"MSFC TECHNICAL FACILITIES HISTORY AND DESCRIPTION"

This document includes a brief history of MSFC facilities, defunct names used by various Redstone located missile organizations, Michoud facilities history, the Slidell Operations Office history, the Mississippi Test Facility (MTF) history, and detailed description of technical facilities for the MSFC R&D Laboratories.

The final section presents a detailed breakdown of property and facility values for various MSFC facilities over a period of time.

IV. 1
VIII. 1

6/30/68

6/30/8

GEORGE C. MARSHALL SPACE FLIGHT CENTER

(MSFC)

Location: Huntsville, Alabama, Madison County

Land: 3,446.7 total acres (as of 6/30/68)

1,797 acres (under 99-year, irrevocable use permit from U.S. Army)

64 acres (leased on Green Mountain, Huntsville, Ala.)

1,585.7 acres (leased for contractor at Sacramento, Calif.)

Director:

Wernher von Braun (7/1/60 -)

Deputy Director Technical:

Eberhard Rees (7/1/60 -)

Deputy Director Administrative:

Harry H. Gorman (9/9/61 -)

Delmar M. Morris (7/1/60 - 9/9/61)

Cross

III--MSFC

History:

In 1941, the United States Army activated two facilities at Huntsville, Alabama--the Huntsville Arsenal, which manufactured and loaded chemical mortar and howitzer shells, and the Redstone Ordnance Plant, which assembled explosives for the chemical shells and produced complete rounds. Redstone Ordnance Plant, named for the quality of the local rock and soil, was redesignated Redstone Arsenal on February 26, 1943. 1/

In a search for better facilities for an expanding U.S. Army rocket program, Army Ordnance officials from Fort Bliss (Texas) inspected the Huntsville Arsenal in September 1949. They proposed transfer to Huntsville of rocket scientists and technicians working on missile development for the Army at Fort Bliss, and the Secretary of the Army approved this recommendation on October 28, 1949. In addition to military, civil service, and contractor personnel, the transfer included 130 Germans and Austrians led by Dr. Wernher von Braun who had launched the first successful V-2 from Peenemünde on October 3, 1942, and who had participated in the Army's missile development program at White Sands Proving Ground since January 1946. In April 1950, with the arrival of the von Braun team, Huntsville Arsenal became part of Redstone Arsenal, and the Army established there the Ordnance Guided Missile Center on April 15, 1950. 2/ During the ten years between

the move to Huntsville and their transfer to NASA, the Army group at Redstone developed the Redstone, Jupiter and Juno missiles--each contributing to the U.S. space program.

Work on the Redstone missile began in 1950, and the Guided Missile Development Division's Missile Firing Laboratory (MFL) launched the first Redstone successfully on August 20, 1953, from Cape Canaveral. During the five-year research and development Redstone test flight program, the Army flew 37 Redstones to test missile structures, guidance and control equipment (basis for later guidance on space vehicles), tracking and telemetry, and other missile systems.[3]

From Redstone technology came the Jupiter intermediate range ballistic missile (IRBM), authorized by the Secretary of Defense on November 8, 1955. Experiments conducted and discoveries made in the course of Jupiter IRBM development during the late 1950's proved useful in the nation's space effort. The first Jupiter C (composite reentry test vehicle), a modified Redstone with two additional stages, was launched September 20, 1956, and the Jupiter C nose cone reentry tests the following year verified the ablation principle of heat protection later used in the manned space flight program. On May 31, 1957, the Jupiter, a single-stage, surface-to-surface, liquid-fuel missile, became the first successfully fired U.S. IRBM. Developed at

the same time was a four-stage Jupiter C, the Juno I, which launched the first U.S. earth satellite (Explorer I) on January 31, 1958. The most significant Jupiter flight occurred May 28, 1959, when the primates Able and Baker entered and returned from space in good health.[4]

The Army Ballistic Missile Agency (ABMA), officially established at Redstone in December 1955, became active February 1, 1956, and the Guided Missile Development Division (von Braun's group) became ABMA's Development Operations Division.[5] Shortly after its establishment on October 1, 1958, NASA requested eight Redstones from ABMA for the Mercury program suborbital missions. After a series of test flights, the Mercury-Redstone 3 (MR-3) mission was launched May 5, 1961, with Astronaut Alan B. Shepard, Jr., as pilot in Freedom 7. MR-4, the last flight in the Mercury-Redstone program, was launched with Astronaut Virgil I. Grissom as pilot in Liberty Bell 7 on July 21, 1961.[6]

On August 15, 1958, the Department of Defense's Advanced Research Projects Agency (ARPA) approved ABMA's proposal for development of the Juno V, a large space vehicle booster with 1.5 million pounds thrust. 7/ An Advanced Research Projects Agency memorandum on February 3, 1959, officially renamed the project Saturn. 8/ President Eisenhower announced on October 21, 1959, his decision to transfer the ABMA's Development Operations Division to NASA, 9/ and transfer of the Saturn program to NASA became effective March 14, 1960. On that day NASA established the NASA Huntsville Facility and announced that personnel transfer from ABMA would occur July 1. 10/

President Eisenhower signed Executive Order 10870 on March 15, 1960, formally naming the Huntsville installation the George C. Marshall Space Flight Center in honor of George Catlett Marshall (1880-1959), the only professional soldier to win the Nobel Peace Prize. Officially, the George C. Marshall Space Flight Center (MSFC) began operations on July 1, 1960, in the same facilities as it occupied under the Army, and President Eisenhower dedicated the new center on September 8, 1960. 11/

Assembly of SA-1, the first Saturn I flight vehicle, was completed at Marshall on January 16, 1961, and the vehicle was launched on October 27. By July 30, 1965, when the Saturn I program ended, a total of 10 Saturn I's had flown successfully. 12/

On July 11, 1962, NASA announced the intermediate-size Saturn C-1 IB program; this vehicle was redesignated Saturn IB in early February 1963.[13] The first Saturn IB (SA-201) was launched February 26, 1966.[14] The second flight (SA-203) was on July 5, 1966, and the third (SA-202), on August 25, 1966. SA-204, the fourth Saturn IB launch vehicle, was launched January 22, 1968, for the Apollo 5 mission--the first unmanned orbital tests of the Apollo Lunar Module.[15] SA-205, launched

SA 205 M.14

NASA approved development of the Saturn C-5 vehicle on January 25, 1962; in February 1963 the vehicle was redesignated Saturn V. Development and production of this launch vehicle for the Apollo program remained Marshall's chief mission. The first Saturn V was launched from John F. Kennedy Space Center, NASA, on November 9, 1967. This initial test, the Apollo 4 mission, was the first launch from Launch Complex 39.[17] The Apollo 6 mission, the Saturn V's second flight, was launched April 4, 1968.[18]

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* This section was prepared by David S. Akens and Rowene Dunlap, Marshall Space Flight Center.

II--MSFC

Mission:

Design, development, and test of launch vehicles and space transportation systems for manned space flight.

1) Managing the ~~Uprated~~ Saturn IB program to provide a launch vehicle for Apollo spacecraft orbital development tests; ~~and~~ the Saturn V program to provide the launch vehicle for actual manned lunar landing missions, planetary missions, and future very large scientific satellite payloads; and selected payloads for Apollo Applications missions.

2) Designing, developing, and manufacturing large launch vehicle systems, including vehicle systems test and integration; conducting test programs, such as dynamic and static testing programs; designing, developing, and testing large launch vehicle engines, such as the H-1 (N), J-2 (N), and F-1 (N) systems; developing and integrating scientific experiment payload packages to be flown on Saturn-Apollo vehicles or subsequent post-Apollo missions. 20/

III--MSFC

Sources:

1/ David S. Akens, Historical Origins of the George C. Marshall Space Flight Center, MSFC Historical Monograph No. 1 (Huntsville, Ala.: MSFC, Dec. 1960), 3, 36; Wernher von Braun, "The Redstone, Jupiter, and Juno," Technology and Culture, IV, No. 4 (Fall 1963), 452-465, reprinted in Eugene M. Emme, ed., The History of Rocket Technology: Essays on Research, Development and Utility (Detroit: Wayne State University Press, 1964), 107-121; MSFC Historical Office, "Historical Sketch of MSFC," mimeo (June 16, 1966), 6.

2/ Ibid., 5,6; Memo, Asst. Chief of Ordnance (Army) to Commanding Officer, R&D Service Sub-Office, Fort Bliss, KCRC, Kansas City, Mo.; Akens, 36; Francis E. Jarrett, Jr., and Robert A. Lindemann, "Historical Origins of NASA's Launch Operations Center to July 1, 1962," KHM-1 (KSC Historical Division, ~~comment edition,~~ Oct. 1964), 17.

3/ von Braun, "The Redstone, Jupiter, and Juno," 109-110.

4/ Ibid., 116-117; Jarrett and Lindemann, Appendix B, 8-21.

5/ Dept. of the Army, GO-68, Dec. 22, 1955; Jarrett and Lindemann, 41.

6/ Ibid., 116. For a detailed account of the Mercury-Redstone program, see Loyd S. Swenson, Jr., James M. Grimwood, and Charles C. Alexander, This New Ocean: A History of Project Mercury, NASA SP-4201 (Washington: NASA, 1966), especially 293-301, 310-318, 328-330, and 341-377.

7/ MSFC, Historical Office, Saturn Illustrated Chronology, MHR-4 (Huntsville, Ala.: MSFC, 1965), 1.

8/ Ibid., 5.

9/ President Eisenhower, Statement, Oct. 21, 1959; Akens, 69 ff.; Robert L. Rosholt, An Administrative History of NASA, 1958-1963, NASA SP-4101 (Washington: NASA, 1966), 109, n. 145.

10/ Akens, 76; Rosholt, 119-120; NASA Circular No. 57, March 14, 1960.

11/ President Eisenhower, Executive Order 10780, Federal Register, XXV (March 17, 1960), 2197; Rosholt, 120.; Akens, 81, 89-90.

12/ MSFC, Saturn Illustrated Chronology, 16, 45.

13/ Ibid., 56, 69; NASA Release 62-159. From June 1966 until January 1968, the designation Uprated Saturn IV was in use; see Memo, Julian Scheer, NASA Assistant Administrator for Public Affairs, June 9, 1966, and Memo, Scheer, Jan. 15, 1968.

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14/ MSFC, Saturn Flight Evaluation Working Group, Results of the First Saturn IB Launch Vehicle Test Flight AS-201, Abstract, (Huntsville, Ala.: MSFC, May 6, 1966).

15/ Ibid., Results of the Second Saturn IB Launch Vehicle Test Flight AS-203, Abstract (Huntsville, Ala.: MSFC, Sept. 22, 1966); Ibid., Results of the Third Saturn IB Launch Vehicle Test Flight AS-202, Abstract (Huntsville, Ala.: MSFC, Oct. 25, 1966); NASA Release 68-6

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17/ MSFC, Saturn Illustrated Chronology, 50, 69; MSFC Release 67-226; NASA Release 67-274, 275, 294

18/ NASA Release 68-54; U.S. Congress, Senate, Committee on Aeronautical and Space Sciences, Apollo 6 Mission, Hearing, April 22, 1968 (Washington: GPO, 1968).

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NASA, Budget Estimates, FY 1969, IV, AO 2-19.

III--MSFC

Defunct Names:

Army Ballistic Missile Agency--activated Feb. 1, 1956; discontinued July 22, 1960.

Army Ordnance Missile Command--established July 1, 1958; discontinued Aug. 1, 1962; replaced by U.S. Army Missile Command under U.S. Army Materiel Command.

Development Operations Division (ABMA)--established Feb. 1, 1956; became part of George C. Marshall Space Flight Center when it was established March 1960, effective July 1, 1960.

Experimental Missiles Firing Branch--established Dec. 1, 1951; became Missile Firing Laboratory of Redstone Arsenal's Guided Missile Development Division, Jan. 1953.

Guided Missile Development Branch--established Aug. 1951; became Guided Missile Development Group, Jan. 21, 1952.

Guided Missile Development Division--established Jan. 1953; became Development Operations Division (ABMA), Feb. 1, 1956.

Guided Missile Development Group--established Jan. 21, 1952; became Guided Missile Development Laboratory, Nov. 1952.

III--MSFC

Guided Missile Development Laboratory--established Nov. 1952; became Guided Missile Development Division, Jan. 1953.

Huntsville Arsenal--activated Aug. 4, 1941; merged with Redstone Arsenal, April 1950.

Juno V--redesignated Saturn Feb. 3, 1959.

Launch Operations Directorate (MSFC)--established March 14, 1960, effective July 1, 1960; became NASA Launch Operations Center (LOC), March 7, 1962.

Launch Vehicle Operations Division (MSFC)--established March 7, 1962; gradually phased out.

Michoud Operations--established Dec. 18, 1961; redesignated Michoud Assembly Facility, July 1, 1965.

Mississippi Test Operations--established Dec. 18, 1961; redesignated Mississippi Test Facility, July 1, 1965.

Missile Firing Laboratory (Development Operations Division)--established Jan. 1953; became MSFC's Launch Operations Directorate, July 1, 1960.

Ordnance Guided Missile Center--established April 15, 1950; became Guided Missile Development Branch of the Technical and Engineering Division, Aug. 1951.

Ordnance Missile Laboratories--established Sept. 18, 1952, with Technical and Engineering Division as part of it; disestablished Feb. 1, 1956, with activation of ABMA.

Ordnance Rocket Center--established Dec. 1950 with the separation of the Army Ordnance Rocket program from the missile development program; became Rocket Development Branch of the Technical and Engineering Division, Aug. 1951.

III--MSFC

Pearl River Test Site--sometimes used for Mississippi Test Facility in November 1961; name discontinued by NASA, Dec. 1, 1961.

Redstone Ordnance Plant--activated Oct. 6, 1941; redesignated Redstone Arsenal, Feb. 26, 1943.

Rocket Development Branch--established Aug. 1951; became Rocket Development Group, Jan. 21, 1952.

Rocket Development Group--established Jan. 21, 1952; became Rocket Development Laboratory, Nov. 1952.

Rocket Development Laboratory--established Nov. 1952; became Rocket Development Division, Jan. 1953.

Saturn C-1/N/M--redesignated Saturn I, Feb. 1963.

Saturn C-IB/N/M--redesignated Saturn IB, Feb. 1963.

Saturn C-5/N/M--redesignated Saturn V, Feb. 1963.

Technical and Engineering Division (Redstone Arsenal)/M established Aug. 1951; became part of Ordnance Missile Laboratories, Sept. 18, 1952.

Uprated Saturn I/M--designation for Saturn IB from June 1966 until January 1968.

MICHOUD ASSEMBLY FACILITY

(MAF)

Location: New Orleans, Louisiana, Orleans Parish

Land: 896.8 acres total (as of 6/30/68)

890.8 acres (NASA-owned)

6 acres (under use permit from Dept. of Army XIX Corps)

Manager:

George N. Constan (1/14/62 - ; Acting Manager, 9/20/61 - 1/14/62)

III--MSFC--Michoud

History:

The historical background of Michoud Assembly Facility spans two centuries of Louisiana history. The original land grant was made March 10, 1763, to Gilbert Antoine de St. Maxent, a New Orleans merchant. The property passed through several hands before it was sold to Antoine Michoud in 1827, and the Michoud family held the land until 1910.

With the outbreak of World War II, the Government bought a 1,000-acre tract as a site for building ocean-going ships. After dredging the Michoud Canal, which connected the plant site with the Gulf Intracoastal Waterway, the project was changed, and in October 1942 a contract was issued to Higgins Industries of New Orleans for manufacture of large plywood cargo aircraft. The plant was dedicated October 4, 1943, but the Army Air Corps abandoned the project and closed the plant November 10, 1945. In 1951 the U.S. Army Ordnance Corps selected Michoud as the site for manufacturing engines for Sherman and Patton tanks, and awarded Chrysler Corporation a $30-million contract to reopen the facility. Officially opened on November 28, 1951, the plant was again deactivated in 1954.[1/]

II--MSFC--Michoud

On September 7, 1961, NASA announced selection of the Government-owned Michoud Ordnance Plant as the site for industrial production of the S-N-I, S-N-IB, and later Saturn stages,[2] and in October awarded a contract for rehabilitation and modification to be completed before the end of the year.[3] The facility was officially designated NASA Michoud Operations on December 18, 1961.[4]

Assembly of the first industry-produced booster was started October 4, 1962, when Chrysler began fabrication of S-N-I-N-8.[5] On December 13, 1963, NASA accepted the first of two industry-built Saturn I first stages.[6] On October 22, 1962, Boeing activated the S-N-IC portion of the Michoud plant and began tooling and components manufacture.[7] Boeing completed assembly of its first complete Saturn V booster S-N-IC-N-D (dynamic test stage) in June 1965.[8] On July 1, 1965, MSFC announced that Michoud Operations had been redesignated Michoud Assembly Facility.[9]*

Mission:

Assembly of Saturn IB and Saturn V launch vehicle first stages.[10]

*This section was prepared by David S. Akens, with additional information provided by James M. Funkhouser and Lorraine Marthet, Michoud Assembly Facility.

II--MSFC--Michoud

Sources:

1/ Michoud Operations Programs Office, Michoud Operations: a Facility of the George C. Marshall Space Flight Center, updated Sept. 17, 1963, 2a-2c.

2/ NASA Release 61-201.

3/ Michoud Historical Report dated August 23, 1962.

4/ Letter, Dr. Robert C. Seamans, Jr., NASA Associate Administrator, to Harry H. Gorman, Deputy Director for Administration, Dec. 18, 1961; MSFC, cited in MSFC, History of the George C. Marshall Space Flight Center: July 1-December 31, 1961, MHM-4 (Huntsville, Ala.: MSFC, 1962), I, 38.

5/ MSFC, Saturn Illustrated Chronology, MHR-4 (Huntsville, Ala.: MSFC, May 15, 1965), 64.

6/ MSFC, History of the George C. Marshall Space Flight Center: July 1-December 31, 1963, MHM-8 (Huntsville, Ala.: MSFC, 1964), I, 30, 228.

7/ MSFC, History of the George C. Marshall Space Flight Center: July 1-December 31, 1962, MHM-6 (Huntsville, Ala.: MSFC, 1963), I, 127, 217.

8/ MSFC, Saturn V Quarterly Progress Report, March-June 1965.

9/ Letter, David Newby, MSFC Office of the Director, to Dr. George E. Mueller, NASA Associate Administrator for Manned Space Flight, Sept. 18, 1964; MSFC Release 65-167.

II--MSFC--Michoud

10/ NASA, Budget Estimates, FY 1969, IV, AO 2-120.

COMPUTER OPERATIONS OFFICE

Location: Slidell, Louisiana, St. Tammany Parish

Land: 14 acres (NASA-owned) (as of 6/30/68)

Manager:

Robert L. Reeves (9/15/62 -)

History:

On March 23, 1962, Michoud Operations set up a Michoud Computer Steering Committee to direct the establishment of a Central Computer Facility. This committee selected as site a surplus building which had been constructed by the Federal Aviation Agency as an aircraft control center. On June 16, 1962, the MSFC Director ordered MSFC's Computation Division to begin operation of the facility on an interim basis until a contractor computer specialist could be selected. The first computer in the new facility became operational on August 1, 1962.[1]

By November 12, 1962, the first phase of modifications to the building was complete, and all computers selected by the Steering Committee were operational by November 26. The second phase of construction, begun December 10, 1962, was completed in 1963.[2] At the end of FY 1967, Michoud was responsible for 16 ~~of MSFC's 146~~ general and special-

purpose computers.[3]

Mission:

Maintenance and management of a centralized data processing facility to meet the needs of MSFC and associated contractors in support of Michoud Assembly Facility and Mississippi Test Facility.

1) Serving as official point of contact for contractors' data processing activity in the MAF and MTF areas;

2) Directing, developing, and implementing improved methods for furnishing the required data processing services;

3) Providing contract administration for a computer services contractor who would operate, schedule, and maintain data processing equipment and provide specialized computer programming technical capability as directed.[4]

Sources:

[1] MSFC, History of the George C. Marshall Space Flight Center: July 1-December 31, 1962, MHM-6 (Huntsville, Ala.: 1963), II, 10-12.

[2] Ibid., 13; NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12, 179-181.

II--MSFC--Michoud--Slidell

3/ NASA, Budget Estimates, FY 1968, I, SA 59, 82-83. 9 15.

4/ NASA, Technical Facilities Catalog, II, Section 12, 180-181.

III--MSFC--MTF

MISSISSIPPI TEST FACILITY

(MTF)

Location: Hancock County, Mississippi

Land: 138,870 acres total (as of 6/30/67)

13,428 acres in test area (NASA=owned)

7,568 acres in buffer zone (NASA=owned)

117,874 acres in buffer zone (under restrictive easement)

Manager:

Jackson

J. M. Balch (5/9/65 - N)

William C. Fortune (10/1/62 - N 5/9/65)

III--MSFC--MTF

History:

In 1961 NASA decided to establish a national testing site for large launch vehicle stages.[1] Preliminary studies began in May, and on August 4, 1961, a Site Evaluation Committee was established. The Committee's criteria for the test site area included isolation from populated communities, accessibility by water and highway, availability of utilities, supporting communities within 50 miles, and a climate permitting year-round operation.

A site on the Pearl River in southwestern Mississippi met all these requirements, and was also close to NASA's Michoud Assembly Facility where Saturn boosters were to be built.[2] On October 25, 1961, NASA announced its decision to establish the test facility in Hancock County as an activity of Marshall Space Flight Center.[3] NASA announced on December 1 that the site was to be called Mississippi Test Facility, not "Pearl River Test Site," until an official title was chosen. But even after December 18, 1961, when NASA officially designated it Mississippi Test Operations (MTO), the name Mississippi Test Facility was frequently used. It was not until June 1963 that Marshall Space Flight Center officially redesignated the facility Mississippi Test Operations.[4]

By October 1962 Mobile District Engineers Office (MDE) had acquired all except six of the 163 tracts of land lying in the construction area, and the first tree was felled on May 17, 1963.[5] In July 1964, after court actions, acquisition of all land in the construction site was complete, and by December 31, 1964, the entire buffer zone had been acquired by

the Government.[6] As of June 30, 1963, Marshall Space Flight Center had stationed 24 personnel at the site, and by the end of 1964 this number had nearly doubled.[7] On July 1, 1965, Marshall announced that Mississippi Test Operations was officially redesignated Mississippi Test Facility (MTF).[8]

The first rocket stage to reach Mississippi Test Facility was the Saturn V second stage. S-II-T, an all-systems test model, arrived on October 17, 1965, after a 17-day trip from North American Aviation, Inc.'s Space and Information Systems Division at Seal Beach, California. Transported on the USNS Point Barrow through the Panama Canal to a Michoud Assembly Facility dock in New Orleans, the stage was transferred to the barge Little Lake for the last 45 miles up the Gulf Intracoastal Waterway and the East Pearl River to MTF. The S-II-T was unloaded and to await installation in Test Stand A-2,[9] On April 23, 1966, the stage was successfully static fired for 15 seconds, marking the first operational use of Mississippi Test Facility.[10]

The first Saturn V first stage, S-IC-T, arrived on the barge Poseidon on October 23, 1966, from Michoud Assembly Facility, where it was manufactured by Boeing. On December 17 workmen erected the stage in Stand B-2, activating the stand. The first Systems Demonstration Test Firing, for 15 seconds, was successfully completed on March 3, 1967.

* This section was prepared by David S. Akens.

III--MSFC--MTF

Mission:

Acceptance test firing of the 7.5-million- -thrust Saturn V first stage (S-IC) and the 1-million- -thrust Saturn V second stage (S-II).[12]

Sources:

[1] Robert L. Rosholt, An Administrative History of NASA, 1958-1963, SP-4101 (Washington: NASA, 1966), 215; MSFC, "History of the George C. Marshall Space Flight Center: July 1- December 31, 1962," MHM-6 (Huntsville, Ala.: MSFC, 1963), II, Chap. VIII.

[2] Ibid., 1-3; NASA, "Launch Vehicle Test Site Evaluation by Ad Hoc Site Selection Committee," Aug. 26, 1961, 8, 11-12.

[3] NASA Release 61-236.

[4] NASA Circular No. 188, Dec. 1, 1961; Letter, NASA Associate Administrator Dr. Robert C. Seamans, Jr., to Harry H. Gorman, MSFC Deputy Director for Administration, Dec. 18, 1961, cited in MSFC, "History of the George C. Marshall Space Flight Center: July 1- December 31, 1961," MHM-4 (Huntsville, Ala.: MSFC, 1962), I, 38; Memo, Joseph H. Reed, Chief, MSFC Management Analysis Office, to Distribution, June 11, 1963, Subject: Change 50, MSFC Organization Manual.

[5] MSFC, "Mississippi Test Facility Weekly Status Reports," Oct. 15, 1962, and Oct. 22, 1962; MTO Release, Aug. 24, 1964.

6/ MSFC, "History of the George C. Marshall Space Flight Center: July 1-December 31, 1964," MHM-10 (Huntsville, Ala.: MSFC, 1965), II, 87; Business Week, April 2, 1966, 5-7.

7/ MSFC, "History of the George C. Marshall Space Flight Center: January 1-June 30, 1963," MHM-7 (Huntsville, Ala.: MSFC, 1963), II, Chap. VIII, 3; MHM-10, II, 108.

8/ Letter, David Newby, MSFC Office of the Director, to Dr. George E. Mueller, NASA Associate Administrator for Manned Space Flight, Sept. 18, 1964: MSF C Release 65-167; MSFC Circular no. 7-65, Subject: "Redesignation of MSFC Organizational Elements," July 6, 1965.

9/ Marshall Star, Oct. 20, 1965, 1,4; MSFC Release 65-246

10/ MSFC, Saturn V Program Office, "Saturn V Quarterly Progress Report, April-June 1966," 19; MSFC Release 66-84.

11/ MSFC, Saturn V Program Office, "Saturn V Semi-Annual Progress Report, July-December 1966," and "Saturn V Semi-Annual Progress Report, January-June 1967"; Marshall Star, March 8, 1967,1: Kurt Voss, "S-1C Test to Mark Progress in Mississippi," Technology Week, Feb. 6, 1967, 28-29; James C. Tanner, Wall Street Journal, Jan. 10, 1968, 8.

12/ NASA, Budget Estimates, FY 1968, IV, AO 2-18.

7-10.1(a) Technical Facilities: Aero-Astrodynamics[a]

Functional Name	Year Built	Technological Area Supported
Wind Tunnel, Long Duration Aerodynamic	1943	Continuum flow investigations in a trisonic tunnel, a supersonic tunnel, and a jet flow facility
Shock Tunnel, Hypersonic	1943	Pressure investigation, heat transfer, and force testing with helium as the test medium
Gas Dynamics Laboratory, Rarefied	1943	Transitional and free molecule flow investigations; extreme altitude jet pluming investigations
Vacuum Technology Laboratory	1943	High vacuum to 10^{-7} Torr
Flow Research Facility, Astrodynamic	1953	Impulse base flow and heat transfer studies

(4) a/ ~~Functional name:~~ Also called Gas Dynamics Research Facility (Aero-Astrodynamics); estimated initial cost, $4,143,000.

Source: NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12, 1-16.

7-10.1(b) Technical Facilities: Astrionics[a]

Functional Name	Year Built	Technological Area Supported
Inertial Sensor and Stabilizer Development Laboratory	1957	Missile technology, space technology, guidance, navigation
Guidance Technology Laboratory	1957	Applied missile technology, space technology, guidance
Instrumentation and Communication Development Laboratory	1957	Missile and space technology, guidance and control
Guidance and Control Systems and Components Laboratory	1957	"

a/ Estimated accumulated cost, $26,609,000.

Source: NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12, 4.

7-10.1(c) Technical Facilities: Manufacturing and Engineering a/

Functional Name	Year Built	Technological Area Supported
Fabrication and Assembly Engineering Facility	1955	Launch vehicle and large components fabrication and assembly
Machine Shop Engineering Facility	1955	Precision machining and large component machining
Tube Cleaning Facility	1955	Tube cleaning up to 3" diameter and 60' long
Valve Clinic Facility, Propellant	1955	Propellant valve disassembly, cleaning, and assembly
Surface Treatment Facility	1960	Chemical and mechanical cleaning, electropolishing, painting, anodizing, chemical milling, pickling, passivating, and metal plating
Metal Forming and Fabrication Facility	1955	Metal forming and joining of large vehicle sections
Composite Structure Fabrication Facility	1956	Fabrication of large composite structure panels in steel, steel alloys, or aluminum
Welding Development Facility	1956	Precision and specialty welding
Manufacturing Methods Development Facility	1955	Development of mechanical manufacturing processes and methods
Manufacturing Techniques Development Facility Electronics	1943	Adaptation of advanced scientific discoveries to manufacturing techniques

a/ Estimated accumulated cost, $23,238,000.

Source: NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12, 75-98.

7-10.1(d) Technical Facilities: Propulsion and Vehicle Engineering [a]

Functional Name	Year Built	Technological Area Supported
Structural Static Test Facility	1959	Stage and component structural checkout
Vibration Test Facility	1959	Vibration testing of stages and components with various types of vibration exciters
Shock and Acceleration Test Facility	1959	Shock testing in stage and component structural checkout
Acoustic Test Facility	1959	Acoustic testing in a reverberation room and an anechoic room
Heat Transfer Test Facility	1959	Heat transfer in propellant systems, two-phase flow systems (liquid vapor), insulation schemes for cryogenic tanks, and calorimeter development for heat radiation measurements
Hydraulics Research Facility	1959	Hydraulics testing of stages and components with four hydraulic fluid and RPI flow stands, an impulse test stand, a pump test stand, and engine gimbal test stands
Pneumatic & Cryogenic Test Facility	1959	Studies of vortex, terminal drainage, surge pressure, stratification, bubble dynamics, and geysering in turbulent fluid flow
Materials Laboratory	1959	Evaluation and development of materials and components; determination of effects of vacuum, temperature, radiation, hypervelocity impact, and other environmental conditions

a/Estimated accumulated cost, $25,125,000.

Source: NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12, 55-74.

7-10.1 (e) Technical Facilities: Quality and Reliability Assurance [a]

Functional Name	Year Built	Technological Area Supported
Dimensional Laboratory	1961	Length, threads, optics, angles, roundness, hardness, and flatness tests
Physical Laboratory, Quality Assurance	1961	Pressure, mass, torque, and force acceleration tests
Electrical/Electronics Laboratory, Quality Assurance	1961	Voltage, resistance, current, and frequency tests
Environmental Test Laboratory, Quality Assurance	1955	Force application and environmental qualification testing of flight components

(41) a/ Estimated accumulated cost, $16,051, 000.

Source: NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12, 99-110.

7-10.1(f) Technical Facilities: Research Projects[a]

Functional Name	Year Built	Technological Area Supported
Radiative and Conductive Physics Laboratory	1962	Thermal conductivity of solid particles
Meteoroid Physics Laboratory	1962	Production of high velocity, high density plasmas, and calibration of meteoroid detectors
Geology and Geophysics Laboratory	1961	Secondary impact effects in vacuum upon nonmetallic "rock" materials
Magnetic Field Measurement Physics Laboratory	1962	Electric and Magnetic field meter evaluation
Radiation Physics Laboratory	1962	Space vehicle radiation shielding
Optical Physics Laboratory	1962	Rocket combustion products research in simulated planetary atmosphere
Thermal Environment Physics Laboratory	1962	Space environmental effects on radiometric characteristics
Reaction Kinetics Laboratory	1962	Launch vehicle gases and vapors analysis
Plasma Physics Laboratory	1966	Space plasma studies
Surface Physics Laboratory, Space Vehicle	1962	Space environment interactions with the surface of space vehicles
Computer Techniques Laboratory	1964	Development of advanced methods of data analysis and translation

a/ Estimated accumulated cost, $2,683,000.

Source: NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12, 15-40.

ROCKET PROPULSION TEST COMPLEX [a]

Functional Name	Facility Name	Year Built	Technological Area Supported
Rocket Propulsion Test Stands: (S-IC 4670)	S-IC Static Test Stand (4670)	1965	Saturn 1st stage (S-IC) stage checkout and acceptance firing, propulsion syste systems development
(F-1 4696)	F-1 Engine Test Stand (4696)	1963	Engine propulsion and functional testing
(S-IVB 4514)	S-IVB Test Stand (4514)	1965	Saturn V 3rd stage integration testing, R&D propulsion systems testing
(4572)	Static Test Stand (4572)	1957	Stage and engine functional and acceptance testing
(H-1 4564)	H-1 Power Plant Test Stand	1957	Stage integration, R&D propulsion system testing
(Redstone 4665)	Interim (Redstone) Test Stand (4665 Area)	1953	Rocket propulsion
Rocket Exhaust Effects Test Stand (4665 Area)	Sound Suppressor Test Stand (4665 Area)	1953	Sound suppression
Rocket Propulsion Altitude Test Stand (4710)	Liquid Hydrogen Familiarization Facility (4710)	1957	Hydrogen fueled engines
Rocket Propulsion Altitude Test Cell (4753)	Storable Propellant Test Facility (4753)	1951	Storable propellant engines, altitude firing
Propellant Systems Test Stand, Cold Flow (4588)	Cold Calibration Test Stand (4588)	1957	Propellant systems

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Rocket Systems Development...contd.

Functional Name	Facility Name	Year Built	Technological Area Supported
Propellant Systems Test Stand Cold Flow (4548)	F-1 Turbopump Facility (4548)	1964	Propellant feed systems
Vibration Effects Test Stand, Rocket (4557)	S-IB Dynamic Test Stand (4557)	1962	~~Uprated~~ Saturn IB Structural dynamics and propellant tankage
Vibration Effects Test Stand, Rocket (4550)	S-V Dynamic Test Stand (4550)	1964	Saturn V structural dynamics
Drop Tower, Reduced Gravity Effects (4550)	Low Gravity Test Facility (4550)	1964	Low gravity physical phenomena
Environmental Test Facility (4748)	Ultra High Vacuum Facility (at 4748)	1951	Space environment effects, propellant systems
Environmental Test Facility, Rocket Systems (4750)	Test Facility Building 4750	1955	Rocket systems altitude ignition and launch methods
Rocket Component Hazardous Test Cells (4583)	Test Positions 100 100 through 108 (4583)	1957	Propellant flow and combustion; nozzles and component hardware
Altitude Test Cell (4583)	Test Position 112 (4583)	1957	Altitude studies, such as materials tests, ignition problems, scaled vehicle studies
Rocket Propulsion Test Stand, Model and Component (4583)	Test positions 113, 114, and 117 (at 4583)	1957	Rocket combustion and component hardware

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Rocket Systems Development...contd.

Functional Name	Facility Name	Year Built	Technological Area Supported
Rocket Propulsion Test Stand (4583)	Test Position 115 (at 4583)	1957	Rocket combustion, He and LH_2
Rocket Acoustic Effects Test Stand (4540)	Test Position 116 (at 4540)	1964	Dynamic pressure effects, low-frequency noise
Rocket Component Test Stand (4530)	Test Positions 301 and 302 (4530)	1964	Rocket hardware
Rocket Component Test Stand, LOX/H Cold Flow (4522)	Test Position 500 (dual 501 and 502) (4522)	1964	Propellant systems
Launch Simulation Facility, Saturn V (4646)	Saturn V GSE Test Facility (at 4646)	1964	Launch pad equipment
Missile Lift-Off Simulator Facility (4583)	Swing Arm Test Facility (at 4583)	1957	Launch
Fluid Flow and Pressure Test Facility (4648)	High Pressure Fluid Test Facility	1965	Rocket fluid systems, ground support equipment
Instrument Laboratory (4650)	same	1958	Ground support and test instrumentation
Acoustic Investigation Facility (4565)	Noise Source for the Far Field Noise Propagation and Measurement System (4565)	1952	Rocket noise measurements

(11) a/ Estimated accumulated cost, $107,408,000.
Source: NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12, 113-174. (26)

7-10.1(h) Technical Facilities: Michoud Assembly Facility[a]

Functional Name	Facility Name	Year Built	Init. Cost (thousand)	Accum. Cost (thousand)	Technological Areas Supported
Flow Test Facility, High Pressure Gas	High Pressure Test	1964	$140.5	$377.5	Dynamic and steady-state gas flow testing under extreme pressure, temperature, and flow conditions
Stage Test Position Facility	same	1965	1,809.7	1,889.5	Systems checkout of Saturn V first stage before and after static test firing

[a] For definition of terms in headings, see introduction to Chapter Two.

Source: NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12, 175-178.

III--MSFC--MTF

7 10.1(i) Technical Facilities: Mississippi Test Facility

Functional Name	Facility Name	Year Built	Init. Cost	Accum. Cost	Technological Areas Supported
Acoustic Laboratory, All Purpose a/	Acoustics Laboratory	1965	...	...	Far-field, mid-field, near-field, and special purpose acoustics data collection; calibration, maintenance and repair of acoustic devices
Measurement Standards Laboratory a/	same	1965	...	...	Primary standards in support of the various Electronics, Instrumentation and Materials Laboratory functions, and secondary standards for site-wide support
Pressure and Strain Calibration Laboratory a/	same	1965	...	...	Site-wide pressure and strain calibration support
Atmospheric Laboratory	Meteorology Building	1965	...	...	Atmospheric observations and predictions in support of acoustic propagation predictions; severe weather warning service
Electronics, Instrumentation and Materials Laboratory a/	same	1965	2,027	2,047	Materials analysis, measurement standards, photographic, pressure and strain, temperature and flow, and field support
Rocket Propulsion Test Complex, Saturn IC (B^1_N, B^1_N)	S-IC Test Stand	1965	1,993	2,091	Static firing of Saturn V 1st stage
S-II A^1_N2 Test Stand b/ (A^1_N, A^N_N2)	same	1965	1,195	1,571	Static firing of Saturn V 2nd stage

Technical Facilities (cont'd)

Functional Name	Facility Name	Year Built	Init. Cost	Accum. Cost	Technological Areas Supported
Data Handling Facility a/	Data Handling Center	1965	$653	$2,879	On-site data reduction (digital and analog) for the Data Acquisition Facility and other test elements at MTF
Rocket Components Service Facility c/	Component Service Facility	1966	...	...	On-site repair, servicing, and test operations on Saturn V 2nd stage J-2 engines
Cryogenic Component Test Facility a/	Component Service Facility (CSF)	1966	...	...	Cryogenic testing of components
Data Acquisition Facility (DAF)	same	1966	9320	9,490	Acquisition and recording of data signals transmitted, via land lines, from test vehicles, flight vehicles, and static test support facilities within the Saturn V complex

(1) a/ Contractor operated (General Electric Co.).

(2) b/ Contractor operated (Space and Information Systems Div., North American ~~Aviation, Inc.~~ Rockwell Corp.).

(3) c/ Contractor operated (Rocketdyne).

Legend: ... = Data not available. For definition of terms in headings, see introduction to Chapter Two.

Source: NASA, Technical Facilities Catalog (March 1967 Edition), II, Section 12.