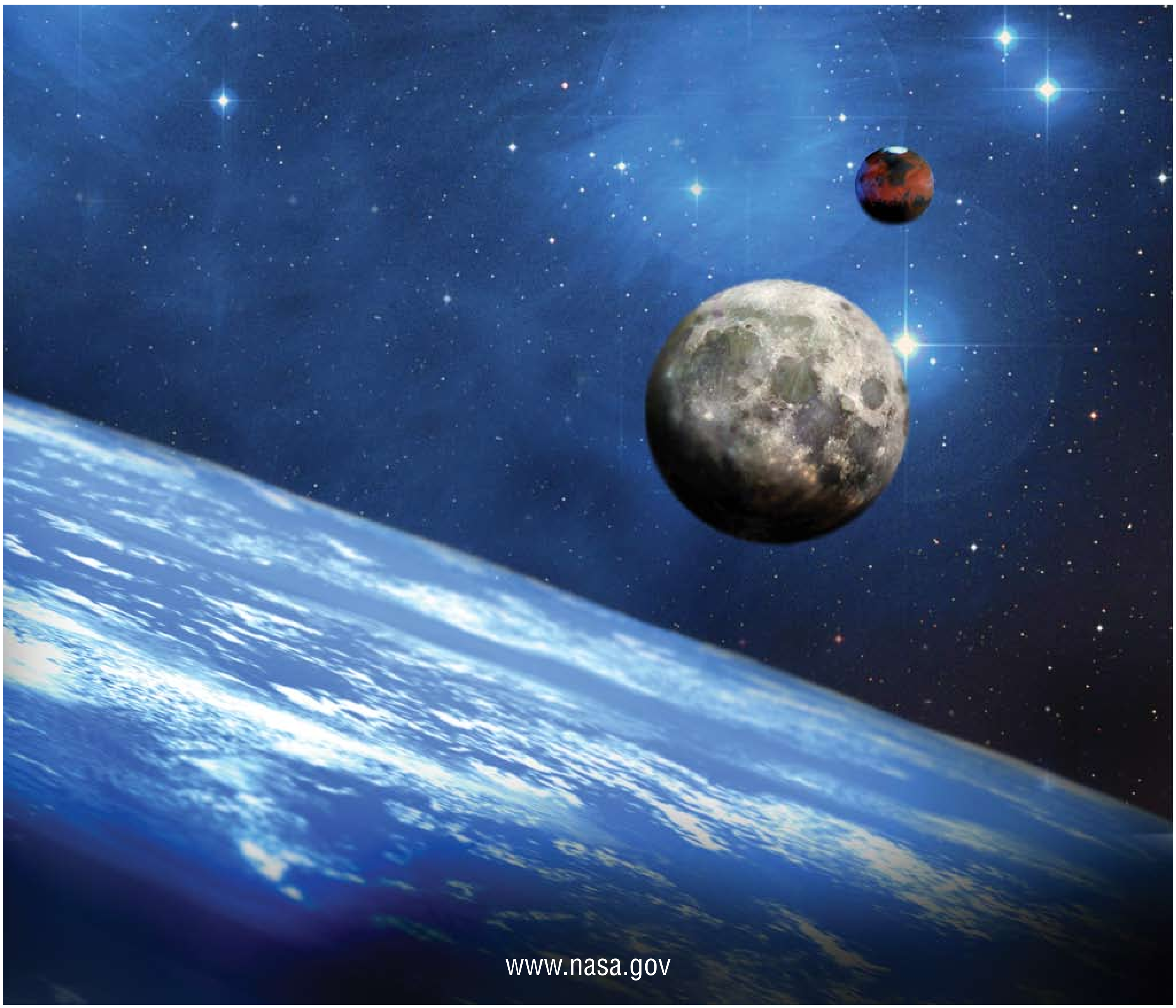
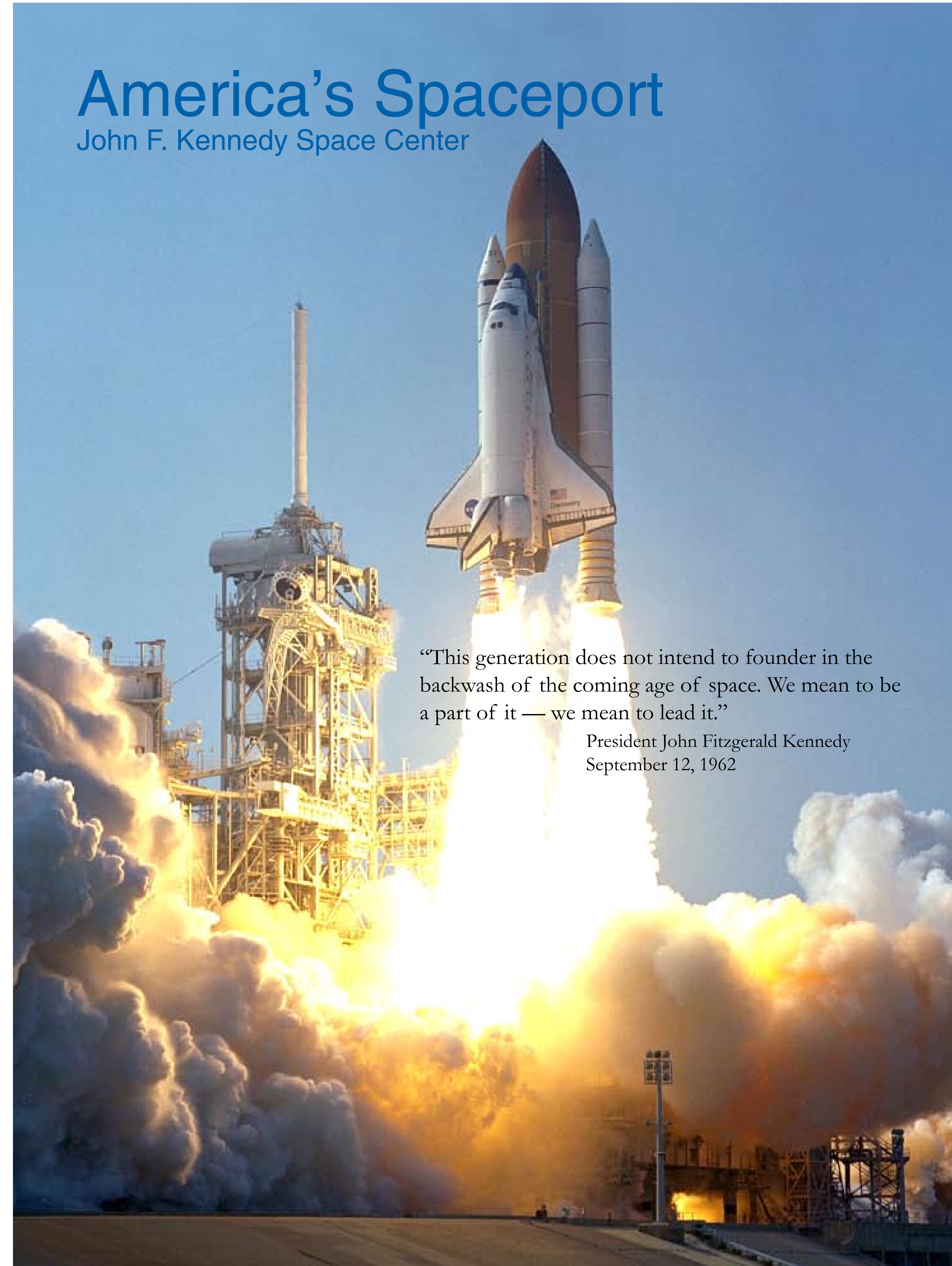
National Aeronautics and Space Administration

America's Spaceport



America's Spaceport

John F. Kennedy Space Center



"This generation does not intend to founder in the backwash of the coming age of space. We mean to be a part of it — we mean to lead it."

President John Fitzgerald Kennedy
September 12, 1962

Origins

The John F. Kennedy Space Center — America's Spaceport — is the doorway to space. From its unique facilities, humans and machines have begun the exploration of the solar system, reaching out to the sun, the moon, the planets and beyond. While these spectacular achievements have fired the imagination of people throughout the world and enriched the lives of millions, they represent only a beginning. At America's Spaceport, humanity's long-cherished dream of establishing permanent outposts on the new space frontier is becoming a reality.

Yet, our leap toward the stars is also an epilogue to a rich and colorful past . . . an almost forgotten legacy replete with Indian lore, stalwart adventurers, sunken treasure and hardy pioneers.

The sands of America's Spaceport bear the imprint of New World history from its earliest beginnings.

Long before people in modern times erected steel and concrete sentinels, the Spaceport was inhabited by dusky-skinned hunters – the Paleo peoples – who crossed the continent from Asia by way of the frozen Bering Sea approximately 12,000 to 20,000 years ago. When Columbus landed at San Salvador (Bahamas) in the 15th century, the Cape area was home to the fierce and often cannibalistic Ais and Timucuan Indians. By the middle 1800s, these aboriginal tribes had virtually disappeared. They had become the victims of internal strife, conflict with the Europeans moving into the area and, worst of all, new and deadly diseases – some unwittingly brought by the recent arrivals and spread to an Indian population with no built-up immunities.

The early European explorers came in search of territory, wealth, religious freedom, and even a Fountain of Eternal Youth – first the Spanish, then the French and the English. Among these adventurers were such notables as Juan Ponce de Leon, Hernando de Soto, Pedro Menendez de Aviles, Jean Ribault and Amerigo Vespucci, discoverer of Cape Canaveral and after whom America was named.

The first launch from Cape Canaveral – July 24, 1950. The modified German V-2 rocket attained an altitude of 10 miles. Note the primitive facilities: a tarpaper shack served as a blockhouse; the pad service structure was made from painters' scaffolding.

During the centuries that followed, Florida, which straddled the main sea route between Europe and the Gulf of Mexico, was bitterly contested by the European powers. Throughout this swashbuckling era, America's Spaceport remained a virtual wilderness. But its coastal waters reverberated to the sounds of muskets and cannons as pirates and privateers preyed upon Spanish treasure ships laden with riches from the mines of Mexico and Peru. Shoals, reefs and storms also exacted their toll on the treasure fleets, leaving behind a sunken bonanza now being reaped by modern-day treasure hunters.

By the early 18th century, America's Spaceport echoed with the footsteps of other intruders: English settlers and their Indian allies (the latter to become known as the Seminoles) from colonies in Georgia and South Carolina. Thus began a new era of conflict and expansion that would continue until the end of the Second U.S. – Seminole Indian War in 1842.

Against this backdrop, permanent settlement of the Spaceport area began. And in the years following the American Civil War, small rural towns and communities sprang up along a 70-mile-long stretch of mainland, rivers and beaches later to become known as Brevard County. The principal industries were agriculture, fishing and tourism.

Entering the Space Age

After World War II, however, another kind of industry, destined to bring explosive growth and international stature, took root in the area. Brevard County, by virtue of its most prominent geographical feature – Cape Canaveral – became the focal point of a new era of exploration: the Space Age.

The first step in the transformation began in October 1949, when President Harry S. Truman established the Joint Long-Range Proving Ground (currently known as the Eastern Range), a vast over-water military rocket test range that now extends 5,000 miles along the Atlantic coast from Cape Canaveral to Ascension Island.

The Cape was ideal for testing missiles. Virtually uninhabited, it enabled personnel to inspect, fuel and launch missiles without danger to nearby communities. The area's climate also permitted year-round operations, and rockets could be launched over water instead of populated areas.

The first launch from the Cape was conducted by a military-civilian team July 24, 1950. The rocket, a modified German V-2 with an attached upper stage, attained an altitude of 10 miles. By the late 1950s, the military services had elevated their sights from missile testing to launching artificial satellites. On

Perched atop a Juno I rocket, America's first satellite, Explorer I, awaits launch Jan. 31, 1958. The Army-civilian launch team would form the nucleus of the Kennedy Space Center.

Jan. 31, 1958, America's (and the free-world's) first satellite, Explorer I, was launched from Complex 26 at Cape Canaveral by a military-civilian team of the Army's Missile Firing Laboratory. This group, under the direction of Dr. Kurt H. Debus, a key member of the famed Wernher von Braun rocket team, later formed the nucleus of the Kennedy Space Center.

With the creation of the National Aeronautics and Space Administration (NASA) in October 1958, the nation turned its attention to the peaceful exploration of space. Cape Canaveral thundered with the sound of rockets carrying sophisticated instruments and payloads to explore mankind's newest frontier. And soon, a new breed of pioneers - American astronauts - were soaring skyward from the Cape to take their first halting steps beyond the Earth.

But even as the first Americans ventured into space, more ambitious undertakings were planned. In May 1961, President John F. Kennedy announced that the U.S. would send men to the moon and back by the end of the decade. The program, called Apollo,

Rocket pioneers Wernher von Braun and Kurt Debus at rollout of the first Apollo/Saturn V from the Vehicle Assembly Building. Von Braun, then director of the Marshall Space Flight Center, was responsible for design and development of the Saturn V. Debus, the first director of the Kennedy Space Center, created the mobile concept of launch operations used at the Spaceport.

The steel framework of the Vehicle Assembly Building rises on Merritt Island during construction of America's Spaceport. The low structure at right is the Launch Control Center.

would require the largest rocket ever built – the 363-foot-tall Saturn V. The Cape, which had served so well up to now, was inadequate as a launch site for the monstrous vehicle, and another location was needed.

Debus, representing NASA, and Lt. Gen. Leighton I. Davis, representing the Department of Defense, organized a joint study to find a new launch site. They considered Hawaii, Texas, the California coast, an island off the coast of Georgia, islands in the Caribbean and Merritt Island (adjacent to the Cape) as possible sites.

The study concluded that Merritt Island offered compelling advantages. Several small communities were within easy driving range, and larger cities like Daytona Beach, Vero Beach and Orlando were only slightly farther. Locating on Merritt Island also would allow NASA to share facilities of the Atlantic Missile Range, avoiding costly duplication. Only at this location could the same NASA launch organization continue operations on the Cape Canaveral complex while building the Spaceport. Debus and Davis recommended the acquisition of the northern part of Merritt Island. The choice was endorsed by NASA and the Defense Department. Congress authorized NASA to acquire the property.

The space agency began acquisition in 1962, taking title to 83,894 acres by outright purchase. NASA negotiated with the state of Florida for use of an additional 55,805 acres (of state-owned submerged land, most of which lies within the Mosquito Lagoon). The investment in property reached approximately $71,872,000.

In July 1962, the Launch Operations Directorate at the Cape was separated from the Marshall Space Flight Center by executive order. It became the Launch Operations Center, an independent NASA installation, with Debus as its first director. It was renamed the John F. Kennedy Space Center in December 1963, in honor of America's slain president.

NASA started construction of the massive Apollo-Saturn facilities in 1963. In December 1964, launch elements of Houston's Manned Spacecraft Center (now the Johnson Space Center) were transferred to the Kennedy Space Center. The following October, Goddard Space Flight Center's Field Projects Branch on the Cape was incorporated into the Kennedy Space Center.
On July 16, 1969, humans departed from the Spaceport's Launch Complex 39 to walk on the moon for the first time in history. Following completion of the Apollo-Soyuz Test Project in 1975, the facilities of the Spaceport were modified to support the nation's newest launch vehicle: the reusable space shuttle.

Construction of Pad A at Spaceport's Launch Complex 39. The pad hardstand contains 68,000 cubic yards of concrete.

From Redstone to Saturn to the space shuttle, from the time of the earliest scientific and applications satellites to the threshold of the International Space Station era, the Kennedy Space Center has been the primary launch base for the nation's manned and unmanned civilian space programs. It is here, at America's Spaceport, that the dreams and aspirations of space planners reach fruition – where the individual parts of a space mission come together for the first time, to be melded into a single, cohesive element and boosted into space.

At Launch Complex 39, where rockets were once readied for flight to the moon, engineers and technicians prepare the reusable space shuttle for manned Earth-orbital missions. Unmanned military and commercial rockets are processed and launched at complexes on nearby Cape Canaveral, under the oversight of the U.S. Air Force.

Cargoes destined for space – whether a planetary explorer to survey Jupiter and Saturn, a communications satellite, or an Earth-observing satellite – are assembled and tested in specially designed and equipped laboratories.

From the first launch April 18, 1981, through 2005, KSC launched 114 space shuttle missions. Between 1998 and 2002, there were 16 missions supporting the International Space Station. Less than a dozen more are planned to complete construction of this research facility in space.

Beginning in 1958, the Spaceport team has launched more than 300 unmanned space vehicles. These were primarily Deltas, Atlas-Centaurs, Atlas-Agenas, and Titan-Centaurs. All of these lifted off from NASA-operated facilities on Cape Canaveral Air Force Station and Vandenberg Air Force Base in California. Elements of the Spaceport team have also conducted launch operations for unmanned polar-orbiting missions from NASA facilities at Vandenberg Air Force Base at the Western Range in California.

At the cusp of the 21st century, Delta IV and Atlas V launch vehicles were introduced.

The history of the Kennedy Space Center is a

Payloads, such as the SHI Research Double Module (SHI/RDM), also known as SPACEHAB, to be carried into orbit by the space shuttle, are assembled and checked out in specially designed and equipped facilities at the Spaceport.

A Delta rocket lifts off from Complex 17, Cape Canaveral. The workhorse of the nation's space program, Delta has put into orbit more scientific, weather and communications satellites than all other vehicles of its class combined.

chronicle of the Space Age, written in the blinding glare and thunder of rockets and space vehicles. Its distinguished record of achievement in the development and conduct of space vehicle checkout and launch operations is unmatched.

And so it is today. Kennedy Space Center — America's Spaceport — has become the "gateway to the universe," home port for voyages of exploration undreamed of centuries ago and staffed by men and women who, like their forebears, still dream of discovering and settling new worlds.

The elements of a space shuttle are integrated in one of the cavernous high bays of the Vehicle Assembly Building at Launch Complex 39. The platforms slide in and out, allowing workers to reach all levels of the vehicle. The orbiter is in the foreground. At the rear is the huge external tank, bracketed by solid rocket boosters.

People and Facilities

People and Facilities

As the future unravels, the people and resources of America's Spaceport will continue to be a major force in our nation's effort to explore and utilize space for the benefit of all humanity.

The men and women of the Kennedy Space Center's NASA/industry team are a very special resource of the United States and the world. Their skills and capabilities, many of which are found only at America's Spaceport, have been utilized for every American space flight to date.

All who work at the Spaceport are members of the team, even if their jobs are not directly involved with launch operations. Most of the hands-on work is performed by contractors. The center has a government work force (in round numbers) of approximately 1,800 civil service employees, plus more than 35 resident NASA personnel from other centers. There are about 12,000 contractor employees. These numbers can fluctuate, depending on the programs and responsibilities assigned to the center.

The largest contractor organization handles space shuttle processing and launch operations, as well as astronaut training and mission operations at the Johnson Space Center. At KSC this includes everything from repairing shuttle orbiter tiles to recovering the solid rocket boosters at sea to refurbishing the space shuttle main engines for their next flight.

The second-largest contractor at KSC supports the facility itself, providing upkeep and maintenance for the buildings and grounds, and operating the support computers and electrical, mechanical, painting, rigging and other shops. The third major contractor is involved with the complicated process of preparing the spacecraft and other payloads for launch. Several other firms provide various operational, support and housekeeping functions.

Some of the more unusual facilities in which people work are the giant Vehicle Assembly Building, one of the largest enclosed structures in the world; the Orbiter Processing Facility, filled with complicated equipment used to prepare shuttle orbiters for flight; Pads 39A and 39B, from which shuttles lift off; NASA-operated space shuttle support

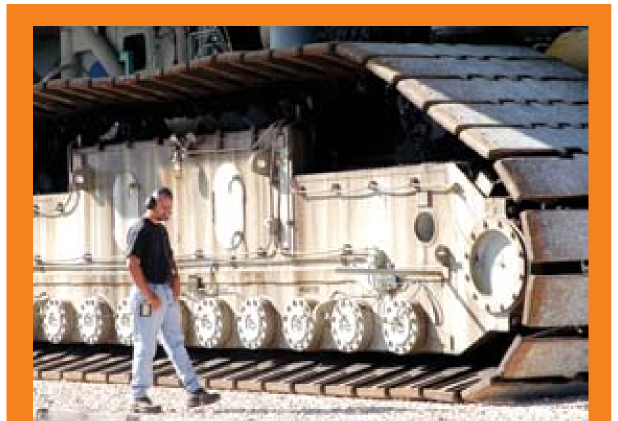
In the blockhouse on Launch Complex 36-A, Cape Canaveral Air Force Station, members of the NASA-industry launch team make final checks before launch of the GOES-M satellite, one in a series of advanced geostationary weather satellites in service, July 23, 2001.

and spacecraft checkout facilities on both KSC and Cape Canaveral; and a host of other processing and support facilities. Some of the buildings on both the Cape and KSC are specially designed for spacecraft assembly and checkout, and others for hazardous work such as installing explosive ordnance and loading propellants.

The heart of the Kennedy Space Center is its engineering work force, both contractor and NASA. People with electrical, mechanical, electronic and computer engineering degrees have the necessary background to begin work here. After that, it may take years to learn some of the more unusual functions of their jobs.

The engineering departments do their work along with other groups that might be found at any industrial facility. Logistics personnel order supplies and keep them available in warehouses. Another organization operates a facilitywide bus system and supplies vehicles for local use. Writing and graphics departments produce a variety of publications, which are printed on- and offsite. A janitorial force keeps the facilities clean. A guard force provides security.

The diversity of occupations and the pioneering thrust of America’s Spaceport make it a special place to work. Watching a rocket or space shuttle blaze a fiery trail into the sky, hearing and feeling the thunder of its passage, is a fringe benefit not available to many elsewhere.



This Spaceport worker is dwarfed by the massive track of a crawler-transporter, which is used to carry a mobile launcher platform and space shuttle from the Vehicle Assembly Building to the launch pad. Space shuttle launch operations require experience and skills found nowhere else in the world.

Readying a space shuttle orbiter for flight is an exacting job. Here Soichi Noguchi, with the Japan Aerospace Exploration Agency, JAXA, takes a close look at the some of the tiles underneath Atlantis.

In a Space Station Processing Facility clean room, two workers perform prelaunch processing activities on the Canadian Space Agency’s space station remote manipulator system before it is installed in the cargo bay of an orbiter. The mechanism, built in Canada, helps astronaut crews handle payloads in space.

Human Space Flight — The First Era

On Oct. 7, 1958, just six days after NASA was formally organized out of the old National Advisory Committee for Aeronautics, the infant agency initiated Project Mercury, the first American human space flight program.

Considering that only four American satellite launch attempts out of 13 had been successful at the time, this was an undertaking of high ambition. The task of making the launch systems, rockets and spacecraft safe enough to risk a human life was a daunting challenge.

The Redstone, one of the most reliable launch vehicles then available, was chosen first for “man-rating” – upgrading in reliability to be as safe as human talent and ingenuity could make it. This meant the pad, the checkout and launch procedures, and the tracking systems all had to be reexamined. Astronaut escape and rescue systems had to be designed and installed, and Kennedy personnel trained in their use.

On May 5, 1961, after extensive preparations and several frustrating and nerve-wracking launch attempts, Alan Shepard became the first American to make a suborbital flight. His Mercury-Redstone vehicle reached an altitude of 116 miles and splashed down about 304 miles out into the Atlantic.

The seven Mercury astronauts, the first Americans chosen to venture into the dangerous new frontier of space, pose for a group photograph. They are from left to right (front): Walter M. Schirra Jr.; Donald K. Slayton; John H. Glenn Jr.; and Scott Carpenter; (back): Alan B. Shepard Jr.; Virgil I. “Gus” Grissom; and L. Gordon Cooper.

Alan Shepard and Gus Grissom completed two suborbital flights before an Atlas vehicle roared off Complex 14 Feb. 20, 1962, carrying John Glenn. After three trips around the world, the Mercury spacecraft he had named Friendship 7 re-entered the atmosphere and parachuted to a safe landing in the Atlantic Ocean. Glenn became the first American to orbit the Earth.

Gus Grissom followed on an almost identical flight July 21. The Kennedy team had adapted to the tough new requirements of human space flight and America had entered a new era.

For Mercury orbital flights, NASA selected the larger and more powerful Atlas, until then only used as an intercontinental ballistic missile by the U.S. Air Force. After two successful missions, the second of which carried the chimpanzee Enos into space for two orbits, John Glenn was launched Feb. 20, 1962, aboard a Mercury-Atlas. He became the first American to complete three circles of the Earth. Glenn was followed by Scott Carpenter, Wally Schirra and Gordon Cooper, the latter staying in orbit a full day after his launch on May 15, 1963.

The next step in the nation's human space program was Project Gemini, which served as a bridge between the Mercury flights and the more difficult Apollo missions to come. For the larger two-man Gemini spacecraft, the Air Force Titan missile was chosen and man-rated.

The first manned Gemini vehicle was launched March 23, 1965, and the 10th and final one Nov. 11, 1966. During the brief span of 20 months, 20 astronauts were sent into orbit. Seven unmanned target vehicles were launched in the same time period for rendezvous practice and other associated functions. When the program was completed, enough had been learned about launching and operating manned vehicles in space to make fulfilling President Kennedy's commitment to a moon landing a real possibility.

For the Apollo lunar landing program, an entirely new family of launch vehicles was required: the massive and powerful Saturns. Eleven Saturn I launches were followed by several of the more powerful Saturn I-Bs. Both vehicles were initially used to test unmanned elements of the three-man Apollo spacecraft. They were launched from new complexes constructed by NASA on Cape Canaveral.

A Titan II vehicle carrying the Gemini 11 spacecraft heads for space from Launch Complex 19, where all 10 manned Gemini flights began. Charles Conrad Jr. and Richard F. Gordon Jr. made four practice rendezvous with a target vehicle, reached an altitude of 851 miles, and flew with the hatch open for more than two hours.

Apollo 17 heads for Pad A atop its giant Saturn V rocket for the last manned flight to the moon. Riding a mobile launcher that towered well over 400 feet into the air, with a total weight on the crawler-transporter treads of more than 18 million pounds, an Apollo/Saturn V vehicle in motion on the crawlerway was an awesome and unforgettable sight.

On Nov. 9, 1967, the first Saturn V – 363 feet tall, and still the largest vehicle ever flown – was launched on a test flight from Complex 39 at the Spaceport. This powerful three-stage vehicle produced more than 7.5 million pounds of thrust, equal to about 180 million horsepower – enough to place almost a quarter of a million pounds of payload into Earth orbit.

Apollo 7, the first manned Apollo mission, lifted off into Earth orbit Oct. 11, 1968, on a Saturn I-B vehicle. And Dec. 21 – just two months later – on Apollo 8, the third flight of the Saturn V and the second manned launch of an Apollo spacecraft, Frank Borman, James Lovell and William Anders flew to the moon and into orbit around it. Considering the short test history of both the launch vehicle and the spacecraft, this was a feat of incredible courage and daring.

The next Apollo/Saturn V (Apollo 9), launched by the Kennedy Space Center team March 3, 1969, sent three astronauts into Earth orbit to flight-test the Lunar Module in microgravity. This new vehicle was a lightly built, insect-shaped craft designed to actually descend to the lunar surface.

On May 18, a second Apollo/Saturn V was sent toward the moon. This was Apollo 10, flight-testing another Lunar Module, this one while actually in lunar orbit. And on July 16, 1969, all the parts, planning, care and labor came together for the launch of Apollo 11. Neil Armstrong and Edwin Aldrin Jr. subsequently became the first human beings to set foot on the surface of another planetary body, while their crewmate Michael Collins kept a lonely vigil in the orbiting Command Module.

Through December 1972, the Kennedy team processed and launched six more of the giant Apollo/Saturn V vehicles, maintaining a hectic pace that never evolved into a repetitive and routine job. A wealth of scientific data and physical artifacts was brought back from the moon; these are still under study today. Apollo entered history books as the greatest and most far-reaching feat of scientific exploration of humankind.

The Apollo Program was over. But the Kennedy team still had to process and launch one more of the huge Saturn V vehicles. On May 14, 1973, KSC hurled the world's first orbital workshop, Skylab 1, into space. Skylab was actually an inert Saturn V third stage which had been internally modified to function as a manned scientific laboratory, with three other scientific and operational modules added.

Skylab was launched without an astronaut crew. The Kennedy team later sent up three separate crews of astronauts to occupy it. They were transported by Apollo/Saturn I-B vehicles launched from modified facilities at the Spaceport's Launch Complex 39. Skylab produced a bonanza of scientific information and proved that humans could work in space for extended periods of time. The final crew, launched Nov. 16, 1973, stayed in space for 84 days. This length of time in microgravity remained the record for American astronauts until 1995, when Norman Thagard exceeded it while working onboard the Russian Space Station Mir.

One last mission remained to be flown before America entered a long hiatus from human space flight. On July 15, 1975, the last Apollo/Saturn I-B lifted off from Complex 39. It carried three American astronauts into space to rendezvous with a Russian Soyuz spacecraft and its crew of two cosmonauts.

The ascent stage of the Apollo 11 Lunar Module floats over the eerie, crater-scarred landscape of the moon after Neil Armstrong and Edwin Aldrin Jr. successfully lifted off using the descent stage as a stable launch platform. This photo was taken through the orbiting Apollo spacecraft window by Michael Collins. After the rendezvous in orbit, the astronauts headed for Earth, seen here, half shadowed in darkness, above the bleak lunar horizon.

Astronaut Thomas Stafford (center left) and cosmonaut Aleksey Leonov meet in the module temporarily connecting their spacecrafts in orbit. The Apollo-Soyuz mission was the first international meeting in space. The two vehicles remained docked together for several days, and astronauts and cosmonauts visited each other s spacecraft.

The Apollo-Soyuz Project remained the only such international meeting for 20 years, until the Space Shuttle Atlantis rendezvoused and docked with Mir in June 1995.

The Apollo-Soyuz flight also was the last American manned space vehicle that could fly only once. NASA needed a more economical way to get into orbit and safely back to Earth. The era of the reusable space shuttle was at hand.

Skylab, the orbital workshop that was a precursor to the International Space Station, floats above a heavily clouded Earth. The solar array on the left side of the workshop is missing and an improvised sunshade protects the main body from excessive heat accumulation. Skylab was repaired in orbit after suffering damage during ascent, and went on to complete a highly successful mission. It was one of the largest habitable structures ever placed in orbit at that time.

The Space Shuttle — The Second Era

The Space Shuttle

For nearly two decades, NASA had blazed new trails across the heavens with expendable vehicles and spacecraft, but the cost had been high. To continue the exploration and utilization of space on a permanent basis, a more economical way to reach orbit was urgently needed. This was apparent well before the end of the Apollo era, and work had already started on a new type of space vehicle. This became the space shuttle, where the reusable orbiter resembled an airplane and could fly again. The space shuttle required a new philosophy of operations. No longer would a vehicle be prepared for a single flight. In the future, the same vehicle would return many times to the Kennedy Space Center, to be processed and launched once more.

The space shuttle was very different from the Apollos and Saturns, and far more sophisticated and technically complex. It was designed, tested and built with limited funds. To help keep costs down, Kennedy engineers adapted the Apollo launch facilities, rather than building all new ones. The huge Vertical Assembly Building was converted to handle shuttle components, and renamed the Vehicle Assembly Building (VAB). The three mobile launchers used for the Saturns were modified to stack and carry the new vehicle, and Pads A and B were given new above-ground configurations.

Some new facilities were mandatory. A 3-mile-long landing strip was one of the first constructed. The orbiter would land at Kennedy after enough landing experience had been gained on the extra-long, dry lake beds at Edwards Air Force Base in California. A large, highly specialized two-bay building called the Orbiter Processing Facility was constructed near the Vehicle Assembly Building. A few years later, a similar building used as a refurbishment facility was upgraded to become the facility's Bay 3. Spacecraft checkout and assembly facilities were modified to process and integrate a large number of payloads each year. Many other modifications were required throughout the center. This rebuilding and conversion process became the main activity at Kennedy during the years following the Apollo-Soyuz flight.

Orbiter Atlantis begins backing out of the Orbiter Processing Facility for rollover to the Vehicle Assembly Building, where it will be mated with the external tank and solid rocket boosters for launch.

Space Shuttle Atlantis inches its way to the launch pad, in the background. The crawlerway leading to it (on the right) extends toward the horizon.

With a roll of thunder and riding a pillar of flame, Space Shuttle Discovery launches into the blue sky over America's Spaceport on mission STS-95. The flight was the second for Mercury astronaut John Glenn Jr. and his first on the space shuttle.

The first orbiter intended for space flight, Columbia, arrived at the Spaceport in March 1979. A great deal of work remained to be done. Both Kennedy and Johnson Space Center (the lead design agency) were very busy for the next 610 days in the Orbiter Processing Facility. They had to perform the remaining assembly work and a series of major modifications. The orbiter then spent another 35 days in the Vehicle Assembly Building and 105 days on Pad A, before finally lifting off on April 12, 1981. John Young and Robert Crippen became the first two astronauts to enter orbit in a reusable spacecraft and to land it like an airplane at the end of the mission.

The launch of the first space shuttle was a true milestone for KSC. The launch team had learned new checkout and launch procedures. Two entirely new sets of computers, called the Launch Processing System, had been installed in two of the old Apollo/Saturn V firing rooms in the Launch Control Center, and crews had been trained in their use.

Once the first space shuttle mission was over and the orbiter Columbia returned to Kennedy, the senter again went into high gear. One more space shuttle was launched in 1981, three in 1982, four in 1983, five in 1984, and nine in 1985 – the latter a total that had seemed unobtainable back in 1981.

As 1986 began, NASA was close to having the ability to launch a space shuttle every month, or 12 per year. There were four orbiters in the fleet: (in order of first flight) Columbia, Challenger, Discovery and Atlantis. Then, on Jan. 28, tragedy struck. The orbiter

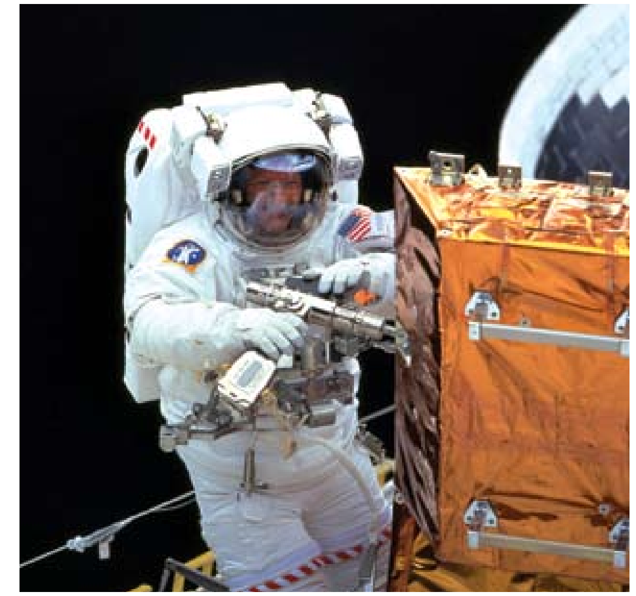
Challenger and its crew were lost during the launch of STS-51L, the 25th space shuttle mission.

The longest and most intensive investigation ever conducted by NASA up to that time indicated the primary culprit in the Challenger accident was an inadequate design of the field joints between the solid rocket booster segments. These were redesigned and retested. Many other critical flight systems were also re-examined and recertified at the same time.

The unique checkout and launch facilities at the Spaceport, and the detailed procedures and software that determined their operation, were all thoroughly reviewed and improved where necessary. It took 32 months before everyone was satisfied that the vehicle and its crew were now made as safe as humanly possible for space flight.

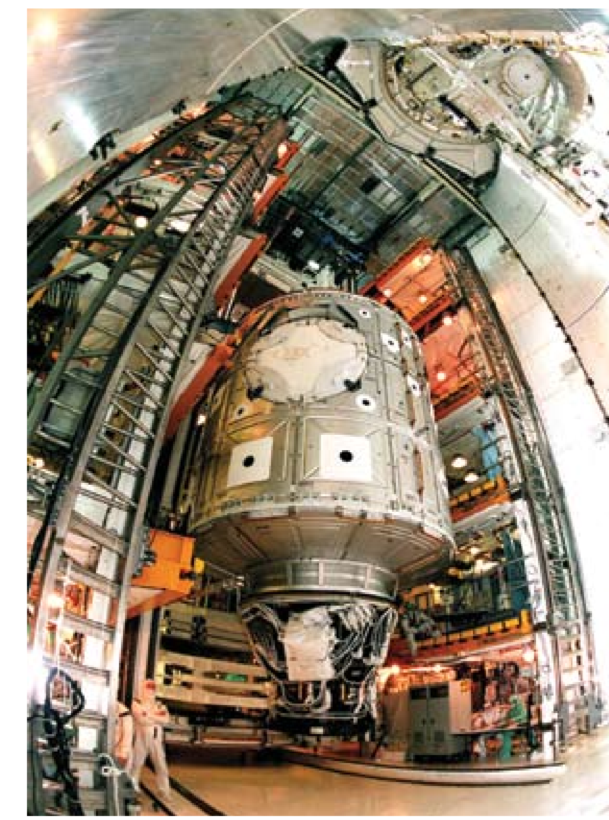
The space shuttle had just started fulfilling its promise of frequent and economical access to orbit before the Challenger accident. A large variety of scientific and commercial spacecraft had been launched. One expensive scientific spacecraft had been repaired in orbit, and two large commercial satellites were recovered from improper orbits and returned to the ground. Both were later re-launched and entered active service, saving their owners many millions of dollars compared to buying new spacecraft.

The space shuttle was becoming a true national and international asset, carrying into space student experiments, small business payloads and foreign payload specialists who accompanied their scientific experiments to perform them in orbit.



On a Hubble Servicing Mission (STS-103) in 1999, astronaut Claude Nicollier, mission specialist from the European Space Agency, works at a storage enclosure, using one of the Hubble power tools, during the second of three extravehicular activities.

The Hubble Space Telescope, a joint program of NASA and the European Space Agency, has made many contributions. The large telescope was launched in April 1990 aboard Discovery on the STS-31 mission. Hubble made the deepest look into the universe revealing thousands of galaxies, supporting the fact that the universe made most of its stars long ago (when the universe was one-tenth its present age), and that the vast majority of stars are only one-fifth the mass of our sun. Hubble also made the first surface map of the planet Pluto and discovered that massive black holes are common throughout the universe.



This wide-angle view shows the Unity connecting module being moved toward the payload bay of the orbiter Endeavour at Launch Pad 39A. Part of the International Space Station, Unity is a connecting passageway to the living and working areas of ISS. While on orbit, the flight crew deployed Unity from the payload bay and attached it to the Russian-built Zarya control module that was in orbit at that time.

The next major task for the space shuttle fleet, the assembly of a permanent manned space station, had already been authorized by President Ronald Reagan and the Congress in January 1984. But the problems that caused the loss of Challenger and its crew had to be found and corrected before space shuttles could fly again.

Space Transportation System (STS) 26 lifted off Sept. 27, 1988, with Discovery as the orbiter. The flight was completely successful. By 2003, space shuttles had flown 112 missions, more than four times the 24 safe flights that preceded Challenger's last flight, and had settled into a steady launch rate of about six times a year.

On Nov. 20, 1998, the Zarya Control Module, the first component in constructing the International space station, was launched. In the following four years, the space station grew to include the Russian-built service module, Zvezda; the U.S.-built Unity Node 1; the U.S. Laboratory Destiny; a Canadian-built robotic arm to aid in construction; and several trusses. In addition, Italian-built multi-purpose logistics modules began regular service as cargo modules, especially for experiments. The date Nov. 2, 2000, marked the first human presence on the space station with the three-person crew of Commander Bill Shepherd, Soyuz Commander Yuri Gidzenko and Flight Engineer Sergei Krikalev.

Thus, NASA's goal of steady progress toward living and working on the new frontier of space began.

Since the October 2000 launch, there has been permanent human presence on the space station.

On Feb. 1, 2003, another tragedy struck: The flagship of the fleet, Columbia, was lost along with its crew of seven on its return to Kennedy Space Center from mission STS-107. A yearlong formal investigation followed. The Columbia Accident Investigation Board (CAIB) report in 2004 concluded:

The physical cause of the loss of Columbia and its crew was a breach in the Thermal Protection System on the leading edge of the left wing, caused by a piece of insulating foam which separated from the left bipod ramp section of the External Tank at 81.7 seconds after launch, and struck the wing in the vicinity of the lower half of Reinforced Carbon-Carbon panel number 8. During re-entry, this breach in the Thermal Protection System allowed superheated air to penetrate through the leading edge insulation and progressively melt the aluminum structure of the left wing, resulting in a weakening of the structure until increasing aerodynamic forces caused loss of control, failure of the wing, and break-up of the orbiter.

KSC adopted the recommendations of the CAIB for improving safety, and worked for an expected return to flight in 2005. On July 26, 2005, Space Shuttle Discovery was launched with a crew of seven to the International Space Station. After a successful 13-day mission that included testing camera views around the outside of the orbiter, Discovery returned to Earth. It landed at Edwards Air Force Base in California August 9, 2005.

Space Shuttle Discovery, atop a modified Boeing 747 Shuttle Carrier Aircraft, is towed to the mate/demate device at NASA Kennedy Space Center's Shuttle Landing Facility following touchdown on runway 15 on Aug. 21, 2005. The cross-country ferry flight became necessary when two days of unfavorable weather conditions at KSC forced Discovery to land at Edwards Air Force Base, California, on Aug. 9 following mission STS-114.

Unmanned Space Missions

For more than 30 years, NASA's unmanned space programs compiled an enviable record of achievement in space science and applications. During this span, more than 300 launches were conducted for programs ranging from solar system exploration to improved weather forecasting, global communications and Earth resources studies. These projects, which have more than repaid the nation's investment in time, money and technical talent, depended on the development and evolution of a varied fleet of unmanned rockets.

The origins of this fleet were primarily military. When NASA was created in October 1958, it lacked the launch vehicles and facilities to carry out its mandate to explore space, and drew heavily on rocket systems under development by the armed services.

During its first year of operation, for instance, NASA awarded a contract to McDonnell Douglas to upgrade the Thor-Able missile, developed under Air Force management, to become the Thor-Able-Delta launch vehicle – later known simply as the Delta. A group of employees from the Naval Research Laboratory had been at the Cape for some time, launching the early Vanguard vehicles that placed America's second satellite into orbit. With the establishment of NASA, this group became the Launch Operations Branch of the Goddard Space Flight Center, and later formed the nucleus of the "Unmanned Launch Operations" directorate of the Kennedy Space Center. Another early launch team, from Goddard, was responsible for the engineering management and configuration control of the Delta vehicle. In 1965, this team also was phased over into Kennedy.

Workers on Launch Pad 17-B, Cape Canaveral Air Force Station, complete mating of the Mars Exploration Rover 1 (MER-B) above, to the Boeing Delta rocket below. The second of twin rovers sent to Mars, it is equipped with a robotic arm, a drilling tool, three spectrometers, and four pairs of cameras that allow it to have a human-like, 3-D view of the terrain. The rovers landed safely on Mars in 2004 and lasted much longer than the three months originally planned for. They provided spectacular views and data that is still being analyzed.

At Launch Pad 36-A, Cape Canaveral Air Force Station, a Centaur upper stage is mated to the lower stage Lockheed Martin Atlas IIA rocket. The rocket is scheduled to launch a NASA GOES satellite.

The upgraded Thor-Able vehicle soon acquired the reputation of being "Dependable Delta." By the end of 1989, more than 180 had been launched by NASA, from facilities on Cape Canaveral and at Vandenberg Air Force Base in California. This was more than all other vehicles of an equivalent size combined. The Delta has been continuously upgraded over the years.

Delta II rockets can be configured as two- or three-stage launch vehicles with three, four or nine strap-on solid rocket boosters and two sizes of payload fairings, depending on mission requirements. Delta II rockets can carry payloads ranging from 1,965 to 4,723 pounds to geosynchronous transfer orbit (GTO), and 5,934 to 13,281 pounds to low-Earth orbit. Two-stage Delta II rockets typically fly low-Earth orbit missions, while three-stage Delta II vehicles generally deliver payloads to GTO or are used for deep space and planetary exploration missions.

The Delta IV is the most advanced family of launch vehicles developed by The Boeing Company in partnership with the U.S. Air Force Evolved Expendable Launch Vehicle program. Delta IV rockets can accommodate single or multiple payloads on the same mission and can carry satellites weighing between 9,285 pounds and 28,950 pounds to GTO. Delta IV rockets can also launch satellites to polar orbits, sun-synchronous orbits and the International Space Station orbit with the capability to lift more than 50,000 pounds to low-Earth orbit.

NASA also adopted another Air Force-developed stage, the Agena, and combined it with a Thor first stage. This was the first NASA vehicle launched from Vandenberg AFB, and the first to have solid motors strapped to the outside of the first stage for extra power. NASA launched a total of 12 Thor-Agenas from the West Coast. The Agena was also adapted to fly on top of an Atlas booster, creating a larger and more powerful combination than either of the other two. This vehicle performed well for many missions, but was eventually phased out in favor of a still more powerful combination, the Atlas booster and a new stage called Centaur.

Developed under NASA contract by General Dynamics, builder of the Atlas, Centaur was the first stage to use liquid hydrogen for its fuel. Liquid oxygen remained the choice for the oxidizer. Centaur uses very high-performing engines, and its pressure-stabilized, thin-wall, stainless-steel design is the most weight efficient in the world.

After the last Atlas-Agena was launched in March 1968, the Delta and the Atlas-Centaur became the standard unmanned launch vehicles for NASA. One test flight and six operational launches were conducted of a new, more powerful vehicle, a combination of Titan and Centaur. The latter was needed to launch two Helios spacecraft to the sun, two unusually heavy Vikings to Mars, and two Voyagers to the outer giant gas planets.

Unmanned Launch Operations continued to place the large majority of spacecraft in orbit until the space shuttle became operational. As the new system matured, many payloads were shifted from unmanned launch vehicles to the space shuttle. But after the loss of Challenger and its crew, the decision was made to reserve the space shuttle primarily for scientific spacecraft. Responsibility for the launch of the Delta, Titan and Atlas-Centaur vehicles was assumed extensively by their manufacturers and the U.S. Air Force. All three vehicles have been used to launch payloads for the Air Force, NASA and commercial customers on a contract basis.

Automated spacecraft have performed some of the most spectacular feats of the American space program. Surveyors landed softly on the moon, helping to pave the way for later Apollo missions. Mariners provided detailed photographs of the cloud-tops of Venus and the surfaces of Mars and Mercury. Two Viking Landers descended to the surface of Mars and searched for evidence of life, while two orbiters mapped almost the entire planet from overhead. Two Pioneers went to Jupiter, and one flew onward to Saturn. Two much larger Voyager spacecraft followed them to both planets, and one of these has now visited Uranus and Neptune as well.

NASA's ambitious plan to send spacecraft to Mars was realized with the November 1996 Mars Global Surveyor project, which studied the planet's surface, atmosphere, and gravitational and magnetic fields. One month later, the Mars Pathfinder delivered the rover, named Sojourner, to Mars' surface to study and record data about ancient rocks. The Cassini satellite arrived at Saturn in July 2004.

In June and July of 2003, two Mars Exploration Rovers, named Spirit and Opportunity, were launched from Cape Canaveral Air Force Station aboard Delta II rockets. Both reached Mars in January 2004. The mission of the two identical rovers was to develop the history of climate and water at two sites on Mars, where conditions may once have been favorable to

Protected by its gantry, a Delta rocket awaits launch under leaden skies at Complex 17. It later hurled a GOES weather satellite into a geostationary orbit. Three of the Delta's five strap-on solid rocket boosters are visible in this photo.

The salmon sky and red, boulder-strewn expanse of Mars' Utopian Plain, as seen by the camera of NASA s Viking 2 lander shortly after setting down on the planet's surface Sept. 3, 1976. Portions of the lander are in the foreground. Unmanned exploration of the solar system is one of the most exciting and scientifically rewarding aspects of the nation's space program.

The unmistakable swirl of a monster hurricane straddles the Gulf of Mexico, bound for the Mississippi and Louisiana coastlines. Photographs taken from space help meteorologists track dangerous storms and add a new dimension to accurate weather forecasting.

life. They navigated around obstacles while driving across the Martian surface, traveling up to about 130 feet each Martian day.

By far, however, the largest number of unmanned spacecraft have remained in orbit around the Earth. So many communications, weather and other types of satellites have crowded into geosynchronous orbit – that region above the equator at about 22,240 miles altitude, where a velocity of 6,878 miles an hour toward the east will keep a satellite apparently motionless in the sky – that international agreements have had to be worked out on assigning spaces. Weather and other Earth-observation satellites patrol our planet steadily in north-south polar orbits. Scientific explorers in many types of orbits have returned a wealth of information that could not have been obtained in any other way.

The two gantries of Launch Complex 36 (foreground), where Atlas rockets are launched, still stand on the easternmost point of Cape Canaveral. But the gantries in a line extending north from the right-hand pad in this 1964 photograph have mostly been dismantled. Corrosion from the salt air weakened the steel structures until they were no longer safe.

The following table lists some of the more notable spacecraft launched by the Kennedy teams, with brief descriptions of the results.

Launch Spacecraft	Date	Mission Description/Results
TIROS 1	4/1/60	Relayed thousands of cloud pictures, demonstrating thefeasibility of satellite observations in weather forecasting.
Mariner 2	8/27/62	First U.S. interplanetary probe to reach the planet Venus.
Syncom 2	7/26/63	First communications satellite in geosynchronous orbit; proved out the concept widely used today.
Ranger 7	7/28/64	First U.S. spacecraft to impact on the Moon; returned a series of photos and other data.
Intelsat 1 (Early Bird)	4/6/65	First international communications satellite. Intelsat grew to become largest international carrier in history.
Surveyor 1	5/30/66	Performed first U.S. soft landing on the Moon, sending back thousands of excellent surface photographs.
Mariner Mars 6	2/24/69	Passed within 3,220 km (2,000 miles) of Mars' equatorial region, returning the first good photographs for the U.S.
Pioneer 10	3/2/72	Performed flyby of Jupiter, returning first close-up photographs and measuring radiation emissions.
LANDSAT 1	7/23/72	First satellite to perform major assessment of Earth resources from outer space.
Pioneer 11	4/5/73	Performed flyby of Jupiter and first flyby of Saturn.
Mariner Venus/ Mercury	11/3/73	Performed a flyby of Venus,then continued on to Mercury and completed the first three flybys of that planet.
Helios 1	12/10/74	Approached the Sun to within outer solar corona and took density, temperature, velocity,and magnetic field measurements.
Viking 1	8/20/75	Placed an orbiter in orbit around Mars and a lander on the surface; obtained voluminous data in a search for life.
GOES 1	10/16/75	First weather satellite to photograph complete disk of the Earth every 30 minutes from geosynchronous orbit.
PALAPA 1	7/8/76	First geosynchronous orbit domestic communications satellite in Southeast Asia. PALAPAs now also serve Thailand, Singapore, and Malaysia.
Voyager 2	9/5/77	Performed flybys of Jupiter, Saturn,Uranus and Neptune,and some of their moons.
Pioneer Venus Orbiter	5/20/78	Placed in orbit around Venus to study the atmosphere and surface; compiled radar maps of surface features.
Pioneer Venus Multiprobe	8/8/78	Sent four probes into the Venusian atmosphere five days after the Orbiter arrived; returned much useful data.
International Sun-Earth Explorer (ISEE)	8/12/78	Third International Sun-Earth Explorer; examined solar wind and its interaction with Earth's magnetosphere. Renamed International Cometary Explorer (ICE) and redirected in 1983 to make the first flyby of a comet —Giacobini-Zinner-on Sept.11,1985.
HEAO 2	11/13/78	Examined selected x-ray astronomcal sources in detail with the largest Xray telescope ever made.
Infrared Astronomical Satellite (IRAS)	1/25/83	Made first detailed infrared examination of the universe; discovered new stars being born and possible evolution of new planetary systems.
COBE	11/18/89	Measured the diffuse infrared and microwave radiation from the early universe to the limits set by our astrophysical environment.
SOHO	12/3/95	Gathered data on the internal structure and outer atmosphere of the sun, and on the origin of the solar wind.
NEAR	2/17/96	Conducted the first long-term, close-up look of an asteroid's surface. For a year, NEAR studied Eros' physical properties.
Mars Global Surveyor	11/7/96	Conducted a global mapping of Mars by studying the planet's surface, atmosphere, and gravitational and magnetic fields.
Mars Pathfinder	12/4/96	Delivered a lander and small robotic rover, Sojourner, to Mars' surface to study and record data about ancient rocks.
Cassini	10/15/97	Cassini used gravity-assist flybys of the planets Venus and Jupiter, then arrived at Saturn in July 2004.
Lunar Prospector	1/6/98	Provided the first global maps of the Moon's surface elements and its gravitational and magnetic fields.
Stardust	2/7/99	Brought comet material back to earth and collected interstellar dust.
EOS/TERRA	12/18/99	Consisted of a science component and a data system supporting a coordinated series of polar-orbiting and low-inclination satellites for long-term global observations of the land surface, biosphere, solid Earth, atmosphere, and oceans.
GOES I-M	1994-2001	NASA-developed payload for the National Oceanic and Atmospheric Administration (NOAA); launch vehicle services contract. Launched into geosynchronous Earth orbit.
Mars Exploration Rover **Spirit** **Opportunity**	 6/10/03 7/6/03	The two identical spacecraft reached Mars in January 2004, landing at two sites to explore farther and examine rocks better than anything that has ever landed on Mars.
SCISAT-1	8/12/03	The SCISAT-1 spacecraft investigated chemical processes that control the distribution of ozone in the Earth's atmosphere, particularly at high altitudes.
Space Infrared Telescope Facility (SIRTF)	8/25/03	Fourth and last of the Great Observatories, the telescope is obtaining images and spectra by detecting the infrared energy, or heat, radiated by objects in space.

A Place to Visit

Exciting, educational exhibits. Peaceful nature trails. Pristine seashores. The nation's only manned vehicle Spaceport, and one of Central Florida's most popular tourist destinations, Kennedy Space Center offers visitors a wide variety of things to see and do.

Each year, more than 2.2 million guests from around the world explore the past, present and future of America's space program at the Kennedy Space Center Visitor Complex. Since 1995, every aspect of this 70-acre facility has been entirely redeveloped and enhanced, offering guests a high-quality, full-day space experience.

The KSC Tour takes guests on a narrated tour with self-paced stops at the Launch Complex-39 observation gantry, where they view space shuttle launch pads; the Apollo/Saturn V Center, where they relive the launch of Apollo 8 from mission control, walk beneath a massive Saturn V rocket, touch a moon rock and enjoy "front row seats" as a human lands on the moon; then drive by the Vehicle Assembly Building and Orbitor Processing Facility.

Special interest tours are also available. "NASA Up Close" highlights space shuttle processing and launch facilities. Wildlife tours are available to groups of 10 or more when arranged in advance.

In addition to its tours, the KSC Visitor Complex offers a variety of programs, exhibits and films. The live-action stage show, Mad Mission to Mars 2025, takes guests on an action-filled adventure to the Red Planet. The Visitor Complex's daily Astronaut Encounter program aims at inspiring children to pursue academic excellence. It is the only place in the world where children and families may come face to face every day with a real astronaut. New exhibits such as Exploration in the New Millennium, Early Space Exploration and Robot Scouts complement long-time favorites such as the Rocket Garden and Shuttle Plaza. Visitors are also encouraged to watch five-story-tall space films at the world's only back-to-back IMAX® theaters.

The KSC Visitor Complex is located 45 minutes east of Orlando on S.R. 405 (accessible from U.S. Highway 1, S.R. 3 and I-95). The Visitor Complex is operated for NASA by Delaware North Parks Services of Spaceport, Inc. For more information, call (321) 449-4444 or visit **www.kennedyspacecenter.com**.

The Rocket Garden at the KSC Visitor Complex features eight authentic rockets from the past, including a Mercury-Atlas rocket. The garden also features a climb-in Mercury, Gemino and Apollo capsule replicas, seating pods and informative graphic elements.

The KSC Visitor Complex is accessible to the public and open for business every day of the year except Christmas and certain launch days.

The Educator Resource Center, located in the Center for Space Education at KSC Visitor Complex, provides extensive facilities to aid teachers in the preparation of aerospace-related teaching materials. These include a large number of aerospace publications, videotapes, 35mm slides, text data and computer programs that can be copied on site.

The Exploration Station, also in the Center for Space Education, provides educational programs and hands-on, stimulating activities that illustrate and explain the principles of rocketry and space science. Students often work with actual hardware used for space missions. For more information about the Educator Resource Center or the Exploration Center, or to make reservations, call (321) 867-4090.

To find out more about NASA KSC education programs, visit **http://www-pao.ksc.nasa.gov/kscpao/educate/edu.htm**.

The "other side" of America's Spaceport is less known, perhaps, but an equally treasured national asset. Under agreements between NASA and the Department of Interior, all but the operational areas of the Kennedy Space Center are designated as the Merritt Island National Wildlife Refuge, including 25 miles of undeveloped ocean beach that forms the Canaveral National Seashore.

This gentle but untamed land swarms with wildlife. More than 500 species of birds, mammals, reptiles and amphibians are found here. Some, like the American bald eagle, wood stork, alligator and the ponderous manatee, or sea cow, are on the endangered or threatened species list.

Recreational activities abound: freshwater and surf fishing, waterfowl hunting in season, bird-watching, swimming at the ocean beaches, canoeing, and hiking nature trails.

Most of the refuge and all of the seashore are open to visitors during daylight hours, except when space operations require closure. Seashore headquarters are located in nearby Titusville. A wildlife refuge visitors center is located east of Titusville, on S.R. 402.

This snowy egret is spotted near the Kennedy Space Center.

The Canaveral National Seashore is an unspoiled mecca for swimming, sunbathing and surf-fishing.

Many important scientific and commercial spacecraft have been launched on space shuttles since the first flight in 1981, including a number of interplanetary explorers. Among the more notable scientific spacecraft was Magellan, which used radar to map the surface of Venus, providing excellent profiles of this cloud-shrouded planet. The Hubble Space Telescope was launched into Earth orbit in April 1990 and became the most powerful telescope in history. The Compton Gamma Ray Observatory, launched in April 1991 and also in Earth orbit, is the largest telescope to operate in this very high energy range. Ulysses looped around Jupiter and out of the planetary plane, becoming the first spacecraft to directly examine the south and north poles of the sun. The Galileo mission sent a probe plunging into Jupiter, while an orbiter analyzed both this giant planet and several of its largest moons from space.

The Earth-orbiting Chandra X-Ray Observatory launched in July 1999 was designed to make astrophysical observations of celestial objects from normal stars to quasars, allowing scientists to understand the nature of physical processes that take place within astronomical objects, and understand the history and evolution of the universe.

The Space Infrared Telescope Facility, launched in August 2003, was designed to obtain images and spectra by detecting the infrared energy, or heat, radiated by objects in space. Now named Spitzer, the largest infrared telescope ever launched into space is the fourth and final element in NASA's family of orbiting "Great Observatories." Its highly sensitive instruments give a unique view of the universe and peer into regions of space that are hidden from optical telescopes.

On the commercial side, satellite communications now provide several billion dollars in revenue each year, and continue to steadily grow. These spacecraft fly primarily on unmanned vehicles but the space shuttle did place several in orbit. The ability of a single transponder (on a satellite often providing 30 or more) to bring television into every home in most countries is unique to the space program. Satellite observations and the data they produce, such as from the Geostationary Operational Environmental Satellites, greatly improve the ability of meteorologists to make more accurate and longer-range weather forecasts. And Earth resources spacecraft provide powerful tools to help in locating new mineral and water resources, as well as measuring the effects of human activities on land and sea.

Backdropped against water and clouds on March 18, 2001, the International Space Station is separated from Space Shuttle Discovery after several days of activities and an important crew exchange. One of the astronauts aboard Discovery took this photograph from the aft flight deck.

A major program, "Mission to Planet Earth," operated economical new satellites with greatly improved capabilities to observe, monitor and analyze Earth's very complex environment. This includes gaining a better understanding of the relationships between solar radiation and Earth's atmosphere, and tracking the ozone layer and the "ozone hole" over Antarctica. The Earth Observing System and National Oceanic and Atmospheric Administration satellites have been instrumental in expanding the available data on Earth's environment.

Many other commercial and scientific spacecraft were launched into Earth orbit by space shuttles and unmanned vehicles. Hundreds of human-tended experiments have been conducted in the microgravity of orbit, including international crews performing several Spacelab and shuttle missions.

In 1995 NASA astronauts began rotating assignments on the Russian space station Mir, with space shuttles docking with Mir on a regular basis. This continued until the International Space Station welcomed its first permanent crew Nov. 2, 2000. The space station is the largest construction project ever attempted. The United States and its partners in Europe, Japan, Russia and Canada are assembling this facility in orbit. There has been continuous occupation of the space station since 2000, with rotating crew assignments.

The station greatly improves our ability to utilize the space environment for the benefit of humanity. Shuttle-transported elements brought to KSC for future payloads are first checked out in the 457,000-square-foot Space Station Processing Facility in the KSC Industrial Area. By late 2002, more than nine elements had been processed, launched and assembled in space, including the Unity Node 1, U.S. Lab Destiny, Russian modules Zarya and Zvezda, various truss segments and pressurized mating adapters, plus the Canadian remote manipulator system needed to continue construction.

Multi-purpose logistics modules, built by the Italian Space Agency, have enabled transporting of experiments to the U.S. Lab plus needed supplies and equipment. The first crews set up residence for three to six months in duration. By 2004, a total of 18 space shuttle flights had supported the space station and nine Expedition crews had called it home.

Two probes, the Mars Global Surveyor and Mars Pathfinder, were launched in late 1996. Two additional orbiters were launched in late 1998 and early 1999 but were lost after arrival at Mars. The Mars Odyssey spacecraft was successfully launched in 2001 and was designed to map the Martian surface. Cassini was launched in 1997 on a four-year mission to explore Saturn, its rings and moons. The Mars Exploration Rovers were launched in 2003 to determine the history of the climate and water on Mars.

Unmanned interplanetary exploration will continue, with highly sophisticated spacecraft launched on expendable vehicles.

Following completion of space station assembly, the space shuttle fleet will retire.

Then begins a new era: to the moon, Mars and beyond.

Discovery's robot arm lifts the Hubble Space Telescope out of the payload bay after a successful servicing mission, STS-103, in December 1999.

A New Era: the Moon, Mars and Beyond

On Jan. 14, 2004, President George W. Bush announced the vision for space exploration:

To advance U.S. scientific, security and economic interests through a robust space exploration program. In support of this goal, the U.S. will:

- Implement a sustained and affordable human and robotic program to explore the solar system and beyond;
- Extend human presence across the solar system, starting with a human return to the moon by the year 2020, in preparation for human exploration of Mars and other destinations;
- Develop the innovative technologies, knowledge and infrastructures both to explore and to support decisions about the destinations for human exploration; and
- Promote international and commercial participation in exploration to further U.S. scientific, security and economic interests.

The same day, the Office of Exploration Systems was established to set priorities and direct the identification, development and validation of exploration systems and related technologies for the agency.

NASA plans to initiate a series of robotic missions in preparation for future human exploration activities. Some of these prospects include sending the first human expedition to the moon, and using the distinctive lunar surface to prepare for sustained human space exploration to Mars and other destinations.

To study the solar system's history and search for evidence of life, specific projects are in development.

Robotic explorations will focus primarily on Mars, the moons of Earth and Jupiter, asteroids and other bodies. NASA will use advanced telescopes to search for Earth-like planets and habitable environments around other stars.

To conduct this work, NASA will develop and demonstrate the power and life support needed to conduct longer-duration human and robotic missions.

Finally, with the acquired knowledge from robotic, human exploration and moon missions, humans will venture to Mars.

Maintaining the strong partnership history that supports U.S. space exploration goals, the agency will pursue opportunities for international and commercial participation as well.

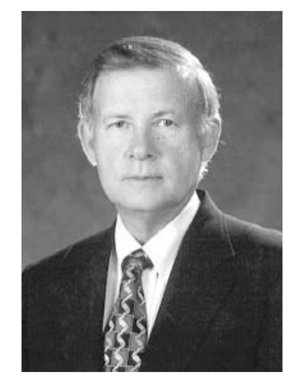
Since the creation of NASA in October 1958, the Kennedy Space Center has pioneered in developing the launch procedures, facilities, equipment and skills needed to place and keep the United States in space. Whatever the future holds, the space program will depend in large part on the unique experience and resources of the people of KSC.

Directors of the Kennedy Space Center

National Aeronautics and Space Administration
John F. Kennedy Space Center

James W. Kennedy
2003 - Present

Roy D. Bridges Jr.
1997 - 2003



Jay F. Honeycutt
1995 - 1997

Robert L. Crippen
1992 - 1995

Lt. Gen. Forrest S. McCartney
1986 – 1991

Richard G. Smith
1979 - 1986

Lee R. Scherer
1974 - 1979

Dr. Kurt H. Debus
1961 - 1974