NPS Form 10-900
(7-81)

NATIONAL HISTORIC LANDMARK FEDERAL AGENCY NOMINATION
REVISED SEPTEMBER 1, 1983

**United States Department of the Interior**
National Park Service

# National Register of Historic Places Inventory—Nomination Form

See instructions in *How to Complete National Register Forms*
Type all entries—complete applicable sections

| For NPS use only |
|---|
| received |
| date entered |

## 1. Name

historic Cape Canaveral Air Force Station

and/or common Cape Canaveral

## 2. Location

street & number Cape Canaveral Air Force Station ___ not for publication

city, town ___ vicinity of congressional district City of Cape Canaveral

state Florida code county Brevard code

## 3. Classification

| Category | Ownership | Status | Present Use | |
|---|---|---|---|---|
| _x_ district | _x_ public | _x_ occupied | ___ agriculture | _x_ museum |
| ___ building(s) | ___ private | ___ unoccupied | ___ commercial | ___ park |
| ___ structure | ___ both | ___ work in progress | ___ educational | ___ private residence |
| ___ site | **Public Acquisition** | **Accessible** | ___ entertainment | ___ religious |
| ___ object | ___ in process | _x_ yes: restricted | _x_ government | ___ scientific |
| | ___ being considered | ___ yes: unrestricted | ___ industrial | ___ transportation |
| | | ___ no | _x_ military | ___ other: |

## 4. Owner of Property

name U.S. Government

street & number HQ ESMC/ETR Patrick Air Force Base

city, town Cocoa Beach ___ vicinity of state Florida

## 5. Location of Legal Description

courthouse, registry of deeds, etc. Brevard County Courthouse

street & number

city, town Titusville state Florida

## 6. Representation in Existing Surveys

title NONE has this property been determined eligible? ___ yes ___ no

date ___ federal ___ state ___ county ___ local

depository for survey records

city, town state

# 7. Description

| Condition | | Check one | Check one |
|---|---|---|---|
| X excellent | X deteriorated | X unaltered | X original site |
| X good | X ruins | X altered | ___ moved date _____ |
| X fair | ___ unexposed | | |

Detailed description of nominated pads is given below.

**Describe the present and original (if known) physical appearance**

This National Historic Landmark Nomination is a revised form prepared at the direction of the Secretary of the Interior's Advisory Board to reflect an agreement between the National Park Service, the United States Air Force and the Board as to what facilities are nationally significant and can be designated at the present time. The omission of other facilities at Cape Canaveral Air Force Station does not preclude their being designated as nationally significant at some future time. The National Historic Landmark District encompasses a series of discontiguous properties immediately surrounding each designated launch pad. The enclosed map prepared by the United States Air Force indicates the boundaries of these properties. It was the consensus of the Board that the designation of these facilities should not interfere with the mission of the United States Air Force at Cape Canaveral Air Force Station. At the direction of the United States Air Force only properties being nominated for National Historic Landmark status are described.

Photographs and additional maps can be found in the original Cape Canaveral Air Force Station National Historic Landmark Study.

Cape Canaveral Air Force Station (CCAFS) is on the east coast of Florida, in Brevard County, about 155 miles south of Jacksonville. The station occupies 15,804 acres of land, of which 15,375 acres are owned in fee and the balance acquired through leases, licenses, permits, and rights-of-way easements.

In 1947, CCAFS was elected as the site for a U.S. Missile Testing Range and construction began in 1950. The first missile, a German V-2 rocket with an Army WAC, Corporal second stage, was launched from the Cape on July 24, 1950.

Continuous advancement in technology made possible the launching of the NASA Saturn IB in 1961, the Air Force Titan III in 1974, and the Navy Trident missile which began testing in 1977.

The Cape has 73 miles of paved roads connecting the various launch and support facilities with the centralized Industrial Area. Thirty-three launch complexes have been constructed on the Cape, but only 7 are still active missile launch sites.

A 10,000-foot long skid strip was built in 1952 to support aerodynamic missile recovery operations, but is now primarily used as an airstrip for logistic and test support purposes.

The development of this station as a missile test center has produced an installation that is unique with respect to other Air Force installations. The operation areas, launch facilities, instrumentation, utility, and communications systems which have evolved are as distinctive and almost as numerous as the programs they were developed to support.[1]

At the present there are hundreds of existing facilities at Cape Canaveral Air Force Station. Many of these facilities were associated with now completed missile testing and space exploration programs and are abandoned. A list of facilities still in use by the Air Force and NASA is given below:

COMMON NAME

Cafeteria (1748)
Central Computer Complex (49639)
Central Heating Plant (55055)
Command Control (81585)
Communications Receiver (1102)

DASO Data Support Bldg (90302)
Delta Spin Test (67900)
Defense Prop Disp Office (DPDO)
Dispensary (49635)
East Cable Terminal Bldg (1532)

Fire Station (1608)
Fuel Storage Area #1 (Liquids)
Fuel Storage Area #2 (Solids)
Fuel Storage Area #3 (Solids)
Headquarters CCAFS (1733)

Heliport (49620)
Industrial Area
JPL Explosive Safe Facility
Launch Complex 16
Launch Complex 17 (1270)

Launch Complex 25 (1114)
Launch Complex 29 (1131)
Launch Complex 36 (5500)
Launch Complex 40 (47100)
Launch Complex 41 (29100)

Launch Complex 43 (300)
Liq. Propellant Disposal (80700)
Museum (AF Space Museum) (1275)
Museum (NASA Space Museum) (1207)
North Cable Terminal Bldg (1664)

North Cape Substation (60602)
Physical Standards Lab (1724)
Polaris/Poseidon/Trident Areas
Port Area
Press Site, Complex 34 BH (29100A)

Range Communications (X-Y) Bldg (1641)
Range Control Center (1645)
Sanitary Landfill (23600)
Satellite Assembly Bldg (49904)
Security Police Bldg (1638)

Sewage Treatment Plant (1798)
Skid Strip (50305)
South Cable Terminal Bldg (1307)
South Cape Substation (1002)
South Port Cable Terminal Bldg (89002)

SW Cable Terminal Bldg (78150)
TV Operations Bldg (1663)
Timing Tower UHF (54710)
Titan III Area
Waste Hydrocarbon Disp. Fac. (18410)

Water Pump Station #1 (40906)
Water Pump Station #4 (1660)
Water Pump Station #6 (70520)
Water Pump Station #7 (29150)
Weather Station (1383) [2]

A list of all existing facilities with accompanying maps can be found in Appendix A at the rear of the original report.[3]

A list of all launch sites at Cape Canaveral Air Force Station including their historical use and current status can be found in Appendix B at the rear of the original report.[4]

Cape Canaveral Air Force Station is unique for its contribution to both the manned and unmanned Space Program of the United States.

At the direction of the Secretary of the Interior's Advisory Board the following facilities at Cape Canaveral Air Force Station have been found to be nationally significant because of their contribution to the manned and unmanned space program of the United States of America:

Launch Complex 5/6

Complex 5/6 is a dual-pad facility with a shared blockhouse. It was constructed in 1955 for the Redstone missile testing program and was subsequently used to launch the Jupiter C, Juno 1, Juno II, and Mercury/Redstone missiles. Explorers 3, 4, 5, and 7 were launched from pad 5 by Juno II vehicles. All of the Mercury/Redstone suborbital flights, both manned and unmanned, were launched from complex 5/6, the most famous being the launch of Alan Shepard in "Freedom 7" on May 5, 1961, and the launch of Gus Grissom in "Liberty Bell 7" on July 21, 1961. These launches were under the control of a NASA team headed by Dr. Kurt H. Debus.

During the Apollo program, the complex was programmed to be the launch site of the Little Joe II rocket, however, it was never modified for this purpose. The blockhouse now houses a small NASA Space Museum.[7]

The Redstone Service Tower used at 5/6 evolved out of efforts to provide a more economical and versatile structure than the gantries used by the Germans in V-2 experiments in World War II. A reclining type single-mast structure with cantilevered access platforms capable of encircling the missile was determined to be the most advantageous device for Redstone. An "A" frame mast, as the backbone supporting the cantilevered access work platforms, towered 140 feet above the launch pad. The mast was supported by a large structural steel base, mounted on railway tracks and capable of moving under its own power to and from the missile.

Elevators traveled up and down the mast, with stops at various work-levels, to a 15-ton hammerhead crane mounted at the top of the structure. Modeled on the open-faced masts used in oil fields, the Redstone service tower was built by Noble Company of Oakland, California, transported to Cape Canaveral in 14 railway cars, and reassembled at the launch site (by seven Noble men, within five days after delivery) and made immediately available to service Redstone's maiden voyage.[8]

Originally, Complex 5/6 had a segment of railroad track on which its gantry rode from pad 5 to pad 6, which was interconnected with Complex 26 so that the gantries could be interchanged as needed. Only the Complex 26 gantry remains, and the tracks and roadbed of both complexes have been torn up for use elsewhere.

The principal structure at Complex 5/6 is the blockhouse which served both launch pads and has two rooms facing diagonally northeast and southeast. Being of extremely thick, hardened and reinforced concrete, with two thick safety glass windows, there is little corrosion aside from possible rusting of the blast doors. The other structures are built similarly of concrete and have heavy steel fittings.

The rooms adjacent and connected to the blockhouse by a breezeway roof were originally used as "ready rooms," plus kitchen and office space. They are within a concrete block wall and have a built-up tar and gravel roof. This structure is in good condition and is used, for a briefing room, records storage, and office space.[9]

Complex 5/6 and the NASA Space Museum are now grouped with launch complex 26 and the Air Force Space Museum. [10]

The Air Force Space Museum at complex 26, including the blockhouse, an exhibit hall, and an outdoor rocket exhibit area, is part of the Kennedy Space Center tour. The museum collection contains old and modern missiles, including the Atlas, Thor, Titan, Jupiter, and many others. More than 70 missiles representing all stages of rocket development are on display. The displays have been prepared by the Air Force, NASA, companies, and individual volunteers.

Launch Complex 26

Associated with complex 5/6 is launch complex 26. This complex is a dual-pad, single blockhouse complex that was constructed for the Redstone research and development program. It was later used for Jupiter research and development and was then modified for the launching of the Juno I and II missiles. Explorer I, the first U.S. satellite, was launched by a Juno I rocket from pad 26B on January 31, 1958, and many other early NASA launches in the Explorer series were launched there. Pad 26A was the site of the launch of primates Ham, Gordo, Able, and Baker in tests that paved the way for Alan Shepard's Mercury suborbital flight. Pad 26B still contains the original service structure, blockhouse, and most of the equipment used in the early launches. Launch complex 26 was used until 1963 as part of the NATO training program for Italian and Turkish missile crews deploying the Jupiter missile.[11]

The Service Structure at launch pad 5/6 was demolished sometime ago. The existing service structure at launch pad 26B is identical to that used at 5/6. The blockhouses at 5/6 and 26 are identical reinforced-concrete structures shaped like arrows facing their pads. Blockhouse 26 is the only known blockhouse to have had an abortive launch fall on it (there was some minor damage but no injuries). Both blockhouses have some launch equipment in the firing rooms and displays in their outer passages.

The service structure at 26B was painted approximately 10 years ago. It currently is fenced off to keep people from accidently being hit by pieces of flying metal that periodically blow off the structure during high winds. These pieces of metal are separated from the structure by corrosion of the floor members, grating, and railings. The main structural members of the service

structure are in reasonable shape but will need attention soon, especially at connection points. The most severe problem is the rusting out of secondary members for flooring and railings and the floor grating itself. In addition, equipment room walls, floor, and roof made up of steel plate are corroded through in places. If corrective measures are not undertaken soon, the extent of secondary member loss coupled with primary member connection risk will make the structure unsafe.[12]

Launch Complex 26 was constructed in 1957. By mutual Air Force/NASA agreement all structures on both complexes are painted blue. The Armed Services and NASA have donated artifacts to the museum which are obsolete. Many of the displays were prepared by volunteers. One final note, the Explorer I satellite in front of the Air Force Space Museum is the original backup satellite for America's first satellite. It is not a model but a working satellite designed to orbit the earth.

Launch Complexes 5/6 and 26 retain much of their integrity and configuration and give the visitor a good understanding of facilities associated with the early space program at Cape Canaveral Air Force Station.

Launch Complexes 13 and 14

These launch complexes were constructed from 1956 to 1958 to support the Atlas research and development program. The Atlas was developed by the Air Force as the nation's first intercontinental ballistic missile. Several models of the Atlas evolved in the course of the program, designated "A" through "F." The first Atlas was launched from complex 11 on June 11, 1957.

The Atlas scored a number of firsts. On November 28, 1958, it became the first U.S. ICBM to reach full ICBM range of 5,000 nautical miles. (The Thor-Able, designed as an IRBM, flew 5,000 nautical miles on July 9, 1958.) In May 1960, the Atlas flew 9,039 statute miles into the Indian Ocean, a first for this distance.

On December 18, 1958, the Atlas demonstrated its ability and versatility as a space launch vehicle. On this date, an entire Atlas vehicle, PROJECT SCORE, was placed into orbit carrying a tape recorded Christmas message from President Dwight D. Eisenhower to the world. On command from the ground stations, the Christmas message was relayed from the orbiting vehicle. Although not a communications satellite in the sense of the later TELSTAR or Relay programs, this was another first for the United States.

In addition to its ballistic missile role, the Atlas, combined with a second stage Agena, has performed a variety of other missions ranging from low earth orbits to deep space missions. Missions have included the Ranger Moon-probe spacecraft, Mariner interplanetary spacecraft used for Venus and Mars flyby missions, as well as the lunar explorations and lunar soft landings of the Surveyor. The Atlas-Agena combination has been launched from all four Atlas Complexes--11, 12, 13, and 14.[13]

Launch Complexes 11, 15, and 20 were sold for scrap June 13, 1967, for the sum of $40,250,000. Although the launch tower at complex 11 is now gone the launch stand, ramp, and blockhouse remain. Although no manned or unmanned scientific payloads were flown from complex 11 it is significant because of its development of the Atlas which contributed to the manned and unmanned program. Launch complex 11 was the site where the operational status of the nation's first ICMB was proven. Architectural drawings of the approach ramp and blockhouse are included in Appendix D of this report. Although the launch tower was salvaged in 1967 and much of the original equipment was removed from the blockhouse and launch ramp area, the blockhouse, ramp, and pad still remain and preserve much of the original integrity of the site.

Launch Complex 12 was designed to support Atlas "D" operations. Between 1958 and 1967 there were 37 Atlas launches from Complex 12. The first launch in 1958 was for an Air Force Atlas Research and Development Atlas vehicle. Complex 12 has launched many historic payloads. These include the first Ranger spacecraft. In all nine Rangers were flown from the complex, and the spacecraft returned to earth the first closeup photographs of the lunar surface.

Four Mariner interplanetary missions were launched at Pad 12. These included the highly successful flybys of the planets Venus, in 1962 and 1967, and of Mars, in 1965.

Other NASA flights at the complex have included two Orbiting Geophysical Observatories, one Orbiting Astronomical Observatory, two Project Fire (reentry) shots, and three ATS satellites.

The description of the physical facilities at Complex 12 is basically the same as those of Complex 14 given below. These facilities include a launcher with ramp; umbilical tower; service structure, first, second and third stage fuel storage and loading area; blockhouse and launch contractor ready room; range contractor shop and an operations support building. A diagram of complex 12 is included in Appendix E at the rear of this report. This diagram is that of a typical Atlas launch complex at Cape Canaveral. The physical difference between complexes 11, 12, 13, and 14 were very slight usually involving the configuration of the umbilical tower. Complex 12 was salvaged in 1976. The umbilical tower and much of the original equipment were removed. The other facilities were abandoned in place and still remain at the site.

Launch Complex 13, the third site constructed for the Atlas research and development program, was later modified to launch the Atlas/Agena rocket and was assigned to NASA. The complex was used for five lunar orbiter missions and the Mariner 3 mission. When the Atlas/Centaur rocket was developed, complex 13 was returned to the Air Force; it was deactivated in 1978.

The most relevant feature of this complex is the fact that it resembles complex 14 (where all manned orbital Mercury-Atlas missions were launched). The mobile service structure at 14 was trapizoidal in shape while it is box shaped at 13. This service structure is the only one standing associated with the manned space program other than Complex 39. Launch complex 13 is the one remaining facility which fully illustrates the support facilities required in the Mercury-Atlas flights.

The major components of this complex are: a launcher with ramp; umbilical tower (still intact); service structure; first, second, and third stage fuel storage and loading area; and blockhouse and launch contractor ready room. At the present, no maintenance work is being done the umbilical tower. Rust is beginning to accumulate at the base of the gantry and at the principal connecting members of the structure. There has been some cannibalization of the ramp and gantry by the Air Force. Unless some maintenance is soon given to the umbilical tower, the structure will be lost through excessive rust.

The blockhouse and other structures remain intact although the original equipment has largely been removed. At the present the Air Force plans to remove two large LOX (Liquid Oxygen) Storage tanks from the site.

Launch Complex 14 is the most significant and important of the Atlas Complexes. Launch Complex 14 was constructed in 1956 and 1957 to support the Atlas research and development program. It was subsequently modified to launch the Atlas-Able rocket and was the site of the NASA Pioneer lunar launch in November 1959. The pad was then assigned to NASA for use in the Project Mercury program. The Atlas-Big Joe flight, and all Mercury-Atlas manned and unmanned missions were launched from this site. After the completion of the Mercury program in 1964, Complex 14 was again modified to the Atlas-Agena configuration and served as the launch site for the Gemini-Agena target vehicles used in the Gemini program.

Complex 14 was basically designed to support Atlas "D" operations. Since the "D" model was used in Project Mercury, very minor modifications were necessary for this first man-in-space program. Modifications consisted of installation of the "white room" to house the spacecraft atop the service tower, inclusion of an egress tower, and changes to the internal configuration of the top of the gantry to accommodate the escape rocket tower. The environment of the "white room" was controled to minimize the effects of humidity and dust on the

spacecraft components. The Emergency egress tower had an extending platform reaching to the door of the spacecraft as a means for astronauts to evacuate the spacecraft without external aid. In case of an incapacitated astronaut the external egress crew could use the tower.

Upon the successful completion of the Mercury program. Complex 14 was once again programmed for modifications, this time to support Atlas/Agena launches. Work in support of this program consisted of $1.1 million in alterations which included dismantling the egress tower used in the John Glenn, Scott Carpenter, Wally Schirra, and Gordon Cooper flights and erecting a new 101-foot umbilical tower to handle Agena requirements. Also included in the work were modifications to the existing service tower; installation of a new liquid oxygen storage tank; and construction of launch pad facilities (an enclosure for a propellant transfer unit, additional cable trenches for Agena; Lockheed, and McDonnell equipment room; and a mechanical shop). The white room was modified to house Agena fuel and pressure servicing units for pre-launch checks of the spacecraft.

The complex consisted of a blockhouse, fuel and liquid oxygen storage, electrical power supplies, service tower, and the launch pad. All equipment necessary to check out each complex and launch vehicle system was in these facilities and all systems were validated before each launch operation.

The igloo-shaped blockhouse, about 750 feet from the launch pad, was "floated" in sand for structural protection against blasts. In construction, a large excavation was filled with sand and the reinforced concrete flooring and walls of the blockhouse were poured in two layers with a layer of sand between them. The sand was expected to absorb the shock if a launch vehicle should go awry and impact on or near the blockhouse. The inside walls of the 12-sided building were 10-1/2-feet thick at the base, with 40-feet of sand around them. At the apex of the dome the inside wall was 5-1/2 feet thick, with 10 feet of sand over it. The layer of sand was covered with a thin sheet of concrete to hold it in place. A retaining wall around the base also helped in holding the sand at this pont. The inside diameter of the floor is 60-feet.

Liquid Oxygen (LOX) was stored in a 28,000-gallon steel tank which had an aluminum inner liner. To fuel the vehicle, the LOX flowed through stainless steel lines at 1600 gallons per minute -- flow control was maintained by 150 pounds per square inch air pressure. Fuel was stored in a 28,000 gallon tank which has an aluminum liner. To fuel the vehicle, the LOX flowed through stainless steel lines at 1600 gallons per minute. The flow control was maintained by 150 pounds per square inch air pressure and transferred by two pumps of 500 gallons per minute capacity.

The service tower, a 145-foot-high steel structure with 14 movable decks, allowed maintenance access to the launch vehicle. The tower was mounted on rails which moved it to a rail-mounted transfer table which carried the structure to an area approximately 300 feet from the launch pad.

The launch pad was constructed of concrete and steel with a 20-foot ramp to the top. Inside were two levels containing hydraulic and pneumatic pressure units, electrical junctions and power supplies, equipment for pre-launch checkouts, landline instrumentation room, air-conditioning equipment, and shops. The launch pad had a hold-down capability -- two steel arms attached to the base of the vehicle were released through air pressure when sufficient thrust had been built up. Water deluge and spray systems were mounted at strategic locations for cooling purposes during launch. A water-cooled flame bucket used approximately 30,000 gallons of water per minute during engine operation. Complex 14 was deactivated in February 1967.[14]

The Blockhouse at Launch Complex 14 is abandoned and is in relatively good shape. The service structure was razed in December 1976 due to excessive rust and general deterioration. The launch stand was also demolished at the same time. Only a few steel skeleton support members remain intact. The concrete foundations of the pad are intact in good condition.

Launch Complex 19

Launch Complex 19 was constructed in 1959 to support the development and testing of America's large liquid fueled missiles and launch vehicles. On February 2, 1960, a Titan I ICBM flew off of complex 19 to mark the beginning of the Titan test program. Complex 19 later became the launch site for the Gemini Program. The Gemini Program marked the beginning of sophisticated, manned space flight--it was the intermediate step between the earlier Mercury flights and the manned Apollo missions to the moon. The invaluable experience of Project Mercury had shown that man could survive a rocket ride into space, that he could survive orbital flight, and that he could serve a useful function in space. Gemini expanded and refined these scientific and technological endeavors, adding a second crew member and a maneuverable spacecraft. With Project Gemini, whole new vistas opened for man.[17]

A total of 10 Gemini launches were flown from Complex 19 in 1965 and 1966. The complex consisted of a blockhouse, propellant farms, astronaut recovery area, water flumeway, and a launch stand containing the umbilical tower and erector/service tower. The stand was 65 feet wide, 450 feet long, and three stories high. The umbilical tower stood 102 feet tall.

All electrical equipment has been salvaged from the pad. With the exception of the removal of the umbilical tower and launch stand the remainder of the complex retains much of its integrity. Near complex 14 is the Project Mercury Monument. This 13 foot high astronomical symbol for the Planet Mercury made of stainless steel stands to honor those astronauts who took the initial steps that led to man's first footsteps on the moon. The monument was dedicated in 1964. There is a time capsule buried beneath the monument which is to be opened in the year 2464. It contains reports, photographs, motion pictures and other memorabilia.

At the entrance way to the launch ramp at complex 14 is a monument to John Glenn, the first American to orbit the Earth on February 20, 1962.

The service tower at Complex 19 was simply laid down as if on a gigantic hinge. After each launch, maintenance men converged en masse to repair burned facilities.

Repairs were needed in spite of a built-in cooling system which sent 23,500 gallons of water per minute through the flame bucket. During launch, 32,000 gallons per minute came from 80 water nozzles for fire safety purposes. A "skimming basin" near the base of the stand was able to hold half a million gallons of water. The two-story blockhouse is 156 feet in diameter, 50 feet tall, and has 20-foot thick walls. There is a cableway tunnel 650 feet long between the blockhouse and the launch stand. A fuel storage area is 440 feet northeast of the test stand and an oxidizer farm is 330 feet south of the thrust mounts. A decontamination building is 545 feet southwest of the test stand. Site plans and maps for Launch Complex 19 can be found in Appendix G at the rear of this report.

The blockhouse at Complex 19 is in good shape. The launch stand shows heavy corrosion on the support structures and is probably beyond the point of repair. The launch ramp is also heavily rusted and essentially unsafe. The erector service tower is currectly laying on its side and also suffers from heavy rust and corrosion and is probably beyond repair. The umbilical tower was salvaged in 1977. Electrical equipment and fuel tanks have been removed. All other facilities are largely intact. Because of the preservation of many of the support buildings and the pad and blockhouse, the integrity of Complex 19 is largely intact.

Launch Complex 34

Launch Complex 34 was constructed in 1959 to support the flight testing program for the Saturn I and Saturn IB launch vehicles. Launch Complex 37 was constructed in 1961 for the same purpose. A total of 15 Saturn vehicles (I and IB) were successfully launched from these two complexes.

To accomplish the manned moon landing mission, NASA, of necessity, incorporated a "steppingstone" approach leading to the development, testing, and ultimate accomplishment of manned lunar landings. The Saturn Program was divided into two "blocks" with interrelated phases: Block I--launch, abort, suborbital, and earth orbital phases; Block II--earth orbital and lunar orbital phases.

Three vehicles were developed as part of the steppingstone approach--the two-stage Saturn I, the intermediate two-stage Saturn IB, and the advanced three-stage Saturn V. Saturns I and IB were flight tested from Complexes 34 and 37. Saturn V was launched from Complex 39.[18]

Launch Complex 34 was the site of the fire that took the lives of astronauts Gus Grissom, Edward White, and Roger Chaffee on January 27, 1967. Complex 34 was a major facility designed to service the Saturn I vehicle. A description of the complex is given below. Site plans and drawing of the complex can be found in Appendix H at the rear of this report.

Launch Complex 34 facilities include the following:

LAUNCH CONTROL CENTER

The launch control center has approximately 10,000 square feet of protected floor space on two levels and an additional 2,150 square feet of unprotected space in an equipment room which is not occupied during launchings. It is a domed building, 120 feet in diameter. The inner dome is of reinforced concrete, five feet thick.

On top of the inner dome is an earth fill which varies from seven feet in the center to 14 feet at the edges. The final layer is four inches of concrete. The main entrance door weighs 23 tons. The building was designed to withstand a blast pressure equivalent to the explosion of 50 kilotons of TNT at a distance of 50 feet.

The first floor of the building was used by booster and upper stage contractor personnel involved in tracking and telemetry.

Launch supervision and various monitoring and recording panels are on the second floor. A small observation room is separated by glass from the operating area. Pre-launch activities in the area can be viewed from an observation balcony on top of the control building.

SERVICE STRUCTURE

The service structure was used to erect and check out the vehicle on the launch pedestal. The structure was 310 feet high and weighed 2,900 tons. The center opening in which the vehicle was situated was 56 feet wide.

Each leg of the service structure housed a two-floor building containing operating and checkout equipment. In addition, each leg had a work deck, seven fixed platforms at various elevations, and five movable horizontally-retracting platforms which could be adjusted to embrace the vehicle at any desired level.

It was mounted on four carriages which were powered by four, 100-horsepower electric motors. Anchored to steel piers by hydraulically operated steel pins, the stucture and protected vehicle could withstand wind forces up to 125 miles per hour.

After completion of checkout, the structure was moved to a parking area approximately 600 feet from the launch pedestal. Its movement was controled by a single operator situated in a cab at the 27-foot level. It was capable of moving from 1 1/2 to 40 feet per minute.

LAUNCH PAD

The launch pad, 430 feet in diameter, was constructed of reinforced concrete, eight inches thick. In the vicinity of the flame deflector the pad was paved with refractory brick to protect it from heat. The pad has a perimeter flume for drainage of surface water and possible propellant spillage.

PEDESTAL

In the center of the launch pad, the pedestal was used to support and retain the vehicle during checkout and firing. It is 42-feet square and 27 feet high. Bolted to the structure at the top of the pedestal were eight steel arms, four for support only, and four to support and restrain the vehicle until proper engine operation has been achieved. The arms were automatically controled during the launch sequence.

The foundation of the pedestal is a concrete block 106 feet by 160 feet; four feet thick at the outer edges and eight feet thick at the center.

DEFLECTOR

The rail-mounted, two-way blast deflector was constructed of steel. During launch, it was used to deflect the engine flame into controled directions. While not in use it was parked on rails adjacent to the pedestal.

UMBILICAL TOWER

The umbilical tower adjacent to the launch pedestal was used to provide electrical, hydraulic, and pneumatic lines to the vehicle. It was 24 feet square at the base and 240 feet high. Hydraulically controled swing arms connect the umbilical tower to the vehicle, and swing out of the way during launch.

AUTOMATIC GROUND CONTROL STATION

Beneath a large portion of the launch pad was the automatic ground control station which served as a distribution point for all measuring and checkout equipment, power, and high-pressure gas. It is 215 feet long and 38 feet wide. Cables from the automatic ground control station were fed to the launch control center through a roofed cableway.

FUEL FACILITY

The RP-I fueling facility consisted of storage and transfer equipment, protective revetments, foundation, and partial weather protection. In the event of a tank rupture, the revetments and wall retained the fuel.

Two 30,000-gallon cylindrical tanks were used for fuel storage. The transfer system and associated plumbing consisted of 1,000-gallon-per minute pumps, a circulation pump, filter-separator unit, eductor system, miscellaneous valves, piping, controls, and support pad. The transfer system was automated and was controlled from the launch control center.

LIQUID OXYGEN SYSTEM

There were two liquid oxygen (LOX) storage tanks approximately 650 feet from the launch pedestal and well-removed from the fuel facility. The main tank had an inner and outer sphere with an outside diameter of 43 feet. The spheres were separated by four feet of "perlite," a mineral insulating powder. A smaller liquid oxygen tank was used for replenishing the oxygen which boils off during the latter stages of launch preparation. Vacuum insulation insured low evaporation loss.

An earth revetment protects the LOX facility on the side facing the launch pedestal.

LIQUID HYDROGEN FACILITY

The liquid hydrogen facility consisted of a vacuum jacketed spherical tank, pneumatic and electrical consoles, and necessary plumbing and valves. Liquid hydrogen with a very low boiling point and high flammability, required special handling and storage techniques.

HIGH PRESSURE GAS FACILITY

High-pressure helium and nitrogen gases were required for the vehicle. Helium was supplied at 3,000 pounds per square inch (p.s.i.) pressure and boosted to 6,000 p.s.i. Nitrogen was supplied in liquid form and was converted to gas before it entered the vehicle. Helium was used for bubbling the LOX tanks of the booster to keep the LOX from forming strata of different temperatures. Nitrogen was used for purging fuel and LOX lines, engine and instrument compartments, and operating certain pneumatic components.

SKIMMING BASIN:

The skimming basin, about 300 feet from the edge of the pad, is a concrete paved vat 104 feet by 180 feet. It was used to collect fluids spilled on the pad, thus preventing them from entering normal Cape drainage canals.

WATER SYSTEM:

Primarily as a safety measure, a water system was installed on the pad and throughout the service structure. Water was available at all work levels on the tower for fire protection. There was a pad flush system to wash away any spilled fuel. At the pedestal there was a quenching system for use in case fire occurred accidentally in the launch vehicle "boattail" or engine compartment. This system was also used to extinguish flame in the engine compartment if engines were cut off immediately after ignition and before lift-off. Four 3,500-gallon-per-minute nozzles are installed at the pad surrounding the vehicle as a general protection measure.

OPERATIONS SUPPORT BUILDING

The operations support building contains about 30,000 square feet of floor space. It was used for general shop and engineering activities in direct support of launch operations.

CAMERA STATIONS

Camera stations were around the launch pedestal to permit remote controled photographic coverage of launch operations.

COMMUNICATIONS SYSTEMS

A comprehensive voice communications network, consisting of approximately 200 stations, is installed throughout the 45-acre site. A closed circuit television loop is also used for monitoring, checkout, and observing launch.[19]

CURRENT CONDITION

The Service Structure and umbilical tower at Complex 34 were salvaged between 1970 and 1972. The Blockhouse is in good condition and contains some of its original electrical equipment. The launch stand is in place and in a good state of preservation. Most of the other permanent structures are in place. Complex 34 is abandoned and retains much of its integrity.

Original Mission Control Center

In addition to the above cited launch pads, the original Mission Control Center contributes to the National Significance of Cape Canaveral Air Force Station. This center at the Cape was used for all Mercury flights and the first three Gemini flights. The center took over flight control when the rocket left the pad, and followed through until splashdown. This function was transferred to the new mission control center at the Johnson Space Center in Houston, Texas, after Gemini III.

The mission control center supported checkout, launch control, tracking, and astronaut training for the Mercury and early flights in the Gemini program.

The TWA bus tour now includes a stop at the original mission control center. A narrative tape and lighted consoles are used to interpret the facility.

# 8. Significance

| Period | Areas of Significance—Check and justify below | | | | |
|---|---|---|---|---|---|
| ___ prehistoric | ___ archeology-prehistoric | ___ community planning | ___ landscape architecture | ___ religion | |
| ___ 1400–1499 | ___ archeology-historic | ___ conservation | ___ law | X science | |
| ___ 1500–1599 | ___ agriculture | ___ economics | ___ literature | ___ sculpture | |
| ___ 1600–1699 | ___ architecture | ___ education | ___ military | ___ social/ humanitarian | |
| ___ 1700–1799 | ___ art | X engineering | ___ music | ___ theater | |
| ___ 1800–1899 | ___ commerce | ___ exploration/settlement | ___ philosophy | ___ transportation | |
| X 1900– | X communications | ___ industry | ___ politics/government | X other (specify) Space Exploration | |
| | | ___ invention | | | |

**Specific dates** 1949-Present **Builder/Architect** United States Air Force, NASA

**Statement of Significance (in one paragraph)**

Cape Canaveral Air Force Station is nationally significant because of its association with the Space Program of the United States. Its association with the Space Program of the United States is divided into two areas. These are the unmanned scientific exploration of space and near-space and earth environment; and the manned space program that resulted in the landing of Americans on the surface of the moon in 1969. Tentatively, Canaveral is also nationally significant because of its association with the missile testing program of the United States. A final determination of Cape Canaveral's national significance in this area must be deferred until completion of a comprehensive space theme study is done because there are other missile testing facilities around the country that have not been evaluated. A brief history of Cape Canaveral Air Force Station and its association with the manned and unmanned space program follows:

During World War II the United States began to build upon the work of Dr. Robert Goddard and others to develop increasingly sophisticated rockets. The need for research in this area was made apparent to all Americans when in the closing months of World War II German V-2 missiles were launched against Great Britain. These rockets carried a warhead of 1,000 pounds of TNT and reached an altitude of 60 miles and a range of 200 miles. The V-2 held the promise of designing a rocket that could span the oceans and reach the United States.

In America, missile proving grounds were established at the artillery testing facilities at Dahlgren, Virginia, and Indian Head, Maryland. By 1944 these two facilities had been replaced by the Alleghany Ballistics Laboratory (ABL) at Pinto West Virginia. In the West, the military missile effort utilized the Mojave Antiaircraft Artillery Range at Camp Irwin, California, which was soon replaced by the more famous adjacent Goldstone Lake. The need for additional missile testing facilities led to the establishment of two new missile proving grounds in the summer of 1943 at the Marine reservation of Camp Pendleton, California, and the Naval Ordnance Test Station (NOTS) at Inyokern, California. Additional missile testing were also established at the White Sands Missile Test Range in New Mexico to take advantage of the area's good weather and low population.

When Operation Paperclip brought many of the German rocket scientists to the United States, the Peenemunde range instrumentation was also transferred. Yet, within a year of the war's end United States missile ranges had already modified, and gone beyond, the two World War II technologies.[25]

On May 29, 1947, a V-2 went out of control, traveling only 47 miles, but landing near Juarez, Mexico. This flight together with the size constraints of America's largest missile range expedited the recommendations of the Committee on Long-Range

Missile Proving Grounds of the Joint Research and Development Board of the War Department. Within a month the committee responded with four proposed locations to permanently solve the missile range size problem.

To avoid impringing on populated areas, a consideration which originally brought Goddard to New Mexico, the committee used the Peenemunde approach--sea ranges. The principal problem with sea ranges which would eventually extend for thousands of miles was the location of permanent tracking facilities. Although ships could be used in open seas, the committee preferred chains of islands and other land masses at this early point in range history. The other Goddard consideration, favourable weather, also played a decisive role.

The selection of a launch facility in Washington State with tracking facilities along the Aleutian chain was relegated to fourth choice because of its adverse climate, while the possibility of expanding the Naval Air Missile Test Center at Point Mugu, California, across the Pacific was relegated to third choice because of the lack of nearby land masses for tracking sites. This left the first choice, a launch site at the El Centro, California Naval Air Station, with tracking facilities on either side of the flight path down the Gulf of California to the South Pacific; and the second choice, a launch site on Cape Canaveral 18 miles north of the existing Banana River Naval Air Station with tracking facilities on the British owned Bahama Islands. The first choice was abandoned after negotiations with the President of Mexico in December 1947 failed to secure sovereignty rights for tracking stations. Great Britain was more cooperative, and the Florida choice became the first long-range proving ground. The range of the missiles being tested may have caused the selection of a sea range, but the need for tracking stations provided the specific key for its location.[26]

Thus by 1947, Cape Canaveral was selected as the launch center and the Banana River Naval Air Station 16 miles to the south was selected as the support base. In the same year, the responsibility for developing the Range was given to the newly constituted Department of the Air Force and Brig. Gen. W.L. Richardson was named to direct the project.

During the next few years land was acquired at the Cape for launch operations and on islands in the Bahamas and West Indies for tracking sites. In May 1949, President Harry S. Truman had signed legislation which officially established the "Joint Long Range Proving Ground." In 1950, construction of the first missile launching pads and support facilities at the Cape, and tracking facilities at the downrange sites, was begun. In 1949, the Banana River Naval Station

was reactivated as the headquarters and support base for the Proving Ground, and in August 1950 the installation was formally named Patrick Air Force Base. Between 1949 and 1974 the name of the launching areas was changed five times by either general or special orders:

1949 Cape Canaveral
1950 Operating Subdivision #1
1951 Cape Canaveral Auxiliary Air Force Base
1955 Cape Canaveral Missile Test Annex
1964 Cape Kennedy Air Force Station
1974 Cape Canaveral Air Force Station

During the same time period, the name of the Range was also redesignated three times:

1949 Long Range Proving Ground
1952 Florida Missile Test Range (unofficial)
1958 Atlantic Missile Range
1964 Eastern Test Range

The first facilities constructed at CCAFS were technologically austere in comparison to present day facilities. In many instances engineering followed or modified facility designs standardized for military installations which later proved limited in keeping up with the technical demands of rapidly moving and sometimes dynamic missile developments. By the early 1960s, launch and support facilities were developed with a greater degree of flexibility to support operational changes and follow-on-programs including the first manned orbital space flights.

The first missile, a German V-2 rocket with an Army WAC Corporal second stage, was launched from the Cape on July 24, 1950. During the next three years facilities were constructed for the testing of cruise-type missile weapons including the Matador, launched in 1951 and later the Snark and Bomarc. After 1953, facility construction was primarily limited to that needed to support the IRBM and ICBM missile programs. In August 1961, a large section of Merritt Island three miles west and across the Banana River from CCAFS, was officially selected as the launch center for the Manned Lunar Landing Program. During the land acquisition and development phase of the John F. Kennedy Space Center (KSC), NASA built and/or modified a number of existing Air Force launch and support facilities at CCAFS to carry out manned and unmanned space programs.

Two of the largest and most advanced launch facilities built at CCAFS by NASA were Saturn IB Complexes 34 and 37. The first launching of the Saturn space vehicle took place on October 27, 1961. In the following years, the complexes

served to launch the first series of the three-man Apollo space flights. In 1972 these two complexes were declared excess by NASA and dismantling began the same year.

In 1962, CCAFS was selected to support the Air Force Titan III Program. Because of safety considerations and the size of the area required to satisfy operational concepts, the facilities could not be located on the station proper. As a result, the facilities were constructed on land pumped up in the Banana River about a mile from the west shoreline of the station.

The Titan III Program sparked a new and major era at the station in construction, missile handling technology, engineering, and launching techniques. The Titan III Integrate-Transfer-Launch (ITL) System involves a three-stage procedure which provides for off-pad assembly of the missile, integration of the boosters, payload and checkout, and, finally, rail transport to Complex 40 or 41 for launching. The Titan III facilities were completed in 1964 and in addition to two launch complexes and special assembly buildings, included the first rail line connection to CCAFS. Since then, construction projects have provided for modifications to various existing complexes and other facilities, additional storage, assembly and checkout buildings, and a new central heating plant in the Industrial Area. The most recent major construction consisted of a new deep draft turn basin and wharf facility for the Navy Trident Program.

By 1966, activities at the station had reached their apogee and the years following saw a gradual decline in most phases of operations. Launch complexes and support buildings which had served their purposes and were neither adaptable to other uses or economically maintainable were deactivated or put on standby. Similarly, facilities transferred to NASA during the early 1960s are gradually being returned to the Air Force.[27]

The development of Cape Canaveral Air Force Station as a missile test center and space center has produced an installation that is unique with respect to other Air Force installations. It was at Cape Canaveral that man constructed the facilities that made possible the Mercury, Gemini, and Apollo manned space programs.

Launch complexes 5, 6, 14, 19, 26, 34, 37, and the original mission control room are directly linked to this aspect of the space program.

It was at Cape Canaveral that America developed the facilities to launch scientific payloads into space that have greatly accelerated the knowledge of the earth and its weather and resources, the sun and planets, and the universe in general. Such programs as the Voyager, Mariner, Ranger, Viking, Pioneer,

Telstar, Tiros, Westar, and many others were launched from complexes, 5, 6, 11, 12, 13, 17, 18, 36, 37, 40, and 41. These satellites were launched almost exclusively from Cape Canaveral. As America's Spaceport, Cape Canaveral, is without qualification, of national significance.

FOOTNOTES

[1]Pan American World Airways, Inc., Basic Information Guide, Cape Canaveral (Patrick Air Force Base Florida: Aerospace Services Division, 1981). p. 1.

[2]Ibid., p. 7.

[3]Ibid., pp. 5-70.

[4]David L. Skinner, "United States Missile Ranges: Origin and History" Spaceflight, February, 1978, pp. 96-97.

[5]For a listing of other sites associated with the space program see Butowsky, et. al. Man in Space (Denver, National Park Service, 1981).

[6]Butowsky, p. 46.

[7]Butowsky, p. 46.

[8]U.S. Army Corps of Engineers, History of the Canaveral District 1950-1971 (South Atlantic Division, 1971), p. 11.

[9]State of Florida, Department of State, "Master Site File, Air Force Space Museum," Tallahassee, 1972, p. 5.

[10]For a complete listing of materials and artifacts located at the Air Force Space Museum see Appendix C at the rear of this report.

[11]Butowsky, p. 46.

[12]Ibid., pp. 63-64.

[13]United States Air Force and Pan American World Airways, Inc. From Sand to Moondust. (Cape Kennedy, no date), p. 41.

[14]United States Air Force, Fact Sheet Complex 14 (Patrick AFB, Florida., Public Affairs, Eastern Space and Missile Center, no date).

[15]National Aeronautics and Space Administration, Technical Facilities Catalog Vol. 11 (Washington, D.C. 1974). p. 9-145.

[16]From Sand to Moondust, p. 35.

[17]Ibid., p. 45.

[18]Ibid., p. 49.

[19]National Aeronautics and Space Administration, Launch Complex 34 (John F. Kennedy Space Center, no date), pp. 4-13.

[20]Kennedy Space Center Historical Note, "Utilization of Cape Kennedy Launch Complexes" (Unpublished Report, Kennedy Space Center, 1972), pp. 9-10.

[21]Technical Facilities Catalog, 1974, p. 9-147.

[22]National Aeronautics and Space Administration, Launch Complex 37 Facilities, (John F. Kennedy Space Center, 1968)

[23]From Sand to Moondust, p. 54.

[24]Butowsky, pp. 51-56.

[25]Skinner, p. 91.

[26]Ibid., p. 92.

[27]U.S. Air Force, Cape Canaveral Air Force Station, Eastern Test Range, Comprehensive Plan Revision, (Brevard County, Florida: Pan American World Airways, 1977). pp. 1-2.

[28]Skinner, pp. 96-97.

# 9. Major Bibliographical References

SEE CONTINUATION SHEET

# 10. Geographical Data

Acreage of nominated property 132.5

Quadrangle name Cape Canaveral, False Cape

Quadrangle scale 1:24,000

UMT References

| | Zone | Easting | Northing |
|---|---|---|---|
| A | 17 | 538730 | 3162320 |
| B | 17 | 542140 | 3160800 |
| C | 17 | 546760 | 3141410 |
| D | 17 | 540006 | 3142160 |
| E | 17 | 537880 | 3142720 |
| F | 17 | 540360 | 3154460 |
| G | 17 | 538800 | 3155300 |
| H | | | |

**Verbal boundary description and justification**

SEE CONTINUATION SHEET

**List all states and counties for properties overlapping state or county boundaries**

| state | code | county | code |
|---|---|---|---|
| state | code | county | code |

# 11. Form Prepared By

name/title History Division National Park Service/United States Air Force

organization National Park Service date September 1, 1983

street & number Division of History telephone 343-8168

city or town Washington, DC 20240 state

# 12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

___ national ___ state ___ local

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

State Historic Preservation Officer signature

title date

For NPS use only

I hereby certify that this property is included in the National Register

date

Keeper of the National Register

Attest: date

Chief of Registration

**United States Department of the Interior**
National Park Service

# National Register of Historic Places Inventory—Nomination Form

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date entered



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**United States Department of the Interior**
National Park Service

# National Register of Historic Places Inventory—Nomination Form

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At the direction of the Secretary of the Interior's Advisory Board the boundary of the National Historic Landmark District shall include only the area immediately surrounding Launch Pads 5, 6, 13, 14, 19, 26, 34, and the Original Mission Control Center. The exact location of these boundaries are shown on the map attached to the end of this report. The above site UTM coordinates are the general coordinates for Cape Canaveral Air Force Station.