude Bombing System (LABS)—use of an Immelmann maneuver from low altitude and so-called "toss bombing." In 1957, USAF began using "Reflex," a system in which B-47 wings pulled 21-day "alerts" overseas. By 1957, SAC had about 1,800 B-47s (and RB-47s) in service, but that number rapidly declined as the Air Force brought on the new workhorse B-52.

—Walter J. Boyne

This aircraft: B-47E-125-BW Stratojet—#53-2399—as it looked in 1964 when deployed to RAF Brize Norton in Britain. The bomber was permanently assigned to SAC's 380th Bomb Wing, Plattsburgh AFB, N.Y. The tail numeral "0" indicates the airplane is 10 years old.



In Brief

Designed by Boeing ★ built by Boeing, Lockheed, Douglas ★ first flight Dec. 17, 1947 ★ crew of three ★ number built 2,049 ★ armament, two 20 mm cannon in tail turret ★ bomb load 20,000 lb ★ **Specific to B-47E:** six General Electric J47-GE-25 jet engines, plus 30 or 33 RATO bottles ★ max speed 606 mph ★ cruise speed 557 mph ★ max range 4,000 mi ★ weight (loaded) 230,000 lb ★ span 116 ft ★ length 109 ft 10 in ★ height 27 ft 11 in.

Famous Fliers

Gen. Curtis E. LeMay (SAC commander, CSAF); Col. Donald E. Hillman (leader of 1952 overflight of Russia); 1st Lt. James Obenauf (DFC in 1958 for heroism); Gen. Thomas S. Power (SAC commander); Gen. John A. Shaud (chief of staff, SHAPE); Gen. Walter C. Sweeney Jr. (commander, Tactical Air Command); Brig. Gen. Paul W. Tibbets Jr. (pilot of B-29 bomber *Enola Gay*); Editor's addition: Col. Walter J. Boyne, noted USAF historian.

Interesting Facts

Flown in some 19 variants ★ wing so flexible that tip could deflect through 17-foot-long arc ★ carrier of Bell GAM-63 Rascal "supersonic pilotless bomber" ★ RB-47s overflew Soviet Union in 1952 ★ two RB-47s shot down in Cold War ★ launched an anti-satellite missile against Explorer VI.



B-47s sometimes made rocket-assisted takeoffs.

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