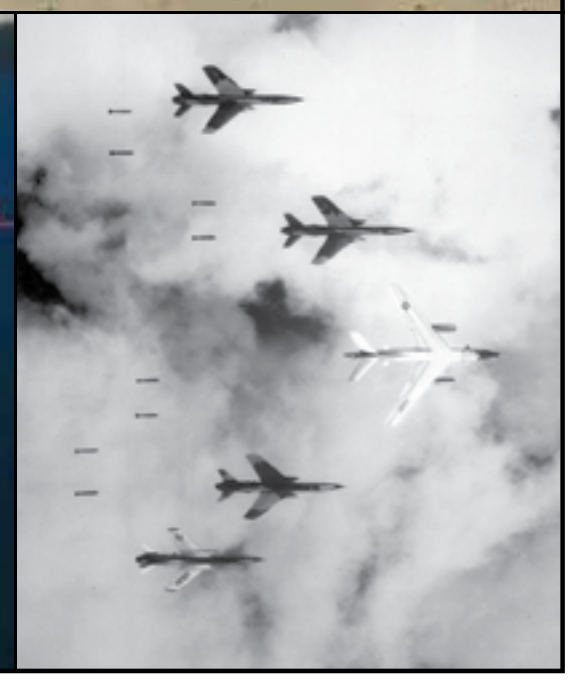
AEROTECHNEWS
JOURNAL OF AEROSPACE, DEFENSE INDUSTRY AND VETERANS NEWS
AN AEROTECH NEWS AND REVIEW PUBLICATION • WWW.AEROTECHNEWS.COM • SEPTEMBER 2022

U.S. AIR FORCE CELEBRATES — 75 YEARS —

U.S. Air Force
75
Established 1947



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U.S. Air Force celebrates 75th anniversary

With the stroke of a pen, President Harry S. Truman signed the National Security Act of 1947 on Sept. 18, 1947.

The Act created the National Military Establishment — later renamed the Department of Defense — and created the U.S. Air Force as a separate branch of the U.S. military.

The signing began a three-year transition period in which soldiers became airmen and army air fields became air force bases.

Before that, the responsibility for military aviation was divided between the U.S. Army for land-based operations and the U.S. Navy for sea-based operations.

And while we celebrate the 75th anniversary of the creation of the U.S. Air Force on Sept. 18, the history of U.S. military aviation can be traced back to 1907, when the U.S. Army created the Aeronautical Division, Signal Corps.

In this special issue of *Aerotech News and Review,* we take a look back at the past 75 years.

W. Stuart Symington, former Assistant Secretary of War for Air (1946-47) is shown taking the oath of office as the first Secretary of the Air Force from Chief Justice Fred Vinson. Left to right: Symington, Secretary of the Army Kenneth C. Royall; Secretary of Defense James N. Forrestal; Chief Justice Fred Vinson; and Secretary of the Navy John L. Sullivan.

Courtesy photograph

Above: President Harry S. Truman signs the National Security Act of 1947 on Sept. 18, 1947, creating the U.S. Air Force as a separate service of the U.S. military. **Left:** Secretary of the Air Force W. Stuart Symington prepares to cut the cake celebrating the first anniversary of the Air Force, as Chief of Staff of the Air Force, Gen. Hoyt S. Vandenberg looks on.

On the cover, clockwise from top left:
One: U.S. Air Force bombers from the 1930s through the late 1940s — A Douglas B-18 Bolo, a Boeing B-17 Flying Fortress, a Boeing B-29 Superfortress and the B-36 Peacemaker. **Two:** Aircraft of the 379th Air Expeditionary Wing and coalition counterparts stationed together at Al Udeid Air Base, Qatar, in southwest Asia, fly over the desert. Aircraft include KC-135 Stratotanker, F-15E Strike Eagle, F-117 Nighthawk, F-16CJ Falcon, British Tornado GR4, and Australian F/A-18 Hornet. **Three:** A U.S. B-66 Destroyer and four F-105 Thunderchiefs dropping bombs on North Vietnam in 1966. **Four:** The U.S. Air Force Thunderbirds operated the F-100C from 1956 until 1964. After briefly converting to the F-105 Thunderchief, the team flew F-100Ds from July 1964 until November 1968. **Five:** Maj. Kristin Wolfe, F-35A Lightning II Demonstration Team pilot and commander, flies at the Wings over South Texas air show at Naval Air Station Kingsville, Texas, April 2, 2022.

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Aerotech News and Review is published every other Friday, serving the aerospace and defense industry of Southern California, Nevada and Arizona. News and ad copy deadline is noon on the Tuesday prior to publication. The publisher assumes no responsibility for error in ads other than space used. Your comments are welcomed and encouraged. Write to the address below.

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USAF 75th Anniversary — In the beginning, World War I

In 1917, upon the United States' entry into World War I, the first major U.S. aviation combat force was created when an Air Service was formed as part of the American Expeditionary Force. Maj. Gen. Mason Patrick commanded the Air Service of the AEF; his deputy was Brig. Gen. Billy Mitchell.

These aviation units, some of which were trained in France, provided tactical support for the U.S. Army, especially during the Battle of Saint-Mihiel and the Meuse-Argonne offensives.

Air Force photograph

U.S. Airmen in France, Oct. 2, 1918.

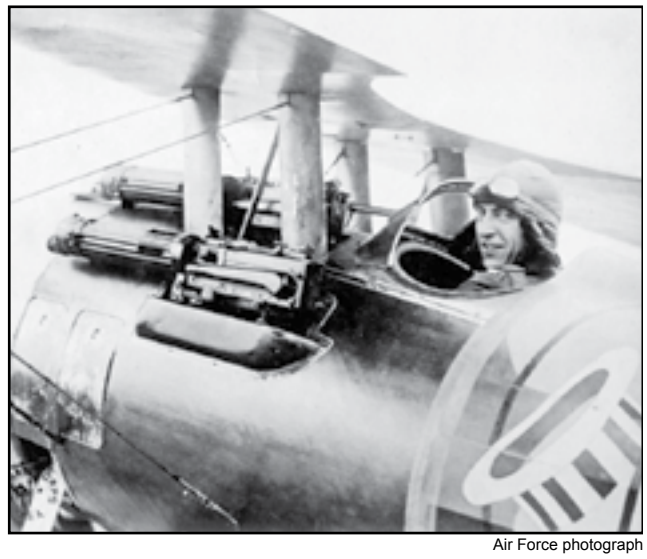
Concurrent with the creation of this combat force, the U.S. Army's aviation establishment in the United States was removed from control of the Signal Corps and placed directly under the United States Secretary of War. An assistant secretary was created to direct the Army Air Service, which had dual responsibilities for development and procurement of aircraft, and raising and training of air units. With the end of the First World War, the AEF's Air Service was dissolved and the Army Air Service in the United States largely demobilized.

In 1920, the Air Service became a branch of the Army and in 1926 was renamed the Army Air Corps. During this period, the Air Corps began experimenting with new techniques, including air-to-air refueling and the development of the B-9 and the Martin B-10, the first all-metal monoplane bombers, and new fighters.

Technology

During World War I, aviation technology developed rapidly; however, the Army's reluctance to use the new technology began to make airmen think that as long as the Army controlled aviation, development would be stunted and a potentially valuable force neglected.

Air Corps senior officer Billy Mitchell began to campaign for Air Corps independence. But his campaign offended many and resulted in a court martial in 1925 that effectively ended his career. His followers, including future aviation leaders "Hap" Arnold and Carl Spaatz, saw the lack of public, congressional, and military support that Mitchell received and decided that America was not ready for an independent air force. Under the leadership of its chief of staff Mason Patrick and, later, Arnold, the Air Corps waited until the time to fight for independence arose again.



Air Force photograph

Capt. Edward Vernon Rickenbacker was an American fighter ace in World War I and Medal of Honor recipient. With 26 aerial victories, he was America's most successful fighter ace in the war.

USAF 75th Anniversary:

World War II, airpower comes of age

President Franklin D. Roosevelt took the lead, calling for a vastly enlarged air force based on long-range strategic bombing. Organizationally it became largely independent in 1941, when the Army Air Corps became a part of the new U.S. Army Air Forces, and the GHQ Air Force was redesignated the subordinate Combat Command.

In the major reorganization of the Army by War Department Circular 59, effective March 9, 1942, the newly created Army Air Forces gained equal voice with the Army and Navy on the Joint Chiefs of Staff and complete autonomy from the Army Ground Forces and the Services of Supply.

The reorganization also eliminated both Combat Command and the Air Corps as organizations in favor of a streamlined system of commands and numbered air forces for decentralized management of the burgeoning Army Air Forces.

The reorganization merged all aviation elements of the former air arm into the Army Air Forces.

Although the Air Corps still legally existed as an Army branch, the position and Office of the Chief of the Air Corps was dissolved. However, people in and out of AAF who remembered the prewar designation often used the term "Air Corps" informally, as did the media.

Maj. Gen. Carl A. Spaatz took command of the Eighth Air Force in London in 1942; with Brig. Gen. Ira Eaker as second in command, he supervised the strategic bombing campaign.

In late 1943, Spaatz was made commander of the new U.S. Strategic Air Forces, reporting directly to the Combined Chiefs of Staff.

Spaatz began daylight bombing operations using the prewar doctrine of flying bombers in close formations, relying on their combined defensive firepower for protection from attacking enemy aircraft rather than supporting fighter escorts. The doctrine proved flawed when deep-penetration missions beyond the range of escort fighters were attempted, because German fighter planes overwhelmed U.S. formations, shooting down bombers in excess of "acceptable" loss rates, especially in combination with the vast number of flak anti-aircraft batteries defending Germany's major targets. American fliers took heavy casualties during raids on the oil refineries of Ploesti, Romania, and the ball-bearing factories at Schweinfurt and Regensburg, Germany. It was the loss rate in crews and not materiel that brought about a pullback from the strategic offensive in the autumn of 1943.

The Eighth Air Force had attempted to use both the P-47 and P-38 as escorts, but while the Thunderbolt was a capable dog-fighter it lacked the range, even with the addition of drop tanks to

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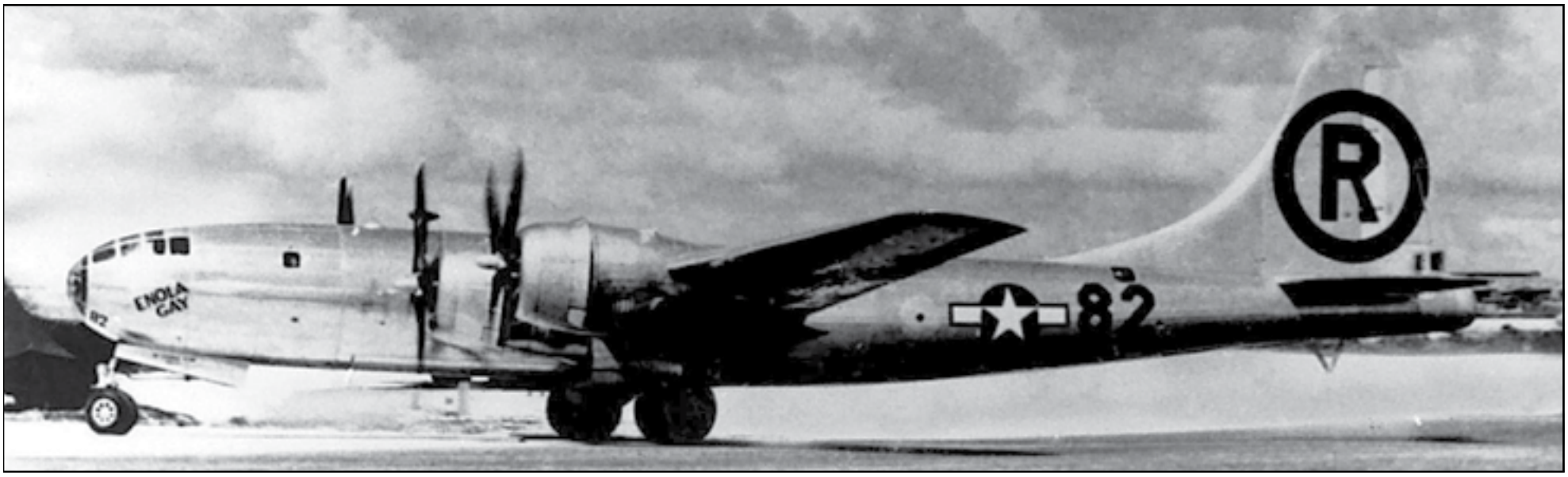
Air Force photograph

On April 18, 1942, the United States conducted an air raid on Tokyo and other locations in Japan. The raid was planned and led by Lt. Col. James "Jimmy" Doolittle, thus becoming known as the Doolittle Raid. Sixteen B-29 Mitchell bombers were launched from the USS Hornet — and following the raid, were supposed to land in China. Fifteen aircraft reached China, but they all crashed, while the 16th landed in Vladivostok in the Soviet Union.

Air Force photograph

A P-47N Thunderbolt. The Thunderbolt flew its first combat mission — a sweep over Western Europe. Used as both a high-altitude escort fighter and a low-level fighter-bomber, the P-47 quickly gained a reputation for ruggedness. Its sturdy construction and air-cooled radial engine enabled the Thunderbolt to absorb severe battle damage and keep flying.



Air Force photograph

The Enola Gay is a Boeing B-29 Superfortress bomber, named for Enola Gay Tibbets, the mother of the pilot, Col. Paul Tibbets, who selected the aircraft while it was still on the assembly line. On Aug. 6, 1945, during the final stages of World War II, it became the first aircraft to drop an atomic bomb. The bomb, code-named "Little Boy", was targeted at the city of Hiroshima, Japan. Enola Gay participated in the second atomic attack as the weather reconnaissance aircraft for the primary target of Kokura. Clouds and drifting smoke resulted in a secondary target, Nagasaki, being bombed instead.

extend its range and the Lightning proved mechanically unreliable in the frigid altitudes at which the missions were fought.

Bomber protection was greatly improved after the introduction of North American P-51 Mustang fighters in Europe. With its built-in extended range and competitive or superior performance characteristics in comparison to all existing German piston-engined fighters, the Mustang was an immediately available solution to the crisis.

In January 1944, the Eighth Air Force obtained priority in equipping its groups so that ultimately 14 of its 15 groups fielded Mustangs. P-51 escorts began operations in February 1944 and increased their numbers rapidly, so that the Luftwaffe suffered increasing fighter losses in aerial engagements beginning with Big Week in early 1944. Allied fighters were also granted free rein in attacking German fighter airfields, both in pre-planned missions and while returning to base from escort duties, and the major Luftwaffe threat against Allied bombers was severely diminished by D-Day.

In the Pacific Theater of Operations, the AAF provided major tactical support under Gen. George Kenney to Douglas MacArthur in the Southwest Pacific Theater.

Kenney's pilots invented the skip-bombing technique against Japanese ships. Kenney's forces claimed destruction of 11,900 Japanese planes and 1.7 million tons of shipping.

The first development and sustained implementation of airlift by American air forces occurred between May 1942 and November 1945 as hundreds of transports flew more than half a million tons of supplies from India to China over the Hump.

The AAF created the 20th Air Force to employ long-range B-29 Superfortress bombers in strategic attacks on Japanese cities.

The use of forward bases in China (needed to be able to reach Japan by the heavily laden B-29s) was ineffective because of the difficulty in logistically supporting the bases entirely by air from its main bases in India, and because of a persistent threat against the Chinese airfields by the Japanese army.

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USAF 75th anniversary: The Cold War begins

In practice, the Army Air Forces became virtually independent of the Army during World War II, but its leaders wanted formal independence.

In November 1945, Gen. Dwight D. Eisenhower became Army Chief of Staff, while Gen. Carl Spaatz began to assume the duties of Commanding General, Army Air Forces, in anticipation of Arnold's announced retirement.

One of Eisenhower's first actions was to appoint a board of officers, headed by Lt. Gen. William H. Simpson, to prepare a definitive plan for the reorganization of the Army and the Air Force that could be affected without enabling legislation and would provide for the separation of the Air Force from the Army.

On Jan. 29, 1946, Eisenhower and Spaatz agreed on an Air Force organization composed of the Strategic Air Command, the Air Defense Command, the Tactical Air Command, the Air Transport Command and the supporting Air Technical Service Command, Air Training Command, the Air University, and the Air Force Center.

Over the continuing objections of the Navy, the United States Department of the Air Force was created by the National Security Act of 1947. That act became effective Sept. 18, 1947, when the first secretary of the Air Force, Stuart Symington, took office. In 1948, the service chiefs agreed on usage of air assets under the Key West Agreement.

The newly formed U.S. Air Force quickly began establishing its own identity.

Army Air Fields were renamed Air Force Bases and personnel were soon being issued new uniforms with new rank insignia. Once the new Air Force was free of Army domination, its first job was to discard the old and inadequate ground army organizational structure. This was the "Base Plan" where the combat group commander reported to the base commander, who was often "regular army," with no flying experience.

Spaatz established a new policy: "No tactical commander should be subordinate to the station commander."

This resulted in a search for a better arrangement.

The commander of the 15th Air Force, Maj. Gen. Charles Born, proposed the Provisional Wing Plan, which basically reversed the situation and put the wing commander over the base commander. The U.S. Air Force basic organizational unit became the base-wing.

Under this plan, the base support functions — supply, base operations, transportation, security, and medical — were assigned to squadrons, usually commanded by a major or lieutenant colonel. All of these squadrons were assigned to a combat support group, commanded by a base commander, usually a colonel.

Combat fighter or bomber squadrons were assigned to the combat group, a holdover from the U.S. Army Air Force group. All of these groups, both combat and combat support, were in turn assigned to the wing, commanded by a wing commander.

This way the wing commander commanded both the combat operational elements on the base as well as the non-operational elements. The wing commander was an experienced air combat leader, usually a colonel or brigadier general.

All of the hierarchical organizations carried the same numerical designation. In this manner, for example, the 28th became the designation for the Wing and all the subordinate groups and squadrons beneath it. As a result, the base and the wing became one and the same unit.

On June 6, 1952, the legacy combat groups were inactivated and the operational Combat Squadrons were assigned directly to the Wing. The World War II history, lineage and honors of the combat group were bestowed on the Wing upon its inactivation.

The USAAF wing then was redesignated as an Air Division, which was commanded by a brigadier general or higher, who usually, but not always, commanded two or more wings on a single base. Numbered Air Forces commanded both air divisions or wings directly, and the numbered air force was under the major command — Strategic Air Command, Tactical Air Command, etc.

Air Force photograph

Planes are unloaded at Tempelhof airport during the Berlin Airlift.

Air Force photograph

West Berliners watch as a U.S. cargo plane delivers desperately needed supplies during the Berlin Airlift.

After World War II, relations between the United States and the Soviet Union began to deteriorate, and the period in history known as the Cold War began.

The United States entered an arms race with the Soviet Union and competition aimed at increasing each nation's influence throughout the world. In response, the United States expanded its military presence throughout the world.

The U.S. Air Force opened air bases throughout Europe, and later in Japan and South Korea. The United States also built air bases on the British overseas territories of British Indian Ocean Territory and Ascension Island in the South Atlantic.

The first test for the U.S. Air Force during the Cold War came in 1948, when Communist authorities in East Germany cut off road and air transportation to West Berlin.

The Air Force, along with the Royal Air Force and Commonwealth air forces, supplied the city during the Berlin airlift under Operation Vittles, using C-54 Skymasters. The efforts of these air forces saved the city from starvation and forced the Soviets to back down in their blockade.

Conflict over post-war military administration, especially with regard to the roles and missions to be assigned to the Air Force and the U.S. Navy, led to an episode called the "Revolt of the Admirals" in the late 1940s, in which high-ranking Navy officers argued the case for carrier-based aircraft rather than strategic bombers.

In 1947, the Air Force began Project Sign, a study of unidentified flying objects which would be twice revived (first as Project Grudge and finally as Project Blue Book) and which would last until 1969. In the past two years, separate investigations have been conduced by the U.S. Navy, the U.S. Air Force, DOD and NASA, with the most recent being the Airborne Object Identification and Management Synchronization Group who's formation was announced in November 2021.

In 1948 the Women's Armed Services Integration Act gave women permanent status in the Regular and Reserve forces of the Air Force. And on July 8, 1948, Esther McGowin Blake became the first woman in the Air Force, enlisting the first minute of the first hour of the first day regular Air Force duty was authorized for women.

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Air Force photograph

The P-51 Mustang, named Glamorous Glen III, of the 363rd Fighter Squadron. This is the aircraft in which Chuck Yeager achieved most of his 12.5 kills, including two Me 262s. The aircraft was renamed "Melody's Answer" and crashed on March 2, 1945, from unknown causes at Haseloff, west of Treuenbrietzen, Germany.

After the Mariana Islands were captured in mid-1944, providing locations for air bases that could be supplied by sea, Arnold moved all B-29 operations there by April 1945 and made Gen. Curtis LeMay his bomber commander, reporting directly to Arnold.

LeMay reasoned that the Japanese economy, much of which was cottage industry in dense urban areas where manufacturing and assembly plants were also located, was particularly vulnerable to area attack and abandoned inefficient high-altitude precision bombing in favor of low-level incendiary bombings aimed at destroying large urban areas.

On the night of March 9-10, 1945, the bombing of Tokyo and the resulting conflagration resulted in the death of more than 100,000 persons. About 350,000 people died in 66 other Japanese cities as a result of this shift to incendiary bombing. At the same time, the B-29 was also employed in widespread mining of Japanese harbors and sea lanes.

In early August 1945, the 20th Air Force conducted atomic bomb attacks on Hiroshima and Nagasaki in response to Japan's rejection of the Potsdam Declaration which outlined the terms of surrender for Japan.

Both cities were destroyed with enormous loss of life and psychological shock. On Aug. 15, Emperor Hirohito announced the surrender of Japan, stating:

"Moreover, the enemy has begun to employ a new and most cruel bomb, the power of which to do damage is indeed incalculable, taking the toll of many innocent lives. Should We continue to fight, it would not only result in an ultimate collapse and obliteration of the Japanese nation, but also it would lead to the total extinction of human civilization. Such being the case, how are We to save the millions of Our subjects; or to atone Ourselves before the hallowed spirits of Our Imperial Ancestors? This is the reason why We have ordered the acceptance of the provisions of the Joint Declaration of the Powers."

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USAF 75th anniversary — the Korean War

During the Korean War, which began in June 1950, the Far East Air Forces were among the first units to respond to the invasion by North Korea, but quickly lost its main airbase at Kimpo, South Korea.

Forced to provide close air support to the defenders of the Pusan pocket from bases in Japan, the FEAF also conducted a strategic bombing campaign against North Korea's war-making potential simultaneously.

Gen. Douglas MacArthur's landing at Inchon in September 1950 enabled the FEAF to return to Korea and develop bases from which they supported MacArthur's drive to the Korean-Chinese border.

When the Chinese People's Liberation Army attacked in December 1950, the Air Force provided tactical air support. The introduction of Soviet-made MiG-15 jet fighters caused problems for the B-29s used to bomb North Korea, but the Air Force countered the MiGs with its new F-86 Sabre jet fighters.

Although both air superiority and close air support missions were successful, a lengthy attempt to interdict communist supply lines by air attack failed and was replaced by a systematic campaign to inflict as much economic cost to North Korea and the Chinese forces as long as war persisted, including attacks on the capital city of Pyongyang and against the North Korean hydroelectric system.

Air Force photograph

F-86 Sabres with their 51st Fighter Interceptor Wing "Checkertails" are readied for combat during the Korean War at Suwon Air Base, South Korea.

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USAF 75th anniversary — The Vietnam War

The U.S. Air Force was heavily deployed during the Vietnam War.

The first bombing raids against North Vietnam occurred in 1964, following the Gulf of Tonkin Incident.

In March 1965, a sustained bombing campaign began, code-named Operation Rolling Thunder. This campaign's purpose was to destroy the will of the North Vietnamese to fight, destroy industrial bases and air defenses, and to stop the flow of men and supplies down the Ho Chi Minh Trail, while forcing North Vietnam into peace negotiations.

The Air Force dropped more bombs in all combat operations in Vietnam during the period 1965–68 than it did during World War II, and the Rolling Thunder campaign lasted until the U.S. presidential election of 1968. Except for heavily damaging the North Vietnamese economy and infrastructure, Rolling Thunder failed in its political and strategic goals.

The Air Force also played a critical role in defeating the Easter Offensive of 1972.

The rapid redeployment of fighters, bombers and attack aircraft helped the South Vietnamese Army repel the invasion. Operation Linebacker demonstrated to both the North and South Vietnamese that even without significant U.S. Army ground forces, the United States could still influence the war. The air war for the United States ended with Operation Linebacker II, also known as the "Christmas Bombings." These helped to finalize the Paris peace negotiations.

The insurgent nature of combat operations early in the war, and the necessity of interdicting the North Vietnamese regular army and its supply lines in third-party countries of Southeast Asia led to the development of a significant special operations capability within the Air Force.

Provisional and experimental concepts such as air commandos and aerial gunships, tactical missions such as the partially successful Operation Ivory Coast, deep inside enemy territory, and a dedicated Combat Search and Rescue mission resulted in development of operational doctrines, units, and equipment.

When the Vietnam War came to an end, the U.S. Air Force was responsible for flying newly freed POWs from Hanoi, North Vietnam, to the United States. Between Feb. 12 and April 4, 1973, the Air Force flew 54 C-141 flights as part of Operation Homecoming.

Air Force photograph

Capt. Charles B. DeBellevue, Vietnam Ace F-4D Phantom at Udorn AB, Thailand. As a captain, DeBellevue became the first non-pilot ace and the leading ace in the U.S. Air Force during the Vietnam War. He was an F-4 weapon system officer with the 555th Tactical Fighter Squadron. Later in his career, DeBellevue was base commander at Edwards Air Force Base, Calif.

Air Force photograph by Staff Sgt. Mark L. Comerford

Top: F-105 crews played a key role in Operation Rolling Thunder. During this three-year Vietnam War campaign, Air Force, Marine and Navy aircraft bombed targets throughout North Vietnam. U.S. and Australian warships complemented the air assault by bombarding coastal targets. **Middle:** Newly freed prisoners of war celebrate as their C-141A aircraft lifts off from Hanoi, North Vietnam, on Feb. 12, 1973, during Operation Homecoming. The mission included 54 C-141 flights between Feb. 12 and April 4, 1973, returning 591 POWs to American soil. **Bottom:** Left side view of an RF-4C Phantom II with auxiliary fuel tanks in flight August 1968. The aircraft was assigned to the 192nd Tactical Reconnaissance Group, Nevada Air National Guard.

USAF 75th anniversary:
Post-Vietnam to the Global War on Terror

The Air Force modernized its tactical air forces in the late 1970s with the introduction of the F-15, A-10, and F-16 fighters, and the implementation of realistic training scenarios under the aegis of Red Flag.

In turn, it also upgraded the equipment and capabilities of its Air Reserve Components by the equipping of both the Air National Guard and Air Force Reserve with first-line aircraft.

Expanding its force structure in the 1980s to 40 fighter wings and drawing further on the lessons of the Vietnam War, the Air Force also dedicated units and aircraft to Electronic Warfare and the Suppression of Enemy Air Defenses.

The humiliating failure in April 1980 of the Operation Eagle Claw rescue mission in Iran resulted directly in an increased U.S. Air Force emphasis on participation in the doctrine, equipment, personnel, and planning of Joint Special Operations.

The Air Force provided attack, airlift, and combat support capability for operations in Grenada in 1983 (Operation Urgent Fury), Libya in 1986 (Operation El Dorado Canyon), and Panama in 1989 (Operation Just Cause).

Lessons learned in these operations were applied to its force structure and doctrine, and became the basis for successful air operations in the 1990s and after Sept. 11, 2001.

The development of satellite reconnaissance during the Cold War, the extensive use of both tactical and strategic aerial reconnaissance during numerous combat operations, and the nuclear war deterrent role of the Air Force resulted in the recognition of space as a possible combat arena.

An emphasis on "aerospace" operations and doctrine grew in the 1980s. Missile warning and space operations were combined to form Air Force Space Command in 1982.

In 1991, Operation Desert Storm provided emphasis for the command's new focus on supporting combat operations.

Gulf War, Operation Desert Storm

Following Iraq's invasion of Kuwait in late 1990, President George H.W. Bush assembled a coalition to force the Iraqis out of Kuwait.

The U.S. Air Force provided the bulk of the Allied air power during the Gulf War in 1991, flying alongside aircraft of the U.S. Navy and the Royal Air Force.

The F-117 Nighthawk stealth fighter's capabilities were shown on the first night of the air war when it was able to bomb central Baghdad and avoid the sophisticated Iraqi anti-aircraft defenses.

The Air Force, along with the U.S. Navy and the RAF, later patrolled the skies of northern and southern Iraq after the war to ensure that Iraq's air defense capability could not be rebuilt.

Operation Provide Comfort, 1991-1996, and Operation Northern Watch, 1997-2003, patrolled no-fly zones north of the 36th parallel north; and Operation Southern Watch patrolled a no-fly zone south of the 33rd parallel north.

Air Expeditionary Force

Faced with declining budgets for personnel and resources in the late 1990s, the Air Force realized that it had to change the way it did business if it was to remain in business providing air power in support of America's national and international interests.

In the mid-1990s, the Air Force was carrying out the "deny-flight" patrols of Operations Northern and Southern Watch over Iraq. These airborne patrols were tedious, boring and placed additional burdens on an Air Force that had been significantly downsized after the end of the Cold War and Operation Desert Storm.

As the mission continued into one of multi-year

See GWOT, Page 14

Air Force photograph

F-16A Fighting Falcon, F-15C Eagle and F-15E Strike Eagle fighter aircraft fly over burning oil field sites in Kuwait during Operation Desert Storm.

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duration, the obvious drain on equipment and manpower forced the Air Force to reconsider how it was going to meet its future worldwide commitments.

The Air Expeditionary Force concept was developed that would mix Active-Duty, Reserve and Air National Guard into a combined force. Instead of entire permanent units deploying for years on end, units composed of "aviation packages" from several wings, including active-duty Air Force, the Air Force Reserve Command and the Air National Guard, would be married together to carry out the assigned deployment rotation.

In this way, the Air Force and its reserve components did not have to provide complete units of their own to meet the requirements placed before it by the Air Staff and the combatant commanders.

Unlike the overseas major commands already established such as Pacific Air Force, U.S. Air Forces Europe, CENTAF (later AFCENT) would not consist of permanently assigned units. Instead of the "Provisional" deployed units attached to the command during the 1991 (Persian) Gulf War, "Air Expeditionary" units would be the force projection components of CENTAF.

Air Expeditionary Force units are composed primarily of Air Combat Command or ACC gained components, but also components deployed from other major U.S.-based and overseas commands as necessary to meet mission requirements.

Air Force photograph by Staff Sgt. Aaron D. Allmon II

The F-117 Nighthawk, the world's first attack aircraft to employ stealth technology, is retiring after 27 years of U.S. Air Force service. The aircraft made its first flight at the Tonopah Test Range, Nev., in June 1981. The F-117 took part in Operation Desert Storm, as well as operations in the former Yugoslavia.

AEF organizations are defined as temporary in nature, organized to meet a specific mission or national commitment. As such, they are activated and inactivated as necessary and do not carry any official lineage or history.

Knowing that overseas basing was not something that could always be counted on due to the volatility of U.S. relations with host nations, the Air Force decided that keeping units fixed in static locations was no longer a viable option. Instead of using the Cold War model of a large number of permanent bases with units assigned, the Air Force modified its war plans to include the use of fewer, temporary bases that would be used by multiple AEF units rotating in for a finite amount of time then inactivating afterwards.

Another not-to-be-forgotten benefit of the Air Expeditionary Force concept, at least for the reserve components — is that their members are all volunteers. When an AFRC or ANG unit is assigned to the AEF rotation cycle, it is the unit's responsibility to obtain the needed personnel to fulfill the requirement. Other than units activated by presidential order, the utilization of ANG and AFRC personnel to support the AEF rotation cycles has always been accomplished on a completely voluntary basis.

In addition, the various Air Expeditionary Wings formed by the Air Force for the purpose of meeting the various deployment rotations allowed the deployment burden to remote combat areas of AFCENT be spread more evenly over the total force, while providing meaningful training opportunities for reserve component units that otherwise would not have had them.

In 1996, Operation Desert Strike and 1998 Operation Desert Fox, the Air Force bombed Saddam Hussein's Iraq.

Bosnia and Kosovo

The U.S. Air Force led NATO action in Bosnia with no-fly zones (Operation Deny Flight) 1993-96 and in 1995 with air strikes against the Bosnian Serbs (Operation Deliberate Force).

This was the first time that U.S. Air Force aircraft took part in military action as part of a NATO mission. The Air Force led the strike forces as the NATO air force (otherwise mainly composed of RAF and Luftwaffe aircraft) with the greatest capability to launch air strikes over a long period of time.

In 1999, the U.S. Air Force led NATO air strikes against Serbia during the Kosovo War (Operation Allied Force). NATO forces were later criticised for bombing civilian targets in Belgrade, including a strike on a civilian television station, and a later attack which destroyed the Chinese embassy.

Global War on Terror

On Sept. 11, 2001, the world changed.

Following the attacks, in 2001, the U.S. Air Force was deployed against the Taliban forces in Afghanistan.

Operating from Diego Garcia, B-52 Stratofortress and B-1 Lancer bombers attacked Taliban positions. The Air Force deployed daisy cutter bombs, dropped from C-130 Hercules cargo planes, for the first time since the Vietnam War. During this conflict, the Air Force opened up bases in Central Asia for the first time.

The Air Force was deployed in the 2003 invasion of Iraq and, following the defeat of Saddam Hussein's regime, the Air Force took over Baghdad International Airport as a base.

Operations in both Afghanistan and Iraq demonstrated the effective utility of Unmanned Air Vehicles, the most prominent of which was the MQ-1 Predator.

A total of 54 Air Force personnel died in the Iraq War.

By December 2011, all U.S. forces were removed from Iraq. By August 2021, all U.S. forces were withdrawn from Afghanistan.

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Odyssey Dawn

In March 2011, U.S. Air Force jets bombed military targets in Libya as part of the international effort to enforce a United Nations resolution that imposed no-fly zone over the country and protected its people from the civil war that occurred when its dictator, Muammar Gaddafi suppressed the protests calling for the end of his regime. Protests were inspired by the revolutions in Tunisia and Egypt.

The operation was known as Operation Odyssey Dawn, and ran March 19-31.

Modern Day

Today, the U.S. Air Force is the largest, most capable and most technologically advanced air force in the world, with about 5,778 manned aircraft in service, approximately 156 Unmanned Combat Air Vehicles, 2,130 Air-Launched Cruise Missiles, and 450 intercontinental ballistic missiles.

The U.S. Air Force has approximately 328,439 personnel on active duty, 74,000 in the Selected and Individual Ready Reserves, and 106,000 in the Air National Guard. In addition, the Air Force employs 168,900 civilian personnel including indirect hire of foreign nationals.

Today's airmen are the most educated and highly trained the Air Force has even seen.

It is safe to say that the future of the U.S. Air Force is in good hands.

Air Force photograph by Senior Airman Adam Grant

Airmen from the 34th Bomb Squadron work to de-ice a B-1B Lancer March 26, 2011, at Ellsworth Air Force Base, S.D, in preparation for a mission in support of Operation Odyssey Dawn.

USAF technological innovations: 1947-1960

The early years of the newly-established independent Air Force brought a variety of technological breakthroughs, resulting in new capabilities and even new missions. The young Air Force could have easily adapted a modified version of the Olympic motto, with a major focus on "higher, faster and farther."

From the earliest days of flight, airmen strived to set or exceed new altitude, speed, and distance records. The early years of the independent Air Force brought new technologies resulting in sometimes exponential improvements in these and other areas.

Breaking velocity barriers

One of the most famous "barriers" broken by the young Air Force was the sound barrier. That breakthrough established the importance of significantly higher velocities than had been achieved previously, and ensuring that airframes and humans could operate effectively at high speeds.

On Oct. 14, 1947, Capt. Charles E. "Chuck" Yeager made the first faster-than-sound flight at Muroc Air Base, Calif., in a rocket-powered Air Force research plane — the Bell XS–1 — and won the Mackay Trophy for the most meritorious flight of the year.

On Dec. 10, 1954, in a rocket-propelled sled run, Col. John P. Stapp attained a speed of 632 miles per hour and sustained greater G forces than humans had ever endured in recorded deceleration tests — the equivalent of Mach 1.7 at 35,000 feet.

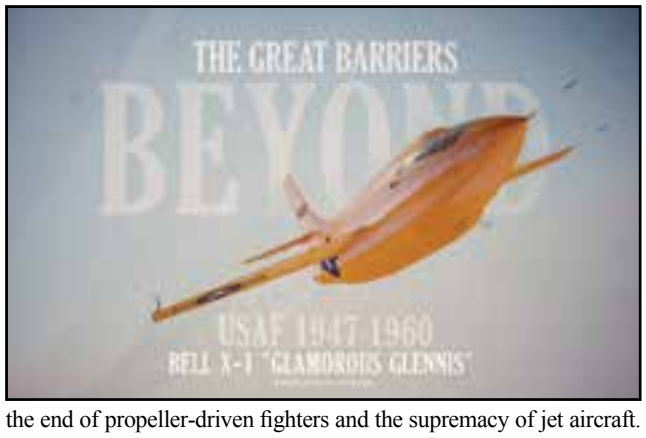
The test determined that humans could survive ejection from aircraft at supersonic speeds.

Then on Feb. 26, 1955, George Smith, a North American Aviation test pilot, ejected from an F-100 Super Sabre traveling at Mach 1.05, becoming the first person to survive ejection from an aircraft flying at supersonic speed.

Advent of the jet age

Speed was one of the primary considerations as the Air Force transitioned to an increasing reliance on jet propulsion. The Korean War was a major milestone in this transition.

The battle for air superiority was vital and also especially reflected



the end of propeller-driven fighters and the supremacy of jet aircraft. As the war began, U.S. Air Force Far East Air Forces had the F-51D Mustang, the all-weather F-82 Twin Mustang, and the straight-winged, jet-powered F-80 Shooting Star.

At first, the inexperienced North Korean pilots with World War II-era piston-engine aircraft were no match for the U.S. American air supremacy; however, it was challenged beginning in November 1950 with the appearance of the MiG-15, flown by Soviet pilots.

The swept-wing F-86 Sabre was the Air Force answer, and U.S. pilots flying the Sabres ultimately prevailed.

During development, the F-86 set a speed record of 670.981 mph at Muroc Air Base.

The 4th Fighter Interceptor Group was the first F-86 unit in theater, and the aircraft entered combat on December 16, 1950, even though it was actually an F-80 that scored the first jet-to-jet aerial victory on Nov. 8, 1950.

Lt. Col. Bruce Hinton, commander of the 336th Fighter Interceptor Squadron, was the first F-86 pilot to down a MiG. The following May, Capt. James Jabara became the first jet-versus-jet ace, with his fifth and sixth aerial victories on May 20, later attaining a total of 15 kills. The leading jet ace was Capt. Joseph McConnell, Jr., who shot down a total of 16 MiG-15s between January and May 1953.

Within the next decade, other aircraft types began to transition to jet propulsion. One of the most well-known is the B-52 Stratofortress strategic bomber.

Although the program had its origins from the late 1940s, the first B-52 flew in December 1954.

Capable of reaching a speed of 628 mph (546 knots) and carrying 43,000 pounds, the aircraft was truly impressive, exceeding the original requirements significantly.

On June 29, 1955, the Boeing Aircraft Company delivered the first B-52 Stratofortress to enter Air Force operational service to the 93rd Bombardment Wing at Castle Air Force Base, Calif. The B-52 became — and continues to be — an important part of the Air Force's strategic bomber inventory.

The Boeing B-52 eight-engine bomber, designed to drop nuclear weapons from high altitude, was used as a conventional bomber in Vietnam in the 1960s and 1970s and in Southwest Asia in 1991 and recent years. On Feb. 12, 1959, when SAC retired its last B-36 Peacemaker, the command officially became an all-jet bomber force.

The application of jet technology to the aerial refueling mission also occurred during this period. On June 28, 1957, the first KC-135 Stratotanker arrived at Castle Air Force Base, Calif., assigned to the 93rd Air Refueling Squadron there. Able to take off at gross weights of up to 322,500 pounds, the jet tanker could cruise at the same speed as jet bombers while refueling, drastically reducing the time for in-flight refueling missions.

The transition to jet propulsion transformed the strategic reconnaissance mission during the Cold War even more dramatically. Working in the strictest secrecy in the early 1950s, the Lockheed Corporation began the design of what would become the U-2 high altitude, long-range reconnaissance aircraft.

The first test flight was in July 1955, and on June 11, 1957, the 4080th Strategic Reconnaissance Wing at Laughlin AFB, Texas, accepted delivery of its first U-2. The aircraft could fly 10-hour missions, flying at top speeds of 600 mph to unprecedented high altitudes.

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Dawn of the missile age

The first atomic weapons were delivered by manned aircraft.

Strategic bombing was a key mission for the Air Force even while it fell under the U.S. Army, and the use of manned bombers for delivering nuclear weapons was a logical consequence of this mission.

In spite of the fact that this puts aircrews in danger, the manned bombers remain an essential element of the nuclear triad today. Nevertheless, another key element of U.S. nuclear capability began to evolve during the 1950s, with the application of rocket propulsion technology and the capability of delivering nuclear warheads using unmanned ballistic missiles.

With the Air Force responsible for developing intercontinental ballistic missiles, on July 1, 1957, the first intercontinental ballistic missile wing, the 704th Strategic Missile Wing, activated at Cooke (later Vandenberg) AFB, Calif.

Less than six months later, on Dec. 17, the Air Force test-launched an Atlas ICBM. Its reentry vehicle landed in the target area after a flight of about 500 miles. A couple of months later, Francis E. Warren AFB, Wyo., became SAC's first intercontinental missile base.

On Sept. 9, 1959, SAC fired an Atlas ICBM from Vandenberg AFB, the first firing from the west coast. The missile travelled 4,300 miles with a speed of 16,000 miles per hour, and after the test, Gen. Thomas S. Power, commander of SAC, declared the Atlas operational.

Air Force photograph

An Atlas missile prepares for a test flight.

By the end of 1959, Atlas had become the first U.S. long-range ballistic missile equipped with a nuclear warhead to be placed on alert status. By the end of August 1960, the 564th Strategic Missile Squadron at F.E. Warren had six Atlas missiles ready to launch, becoming the first operational ICBM squadron.

Even though the ICBM would be an integral part of the strategic nuclear triad, there was no doubt that intermediate-range ballistic missiles were an important capability.

They clearly were vital to the Soviet arsenal, since a Soviet IRBM — with a potential range of up to 3,400 miles — could potentially hitting any target in Europe or Asia. A team of scientists under the leadership of James R. Killian, Jr. recommended making the development of a U.S. IRBM a priority in order to counter a possible Soviet threat, noting that an IRBM capability could be achieved more quickly than an ICBM. Although Secretary of Defense Charles E. Wilson would ultimately give responsibility for ICBM development to the Air Force, he endorsed a decision to assign responsibility for the first IRBM (which became the Thor) to the Air Force and the second IRBM program (subsequently the Jupiter) to the Army and Navy. On Jan. 1, 1958, the Air Force activated the 672d Strategic Missile Squadron, the first unit with Thor intermediate-range ballistic missiles, at Cooke AFB.

This period also brought important developments in the area of air-launched missiles. On April 23, 1959, the GAM-77 (AGM-28) Hound Dog was test fired for the first time from a B–52 bomber at Eglin AFB, Fla.

This was a supersonic air-to-ground missile designed to deliver a nuclear warhead over a distance of several hundred miles. Missile technology also revolutionized aerial combat. On Sept. 11, 1953, the Sidewinder infrared-guided air-to-air missile made its first successful interception, sending an F-6F drone down in flames. This new technology offered pilots a method other than gunfire for shooting down enemy aircraft.

Air Force photograph

An SM-62 Snark.

Automating air defense

A superb example of breaking the automation barrier, the Semi-Automatic Ground Environment was a complex air defense system of radars and other data sources, along with AN/FSQ-7 computers to receive the data to detect and track aircraft, processing the data to create a picture of the air situation and, if necessary, guide weapons to destroy enemy aircraft.

The concept originated in 1951, and on Jan. 17, 1956, the Department of Defense revealed the existence of SAGE. Construction began at McChord AFB in 1957. On Sept. 24, 1958, a Bomarc missile pilotless interceptor, launched from Cape Canaveral, Fla., by a SAGE unit in Kingston, N.Y., destroyed a 1,000-miles-per-hour target flying 48,000 feet over the Atlantic Ocean and traveling about 75 miles.

The Air Force in Space: Satellite Communications

On Dec. 18, 1958, the Air Force placed the first artificial communications satellite, a Project SCORE (Signal Communication by Orbiting Relay) vehicle, into low-earth orbit with the four-ton Atlas B launcher. The launch demonstrated the peacetime application of missile technology. The following day, the satellite broadcast a taped recording of President Dwight D. Eisenhower's Christmas message — the first time a human voice had been heard from space. The projected duration of the orbit was 20 days, and the orbit actually lasted for 35 days.

USAF technological innovations: 1960-1970

Technology panels/reviews

No one did more to harness science to air power objectives than Gen. Bernard A. Schriever.

As commander of Air Research and Development Command and its successor, Air Force Systems Command, Schriever had demonstrated great capacity during the 1950s in bringing the American ICBM force to fruition.

Then, directed in March 1963 by Secretary of the Air Force Eugene M. Zuckert, he undertook a major review of technologies applicable to U.S. Air Force needs through the mid-1970s. Called Project Forecast, it enlisted almost 500 participants, balancing blue-suiters who understood the requirements of war with some of the most eminent civilian scientists and engineers from the universities, manufacturers, institutes and government.

In fact, Schriever drew his team from an unprecedented variety of sources — from the Air Force and 63 other federal agencies, 26 institutions of higher learning, 70 corporations and 10 nonprofit organizations.

The selection of Schriever and his project manager, Maj. Gen. Charles Terhune, in itself suggests a maturing of the forecasting process. Both men not only understood the scientific world, but represented a growing number of engineers in uniform able to grasp the technical and military aspects of weapons development. As a result, Schriever and Terhune structured Project Forecast so that all ideas produced by the technical panels were assessed in relation to factors of cost and military requirements. In addition, evaluations of the predominant threats to American security and broad foreign policy objectives further narrowed the field of candidate technologies.

Finally, the capability panels translated the concepts which survived this screening process into actual weapons systems. Far more structured than Theodore von Karman's Toward New Horizons report generated in the mid-1940s, Project Forecast, nonetheless, incorporated truly independent scientific advice and invited the widest possible participation. Also, like Toward New Horizons, it strove for comprehensiveness, producing twenty-five volumes which related new air power technologies to the world in which the Air Force found itself. Project Forecast enjoyed widespread influence throughout the Air Force and many of its recommendations, such as huge intercontinental transports and lightweight composites for aircraft and engine design, were fulfilled.

The fly-by-wire flight control system conference, 1968

On Dec. 16 and 17, 1968, (the 65th anniversary of powered flight in an unstable airplane: the Wright Flyer), the U.S. Air Force Flight Dynamics Laboratory hosted a meeting of 141 people engaged in fly-by-wire research or vitally interested in its future.

The conference was a showcase for the year-old B-47 test program and the laboratory prototypes built by Sperry Flight Systems Division and Douglas Aircraft Company. It also gave attendees an opportunity to speculate about the nature of fly-by-wire systems in future aircraft.

The conference papers largely reported on work in progress. The hidden agenda was to create a demand for fly-by-wire so great that further research would be sponsored by the Flight Dynamics Laboratory and its industrial partners. The early results, though promising, still did not fully convince the money controllers in Washington. If the laboratory personnel and contractors could sell the industry attendees on the idea, then pressure would be applied to the government for further support.

As Col. Charles A. Scolatti, chief of the Flight Control Division, said in the conclusion to his welcoming remarks, "I hope that this conference will provide you with reinforcement on the potential, soundness, and maturity of fly-by-wire flight control systems and open the doors which will permit you to consider fly-by-wire for flight control system tradeoff studies for our future aircraft and aerospace vehicle." In short, the people at Wright-Patterson were sold, and now it was time to sell the others.

Air Force photograph

The Lockheed-built C-5 Galaxy was, when it entered service in 170, the largest operational airplane in the world.

Missiles, missile warning, missile defense, tactical missiles

With the advent of the Kennedy administration, the ICBM program was reevaluated once more.

Meanwhile, the so-called missile gap faded as

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interest shifted from the numbers of missiles available to their reliability and flexibility. The Thor IRBM became operational in the United Kingdom between June 1959 and April 1960; Atlas D and E models went on alert between August 1960 and November 1961; Titan I and Atlas F became operational during April to December 1962; and Jupiters were installed in Italy in 1961 and in Turkey in 1962. In all, 13 Atlas and six Titan I squadrons became operational. Even as these missiles were put in place, important decisions were made with respect to their successors — the solid-fueled missiles.

In March 1961, Defense Secretary Robert S. McNamara was convinced of the necessity for building a solid-fueled ICBM, now called the Minuteman. The development of the Minuteman was so rapid and so successful that it accelerated by several years the phase-out of the first generation, liquid-fueled ICBMs. By December 1964, Atlas Ds came off alert, and by June 1965, Atlas E and F and Titan I were retired. The first 10 Minuteman I missiles came on alert in time for the Cuban Missile crisis in October 1962. Eventually a force of 1,000 Minuteman and 54 Titan I1 ICBMs were fielded.

Feb. 1, 1961: The Minuteman intercontinental ballistic missile was launched for the first time at Cape Canaveral, Fla., in a major test. Under full guidance, it traveled 4,600 miles to its target area. The solid-fueled Minuteman could be stored more easily and fired more quickly than the liquid-fueled Atlas and Titan intercontinental ballistic missiles.

Feb. 1, 1961: The ballistic missile early warning system site at Thule, Greenland, became operational. Subsequently, other sites became operational at Clear, Alaska, and Fylingdales in the United Kingdom. Operated by the North American Air Defense Command, the system could provide the United States warning of an impending Soviet missile attack in time to respond.

June 1, 1961: At Kincheloe Air Force Base, Mich., the first Bomarc-B pilotless interceptor site was declared operational. The Bomarc was a long-range, antiaircraft surface-to-air missile (SAM), the U.S. Air Force's only one employed.

Aug. 8, 1961: The Air Force launched an Atlas F missile from Cape Canaveral, Fla., for the first time. The Atlas F, designed for long-term storage of liquid fuels and for shortened countdown, was the only Atlas model destined for emplacement in hardened, underground silos.

April 18, 1962: At Lowry Air Force Base, Colo., Strategic Air Command declared operational the Air Force's first Titan I unit — the 724th Strategic Missile Squadron. Its nine missiles were the first to be placed in hardened underground silos.

June 29, 1962: An Air Force team fired a Minuteman missile from an underground silo at Cape Canaveral to a target area 2,300 miles downrange. This Minuteman was the first to be launched by a military crew.

July 19, 1962: A Nike-Zeus antimissile missile fired from Kwajalein Island in the Pacific Ocean made the first known interception of an intercontinental ballistic missile when it brought down the nose cone of an Atlas missile launched from Vandenberg AFB, Calif.

Air Force photograph

An SR-71 Blackbird flies a mission. The first SR-71 unit, the 4200th Strategic Reconnaissance Wing was established at Beale AFB, Calif., on Jan. 1, 1965.

June 8, 1963: The 570th Strategic Missile Squadron, the first Titan II unit, was activated at Davis-Monthan Air Force Base, Ariz. By April 21, 1964, the number of ICBMs equaled the number of bombers on SAC ground alert for the first time. Subsequently, the number of missiles exceeded the number of bombers in the nuclear-deterrent force.

April 20, 1965: Strategic Air Command shipped its last Atlas missile to storage facilities to be used as a launch vehicle in various research and development programs, thus completing the phase out of the first generation of intercontinental ballistic missiles, all of which were liquid-fueled.

June 30, 1965: At Francis E. Warren Air Force Base, Wyo., the last of 800 Minuteman I missiles became operational when Strategic Air Command accepted the fifth Minuteman wing from Air Force Systems Command.

Oct. 31, 1965: Strategic Air Command accepted its first 10 Minuteman II missiles, assigning them to the 447th Strategic Missile Squadron at Grand Forks Air Force Base, N.D. The Minuteman II was larger and more advanced than the Minuteman I, but it could be fired from the same silos.

Feb. 3, 1968: At the Arnold Engineering Development Center at Tullahoma, Tenn., a laser beam was used for the first time as a light source for photographing aircraft and missile models at high velocity.

Dec. 18, 1969: Air Force Missile Development Center crews completed the first guided launch of the Maverick — an air-to-surface television-guided missile capable of attacking moving targets at short range. Designated the AGM-65, the missile would eventually be carried by a variety of bomber, fighter, and attack aircraft.

June 19, 1970: The first Minuteman III missile unit became operational at Minot Air Force Base, N.D. The Minuteman III could launch multiple, independently targetable warheads.

The U.S. Air Force continued its quest of cruise missiles with a bit more success in the 1950s and 1960s. It briefly deployed the intercontinental range Northrop Snark in the period 1959-1661.

It was guided by a one-ton inertial system updated by stellar navigation. But, as with its predecessors, it was expensive, technically flawed, and in the end, unsuccessful. There were numerous aerodynamic problems, and test failures were so frequent that some pundit dubbed the waters off of the test site at Cape Canaveral as "Snark-infested waters." One missile, however, went too far. It was last seen by the Air Force after its launch in 1956; in 1982 a Brazilian farmer in the Amazon basin found it!

Its designated follow-on missile was no better, as the North American Navaho is probably best remembered for the rhyme, "Never go, Navaho." The Air Force did best with the Martin Matador/Mace missile that was operational between 1955 until 1969 in both Europe and East Asia.

Air Force photograph

The F–111, sometimes called the Aardvark, featured swing wings that could be swept forward for slow flight or backward for greater speed.

It was about the size of a fighter and used a number of different guidance systems: radio control, radar map comparison method, and inertial.

But like its big brother the Snark, the Matador/Mace's record was hindered by troublesome engines, guidance problems, as well as low reliability and accuracy. The Navy had about the same luck (or lack of luck) with its Chance Vought Regulus, a missile that was very much like the Matador in appearance and performance. It did give the Navy a nuclear punch and was liked by some naval officers.

New aircraft technology

June 9, 1961: Delivery of the first C–135 Stratolifter introduced jet cargo aircraft into the fleet of the Military Air Transport Service.

Jan. 1, 1965: The Air Force's first SR–71 Blackbird unit, the 4200th Strategic Reconnaissance Wing, activated at Beale Air Force Base, Calif. The SR-71 could attain a speed of more than Mach 3 and altitudes beyond 70,000 feet, but it required special fuel and maintenance support.

April 23, 1965: The first operational Lockheed C-141 Starlifter aircraft was delivered to Travis Air Force Base, Calif. Capable of crossing any ocean nonstop at more than 500 miles per hour, the Starlifter could transport up to 70,000 pounds of payload, including 154 troops, 123 paratroopers, or a combination of troops and supplies.

Dec. 8, 1965: The secretary of defense announced plans to phase out older models of the B-52 bombers and all B-58 bombers. Newer B-52 models made the older ones obsolete, and the B-58 had proven impractical because of its high fuel consumption.

March 31, 1966: Strategic Air Command phased out its last B-47 Stratojet. The first all-jet strategic bomber, it had entered active service in 1951, 15 years earlier.

March 15, 1967: The Sikorsky HH-53B, the largest and fastest helicopter in the Air Force inventory, made its first flight. It would be used for air rescue operations in Southeast Asia.

Oct.16, 1967: The first operational F-111A supersonic tactical fighter landed at Nellis Air Force Base, Nev. The variable swept-wing jet used its terrain-following radar-guidance controls for the flight from Fort Worth, Texas.

June 17, 1968: The first C-9 Nightingale aeromedical-evacuation aircraft ordered by Military Airlift Command for the airlift of patients within the United States rolled out at McDonnell Douglas Corporation, Long Beach, Calif.

Aug. 25, 1968: The North American OV-10 Bronco, the Air Force's newest forward-air-control aircraft, began a 90-day combat-evaluation program in South Vietnam.

Jan. 1, 1969: The 71st Special Operations Squadron of the Air Force Reserve flew the first AC–119 Shadow gunship combat mission in Vietnam. The AC-119's multiple machine guns could strafe the ground even more effectively than those of its predecessor, the AC-47.

June 6, 1970: Gen. Jack J. Catton, commander of Military Airlift Command, accepted delivery of the first C-5 Galaxy for operational use by the Air Force. At the time, the C-5 was the largest operational airplane in the world.

Oct. 2, 1970: The Special Operations Center at Hurlburt Field, Fla., took possession of the new UH-1N Bell Twin Huey, making the center the first operational Air Force organization to have the helicopter.

Command, control development

Feb. 3, 1961: As part of a project called "LOOKING GLASS," Strategic Air Command began flying EC–135s to provide a 24-hour-a-day airborne command post for the president and secretary of defense in case enemy attack wiped out land-based command and control sites that controlled strategic bombers and intercontinental ballistic missiles.

Dec. 15, 1961: The North American Air Defense Command semiautomatic ground-environment system became fully operational with completion of its 21st and last control center at Sioux City, Iowa.

Jan. 5, 1970: Aerospace Defense Command's Backup Intercept Control III radar system became fully operational with the acceptance of the facility at the 80th Air Defense Group, Fortuna Air Force Station, N.D. Designed to provide immediate information on any airborne threat to North America, this system augmented the semiautomatic ground-environment system.

Space

Oct. 16, 1963: At Cape Canaveral, Fla., the Air Force inaugurated a space-based nuclear-detection system by launching twin satellites to assume circular 7,000-mile-high orbits on opposite sides of Earth. The 475-pound, 20-sided satellites, known as Project Vela Hotel or Project 823, could detect nuclear explosions anyplace on Earth.

Dec. 10, 1963: Secretary of Defense Robert S. McNamara assigned development of the Manned Orbiting Laboratory to the Air Force.

July 8, 1965: The National Aeronautics and Space Administration transferred its Syncom II and Syncom III satellites to the Department of Defense. The Air Force Satellite Control Facility and its remote tracking stations in the Pacific and Indian Oceans became responsible for their orbital control.

March 16, 1966: Astronauts Neil Armstrong and David Scott blasted into space atop a Titan II missile on the Gemini 8 mission. The two astronauts later performed the first docking maneuver in space, linking their capsule with an Agena target vehicle that had been launched by an Atlas booster. At the conclusion of the mission, 20 minutes after splashdown in the Pacific Ocean 500 miles east of Okinawa, Air Force pararescuemen attached flotation gear to the Gemini 8 space capsule, marking the first time Air Force rescue forces had participated in the recovery of a Gemini capsule.

June 16, 1966: A Titan IIIC boosted seven experimental communications satellites and one gravity-gradient satellite into orbit 18,000 nautical miles

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above the equator. The satellites demonstrated the feasibility of a global military-communications satellite system.

Sept. 20, 1966: Lt. Col. Donald M. Sorlie became the first Air Force pilot to fly the National Aeronautics and Space Administration lifting body from the Air Force Flight Test Center at Edwards Air Force Base, Calif. Air-launched from a B-52 at an altitude of 45,000 feet, the craft reached a speed of nearly 400 miles per hour during the three-and-one-half-minute flight. It tested the concept that a space capsule could fly back from outer space rather than falling by parachute into the sea for ship recovery.

June 13, 1968: A Titan IIIC launch vehicle successfully placed in orbit eight communications satellites from Cape Kennedy, Fla., to augment the initial Defense Satellite Communications System.

Dec. 21, 1968: The National Aeronautics and Space Administration launched Apollo 8 atop a Saturn V booster from Cape Kennedy, Fla. The astronauts aboard included Col. Frank Borman and Col. William A. Anders, Air Force, and Capt. James A. Lovell, Jr., United States Navy. A few days later, the three men achieved the first lunar orbit.

NASA photograph

On Dec. 21, 1968, NASA launched Apollo 8 atop a Saturn V booster from Cape Kennedy, Fla., with astronauts Air Force Colonels Frank Borman and William A. Anders, Navy Capt. James A. Lovell, Jr. on board.

Feb. 9, 1969: The free world's first tactical communications satellite, the 1,600-pound TACSAT 1, blasted into geostationary orbit from the Air Force Eastern Test Range, Fla., atop a Titan IIIC launch vehicle. TACSAT was designed to relay communications among small land-mobile, airborne, or ship-borne tactical stations.

Nuclear developments

July 8, 1962: In Operation DOMINIC, a Thor rocket launched from Johnston Island carried a megaton-plus hydrogen device to an altitude above 200 miles—the highest altitude for a U.S. thermonuclear blast.

Precision guided munitions

In 1967, an Eglin AFB test unit was in Vietnam with laser-guided bombs, ready to use them in combat, and they were so tested. The reason that they did not get the publicity is that just about the time the Air Force started dropping them, President Johnson called a bombing halt. Bombing in the jungles of South Vietnam did not generate the kind of media attention that PGMs later got from Desert Storm. The Eglin unit employed the test items extensively in South Vietnam in 1968 while the bombing halt was operative up north, and the results were highly encouraging.

Air Force photograph

A Titan I undergoes a test launch.

USAF technological innovations: 1970-1980

Missiles, missile warning, missile defense, tactical missiles

July 23, 1971: Hughes Aircraft Company was awarded a $70 million contract to build 2,000 Maverick (AGM-65A) air-to-surface missiles for use on F-4E and A-7D aircraft.

May 5, 1972: The Air Force's sea-launched ballistic-missile detection and warning system — Pave Phased Array Warning System — achieved initial operational capability.

Sept. 3, 1974: Strategic Air Command removed from alert its last Minuteman I intercontinental ballistic missile at the 90th Strategic Missile Wing, F. E. Warren Air Force Base, Wyo., during conversion to Minuteman III missiles.

New aircraft technology

Oct. 29, 1975: The first F-5E Tiger II aircraft entered the Air Force's inventory at Nellis Air Force Base, Nev.

Jan. 13, 1974: Dr. John L. McLucas, secretary of the Air Force, authorized purchase of the General Dynamics F–16 — a low-cost, lightweight, highly maneuverable aircraft.

Jan. 9, 1975: The first operational F-15 Eagle, a new air-superiority fighter aircraft, arrived at the 1st Tactical Fighter Wing, Langley Air Force Base, Va. The F-15 was the first fighter to have a thrust greater than its weight, allowing it to accelerate while going straight up.

March 22, 1976: The first A-10 Thunderbolt was delivered to Davis-Monthan Air Force Base, Ariz., for test and evaluation. The heavily armored jet attack aircraft, armed with a heavy Gatling gun in the nose and equipped with straight wings able to carry a variety of air-to-ground munitions, was designed for close air support missions.

Sept. 6, 1976: A Soviet pilot landed his MiG-25 Foxbat jet fighter in Hokkaido, Japan, and asked for asylum in the United States. Japanese and U.S. officials closely examined the aircraft and on Nov. 15, returned it, dismantled, to the Soviet Union.

Jan. 8, 1977: The first YC-141B (stretched C–141 Starlifter) rolled out of the Lockheed, Marietta, Ga. Equipped with in-flight refueling capability, it was 23.3 feet longer than the original C-141A, enabling it to carry more troops and cargo.

March 23, 1977: Tactical Air Command's first E-3A Sentry aircraft arrived at Tinker Air Force Base, Okla. The Sentry, the Air Force's first airborne warning and control system aircraft, carried a large rotating radar disk above its fuselage. In October 1980, Operation ELF began with the deployment of four Air Force E-3A airborne warning and control system aircraft to Riyadh, Saudi Arabia, to protect Saudi airspace during the Iran-Iraq War. Three KC-–135s also deployed during the operation.

Jan. 6, 1979: The 388th Tactical Fighter Wing at Hill Air Force Base, Utah, received the first General Dynamics F-16 delivered to the Air Force. The F-16, the newest multirole fighter, could perform strike as well as air-superiority missions.

Digital fly-by-wire

For 20 years, the Air Force Flight Dynamics Laboratory conducted a step-by-step research program in concert with industrial partners to make fly-by-wire possible. Beginning in 1956, the engineers at the lab sponsored and participated in a graduated series of basic and applied research projects that culminated in the adoption of active flight control on the F-16 in the mid-1970s. The F-16 was the first operational fly-by-wire aircraft designed as such. The total direct investment in Air Force fly-by-wire research prior to its design in then-year dollars is slightly under $20 million, inexpensive considering the pervasive results. The speed of this revolution in flight control is a direct function of the persistence of a team of U.S. Air Force scientists and engineers, and a loosely related group of NASA researchers, working closely with industrial contractors. Since fly-by-wire technology enables active control of aircraft, they can be unstable in one or more axes. There are resultant advantages in maneuverability and reduction of the weight of control surfaces — advantages for both military and civilian aircraft. There are additional advantages for military aircraft in terms of survivability and weapons delivery. At the simplest level, the mechanical cables leading from control devices such as stick and rudder pedals are eliminated and replaced with sensors at the base of a control column and other sensors to keep track of aircraft attitude and acceleration. Inputs from the sensors are sent to a computer which then calculates the appropriate commands to actuators that will accomplish the pilot's desires. Since all control signals are carried by wires rather than steel cables, the technology came to be called fly-by-wire.

Lightweight fighter program

The F-16 emerged from the Air Force's Lightweight Fighter Program, an innovative experimental prototyping effort that took place between 1972 and 1975. The LWF program was noteworthy for its rapid execution, innovative management strategies, and successful approach to technology transition.

The purpose of the prototype program, as reported in a July 1972 *Interavia* article, was "to determine the feasibility of developing a small, light-weight, low-cost fighter; to establish what such an aircraft can do; and to evaluate its possible operational utility."

The demonstration, if successful, would give the Air Force the option of complementing the F-15 with a light-weight, lower cost day fighter.

The first YF-16 was rolled out Dec. 13, 1973, and shipped to Edwards in a C-5A on Jan. 9, 1974. There was an unscheduled first flight during a high-speed taxi test on Jan. 20, when roll oscillations caused the left wingtip missile and the right horizontal tail to contact the ground. General Dynamics test pilot Philip Oestricher elected to take off to avoid further damage to the aircraft. This flight lasted six minutes. The first scheduled flight was made on Feb. 2, less than two years after General Dynamics had submitted the proposal for the YF-16, or 22 months after contract award. The first supersonic flight was three days later, and the top speed of Mach 2 was reached on the 20th flight, on March 11. The second YF-16 was shipped to Edwards on Feb. 27, but with no available F100 engine, did not fly until May 9. The test program was completed on Jan. 31, 1975, with a total of 439 flight hours in 347 sorties.

Lockheed Martin photograph

The YF-16 on a test mission over Edwards Air Force Base, Calif.

The quest for stealth

The technology push side of the story also had its foundations in about 1974, when the then Defense Advanced Research Projects Agency, along with the Air Force as a sponsoring element, released a request for proposal for a stealth aircraft, said Paul G. Kaminski, undersecretary of defense for acquisition and technology, during a 1997 symposium.

"The RFP was released at that time in the open, searching for new ideas to move ahead. There were five fighter aircraft manufacturers who were invited to participate in a design competition.

"Lockheed was not one of the original five participants, but they were allowed to come into the program and join the DARPA competition late. In April 1975, a breakthrough occurred at Lockheed that is interesting in an historical sense. A Lockheed radar specialist named Denys Overhalser was reading some Soviet literature. He stumbled onto something that was very, very critically important at the time, given our limited ability to do electromagnetic computations. He found an algorithm for accurately calculating the radar cross-section of particular three-dimensional geometric shapes, allowing us to analyze and determine the contributions of those shapes to radar scatter. In fact, it was those fundamental shapes that Lockheed employed in their design," Kaminski continued.

Courtesy photograph

The underside of Have Blue.

"By April 1976, Lockheed had won both phases of the DARPA design competition. At this point Lockheed was given the go-ahead to build two prototype aircraft (Have Blue) of roughly 10,000 to 12,000 pounds. The purpose of the Have Blue aircraft was to show that we could achieve in flight what we had predicted in our analysis and what we had achieved in scale-model tests on a radar cross-section measurement facility. In this technology push program, in a sense, we were building the very best antenna we could.

"Every now and then we checked to see if it could fly! That was the thrust that had to be taken at this point in the program. We were trying to push the low observable technologies to the maximum degree possible.

"It was an aircraft with very unusual flying characteristics, but it was a key demonstrator, a key predecessor for what became the operational F-117 stealth fighter in 1983. The first Have Blue flight occurred on Dec, 1, 1977, a little over 19 months from go-ahead in the program. The flight test program ended on the next to the last mission. That is, we had one more mission to go before completing the program, when we lost the second of two aircraft," Kaminski said.

Space

July 29, 1971: The Air Force completed its flight tests of the experimental X-24A lifting body. Data from these tests contributed to the development of the National Aeronautics and Space Administration space shuttle.

Feb. 22, 1978: An Atlas booster launched the first Global Positioning System satellite. A "constellation" of such satellites revolutionized navigation.

Munitions

This decade saw the most convincing demonstration of the benefit reaped from precision munitions.

In any event, in the spring of 1972, for Linebacker I, the most famous precision guided missile case was the dropping of the Thanh Hoa bridge. It had been a target for five or six years, and the U.S. had never been able to destroy it. On April 27, 1972, four Air Force fighter crews, releasing Paveway I laser-guided "smart" bombs, knocked down the Thanh Hoa bridge in North Vietnam. Previously, 871 conventional sorties had resulted in only superficial damage to the bridge.

Laser-guided bombs provided further victories. On May 10 and 11, F-4 Phantoms from the 8th Tactical Fighter Wing dropped PGMs on the Paul Doumer Bridge in Hanoi, North Vietnam, closing it to traffic.

One month later, B-52s used laser-guided bombs to destroy a major hydroelectrical plant near Hanoi. Then in September, U.S. aircraft used PGMs to destroy the Long Bien bridge over the Red River in downtown Hanoi.

Breaking training barriers

Nov. 29, 1975: The first annual Red Flag exercise began at Nellis Air Force Base, Nev., ushering in a new era of highly realistic U.S. Air Force air combat training for pilots and aircrews.

USAF technological milestones: 1980s

Missiles, missile warning, missile defense, tactical missiles

Jan. 11, 1981: Boeing delivered the first U.S. Air Force air-launched cruise missiles to the 416th Bombardment Wing at Griffiss Air Force Base, N.Y. Capable of delivering a nuclear weapon to a target 1,500 miles away, the new missiles contained a terrain-contour-matching system that allows extremely low-altitude flight to avoid detection by enemy radar.

May 2, 1981: An airborne laser destroyed an aerial target for the first time when the Airborne Laser Laboratory, a modified KC–135 aircraft armed with a carbon dioxide laser, shot down a drone over White Sands Missile Range, N.M. Two years later, the ALL successfully shot down five Sidewinder air-to-air missiles, proving its utility as an antimissile system.

Oct. 2, 1981: President Ronald Reagan announced that the M-X missile would be deployed initially in existing missile silos.

Feb. 3, 1983: To modernize America's retaliatory capability, Strategic Air Command completed the retrofitting of 300 Minuteman III intercontinental ballistic missiles with new reentry systems.

June 19, 1986: All U.S. Air Force Rapier surface-to-air missile units in Europe became operationally ready.

Oct. 10, 1986: The Air Force placed the LGM-118A, also called the Peacekeeper or MX missile, on alert duty. Each of these new intercontinental ballistic missiles could deliver warheads to 10 different targets.

May 5, 1987: Strategic Air Command removed the last liquid-fueled Titan II missile from alert duty at Little Rock Air Force Base, Ark., ending the operational life of the nation's largest intercontinental ballistic missile and the last one with liquid fuel.

May 4, 1990: The AIM–120A advanced medium-range air-to-air missile passed its final flight test for use on U.S. fighters.

New aircraft technology

March 17, 1981: McDonnell Douglas Aircraft Company delivered the first KC-10A Extender tanker/cargo aircraft to Strategic Air Command. Substantially larger than the KC-135 tanker/cargo aircraft, the Extender not only could carry more fuel and cargo, but also could refuel more types of aircraft, including other KC-10s. On June 21, 1982, Strategic Air Command conducted a successful aerial refueling only 750 miles from the South Pole. During this southernmost in-flight refueling, a KC-10A Extender transferred 67,400 pounds of aviation fuel to a Military Airlift Command transport that was conducting resupply operations in Antarctica. The primary mission of the KC-10A Extender was aerial refueling, but it also carried cargo and passengers.

June 18, 1981: The F-117 Nighthawk, the world's first stealth combat aircraft, flew for the first time. Hal Farley piloted the revolutionary aircraft, which presented very little radar image, at Tonopah Test Range, Nev.

By 1983, the Air Force declared the system operational, and by 1986, 36 F-117s had been delivered, with the remaining 26 delivered by July 1990. On Nov. 10, 1988, the Air Force revealed the F-117 stealth fighter to the public for the first time. Manufactured by Lockheed, the F-117 could evade most radar detection with its radical shape and radar-absorbent surface.

Constituting less than 2.5 percent of all coalition aircraft in Operation Desert Storm, the F-117A stealth fighter-bomber successfully attacked more than 31 percent of Iraqi strategic targets the first day. More than eight years later, Operation Noble Anvil/Allied Force marked the first time that an F-117 was shot down in combat, on March 27, 1999, over Yugoslavia. Capt. (later Brig. Gen.) John A. Cherrey, an A-10 pilot, earned the Silver Star for locating the downed pilot, who was rescued by helicopter the same day.

Sept. 15, 1981: Strategic Air Command received its first TR-1A reconnaissance aircraft. Built by Lockheed, this improved and enlarged version of the U-2 reconnaissance aircraft could conduct all-weather day-and-night missions at altitudes exceeding 70,000 feet.

Jan. 8, 1986: Military Airlift Command accepted delivery of its first C-5B Galaxy, an improved version of the C-5A, at Altus Air Force Base, Okla. On Oct. 4, 1989, a 60th Military Airlift Wing crew landed a C-5B Galaxy in Antarctica for the first time. With a load of 72 passengers and 84 tons of cargo, including two fully assembled Bell UH-1N helicopters, the huge aircraft landed without skis at McMurdo Station.

Aug. 23, 1990: The 89th Military Airlift Wing received the first of two Boeing VC-25A presidential transport aircraft at Andrews Air Force Base, Md. The VC-25A was a modified 747-200B commercial transport that replaced the VC-137C for service as Air Force One.

Space

Sept. 1, 1982: The Air Force activated Space Command, redesignated Air Force Space Command on Nov. 15, 1985, following activation of United States Space Command, a joint organization—at Peterson Air Force Base, Colo., on Sept. 23, 1985. Between April 1 and May 1, 1983, the Air Force transferred 31 units and four installations from Strategic Air Command to Space Command, which took over missile warning and space surveillance systems.

Sept. 13, 1985: The first antisatellite intercept test took place when a weapon launched from an F-15 successfully destroyed a satellite orbiting at a speed of 17,500 miles per hour approximately 290 miles above Earth.

June 14, 1989: On its first launch, the Martin Marietta Titan IV heavy-lift booster, nearly 20 stories tall, successfully lifted a Defense Department satellite into orbit.

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USAF technological milestones: The 1990s

Missiles, missile warning, missile defense, tactical missiles

April 18, 1991: The Air Force completed the first successful flight test of a new Martin Marietta/ Boeing MGM-134A small intercontinental ballistic missile. The missile traveled 4,000 miles from Vandenberg Air Force Base, Calif., to the Pacific Island target area at the Kwajalein Missile Range.

Dec. 27, 1992: A U.S. Air Force pilot patrolling the southern United Nations no-fly zone in Iraq shot down an Iraqi MiG-25, scoring the first aerial victory by an F-16. This was also the first victory using the AIM-120A advanced medium-range air-to-air missile.

New aircraft technology

Dec. 21, 1991: The AC-130U Spectre gunship flew for the first time. The new-generation gunship combined increased firepower, reliability, and accuracy with the latest target-location technology.

J***an. 17, 1992:*** To modernize its fleet of training aircraft, the Air Force accepted the first production model T-1A Jayhawk.

June 14, 1993: The Air Force acquired its first C-17A Globemaster III transport aircraft, which was delivered to the 437th Airlift Wing at Charleston Air Force Base, S.C. Capable of delivering outsized cargo to a tactical environment, the Globemaster III increased the Air Force's ability to airlift to relatively small airfields, eliminating the need to shift cargo from larger to smaller transports. In their first strategic mission, two C-17 Globemaster IIIs transported military equipment and supplies from Langley Air Force Base, Va., to Saudi Arabia, on Oct. 14-16, 1994.

The following year, the C-17 participated in its first disaster-relief operation, following Hurricane Marilyn, which devastated islands in the east-

ern Caribbean. On May 31, 1996, the Air Force awarded the largest military contracts ever for the production of 80 additional C-17 Globemaster III transports over the course of seven years at a cost of $16.2 billion. The new aircraft would bring the C-17 fleet up to a total of 120, which would allow the retirement of most of the aging C-141 Starlifters. In April 1999, a C-17 Globemaster III airlifted relief supplies from Dover Air Force Base, Del., to Tinana, Albania, for refugees from Kosovo at the start of Operation Sustain Hope (Shining Hope), a humanitarian- airlift counterpart to the ongoing Operation Allied Force.

Dec. 17, 1993: The first B-2 Spirit bomber, The Spirit of Missouri, arived at Whiteman Air Force Base, Mo. The B-2, essentially a flying wing, was the first "stealth" heavy bomber. On April 1, 1997, B-2s became operational at Whiteman Air Force Base, where six of the aircraft were initially based to serve with the 509th Bomb Wing. B–2s deployed overseas the first time on Feb. 23, 1998, flying from Whiteman Missouri, to Andersen Air Force Base, Guam. Operation Allied Force (Noble Anvil), to protect ethnic Albanians living in the Serb province of Kosovo, used B–2 Spirit bombers for the first time in combat.

On July 15, 2000, the final B-2 arrived at Whiteman Air Force Base. The Air Force did not plan any new bombers in its inventory for 35 years.

July 1, 1994: The 184th Bombardment Group in Kansas became the first Air National Guard unit to be equipped with the B-1B Lancer.

Oct. 4, 1994: F-16 Fighting Falcons replaced the last F-4 Wild Weasel aircraft in the performance of suppression of enemy air defenses missions.

July 29, 1995: Air Combat Command activated the 11th Reconnaissance Squadron at Indian Springs Air Force Auxiliary Field, Nev., now Creech AFB, the first unit of remotely piloted aircraft, reflecting the Air Force's increasing reliance on unmanned aircraft in combat-support roles. On Sept. 3, 1996, the squadron began operating the RQ-1B Predator, a remotely piloted aircraft designed for aerial surveillance and reconnaissance, over Bosnia-Herzegovina. April 17, 1999, marked the first time the Air Force sent the RQ-1 Predator on flights in a combat zone, where it performed reconnaissance over Serbia during Operation Allied Force.

Sept. 7, 1997: At Dobbins Air Reserve Base, Ga., test pilot Paul Metz piloted the extremely maneuverable F-22 Raptor in its first flight. A new stealth fighter with the ability to cruise supersonically, the F-22 would replace the venerable F-15 for air-superiority missions.

Feb. 28, 1998: The RQ-4 Global Hawk first flew. This new remotely piloted aircraft, designed for high-altitude, long-range, long-endurance reconnaissance missions, took off from Edwards Air Force Base, Calif., on a 56-minute flight. The aircraft, with a wingspan of 116 feet, was built to fly at an altitude of up to 65,000 feet and photograph an area the size of Kentucky in 24 hours.

Dec. 16, 1998: Operation Desert Fox started. The largest air campaign against Iraq since the Southwest Asia War of 1991, Desert Fox involved the first combat use of B-1B Lancer bombers.

Sept. 18, 2000: The first Air Force CV-22 Osprey arrived at Edwards Air Force Base, Calif. Designed originally for the Navy, the tilt-wing Osprey could take off like a helicopter and fly like an airplane.

Space

Extensive use of satellite technology during Desert Storm persuaded some U.S. Air Force leaders subsequently to refer to the operation as the "first space war."

Dec. 2-13, 1993: In one of the most challenging space missions ever, astronauts aboard the space shuttle Endeavour, piloted by Air Fore Col. Richard O. Covey, performed a record five spacewalks to repair the Hubble Space Telescope.

Feb. 7, 1994: The first Titan IV/Centaur rocket boosted the first Military Strategic and Tactical Relay Satellite into geostationary orbit. This system would provide the U.S. military secure, survivable communications through all levels of conflict.

July 1, 1994: Responsibility for maintaining the readiness of the nation's intercontinental ballistic missile force transferred from Air Combat Command to Air Force Space Command, which had previously assumed responsibility for missile warning, space surveillance, space launch, and satellite control.

April 27, 1995: Air Force Space Command declared the Global Positioning System satellite constellation fully operational. The system pro-

See TECH 1990, Page 27

USAF Technological milestones: The 2000s

Missiles, missile warning, missile defense, tactical missiles

Dec. 13, 2001: President George W. Bush informed Russia that the United States would withdraw from the Antiballistic Missile Treaty of 1972, which prevented the United States from developing and implementing a missile defense system.

Oct. 1, 2002: Gen. John Jumper, Air Force chief of staff, authorized deactivation of the Peacekeeper intercontinental ballistic missile system. Each missile was originally designed to carry 10 independently targeted warheads, but the end of the Cold War made the system unnecessary.

Dec. 18, 2007: A ballistic missile target was launched from the Pacific Missile Range Facility, Barking Sands, Kauai, Hawaii. The Japanese ship Kongo crew detected and tracked the target missile and their Aegis Weapon System developed a fire control solution; three minutes later a sea-based missile-3 Block IA was launched and three minutes after that, the SM–3 successfully intercepted the target about 100 miles above the Pacific. This was part of ballistic missile defense systemtesting.

New aircraft technology

September 2000: The first test versions of the CV-22 Osprey were delivered to Edwards Air Force Base. The CV-22 Osprey, the special operations forces variant of the U.S. Marine Corps MV-22 Osprey, is a tiltrotor aircraft that combines the vertical takeoff, hover and vertical landing qualities of a helicopter with the long-range, fuel efficiency and speed characteristics of a turboprop aircraft. Its mission is to conduct long-range infiltration, exfiltration and resupply missions for special operations forces.

The versatile, self-deployable aircraft offers increased speed and range over other rotary-wing aircraft, enabling Air Force Special Operations Command aircrews to execute long-range special operations missions. The CV-22 can perform missions that normally would require both fixed-wing and rotary-wing aircraft. The CV-22 takes off vertically and, once airborne, the nacelles (engine and prop-rotor group) on each wing can rotate into a forward position.

Feb. 21, 2001: An RQ-1 Predator fired a Hellfire missile to hit a tank at Nellis Air Force Base, Nev., becoming the first unmanned aerial vehicle to destroy a ground target. A remotely controlled MQ-1B Predator destroyed an enemy target for the first time when it fired a Hellfire missile to kill a group of senior al Qaeda members in southeastern Afghanistan on Feb. 4, 2002. On Sept. 25, 2007, the MQ-1 completed its first operational sortie, part of Operation Enduring Freedom.

April 23, 2001: The Northrop Grumman RQ-4A Global Hawk completed the first nonstop crossing of the Pacific Ocean by remotely piloted aircraft. It flew from Edwards AFB to Edinburgh, Australia — a distance of 7,500 miles—in about 23 hours. The flight demonstrated the potential of the world's most advanced high-altitude, long-range, remotely operated aircraft.

Oct. 26, 2001: The Defense Department chose Lockheed Martin over Boeing to build the Joint Strike Fighter. The Air Force, Navy and Marine Corps planned to purchase thousands of the stealthy aircraft, designated the F-35. On July 7, 2006, Deputy Secretary of Defense Gordon England and Air Force Chief of Staff Gen. T. Michael Moseley were among those attending the unveiling of the first flight-test model of the F-35 at Lockheed Martin's Fort Worth, Texas, plant. At the ceremony, Moseley announced that Lightning II had been selected as the name of the F-35 and said that the name "was a win for aviation heritage and culture." He noted that the Lightning II was named after "two great pieces of air power history:" the World War II Lockheed P-38 Lightning and the supersonic English Electric Lightning interceptor, developed in the early 1950s. On Dec. 15, 2006, the F-35 Lightning II flew for the first time. At the controls was the F-35 program's chief test pilot Jon Beesley, a 1979 graduate of the U.S. Air Force Test Pilot School at Edwards Air Force Base, Calif. On Oct. 1, 2008, the first F–35 in the Air Force's conventional take-off and landing configuration arrived at Edwards Air Force Base for testing.

On June 20, 2005, the Air Force redesignated Indian Springs Air Force Auxiliary Field, Nev., as Creech Air Force Base. It was the first Air Force base primarily dedicated to remotely piloted aircraft — at the time referred to as unmanned aerial vehicle — operations.

On Nov. 28, 2006, the Air National Guard redesignated the 163rd Refueling Wing at March Air Reserve Base, Calif., as the 163rd Reconnaissance Wing. The wing would operate the MQ-1 Predator, becoming the ANG's first RPA unit.

May 1, 2007: In a major organizational development, the Air Force activated the 432nd Fighter Wing at Creech AFB, Nev., renaming it the 432nd Wing. The service's first RPA wing, it took charge of rapidly expanding intelligence, surveillance, and reconnaissance missions.

May 22, 2002: The X-45A unmanned combat air vehicle flew for the first time at Edwards Air Force Base, Calif. It was the first unmanned aircraft designed for combat operations, such as suppression of enemy air defenses, in an extremely hostile environment.

April 23, 2001: The Northrop Grumman RQ-4A Global Hawk completed the first nonstop crossing of the Pacific Ocean by remotely piloted aircraft. It flew from Edwards AFB to Edinburgh, Australia — a distance of 7,500 miles—in about 23 hours. The flight demonstrated the potential of the world's most advanced high-altitude, long-range, remotely operated aircraft.

Feb. 8–March 21, 2006: A congressionally directed demonstration of the Northrop Grumman-produced U.S. Air Force RQ-4 Global Hawk unmanned aircraft system was conducted to test the system's ability to conduct maritime drug interdiction surveillance. During test flights, the system successfully detected and tracked preplanned maritime and airborne targets and maritime ad hoc targets. The system's final report stated that the Global Hawk system was making satisfactory progress toward demonstrating utility to support maritime counterdrug operations.

Nov. 17, 2006: The Air Force Operational Test and Evaluation Center Detachment 5 Global Hawk test team concluded the first operational flight test of the RQ-4A Global Hawk Block-10 unmanned aircraft system. The team was composed of AFOTEC Det. 5, 452rd Flight Test Squadron, Global Vigilant Combined Test Force, 31st Test Squadron, the 303rd Aeronautical Systems Group and Northrop Grumman, with operators from the 9th Reconnaissance Wing and 480th Intelligence Group also helping. The team's final report concluded that the RQ-4A was effective with limitations that had a substantial impact on persistent intelligence, surveillance, and reconnaissance operations.

Nov. 16, 2009: The first of the next generation of Northrop Grumman's Block 40 configuration of the RQ-4 Global Hawk high-altitude, long-endurance unmanned aircraft system completed its first flight. The aircraft flew in California from Northrop Grumman's Palmdale manufacturing facility to Edwards AFB.

Sept. 19, 2001: The Air Force awarded a contract for low-rate initial production of the F-22 to Lockheed Martin. The contract called for production of 10 of the new stealthy air-superiority fighters.

Dec. 15, 2005: The F-22 Raptor achieved initial operational capability. This followed a process of engine testing at Arnold Air Force Base, Tenn.; flight, ground, and simulation testing at Edwards AFB and Eglin Air Force Base, Fla.; missile testing at Holloman Air Force Base, N.M.; tactics development at Nellis Air Force Base, Nev.; pilot and maintenance training at Tyndall Air Force Base, Fla.; and initial deployment to Langley Air Force Base, Va.

Nov. 29, 2006: The A-10C Thunderbolt II made its official roll-out debut at Davis-Monthan Air Force Base, Ariz. On display at the ceremony were the upgraded jet's enhanced capabilities, which made it a more effective and survivable attack fighter. Precision engagement technology, cockpit changes, improved communication capabilities, and numerous other enhancements accomplished under the Precision Engagement program were the most significant modifications to the A-10 in its 30-year history. The upgrade was expected to result in a much-extended operational lifespan for the A–10C, into the end of the 2020s.

Dec. 30, 2008: Northrop Grumman was awarded a production contract for the B-2 stealth bomber radar modernization program.

March 17, 2009: Northrop Grumman delivered the first operational B-2 Spirit to be equipped with the modernized radar to the 509th Bomb Wing, Whiteman Air Force Base, Mo .

June 29, 2009: The U.S. Air Force approved full-rate production for the new radar for the B-2. Northrop Grumman began fabrication of the remaining units to upgrade the entire B-2 fleet.

July 30, 2009: At Edwards AFB, the 419th Flight Test Squadron conducted the first functional check sortie of a B-1B Lancer that ended two years of modifications to the aircraft. The B-1 was upgraded with the fully integrated data link, allowing the aircraft to communicate quickly with others in the entire battlespace, even when not in theater. The data links provided real-time data, including where the warfighter needed bombs dropped, making the B-1 a more powerful asset to U.S. warfighters.

Oct. 16, 2009: Boeing successfully completed the first phase of flight testing for a B-1 bomber upgraded with the fully integrated data link digital avionics. The flight test plan for Phase 1 included nine sorties flown by the Air Force at Edwards.

May 26, 2010: The X-51A unmanned hypersonic air vehicle made its first flight, setting a distance record for a scramjet flying under its own power. The test was prematurely terminated due to a breached seal.

Space

May 8, 2001: Secretary of Defense Donald H. Rumsfeld designated the Air Force as executive agent for the Pentagon's space activities.

Oct. 1, 2001: The Air Force reassigned the Space and Missile Systems Center from Air Materiel Command to Air Force Space Command, giving the latter cradle-to-grave oversight of space systems.

Aug. 21, 2002: The first Lockheed-Martin Atlas V lifted off from Cape Canaveral, Fla., inaugurating a new type of launch missile. Part of the Air Force's Evolved Expendable Launch Vehicle program, the system used a standard booster, adding supplemental boosters as needed for a variety of payloads.

Sept. 25, 2010: After several delays, the Minotaur IV launch vehicle took the Space-Based Space Surveillance satellite into orbit.

March 23, 2011: Space Based Space Surveillance initial operational test and evaluation began that resulted in a recommendation for follow-on testing with the Space Fence program.

Munitions

Aug, 25, 2006: Maj. Gen. Jeffrey R. "Jeff" Riemer, then commander of the Air Armament Center and Air Force program executive officer for weapons, Air Force Materiel Command, announced that Boeing's GBU-39/B Small Diameter Bomb I was delivered to the U.S. Air Force ahead of schedule and under cost. On Oct. 2, 2006, Gen. Ronald Keys, commander of Air Combat Command, declared initial operational capability for the GBU-39/B Small Diameter Bomb I, manufactured by Boeing.

Aug. 18, 2008: The first laser joint direct attack munition (LJDAM) was successfully used against a moving enemy vehicle in Iraq.

Nov. 21, 2010: The Air Force selected Raytheon's GBU-53/B for the small diameter bomb II program after a 42-month competition.

Nuclear developments

Aug. 24, 2001: At Grand Forks Air Force Base, N.D., the Air Force imploded the last of the Minuteman III missile silos in accordance with the terms of the first Strategic Arms Reduction Treaty.

May 13, 2002: President George W. Bush announced an agreement between the United States and Russia that would reduce the number of nuclear weapons in their arsenals by two-thirds.

Aug. 7, 2009: The Air Force activated Global Strike Command at Barksdale Air Force Base, La., to manage the service's nuclear mission. The command received the lineage and honors of Strategic Air Command.

TECH 1990, from 26

vides accurate geographical coordinates for personnel moving on the ground, sea, or air.

Munitions

Jan. 22, 1991: The Air Force began using precision-guided munitions against Iraqi hardened aircraft shelters. These attacks were so successful that Iraqi fighters began flying to Iran to escape destruction. During the war, coalition forces released approximately 16,000 precision-guided munitions against Iraqi forces and dropped some 210,000 unguided bombs.

Feb. 11, 1998: A B-1B bomber first dropped a Joint Direct Attack Munition, a conventional bomb fitted with satellite-guidance equipment, over a test range at China Lake, Calif.

Operation Desert Storm had demonstrated that dust, smoke, and cloud cover could hinder the effectiveness of precision guided munitions. Shortly after the conflict, Air Force Chief of Staff Gen. Merrill A. "Tony" McPeak sent a terse, hand-written memorandum to Maj. Gen. R. Minter Alexander, his deputy chief of staff for plans and operations. "We need to lay down a requirement for an all-weather PGM," McPeak directed. "Work with TAC [Tactical Air Command]. Keep me up to speed." The JDAM guidance system met that need effectively and at a relatively low cost.

The JDAM is a tail kit that fits on a normal "dumb" bomb, such as a MK-83/BLU-110, MK-84, BLU-109, or a MK-82. The tail section contains an Inertial Navigation System that utilizes GPS technology and can update its trajectory all the way to impact. It can be launched from more than 15 miles from the target. The per-unit cost of the JDAM back in the late 1990s was about $18,000. More recent costs are about $25,000 when warheads and fuzes are included, a bargain compared to the less effective laser and television guided bombs.

Operation Allied Force in 1999 saw the combat debut of the JDAM, with the Air Force dropping more than 650 of the new weapons. More than 80 percent of the JDAMs hit their aiming points. Thanks to the combination of this new munition and the combat debut of the B-2 which carried them, Operation Allied Force was a veritable revolution in warfare, featuring the combined accuracy, low cost, and all-weather capability of the JDAM. No longer could the enemy use bad weather as an ally.

So what does the future hold for the U.S. Air Force?

In the past few years, the service has seen unprecedented change — from the end of combat operations in Afghanistan after 20 years, to forward deployments to Eastern Europe in the wake of Russia's invasion of Ukraine; from the rise in uncrewed aerial vehicles to the testing of hypersonic missiles; and from the introduction of the F-35 Lightning II to the impending roll out of the B-21 Raider bomber.

In a sign of looking back and reaching forward, the new hypersonic missiles are being tested using the B-52 Stratofortress bomber; an aircraft that made its first flight on April 15, 1952, and entered service in 1955!

So what does the future hold for the greatest Air Force in the world?

The service is currently testing Skyborg Vanguard — a system that allows uncrewed aerial vehicles to operate in tandem; the Air Force is also test flying the F-15EX Eagle II — bringing next-generation combat technology to a highly successful fighter airframe, capable of projecting power across multiple domains for the Joint Force; and the service is exploring the future of artificial intelligence within aircraft and weapons systems.

"I truly believe we have the greatest Airmen and best defense and tech industry in the world," said Gen. CQ Brown Jr., chief of staff of the Air Force. "Together we must work to accomplish what seems impossible. We must rise to the challenges of today to prepare for tomorrow."

Air Force photograph by Senior Airman Taylor Crul

An aircrew assigned to the 816th Expeditionary Airlift Squadron prepares to load qualified evacuees aboard a U.S. Air Force C-17 Globemaster III at Hamid Karzai International Airport, Afghanistan, Aug. 21, 2021. The Department of Defense is committed to supporting the U.S. State Department in the departure of U.S. and allied civilian personnel from Afghanistan, and to evacuate Afghan allies safely.

A B-52H Stratofortress undergoes pre-flight procedures at Edwards Air Force Base, Calif., before conducting a flight test of the AGM-183A.

Air Force photograph by Giancarlo Casem

Air Force photograph by Staff Sgt. Danielle Sukhlall

U.S. Air Force's F-22 Raptor has arrived to the 32nd Tactical Air Base, Lask, Poland, to support NATO Air Shielding.The aircraft are from the 90th Fighter Squadron, 3rd Wing, Joint Base Elmendorf-Richardson, Alaska, and will be supporting Air Shielding as the 90th Expeditionary Fighter Squadron.

Northrop Grumman image

An artist's rendering of a B-21 Raider concept in a hangar at Dyess Air Force Base, Texas. The B-21 Raider is currently being built at the Northrop Grumman facility at Air Force Plant 42 in Palmdale, Calif., and will undergo flight test at Edwards Air Force Base, Calif.

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The newest service, the U.S. Space Force

The U.S. Space Force was established Dec. 20, 2019 when President Donald Trump signed the National Defense Authorization Act into law (with bipartisan support), creating the first new branch of the armed services in 73 years.

The establishment of the USSF resulted from widespread recognition that space was a national security imperative. When combined with the growing threat posed by near-peer competitors in space, it became clear there was a need for a military service focused solely on pursuing superiority in the space domain.

For the last 60 years, space capabilities have become essential to the way a modern military conducts operations. Investments in space capabilities have increased the effectiveness of operations in every other domain. The U.S. military is faster, better connected, more informed, precise, and lethal because of space.

The same premise — that space is critical — holds true for the average American; space capabilities are woven into the fabric of daily life. Satellites connect people in every corner of the globe, monitor weather patterns, carry television broadcasts, and the timing and navigation services of the GPS constellation power global financial networks, enable international commerce, synchronize cell phone networks, and optimize critical infrastructure.

Access to and freedom to operate in space underpins our national security and economic prosperity. However, space is no longer free from conflict. Potential adversaries are seeking ways to deny the U.S. access to the space capabilities fundamental to our way of war and modern way of life. They have developed an array of threats, both on Earth and in orbit, that continue to grow in scope, scale, and complexity.

Today, the Guardians of the U.S. Space Force have been called to protect and defend American interests and to ensure our forces, our allies and the world never experience a day without space. They serve across the globe, working 24/7 to design, acquire, field, test, operate, and defend the critical space systems the nation, and the world, rely upon.

The U.S. Space Force falls under the Department of the Air Force, the same way the U.S. Marine Corps is under the purview of the Department of the Navy. Since its formation, six Air Force bases The newest service, the U.S. Space Force Buckley, Colo., Los Angeles, Calif., Patrick, Fla., Peterson Colo., Schriever, Colo., and Vandenberg, Calif., have been transferred from the U.S. Air Force to the U.S. Space Force and most have been renamed Space Force Bases, reminiscent of the switch from Army Air Field to Air Force Base in the 1940s.

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President Donald Trump signs S.1790, the National Defense Authorization Act for Fiscal Year 2020 as senior leaders look on, Friday, Dec. 20, 2019 At Joint Base Andrews. The act authorizes a budget that supports the U.S. armed forces and postures the Air Force to meet the requirements of the National Defense Strategy.

Air Force photograph by Airman 1st Class Spencer Slocum

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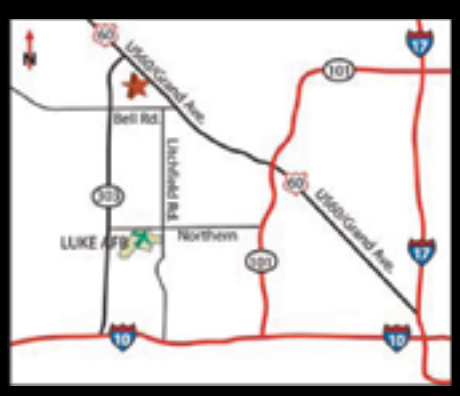

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