CAPE CANAVERAL AIR FORCE STATION, INDUSTRIAL AREA, HANGAR S
(John F. Kennedy Space Center)
Cape Canaveral
Brevard County
Florida

HABS FL-583-D
HABS FL-583-D

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN BUILDINGS SURVEY
SOUTHEAST REGIONAL OFFICE
National Park Service
U.S. Department of the Interior
100 Alabama St. NW
Atlanta, GA 30303

HISTORIC AMERICAN BUILDINGS SURVEY
CAPE CANAVERAL AIR FORCE STATION, INDUSTRIAL AREA
HANGAR S
HABS NO. FL-583-D

Location: Building 1726, Hangar Road, Cape Canaveral Air Force Station (CCAFS) Industrial Area.

USGS Cape Canaveral, Florida, Quadrangle, Universal Transverse Mercator Coordinates E 540530 N 3151415 Zone 17, NAD 1983

Present Owner: National Aeronautics and Space Administration (NASA), John F. Kennedy Space Center (KSC)

Present Use: Vacant

Significance: Hangar S served as the home of NASA's Pre-Flight Operations Division of Project Mercury from 1959-1963. In Hangar S, the Mercury spacecraft capsules were received, tested, and prepared for flight. The hangar housed astronauts' pre-flight training and preparation, including capsule simulator training, flight pressure suit tests, flight plan development, and communications training. The astronaut crew quarters were located on the second floor of the hangar's south wing. Hangar S is directly associated with events that led to the first U.S. manned sub-orbital space flight of Alan B. Shepard in 1961 and the orbital flight of John Glenn in 1962. Hangar S was determined eligible for listing on the National Register of Historic Places (NRHP) at the national level of significance under Criterion A in the area of Space Exploration. Hangar S is also NRHP eligible under Criterion B for association with the training activities of the original Mercury Seven astronauts, including Alan B. Shepard, Virgil "Gus" Grissom, John Glenn, Scott Carpenter, Walter "Wally" Schirra, Gordon "Gordo" Cooper, and Donald K. "Deke" Slayton.

Report Prepared by: New South Associates, Stone Mountain, Georgia

Date: November 24, 2014

PART I. HISTORICAL INFORMATION

List of Acronyms

AFB	Air Force Base
AMR	Atlantic Missile Range
ASCS	Automatic Stabilization and Control System
CCAFS	Cape Canaveral Air Force Station
HABS	Historic American Buildings Survey Record
HVAC	Heating, Ventilation, and Air Conditioning
ICBM	Intercontinental Ballistic Missile
IHA	InoMedic Health Applications
IRBM	Intermediate Range Ballistic Missile
KSC	John F. Kennedy Space Center
LC	Launch Complex
NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautics and Space Administration
NRHP	National Register of Historic Places
SCAPE	Self-Contained Atmospheric Protective Ensemble
SRB	Solid Rocket Booster
STG	Space Task Group

A. PHYSICAL HISTORY

1. Date of Construction: 1957

2. Architect: Steward and Skinner Associates, architects, and Maurice H. Connell and Associates, Inc., engineers.

Steward and Skinner Associates formed in 1940 with the partnership of architects Harold Steward and John and Coulton Skinner. The firm worked throughout south Florida, including a Navy hospital and airport in Key West and many buildings in Miami such as the Miami Seaquarium, Mercy Hospital, University of Miami, the Federal Office Building, Dade County Auditorium, Brickell Townhouse, and an addition to Coral Gables City Hall (which Harold Steward had originally

designed years earlier). The firm specialized in hospitals and airports, including the original terminal at Miami International Airport.[1] Maurice H. Connell and Associates was an engineering firm based in Miami, Florida, that worked on a number of NASA projects.

3. Original and Subsequent Owners, Occupants, Uses:

Hangar S was originally built for the U.S. Air Force and first housed the operations of Project Vanguard, conducted by the U.S. Naval Research Laboratory to launch an Earth-orbiting satellite. In 1959, NASA's Pre-Flight Operations Division of Project Mercury moved into Hangar S, where the Mercury spacecraft capsules were received, tested, and prepared for flight. The hangar also housed the Mercury astronauts' pre-flight training and preparation, including capsule simulator training, flight pressure suit tests, flight plan development, and communications training. The astronaut crew quarters were located on the second floor of the hangar's south wing. The ownership of Hangar S was transferred in 1964 from the Air Force to NASA, who modified the interior of the hangar high bay in 1965 to process spacecraft payloads. NASA has owned the building since 1965.

4. Builder, Contractor, Suppliers: Not known.

5. Original Plans and Construction:

Completed in late 1957, Hangar S construction drawings and historic photographs show that it featured a standardized hangar design shared by the other hangars in the CCAFS Industrial Area. Identified by the large letter "S" on its east elevation, it had a central high bay with two-story concrete block wings on its north and south sides that contained offices and work areas.

[1] The Mackle Company, "Harold Steward," biographical essay at available http://themacklecompany.com/femjrstorypublic/personalstories/haroldsteward.htm, accessed August 7, 2013.

The hangar had a steel and concrete block structural system, a concrete foundation, and a rectangular footprint that contained 41,666 square feet.[2] The upper level of the high bay exterior had a slightly pitched, built-up roof and corrugated metal exterior. There were bands of frosted clerestory windows on the north and south elevations. The east and west elevations of the high bay had full-length horizontal retractable doors.

Located just north of Hangar S were one-story concrete block water and oxygen service buildings, as well as an L-shaped metal storage building that is no longer standing.

6. Alterations and Additions:

In 1961, Hangar S received two annex wing additions constructed on its north and south sides. These annexes contained laboratories and office spaces. The rectangular buildings were constructed with steel frame structural systems and corrugated metal gable roofs and exterior walls. They were connected to Hangar S via narrow enclosed hallways. The annexes were demolished in 2011.

In 1965, J.E. Greiner Company, an engineering firm from Tampa, Florida, submitted construction drawings to build a new spacecraft test area inside the west end of the Hangar S high bay. This new "building within a building" was structurally independent from the surrounding hangar and was separated from it by passages so a person could walk all the way around it. It included a spacecraft test area, clean room, test director's office, spacecraft camera loading room, systems test area, an air lock, and a garment change/restroom. Just south of the spacecraft test area were

[2] National Aeronautics and Space Administration [NASA], "Hangar S (1726)," Real Property Record, on file at the John F. Kennedy Space Center [KSC] Real Property Office.

additional one-story buildings, including measurement test laboratories, storage areas, and personnel offices.[3]

In 1986, Pan Am World Services submitted plans to remodel the second floor of the hangar's north and south wings, including the original "astronaut quarters" from Project Mercury. The drawings showed that the floor plan remained largely the same, but older partition walls that contained asbestos were removed and replaced with new gypsum board walls.[4]

B. HISTORICAL CONTEXT

Since CCAFS was established in 1949, it has played a central role in the United States history of missile testing and the closely-related space program. Following the first Cape Canaveral rocket launch of a modified German V-2 missile called Bumper 8 on July 24, 1950, military scientists and engineers at CCAFS proceeded to test an ever-evolving series of deadly twentieth-century weapons. These included winged cruise-type missiles and the Atlas, the nation's first intercontinental ballistic missile (ICBM). In the midst of this Cold War-era arms development, the unique facilities at CCAFS also hosted the early development of NASA's unmanned and manned space program launches, including the nation's first orbiting satellite, *Explorer 1*, and the first spaceflights of Projects Mercury, Gemini, and Apollo. This distinguished history earned CCAFS designation as a National Historic Landmark in 1984.

At the center of NASA's early presence at CCAFS was Hangar S, the headquarters of NASA's Pre-Flight Operations Division of Project Mercury (Figures 1 and 2). While the hangar's design is not unlike the other missile assembly buildings at CCAFS,

---

[3] J.R. Greiner Company, Consulting Engineers, "Alterations to Existing Spacecraft Facilities, Hangar S, First Floor Plan," Construction Drawings, March 8, 1966.

[4] Pan Am World Services, "Facility 1726, Renovate Hangar S & Annex," Construction Drawings, May 1986.

the events that occurred inside its walls were directly related to the success of the nation's first manned space program, Project Mercury. It was here that the Mercury capsules received their final preparations for launch and where the Mercury Seven astronauts trained and prepared for flight.

CCAFS and Space Exploration

The events that led to CCAFS's association with NASA and the manned space program began in 1952 when leading scientists around the world designated the year 1957 as the International Geophysical Year, a yearlong international scientific effort to better understand global geophysical phenomena. The U.S. and the Soviet Union both participated in the yearlong event in a mutual challenge to see which nation could launch the first artificial satellite into orbit. In 1955, President Eisenhower asked Congress to appropriate $13 million for the effort and created a scientific committee to accept proposals from the Air Force, Army, and the Navy.

Under the direction of its chief missile scientist and space visionary, Wernher von Braun, the Army proposed to use a modified Redstone rocket to put the *Explorer 1* satellite into orbit; however, the committee instead chose the Navy's Project Vanguard that used the Viking missile.[5] In operation from 1957-59, Project Vanguard was beset by technological and logistical problems, including a lack of adequate assembly and checkout space at CCAFS. In 1957, Project Vanguard was temporarily assigned half of Hangar C near the southeastern tip of CCAFS before its final home in Hangar S was completed by October 1957.[6]

---

[5] Kenneth Lipartito and Orville R. Butler, *A History of the Kennedy Space Center* (Gainesville: University Press of Florida, 2007), 41-42.
[6] Loyd S. Swenson, James M. Grimwood, and Charles C. Alexander, *This New Ocean: A History of Project Mercury* (NASA Special Publication 4201, 1989), 155; Constance McLaughlin Green and Milton Lomask, *Vanguard: A History* (NASA Special Publications 4202, 1970), available at http://history.nasa.gov/SP-4202/chapter8.html.

On October 4, 1957, the Vanguard team learned that the Soviet Union successfully launched the satellite *Sputnik I*, making the first strike in the "space race" and a major blow to public confidence of U.S. scientific and missile capabilities. Shortly after learning this, the third Vanguard test vehicle, *TV-3,* arrived for the first time at the new Hangar S to undergo checkout procedures. The vehicle was moved from Hangar S to Launch Complex (LC) 18A in late November and scheduled for launch on December 6. Meanwhile, the Soviets struck again with the November 3 launch of *Sputnik II*, which carried a live payload, a dog named Laika. On the morning of December 6, the Vanguard team attempted to launch *TV-3* vehicle only to have it rise four feet into the air before the rocket lost thrust and fell back down to the launch pad and exploded.[7] The launch failure was a major embarrassment for the Vanguard team in light of the two recent Soviet launches.

Following the Project Vanguard failure, the Army's *Explorer 1* satellite successfully launched on January 31, 1958 atop a modified Redstone rocket. This was followed by the successful launch of Vanguard satellite *TV-4* in March of that year. The Project Vanguard team remained stationed in Hangar S until the program ended with the launch of *Vanguard 3* in 1959.[8] Project Mercury then moved into Hangar S in 1960.

The launch of *Explorer 1* was the U.S. space program's first success and it helped fuel increasing public interest in space exploration. There remained, however, intense national anxiety over the fact that the U.S. was second into space and that the nation's rocket technology was behind that of the Soviet Union. In early 1958, the President's Science Advisory Committee recommended the creation of a new Federal agency for the scientific exploration of space. The agency would be separate from military space research, but would

[7] Lipartito and Butler, 2007, 43-44.
[8] Green and Lomask, available at http://history.nasa.gov/SP-4202/chap12.html.

cooperate with it where missions overlapped and benefit from military advances in rocket technology. On July 29, 1958, President Eisenhower signed the National Aeronautics and Space Act creating NASA to pursue a nonmilitary "activities in space…devoted to peaceful purposes for the benefit of all mankind."[9] While NASA's mission was a peaceful one run by civilians, it was also understood that the space race was a part of the larger Cold War confrontation with the Soviet Union.

NASA was created by combining several predecessor research-oriented agencies into a new hybrid agency. At its core was the National Advisory Committee for Aeronautics (NACA), which had been a leader in both military and civilian aviation and aeronautics research since 1915. NASA also absorbed over 400 scientists from the Naval Research Laboratory and the Army's Jet Propulsion Laboratory at the California Institute of Technology. President Eisenhower transferred the Army's Development Operations Division, including Wernher von Braun's rocket research team at Huntsville, Alabama, which was renamed as the Marshall Space Flight Center. Kurt Debus and the 5,000 members of his Missile Firing Laboratory at Cape Canaveral were similarly released from the military and reassigned to NASA.[10]

The creation of NASA transformed the management and built environment of CCAFS as it absorbed new civilian space programs alongside those of the military. Debus' Missile Firing Laboratory at the Cape was renamed NASA's Launch Operations Center, which by 1964 had acquired or built nearly two dozen facilities in the southwest corner of the CCAFS

[9] Green and Lomask, 46.
[10] Green and Lomask, 46; Patricia Slovinac and Joan Deming, "Cape Canaveral Air Force Station – Mission Control Center (Building No. 1385, Mercury Control Center), HAER No. FL-8-AV, 2010, 6.

Industrial Area, including Hangar S.[11] From these facilities, NASA launched a number of significant unmanned satellites from CCAFS in the early 1960s as it simultaneously worked on its primary goal of manned spaceflight.

Manned Spaceflight Programs

The American space program grew rapidly after the establishment of NASA. The Agency's first major priority was the development of a program to place a man in orbit, which began with the establishment of Project Mercury in October of 1958 and the selection of the first Mercury Seven astronauts in April of 1959.[12] During the research and development phase of Project Mercury, however, the Soviet Union again upstaged the U.S. with the April 1961 orbital launch of cosmonaut Yuri Gagarin in the *Vostok 1* spacecraft. As with the earlier success of *Sputniks I* and *II*, the Soviet achievement undermined American confidence in its space program.[13]

President John F. Kennedy responded to the Gagarin flight and rising national interest in space exploration by issuing a new national challenge to surpass the Soviet space program by "achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to Earth. No single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space; and none will be so difficult or expensive to accomplish."[14] Support for the lunar landing project was widespread among the public and leaders in Washington, D.C., money was appropriated by Congress with virtually no dissent.

---

[11] NASA, "Master Development Plan for NASA Technical Facilities at AMR, Revision II," George C. Marshall Space Flight Center, Huntsville, Alabama, Launch Facilities Design Group, Launch Operations Directorate, Atlantic Missile Range, 1961a, 24-26.
[12] James M. Grimwood, *Project Mercury: A Chronology*, (Washington, D.C.: NASA History Series, 1963).
[13] Harry A. Butowski, *Man in Space: National Historic Landmark Theme Study, Phase I and II* (Washington, D.C.: National Park Service, 1984), 4.
[14] Butowski, 1984, 4-5.

To accomplish this ambitious goal, the space program was organized into a series of progressive missions: Project Mercury, the Gemini Program, and the Apollo Program. Building on the technological advances of each mission, NASA pursued its mission to first send a man into space, followed by manned orbits around the Earth, mastery of rendezvous and docking procedures, and finally, landing a man on the moon and returning him safely to Earth. The launch operations of Project Mercury were conducted entirely within facilities at CCAFS, while the Gemini and Apollo programs used them less so as NASA's new spaceport, the John F. Kennedy Space Center (KSC) was completed in the early 1960s. Gemini and Apollo's relationships to CCAFS are briefly summarized below, followed by an extensive discussion of Project Mercury.

The Gemini Program (1962-1966) began at CCAFS with seven launches at LC 14 and twelve launches at LC 19, including the first manned Gemini mission using a Titan rocket in March 1965. Gemini also utilized the original Mercury Control Center for its early missions before transitioning in 1965 to NASA's new Mission Control Center at the Manned Spacecraft Center in Houston, Texas. The Apollo Program (1963-1972) relied on Wernher von Braun's huge new Saturn rocket that required the construction of LC 34 and 37 at the northern tip of Cape Canaveral. These launch complexes hosted early test flights of the Saturn launch vehicle as well as Apollo 7, the program's first manned flight. It was also at LC 34 that the first major tragedy of the space program took place, the Apollo 1 cockpit fire that claimed the lives of Virgil "Gus" Grissom, Edward White, and Roger Chaffee. The last manned space mission to lift off from CCAFS was Apollo 7 on October 11, 1968. After that launch all manned flights were launched from LC 39 on KSC.[15]

[15] Slovinac and Deming, 2010, 6-7.

Project Mercury

America's manned spaceflight program and its relationship to Hangar S began with Project Mercury and completing its three objectives: 1) place a manned spacecraft in orbital flight around the Earth; 2) investigate man's performance capabilities and his ability to function in the environment of space; and 3) recover the man and the spacecraft safely. NASA accomplished these objectives between 1958 and 1963 with 20 unmanned launches and six manned space-flights, including the first U.S. suborbital ballistic flight of Alan Shepard on May 5, 1961, and the first U.S. orbital flight of John Glenn on February 20, 1961.

Project Mercury proved that man could function well as a pilot-engineer-experimenter for up to 34 hours of weightless flight without undesirable reactions or deteriorations of normal body functions. The program also demonstrated that NASA and its contractors successfully designed a spacecraft that could withstand the conditions of space and atmospheric re-entry, developed a worldwide tracking network, and created mission control procedures that served all future spaceflight programs.[16]

The spacecraft used in Project Mercury was essentially a manned satellite, a one-man, bell-shaped ballistic capsule with high aerodynamic drag. Designed by McDonnell Aircraft Corporation of St. Louis, Missouri, the capsule was 9.5' high and 6' in diameter at the heat shield base and was designed to withstand any combination of acceleration, heat loads, and aerodynamic forces that occurred during boost and re-entry of each mission. McDonnell produced 20 capsules in all, each one essentially similar in overall size and systems, but with certain individual characteristics, such as the astronauts'

[16] James M. Grimwood, *Project Mercury: A Chronology* (Washington, D.C.: NASA History Series, NASA Special Publications-4001, 1963), available at http://history.nasa.gov/SP-4001/cover.htm; Slovinac and Deming, 2010, 8.

custom-fitted "couch" that helped them withstand the high-G forces of launch and re-entry. Once each orbital mission was complete, the capsule was moved out of orbit via a retrorocket system and descended into the Atlantic Ocean with a parachute after atmospheric re-entry.[17]

The launch vehicle for the two manned Mercury suborbital ballistic missions was a modified Redstone rocket, at the time "the only trustworthy booster rocket in the American arsenal."[18] Originally developed as an intermediate range ballistic missile (IRBM) by the Army under the direction of Wernher von Braun at Redstone Arsenal in Huntsville, Alabama, the Redstone rocket generated 78,000 pounds of thrust at liftoff. The four manned orbital Mercury flights used a modified Atlas rocket, which had three engines capable of producing 367,000 pounds of thrust.[19]

The Mercury Seven Astronauts

In December of 1958, NASA published a call for applications to select the first team of Mercury astronauts, who President Eisenhower decided would be chosen from the ranks of America's daring military test pilots. A seven-item formula for "Project Astronaut" selection required that candidates be: a male between 25 and 40 years of age; less than 5 feet 11 inches in height; in excellent physical condition; have at least a bachelor's degree, though additional graduate studies and stringent professional experience were desired; graduate of a military test pilot school; have 1,500 hours total flying time; and be a qualified jet pilot.[20]

After an extensive selection process, NASA announced on April 9, 1959, that seven pilots from the Navy and Air Force had been selected for Project Mercury, including: Lt. Commander

[17] Swenson et al., 1989, 112 and 134.
[18] Swenson et al., 1989, 123.
[19] Butowsky, 1984, 5.
[20] Swenson et al., 1989, 131.

Alan B. Shepard, Navy; Captain Virgil I. Grissom, Air Force; Lt. Colonel John H. Glenn, Jr., Marines; Lieutenant Malcolm Scott Carpenter, Navy; Lt. Commander Walter M. Schirra, Jr., Navy; Captain Donald K. Slayton, Air Force; Captain Leroy Gordon Cooper, Jr., Air Force.[21] The astronauts were officially headquartered at Langley Air Force Base in Virginia, but they increasingly travelled to their eventual launch site at CCAFS for training.

At the end of 1959 and beginning of 1960, the Mercury Seven astronauts underwent a wide-ranging training program, which began with a series of lectures at Langley AFB on all aspects of Project Mercury, including the capsule configuration and escape system. They then toured the various contractor facilities around the nation for closer familiarization with mockup capsules, hardware, and the manufacturing process. Training sessions at Cape Canaveral and other NASA centers helped adapt their bodies to disorientation, tumbling, high-G forces, and high levels of carbon dioxide absorption. Other training included sessions in pressure suits, heat chambers, parabolic flying to simulate weightlessness, and mastering their assigned specialty areas in the program.[22] The training schedule prepared them to manually fly the spacecraft and perform a variety of in-flight tasks, including system checks, under strenuous conditions.[23]

Hangar S – Project Mercury Moves to the Cape

NASA shifted from the development phase of Project Mercury to the operational phase in the summer of 1960 when approximately 50 men from the NASA Space Task Group (STG) established residence at CCAFS. Joining them were nearly 80 technicians from McDonnell who set up new offices and testing areas at Hangar S, which was originally built for the Navy's

[21] Grimwood, 1963.
[22] Swenson et al., 1989, 235.
[23] Slovinac and Deming, 2010, 13-14.

Vanguard satellite program. By the end of the year, NASA referred to Hangar S as the "nerve center" of Project Mercury and home of the STG's Pre-Flight Operations Division, which had grown to over 400 technicians and contractors, who received, tested, and prepared the Mercury capsules for flight.[24]

A sketch map of the Hangar S area in 1960 is shown in Figure 3. The map shows the hangar along with the adjacent Primate Training Area (discussed below), oxygen and water servicing buildings, and a general storage building. This arrangement also appeared in the later 1963 aerial photograph in Figure 4, which shows the hangar near the end of Project Mercury after the north and south annexes were added to the building in 1961.

There were five branches of the Pre-Flight Operations Division, including Launch Coordination, Inspection Office, Capsule Systems, Instrumentation, and Technical Services. The E&O Building adjacent to Hangar S contained the division staff offices, which showed the diversity of administrative duties that Project Mercury required, including the Business Administration, Contracting Officer, Property Administrator, Weather, Goddard's Mercury Tracking Network, Reliability and Flight Safety, Data Coordination, Life Systems, and Public Affairs.[25]

The processing of the Mercury spacecraft began with its arrival at the Skid Strip via airplane and transfer to Hangar S for a capsule "shake-down." As shown in the 1960 floor plan sketch in Figure 5, the hangar contained all the necessary facilities, storage, and work areas required to prepare the capsule, including the "White Room," located in the northeast corner of the high bay. The White Room, or

[24] Swenson et al., 1989, 268; NASA, "Hangar 'S' Facilities Listed," *Space News Roundup!*, November 29, 1961b, 1.
[25] NASA, 1961a, 1.

"Capsule Checkout Area," was an enclosed clean room equipped with high performance air filters and humidity controls for checking out the capsule systems. Figure 6 shows technicians working on a Mercury capsule inside the White Room in 1962.

Across the high bay from the White Room was the Altitude Chamber, which was used for capsule environmental control system checkout and verification in a simulated high-altitude environment. The historic 1962 photograph in Figure 7 shows a Mercury capsule being moved into the Altitude Chamber. Other work areas in the high bay included the enclosed Automatic Stabilization and Control System (ASCS) Fixture Area, in which technicians mounted the ASCS used to stabilize the capsule; the enclosed Rocket Alignment and Weight Check Area; trailers containing telemetry and checkout equipment; and shipping/receiving/office/tool crib area.[26]

Pre-flight operations at Hangar S were unusual compared to other missile operations at the Cape in that the staff there were permitted to make what NASA called "'on-the-spot' analyses of any troubles detected as well as 'on-the-spot' design changes to rectify troubles if presented. This concept is considered mandatory for the Mercury program in order to insure [sic] that adequate flight reliability be obtained with a reasonable schedule."[27] Systems engineers administered all capsule systems tests, which were conducted jointly by NASA and McDonnell personnel.

Among the engineers of the Pre-Flight Operations Division was Guenter Wendt, the Pad Leader for McDonnell who was responsible for all activity in and around the Mercury capsule at Hangar S. "If you came up to the spacecraft," wrote Wendt, "you didn't touch it without my permission." In his memoir, Wendt described the early days of work at Hangar S:

[26] NASA, 1961a, 2-3.
[27] NASA, 1961a, 3.

> Our first job was to get the facility prepared to receive the Mercury capsules from St. Louis. A clean room was built on the hangar floor, and we got our control room established and set up power, cabling, and instrumentation. At that time, all missiles being launched from the Cape – the Thor, Matador, Snark, Navaho, Redstone, and Atlas – were prepared for their flights in hangars surrounding ours. It was a very busy place.
>
> Hangar S, located a couple of miles from the Redstone launch complex, was a fairly large structure. Pretty conventional for a big Air Force hangar. Concrete block, three-stories tall, and huge sliding doors filled with glass windows. As a mechanical engineer, I was anxious to oversee the operation every minute of the day. We constructed our offices inside the hangar at the south end of the building so that we could be close to the activity.[28]

Wendt and his engineering team typically worked long 12 to 14-hour days in Hangar S with little time for rest. Checkout work in the hangar's White Room typically required 50 days for systems tests and 60 more days to verify and rework the capsule's wiring and systems. Technicians in the Altitude Chamber tested the leakage rate of the capsule's pressure shell. In the White Room, they corrected minor difficulties with instruments and conducted integrated tests to verify the sequencing of every capsule system required from launch to splashdown.[29]

---

[28] Guenter Wendt and Russell Still, *The Unbroken Chain* (Burlington, Ontario, Canada: Apogee Books, 2001), 11-12.
[29] Swenson et al., 1989, 274 and 310.

Hangar S also served as the astronaut training area and crew quarters at CCAFS throughout Project Mercury. It was used as the base of operation by the astronauts when they were on the Cape, especially in the days and weeks just prior to a manned mission launch. In Tom Wolfe's non-fiction work on the lives of the Mercury astronauts, *The Right Stuff*, the author described the activities in Hangar S nearly a dozen times, including this descriptive passage:

> The hangar had been rebuilt inside to house the procedures trainer, a pressure chamber, and most of the other facilities an astronaut would need in the final preparations for a flight. There was a suite of rooms for living quarters, a dining room, a medical examination room, a ready room in which the astronaut would put on his pressure suit, a special doorway where the astronaut would get into a van to be driven out to the launch pad, and so forth. The boys seldom stayed there overnight, however, much preferring the motels in Cocoa Beach.[30]

While they preferred the local Holiday Inn to the cramped quarters of Hangar S, the astronauts did manage to sleep and eat in the hangar quarters on the nights leading up to launches. The photograph in Figure 8 shows astronauts Slayton, Cooper, and Schirra having breakfast in the Hangar S crew quarters with Dr. H.A. Minners before Cooper's 22-orbit mission aboard the Mercury-Atlas 9 in May of 1963.

In a memoir he co-wrote with Deke Slayton, Alan Shepard remembered the "crew quarters in Hangar S were spartan, austere, nondescript, and totally uncomfortable".[31] These conditions were somewhat eased by the presence of the

[30] Tom Wolfe, *The Right Stuff* (New York: Farrar, Straus, Giroux, 1983), 218.
[31] Alan Shepard and Deke Slayton, *Moon Shot: The Inside Story of America's Race to the Moon* (Atlanta, GA: Turner Publishing, Inc., 1994), 86.

astronauts' well-liked nurse, Air Force Lieutenant Dolores "Dee" O'Hara, who supervised their physical well-being and flight readiness.[32]

When the astronauts weren't relaxing in Cocoa Beach, they spent long 12-hour days at Hangar S rehearsing launch procedures in the "procedures trainer," an exact mockup of the Mercury capsule's interior. During these training sessions the astronauts climbed into the trainer and lay on their backs as if they were sitting in a chair pushed over backward on the floor. This was the position the astronauts would be in during launch and re-entry. "No one liked the trainer," wrote Shepard and Slayton. "It was like taking a straight-backed chair, placing it on its back and then 'sitting' in it. This is where the astronaut trained to reach all his instruments and controls until he could go through every motion of his scheduled flight with his eyes closed and never miss hitting the right button or lever."[33] Figure 9 shows astronaut Cooper, looking none too happy, leaving the Altitude Chamber in Hangar S after a five-hour training session.

The procedures trainer's control console was connected to a bank of computers manned by technicians who guided the astronauts through every step of their spaceflight from launch to splashdown. The technicians also fed simulated mission scenarios and problems into the system, to which the astronaut learned to react appropriately. Each of the Mercury astronauts spent approximately 100 hours in the Hangar S procedures trainer in preparation for flight.[34]

---

[32] NASA, 1961a, 2.
[33] Shepard and Slayton, 1994, 86.
[34] Wolfe, 1983, 164 and 184; John Catchpole, *Project Mercury: NASA's First Manned Space Programme* (Chichester, UK: Praxis Publishing, 2001), 107.

The Primate Training Area

In January 1961, NASA installed a colony of six chimpanzees and 20 medical specialists and veterinarians in temporary quarters in the Primate Training Area, located just behind Hangar S. Since they were biologically similar to human beings, NASA used chimpanzees and other primates in the Project Mercury research, development, and rocket qualification stages to ensure that a man could withstand the physical strain of g-forces during a rocket launch and to see if he could use his brain and hands throughout the spaceflight. The chimpanzees at Hangar S were trained to ride on the Redstone rocket and perform manual lever-pulling tasks to test the Mercury capsule's environmental control system and to prove that levers could be pulled during launch, weightlessness, and re-entry.[35]

That all of these functions could be completed was finally proven during the Mercury/Redstone (MR-2) qualification launch on January 31, 1961, which launched the chimpanzee named "Ham." Ham and a handler technician show off his "couch," a pressurized capsule in which he rode inside the Mercury capsule, and space suit in Figure 10. Ham performed all of his scheduled tasks well during his 16.5-minute sub-orbital flight and showed that a manned mission could be accomplished successfully. Ham's flight was followed by that of "Enos" during the Mercury/Atlas (MA-5) qualification launch on November 29, 1961.[36]

Mercury Success

Following 20 initial research, development, and qualification launches, Project Mercury successfully launched six manned missions into space from Launch Complexes 5/6 and 14 at CCAFS. The first two were suborbital ballistic flights

[35] Swenson et al., 1989, 312-318; Wolfe, 1983, 194.
[36] Swenson et al., 1989, 312-318; Wolfe, 1983, 194.

launched with the Mercury/Redstone rocket configuration, including the May 5, 1961, launch of Alan Shepard, America's first astronaut in space, in the *Freedom* 7 Mercury capsule from Pad 5 at LC-5/6 at CCAFS. Shepard's 15.5-minute flight took him to an altitude of 116.5 miles and carried him 303 miles downrange at a velocity of 5,134 miles per hour. His mission was a success and demonstrated that a man could safely launch into space and complete his mission objectives in a weightless environment. Shepard's flight was soon followed by that of Virgil "Gus" Grissom on July 21, 1961, in the *Liberty Bell* 7 capsule from Pad 5 at LC-5/6. Grissom's flight was a successful repeat of Shepard's mission until he splashed down and awaited recovery. While in the water, the capsule's explosive egress hatch blew off and the capsule took on water and sank. Grissom was eventually rescued by a helicopter.[37]

The first two suborbital Mercury missions were followed by four orbital missions. John Glenn became the first American to orbit the Earth on February 20, 1962, when he launched in the spacecraft, *Friendship* 7, from LC-14 at CCAFS. Glenn completed three orbits of Earth over a period of nearly five hours at an average velocity of 17,544 miles per hour. His mission was a total success and proved that a man could perform well in a weightless environment for an extended period of time and then be safely recovered.

Following Glenn's historic mission, President Kennedy visited CCAFS to tour its facilities and congratulate Glenn at a special ceremony at Hangar S shown in Figure 11. Vice President Johnson, as well as the other Mercury astronauts, and officials from NASA and its contractors, also were in attendance. President Kennedy then toured the Hangar S facilities and saw the Mercury capsule up close (Figure 12).

[37] Slovinac and Deming, 2010, 20.

Glenn's mission was followed by four more orbital flights from LC-14 by astronauts Carpenter, Schirra, and Cooper, each of which added longer orbits and increasingly sophisticated capsule maneuvers and experiments. With these six manned flights, Project Mercury was deemed a success with all of its mission objectives completed by the summer of 1963.[38]

CCAFS and Hangar S after Project Mercury

Just as Project Mercury concluded in 1963, NASA was beginning to build its new spaceport facilities at KSC on Merritt Island. KSC is located immediately west of CCAFS across the Banana River and included all launch, operations and checkout, engineering, and administrative facilities necessary to send a manned spaceflight to the Moon.

As NASA moved into KSC the Agency maintained a presence in the CCAFS Industrial Area, altering earlier facilities as needed for new programs and building new ones where space allowed. By 1964-65, NASA facilities in the CCAFS Industrial Area included Hangar S, Hangar AE, Hangar AF, Hangar AM, Hangar AO, the Apollo Warehouse, the Solar Array Test Building, the E&O Building, and the Hangar M Annex. Hangars AM and AO were constructed with clean room facilities to process NASA spacecraft payloads.

In 1965 the interior of the high bay at Hangar S was modified with the construction of a new spacecraft test area, clean room, systems test area, and associated support rooms and storage areas (Figure 13).[39] This new area was used in 1966 to conduct checkout operations on the Lunar Orbiter 5 spacecraft, the last of the Lunar Orbiter series, which was used to take additional Apollo landing site photography. The Lunar Orbiter 5 is shown inside the Hangar S checkout area in

[38] Slovinac and Deming, 2010, 21.
[39] J.E. Greiner Company, Consulting Engineers, "Alterations to Exiting Spacecraft Facilities, Hangar 'S'," construction drawings, March 8, 1966.

Figure 14. Additional spacecraft were checked out in the facility through the early 1970s (Figure 15).

By the Space Shuttle era, the spacecraft test area was used to process small orbiter payloads, and the clean room was dedicated to processing orbiter experiments. The hangar was also used to process the Solid Rocket Booster (SRB) recovery equipment and the office areas on either side of the high bay were dedicated to base support and SRB contractor personnel.[40]

PART II. ARCHITECTURAL INFORMATION

A. GENERAL STATEMENT

1. Architectural Character:

Hangar S shares the same standardized design found in all of the hangars in the CCAFS Industrial Area. It was designed to house the assembly of large missile components in the central high bay with shop and office areas in the two-story concrete block wings on the north and south sides. The spacious interior of the high bay offered great flexibility in terms of spatial arrangement during Project Mercury with plenty of room to build the specialized clean rooms, altitude chamber, and other equipment needed to service the Mercury capsules.

2. Condition of Fabric:

The condition of Hangar S at the time of research was good. The hangar retains its overall structural integrity with no major deterioration or damage.

B. DESCRIPTION OF EXTERIOR

1. Overall Dimensions:

[40] NASA, "Facilities Handbook for Hangar S," Revision A, March, 1982.

184′ (W) x 170′-6″ (L) x 45′ (H)

2. Foundations:

Steel reinforced concrete foundation, unknown thickness.

3. Walls:

The exterior walls of Hangar S are a combination of painted concrete block and corrugated aluminum siding. The interior walls are unfinished concrete block and metal with exposed steel skeleton structural system. The sliding hangar doors on the east and west elevations are made of 1/4″ steel plates with translucent ribbed plastic sheets used as window lights.

4. Structural System, Framing:

The hangar bay has a load-bearing steel truss wall structure with a steel truss gable roof structure. The two-story annex wing additions have load-bearing concrete block walls with steel-truss shed roof structures.

5. Porches, etc.:

None

6. Chimneys:

None

7. Openings:

a. Doorways and Doors:

The hangar has segmented horizontal rolling doors on the east and west elevations. The doors each have six segments per elevation that measure 32′-2″ tall and 21′-5″ wide. Each door section rolls on rubber drive wheels to

collapse into concrete block pocket structures on either side of the bay. Set within the outer segment of each door is a half-glass, metal pedestrian entrance. Additional pedestrian entrances with single and double doors are located on the north and south elevations.

b. Windows and Shutters:

The hangar bay has clerestory windows along the north and south elevations, but they have been enclosed with corrugated metal sheets. There are one-over-one, double-hung, metal sash windows throughout the first and second floors of the north and south wings of Hangar S. The windows have protruding concrete sills and no other trim or surrounds.

8. Roof:

The high bay portion of Hangar S has a slightly-pitched, built-up gable roof with aluminum drip edges and gutters. The roof has a steel truss structure that provides a clear, uninterrupted workspace in the bay with enough room for the building's bridge crane to move back and forth along the bay, as needed. The north and south wings sections have built-up shed roofs with an aluminum base and aluminum drip edges and gutters.

C. DESCRIPTION OF INTERIOR

1. Floor Plan:

The original Hangar S floor plan included an open high bay work area flanked on the north and south by two-story office and shop areas. Each wing contained a series of irregularly sized rooms for mechanical equipment, shops, offices, logistics, restrooms, and staircases at each end leading to the second floor. The concrete slab floor of the hangar includes a grid system of covered trenches that

contain electrical cables, mechanical lines, compressed air, and grounding cables that serve the building's various equipment and work stations.

During Project Mercury from 1959-1962, the first floor of the south wing contained rooms (from west to east) for parachute storage, shop and hangar office, welding shop, general shop, reproduction room, and a clean room. The first floor of the north wing contained a transformer room, dark room, battery room, electronic shop and office, instrumentation engineering office, restroom, and a mechanical room.

The second floor of the south wing contained the Mercury astronaut quarters, including the crew quarters, crew personal equipment and dressing room, crew holding room, medical offices and evaluation laboratories, and a utility room. The original astronaut quarters floor plan was renovated to remove asbestos materials and altered for office space in 1986. The north wing second floor contained offices for McDonnell Douglas, Inc., the prime Mercury capsule contractor, and NASA staff offices.

After Project Mercury in 1965, NASA constructed a new spacecraft test area and clean room complex in the hangar high bay. This area was 113′ wide and 80′ long and was structurally independent from the surrounding hangar high bay with corridors all the way around it. Entered from the east end, the building had a central section that contained a personnel clean garment change areas, air shower, toilet, and air lock. From this preparation area, personnel then entered into the spacecraft test and clean room areas. There was also a test director's office and systems test area. NASA also renovated the adjacent work areas in the first floor of the north and south wings by removing partitions to create new offices and workshops.

2. Stairways:

There are concrete stairways located in each of the four corners of Hangar S.

3. Flooring:

The flooring of the Hangar S high bay and throughout its first floor work areas is polished poured concrete. The second floor features carpet.

4. Wall and Ceiling Finish:

Finish materials on the interior of Hangar S include walls of aluminum, steel, concrete block, and drywall. The interior of the hangar bay is unfinished; the walls and ceiling are composed of the building's exposed steel truss structure and the concrete block walls of the north and south wings. Both wings feature painted concrete block on exterior walls with painted drywall finished interior walls. Ceilings throughout these areas are finished with suspended acoustical tile.

5. Openings

a. Doorways and Doors:

The first and second floors of the hangar feature a mixture of double and single metal doors, most of which contain single fixed lights at eye level. There are also modern hollow-core wood doors on the second level of the north and south wings.

b. Windows: N/A

6. Decorative features and trim:

There are no decorative features or trim anywhere in Hangar S.

7. Hardware:

The hardware used throughout Hangar S is standard issue for industrial buildings with no notable styles or types.

8. Mechanical Equipment:

a. HVAC

Both the south and north wings were designed with full heat, ventilation, and air conditioning (HVAC) systems, which remain intact, but no such system treats air in the hangar bay. Both wings had HVAC equipment rooms that contained a chiller-compressor, air compressor, and pumps that forced air throughout the building.

b. Lighting

Hangar S is lit by a system of exterior and interior lights, which includes a number of fixture types. The outdoor lighting system consists of floodlights attached to the building and adjacent telephone poles. The interior of the hangar bay is lit with a combination of ceiling floodlights, and additional floodlights, mounted approximately 20’ above the floor. Interior lighting in the north and south wing sections is provided by fluorescent fixtures installed in the suspended acoustic tile ceiling.

c. Plumbing

The original Hangar S plumbing system included four bathrooms (one on each floor of the north and south wings), as well as floor drains, a fire hose system, and a fire sprinkler system on the first and second floors.

9. Original furnishings: None.

D. SITE INFORMATION

1. Historic Landscape Design:

Hangar S is located on the west side of Hangar Road in the southwest corner of the CCAFS Industrial Area. The CCAFS Industrial Area is a grid-shaped collection of hangars, administrative buildings, and support structures. Hangar S is located between the Missile Assembly Building AE (commonly known as Hangar AE [HAER NO. FL-8-B]) on the north and the Hangar AF Complex (HAER NO. FL-8-11-S) on the south. It is surrounded by a chain-link security fence and paved parking areas and access roads.

2. Outbuildings:

Immediately west of Hangar S is the former Emergency Breathing Equipment Maintenance Building. This was originally two separate buildings that contained the Hangar S water and oxygen servicing areas. After Project Mercury, support service additions and partitions were added to these buildings and their original roll-up bay doors were enclosed with concrete block and pedestrian entrances. In 1969, the building was renamed as the Self-Contained Atmospheric Protective Ensemble (SCAPE) Suit Maintenance Building by NASA. SCAPE suits are protective airtight suits that provide NASA technicians with chemical, bacteriological, and radiation protection during the handling of volatile fuels and other materials. In 1993, the building’s name was again changed to the Emergency Breathing Equipment Maintenance Building. At that time it contained workshops, bench testing areas, filling areas, and offices associated with the maintenance and repair of Emergency Life Support Apparatus and other equipment used in the adjacent Hangar S building.

Just south of Hangar S is the 1957 Paint Storage Building, a one-story concrete block building with a metal hipped roof, concrete foundation, and a rectangular footprint that contains approximately 100 square feet of storage space. It has a single metal entrance on the north elevation and no windows. It was used for the storage of paint, oil, and chemicals used at Hangar S.

PART III. SOURCES OF INFORMATION

A. ARCHITECTURAL DRAWINGS

Steward and Skinner, and Maurice H. Connell and Associates, Inc.

"Missile Assembly Buildings R & S." Construction drawings, May 11, 1956.

Pan American World Airways, Inc.

"Hangar 'S' Area, Site Plan." Construction drawings, April 1962.

J.E. Greiner Company, Consulting Engineers.

"Alterations to Existing Spacecraft Facilities, Hangar 'S', Site Plan." Construction drawings, April 1965.

B. HISTORIC VIEWS

Kennedy Space Center

Aerial View of Hangar S, 1963. Photograph image number LOC-63-4897. Kennedy Space Center Archives.

Sketch Map of Hangar S Area, 1960. Source: "Manual For Launch Operations – Project Mercury." NASA, Launch Operations Branch, Operations Division, Space Task Group. March 1960. On file at the Kennedy Space Center, Environmental Division, Cultural Resources Office.

Sketch Map of Hangar S First Floor Plan, 1960. Source: "Manual For Launch Operations – Project Mercury." NASA, Launch Operations Branch, Operations Division, Space Task Group. March 1960. On file at the Kennedy Space Center, Environmental Division, Cultural Resources Office.

Sketch Map of Hangar S Second Floor Plan, 1960. Source: "Manual For Launch Operations – Project Mercury." NASA, Launch Operations Branch, Operations Division, Space Task Group. March 1960. On file at the Kennedy Space Center, Environmental Division, Cultural Resources Office.

Mercury Capsule #18, April 11, 1962. Photograph image number LOC-62-2948. Kennedy Space Center Archives.

Mercury Capsule #16, 1962. Photograph image number LOC-62-3051. Kennedy Space Center Archives.

Astronauts Deke in Hangar S Before Cooper's 22-orbit Mission, May 14, 1963. Photograph image number 63-MA9-0133. Kennedy Space Center Archives.

Mercury Astronaut Gordon Cooper Leaves Hangar S Altitude Chamber, January 1, 1963. Photograph image number 63-MA9-0045. Kennedy Space Center Archives.

Ham the Chimpanzee, January 23, 1961. Photograph image number KSC-61C-0109. Kennedy Space Center Archives.

President Kennedy Speaking in Front of Hangar S, February 23, 1962. Photograph image number KSC-62PC-0015. Kennedy Space Center Archives.

President Kennedy, Vice President Johnson, and NASA Administrator James Webb in Hangar S High Bay, February 23, 1962. Photograph image number LOC-62-6880. Kennedy Space Center Archives.

Interior of the Spacecraft Test Area in Hangar S, 1970. Photograph image number 102-KSC-70-2606. Kennedy Space Center Archives.

Interior of the Spacecraft Test Area in Hangar S, 1972. Photograph image number 102-KSC-72C-3404. Kennedy Space Center Archives.

Lunar Orbiter 5 in the Hangar S Spacecraft Test Area, 1966. Photograph image number 122-KSC-66PC-322. Kennedy Space Center Archives.

C. SELECTED SOURCES

Butowsky, Harry A.

1984 *Man in Space: National Historic Landmark Theme Study, Phase I and II.* Washington, D.C.: National Park Service.

Catchpole, John

2001 *Project Mercury: NASA's First Manned Space Programme.* Chichester, UK: Praxis Publishing.

Green, Constance McLaughlin and Milton Lomask

1970 *Vanguard: A History.* Washington, D.C.: NASA History Series, NASA Special Publication-4202. Available from http://history.nasa.gov/SP-4202/cover.htm.

Grimwood, James M.

1963 *Project Mercury: A Chronology.* Washington, D.C.: NASA History Series.

Lipartito, Kenneth, and Orville R. Butler

2007 *A History of Kennedy Space Center*. Gainesville, FL: University Press of Florida.

National Aeronautics and Space Administration (NASA)

1960 "Manual for Launch Operations – Project Mercury." NASA, Launch Operations Branch, Operations Division, Space Task Group. On file at the Kennedy Space Center, Environmental Division, Cultural Resources Office.

1961a "Master Development Plan for NASA Technical Facilities at AMR, Revision II." George C. Marshall Space Flight Center, Huntsville, Alabama. Launch Facilities Design Group, Launch Operations Directorate, Atlantic Missile Range.

1961b "Hangar 'S' Facilities Listed." *Space News Roundup!* November 29, 1961.

1964 "Hangar S (1726)." Real Property Record. On file at the Kennedy Space Center Real Property Office.

Shepard, Alan, and Deke Slayton

1994 *Moon Shot: The Inside Story of America's Race to the Moon*. Atlanta, GA: Turner Publishing, Inc.

Slovinac, Patricia, and Joan Deming

2010 "Cape Canaveral Air Force Station – Mission Control Center (Building No. 1385, Mercury Control Center." HAER Documentation Report. HAER FL-8-AV.

Swenson, Loyd S., James M. Grimwood, and Charles C. Alexander

1989 *This New Ocean: A History of Project Mercury*. Washington, D.C.: NASA History Series, NASA Special Publication-4201.

The Mackle Company

n.d. "Harold Steward." Biographical essay available from http://themacklecompany.com/femjrstorypublic/personalstories/haroldsteward.htm. Accessed August 7, 2013.

Wendt, Guenter, and Russell Still

2001 *The Unbroken Chain*. Burlington, Ontario: Apogee Books.

Wolfe, Tom

1983 *The Right Stuff*. New York: Farrar, Straus, Giroux.

D. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at KSC and CCAFS using primary and secondary sources. Sources that were not investigated that may contain secondary information include NASA Headquarters and at the offices of the various architects and contractors that constructed Hangar S. Additional oral history interviews with other engineers and technicians could also prove useful.

PART IV: PROJECT INFORMATION

NASA Kennedy Space Center (KSC) determined that Hangar S is eligible to the NRHP under Criterion A in the area of Space Exploration and Criterion B for association with the Mercury 7 astronauts. KSC chose to complete Historic American Buildings Survey (HABS) documentation of the building, in keeping with the agency's documentation of its other NRHP-listed or eligible properties. New South Associates, Inc., under contract with InoMedic Health Applications (IHA), a subcontractor to NASA KSC, conducted the HABS documentation and historic research for this project in March 2013. David Diener served as the project photographer, David L. Price

served as Project Historian, and Mary Beth Reed served as the Principal Investigator.

In order to complete the project, New South Associates' personnel were allowed full access to the facility, under the supervision of Barbara Naylor, KSC Historic Preservation Officer, and Nancy English, KSC Cultural Resources Specialist. Photographs were taken of the building's interior rooms, exterior, and context. The facility had been placed in an abandoned mode after the Space Shuttle Program Transition and Retirement activities. The rooms and high bay areas had been emptied. David Price conducted oral interviews with available NASA facility managers and personnel with direct knowledge of the building, and otherwise compiled the historic documentation required for the project. Elaine Liston, KSC Archivist, provided a wealth of information from her office in the KSC Archives. Additional documents and information were provided by Thomas E. Penders, CCAFS Archaeologist/Cultural Resources Manager.

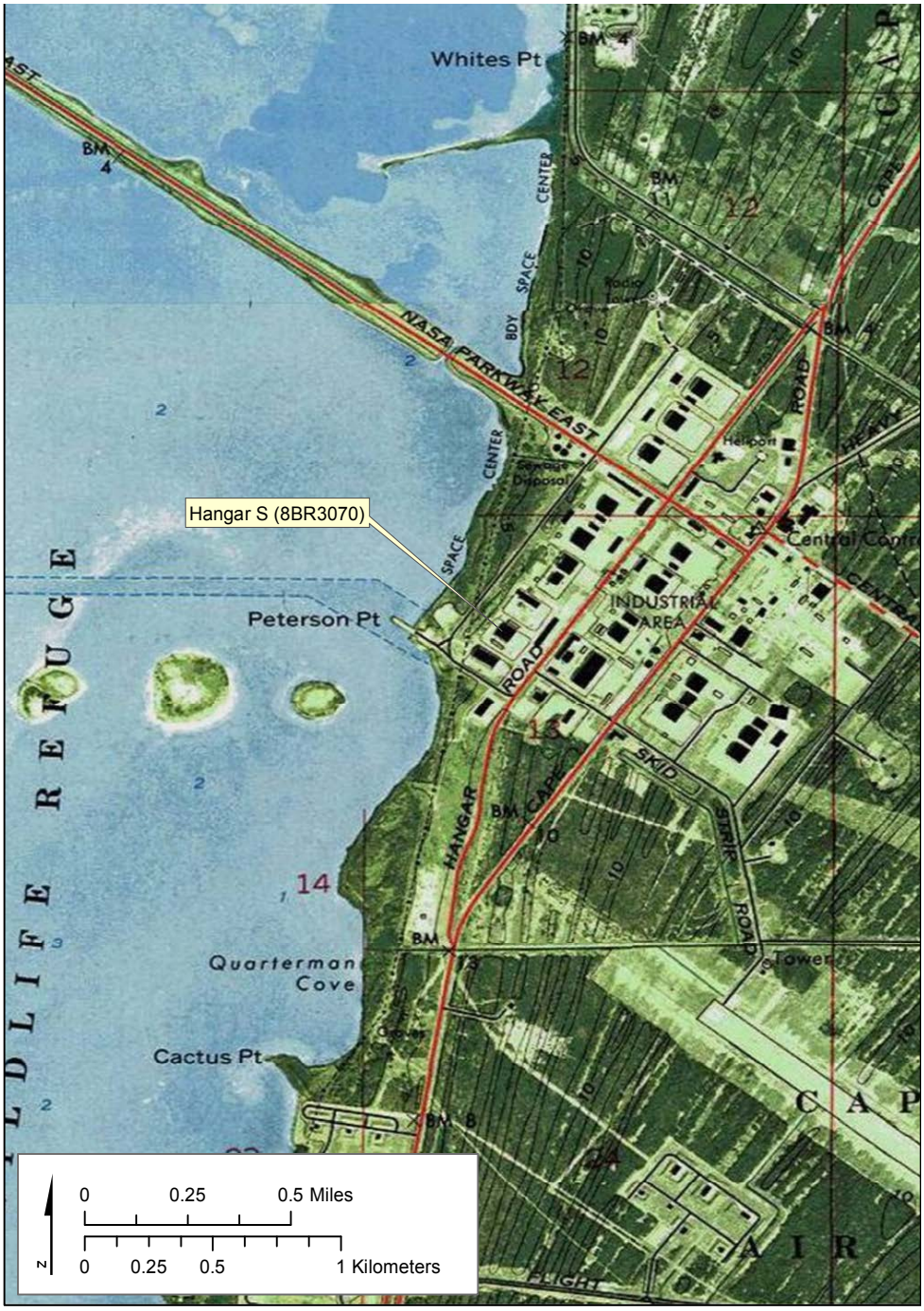

Figure 1. 1976 Orsino Florida 7.5-minute topographic quadrangle map showing the location of Hangar S.

Source: ESRI Resource Data, Imagery Layer

Figure 2. 2013 aerial photograph showing the location of Hangar S in the Cape Canaveral Air Force Station Industrial Area.

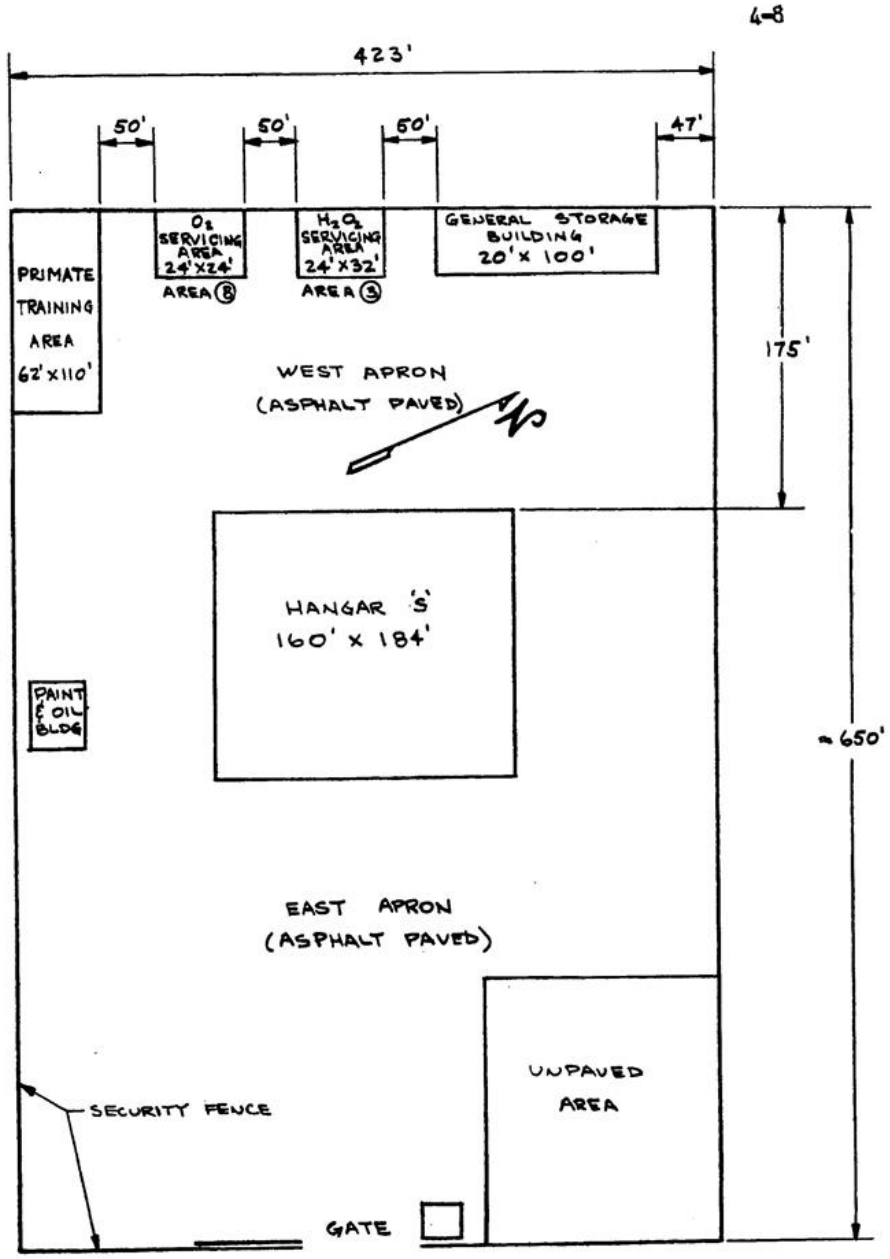

Figure 3. 1960 sketch map of Hangar S area. (Courtesy of NASA 1960).

Figure 4. 1963 aerial view of Hangar S. (Courtesy of Kennedy Space Center Archives, Image LOC-63-4897).

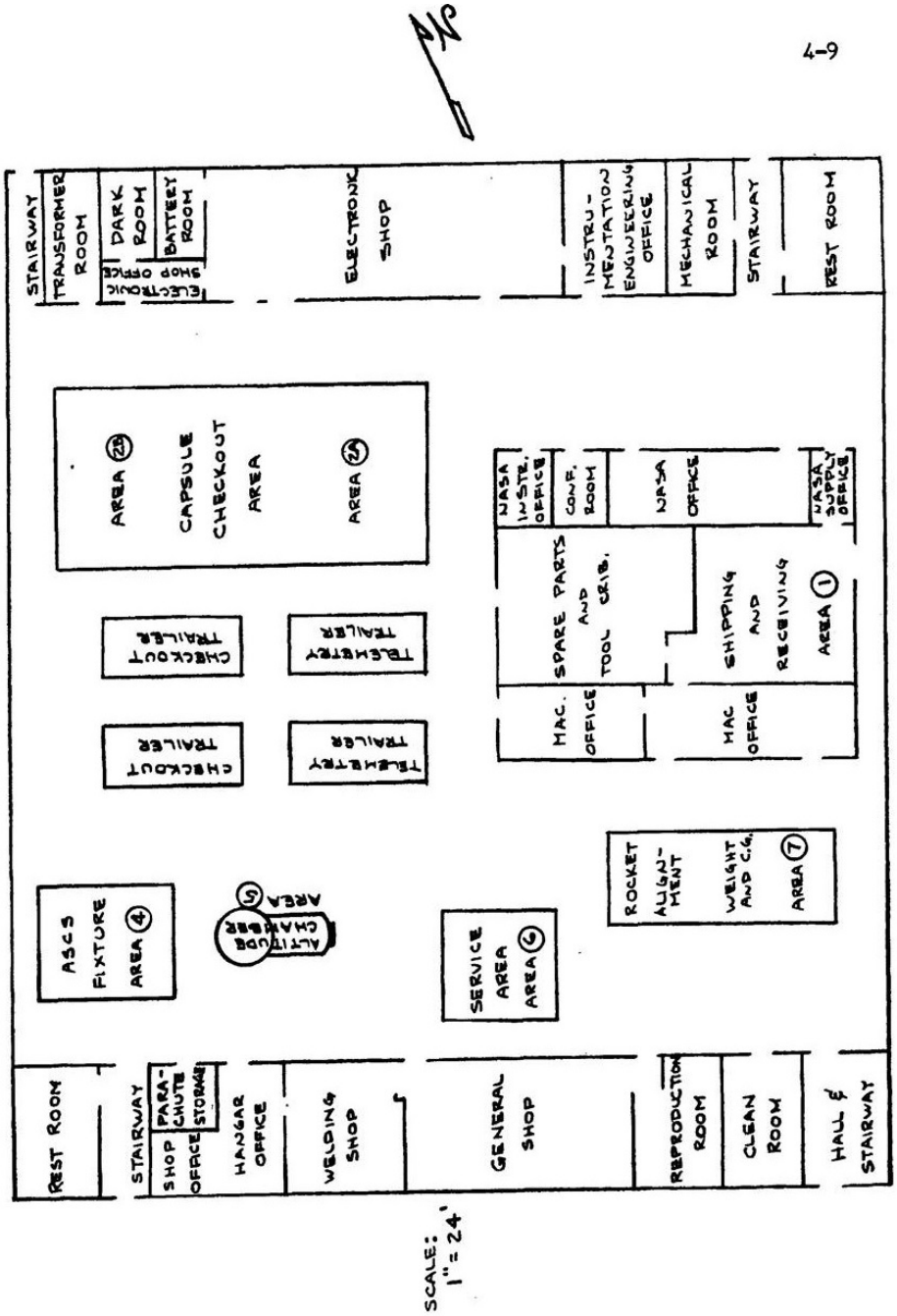

Figure 5. 1960 sketch map of Hangar S first floor plan. (Courtesy of NASA 1960).

Figure 6. Mercury Capsule #18 inside the Hangar S white room, April 11, 1962. (Courtesy of Kennedy Space Center Archives, Image LOC-62-2948).

Figure 7. Mercury Capsule #16 being moved into the altitude chamber in Hangar S, 1962. (Courtesy of Kennedy Space Center Archives, Image LOC-62-3051).

Figure 8. Astronauts Deke Slayton, Gordon Cooper, Wally Schirra and Dr. H.A. Minners having breakfast in Hangar S before Cooper's 22-orbit mission, May 14, 1963. (Courtesy of Kennedy Space Center Archives, Image 63-MA9-0133).

Figure 9. Mercury Astronaut Gordon Cooper in flight suit leaves Hangar S altitude chamber after a 5-hour training session, January 1, 1963. (Courtesy of Kennedy Space Center Archives, Image 63-MA9-0045).

Figure 10. Ham the chimpanzee showing off his space suit and the specially-designed 'Couch' capsule designed to hold him in the Mercury capsule during launch, January 23, 1961. (Courtesy of Kennedy Space Center Archives, Image KSC-61C-0109).

Figure 11. President Kennedy speaking in front of Hangar S after astronaut John Glenn's historic orbital mission, February 23, 1962. (Courtesy of Kennedy Space Center Archives, Image KSC-62PC-0015).

Figure 12. President Kennedy, Vice President Johnson, and NASA Administrator James Webb next to astronaut John Glenn's *Freedom* 7 Mercury capsule in Hangar S high bay, February 23, 1962. (Courtesy of Kennedy Space Center Archives, Image LOC-62-6880).

Figure 13. Interior of the Spacecraft Test Area in Hangar S, 1970. (Courtesy of Kennedy Space Center Archives, Image 102-KSC-70-2606).

Figure 14. Lunar Orbiter 5 in the Hangar S Spacecraft Test Area, 1966. (Courtesy of Kennedy Space Center Archives, Image 122-KSC-66PC-322).

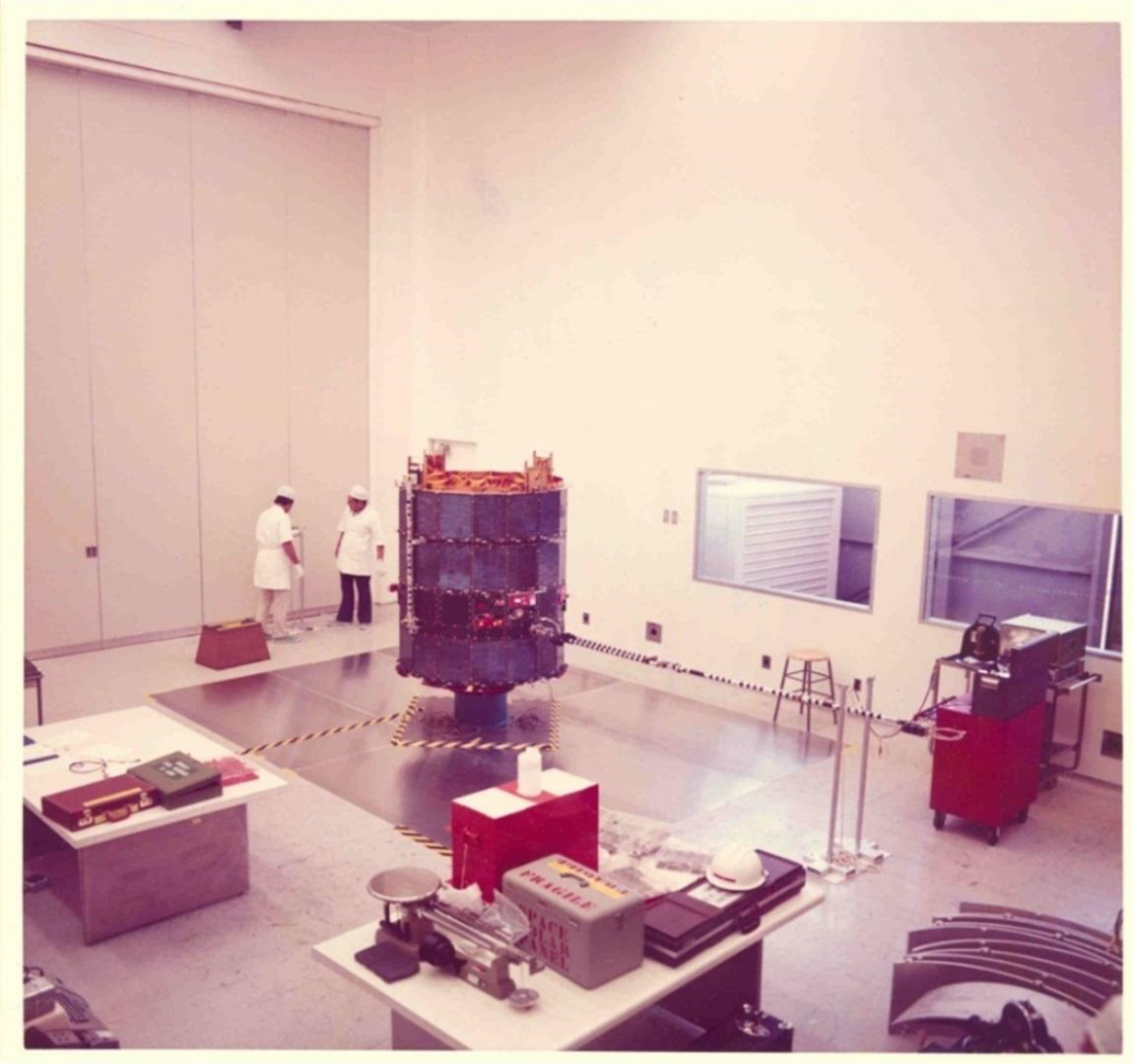

Figure 15. Interior of the Spacecraft Test Area in Hangar S, 1972. (Courtesy of Kennedy Space Center Archives, Image 102-KSC-72C-3404).