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1967+
MARSHALL ANALYSIS

University of Alabama in Huntsville
 saturn history
 11/69

DESIGNATION Marshall Space Flight Center

LOCATION Huntsville, Alabama

COGNIZANCE NASA - Office of Manned Space Flight

MISSION Conducts research and development of launch vehicles and systems for manned and unmanned spacecraft. Develops and integrates experiments for assigned space flight activities, including some of those for the Apollo Applications Programs.

BUDGET The total FY69 Research & Development budget request for Marshall is \$979.5 million. In addition, there is a request for \$400,000 to cover construction at the Michoud Assembly Facility. This latter figure would cover installation of powerlines to preclude power outages at the final stage test facility and the high-pressure test facility; replacement of the environmental control system serving the final stage test facility; and installation of an incinerator system for the disposal of refuse and waste oil. The FY69 R&D budget request and the FY68 and FY67 R&D budgets are shown below.

SATURN HISTORY DOCUMENT
 University of Alabama Research Institute
 History of Science & Technology Group
 Date ----- Doc. No. -----

| PROGRAM | FUNDING (\$ thousands) | | |
|--|---------------------------|-------------|-----------|
| | FY67 | FY68 | FY69 |
| Manned Space Flight | | | |
| Apollo | \$1,279,636 | \$1,001,900 | \$734,000 |
| Apollo Applications | 41,781 | 119,200 | 223,900 |
| Advanced Missions | 1,600 | --- | 2,000 |
| Space Science & Applications | | | |
| Physics and Astronomy | 158 | 36 | 40 |
| Lunar and Planetary Exploration | 1,411 | 385 | 100 |
| Launch Vehicle Procurement | --- | 500 | 500 |
| Bioscience | 100 | 55 | 105 |
| Space Applications | 280 | 300 | 400 |
| Advance Research and Technology | | | |
| Basic Research | 888 | 824 | 840 |
| Space Vehicle Systems | 3,692 | 3,981 | 3,950 |
| Electronic Systems | 4,049 | 2,655 | 2,600 |
| Human Factor Systems | 100 | 300 | 300 |
| Space Power and Electric Propulsion Systems | 1,748 | 960 | 1,200 |
| Nuclear Rockets | 1,650 | 2,100 | 3,000 |
| Chemical Propulsion | 5,200 | 5,890 | 5,800 |
| Aeronautical Vehicles | --- | 380 | 450 |
| Tracking and Data | 800 | 400 | 300 |
| Acquisition | | | |
| Total R&D | \$1,343,093 | \$1,139,866 | \$979,485 |

GENERAL The Marshall Space Flight Center (MSFC) became a part of NASA in July 1960, and has served as NASA's primary center for the design, development, and test of launch vehicles and space transportation systems for manned space flights. MSFC also includes the Michoud Assembly Facility at New Orleans, Louisiana; the Slidell Central Computer Facility nearby; and the Mississippi Test Facility in southwest Mississippi. Building on the experience gained through work on Army missile programs, MSFC has, since its transfer from the Army, successfully completed the Saturn I program, and is now managing the Saturn IB program which provides a launch vehicle for Apollo spacecraft development and serves as a carrier for large scientific satellite payloads. They also manage the Saturn V program which will provide the launch vehicle for actual manned lunar landing missions, planetary missions, future very large scientific satellite payloads, and selected payloads for Apollo Applications missions, such as the Apollo telescope mount and the S-IVB orbital workshop.

In carrying out its management responsibilities for these programs, MSFC has developed the capability to design, develop, and manufacture large launch vehicle systems, including vehicle systems test and integration. MSFC conducts test programs such as the static testing program for the S-IC and S-II stages at the Mississippi Test Facility. They design, develop, and test large launch vehicle engines such as the H-1, J-2, and F-1 systems. In addition, MSFC develops and integrates scientific experiment payload packages to be flown on Saturn-Apollo vehicles or subsequent post-Apollo missions.

In support of its assigned programs, MSFC also maintains the research and development capability to conduct advanced studies on launch vehicle and space systems, space navigation techniques, astronautics, and space science investigations. Its capability for both research and for the management of industrial operations give MSFC a flexible base for manned space program.

Operations for MSFC are conducted at three primary locations.

The first location, the main MSFC site is near Huntsville, Alabama, on Army property at the Redstone Arsenal. The capital investment as of June 30, 1967, was \$551,022,000. Certain facilities such as the Redstone Arsenal Army Air Field and some utilities are used jointly by NASA and the Army. The Huntsville location has deep-water access via the Tennessee, Ohio, and Mississippi Rivers.

The second location, the Michoud Assembly Facility, is located 15 miles east of New Orleans, Louisiana. The capital investment as of June 30, 1967, was \$142,382,000. The vehicle prime contractors produce the Saturn IB and Saturn V booster stages at this lo-

cation. The Michoud Assembly Facility is on the Gulf Intra-Coastal Waterway, and has deep-water access via the Mississippi River.

The third location, the Mississippi Test Facility, is in southwest Mississippi, approximately 50 miles northeast of New Orleans, Louisiana. Capital investment for the Mississippi Test Facility as of June 30, 1967, was \$233,953,000. Test stands include a dual-position stand for testing the Saturn V first stage (S-IC), and two stands for testing the 1,000,000-pound thrust Saturn V second stage (S-II). The vehicle prime contractors are responsible for conducting tests on the stands. The site has deep-water access for transporting large boosters via the Pearl River and the Intra-Coastal Waterway.

The total capital investment of the Marshall Space Flight Center, including work in progress and contractor-held facilities at various locations, as of June 30, 1967, is \$927,357,000.

To accomplish its mission the Marshall Space Flight Center is organized into two major directorates: Research and Development Operations, and Industrial Operations. The offices, laboratories and facilities under these directorates are as follows:

Research and Development Operations

- Advanced Systems Office
- Technical Systems Office
- Experiments Office
- Operations Management Office
- Aero-Astrodynamics Laboratory
- Astrionics Laboratory
- Computation Laboratory
- Manufacturing Engineering Laboratory
- Propulsion & Vehicle Engineering Laboratory
- Quality and Reliability Assurance Laboratory
- Research Projects Laboratory
- Test Laboratory
- Mission Operations Office

Industrial Operations

- Contract Office
- Facilities Projects Office
- Project Logistics Office
- Resources Management Office
- Saturn 1/1B Program Office
- Saturn/Apollo Applications Program Office
- Saturn 5 Program Office
- Engine Program Office
- Michoud Assembly Facility
- Mississippi Test Facility

Unlike other NASA centers which have the procurement office under a Director of Administration, Marshall's purchasing office is a staff function reporting directly to the Center Director.

Marshall has been given the responsibility for the Apollo Telescope Mount (ATM) under the Apollo Applications Program, which is one of the indications of the shifting mission at Marshall. With the final development of launch vehicles accomplished, the Center is considering an increased emphasis in Astrionics -- developing payloads for the launch vehicles. This includes projects in the areas of vehicle guidance and control systems, tracking communications, flight instrumentation, laser applications and on-board electrical power systems. In addition, the Astrionics Lab at Marshall, second largest of Marshall's R&D labs, is studying ground support equipment for improvement of checkout techniques and launch computers, development of fuel cells, radioisotope power supplies and flexible solar cell arrays.

COMMENT

The Marshall Space Flight Center will suffer a projected reduction of 700 personnel (from 7086 to 6386). In terms of percentage, this reduction is consistent with those of other NASA elements. Marshall is already performing in-house work in order to compensate for the FY68 cuts. Reductions in large booster programs, NERVA II, advanced missions, Apollo Applications, and cancellation of VOYAGER means a further shift of true R&D activity to in-house sources. Meanwhile, Apollo will continue with major O&M contracts. AAP has been reduced by one-quarter and there is little prospect for NASA sponsored orbital efforts. Marshall's test facilities will be useful for future unmanned missions, but it is difficult to foresee Marshall sustaining itself at its present level of activity once Apollo is concluded.

Marshall recently built an Apollo Telescope Mount at a conspicuous savings over contracted costs. Utilizing in-house talent, it might be possible to maintain some technological progress at substantially lower budget levels. In this manner NASA might be able to buy time without losing research lead time, thus allowing some programs to continue at a sustenance level, while major funding is held in abeyance awaiting the resolution of problems enjoying a higher national priority.

The following is a listing of the top twenty contractors of the Marshall Space Flight Center.

| <u>COMPANY</u> | <u>AMOUNT</u> (\$ thousands) | <u>PERCENT</u> |
|------------------------------|---------------------------------|----------------|
| North American Aviation | \$ 438,173 | 33.58 |
| McDonnell Douglas | 199,012 | 15.25 |
| Boeing Co. | 176,501 | 13.53 |
| International Business Mach. | 83,628 | 6.40 |
| General Electric Co. | 64,765 | 4.96 |
| Chrysler Corp. | 54,692 | 4.19 |
| Bendix Corp. | 24,914 | 1.91 |
| Brown Engineering | 16,198 | 1.24 |
| Sperry Rand Corp. | 15,640 | 1.20 |
| RCA | 14,041 | 1.08 |
| Mason-Rust | 11,213 | .86 |
| Thiokol Chemical Corp. | 9,116 | .70 |
| Spaco Inc. | 6,632 | .51 |
| Computer Sciences | 6,456 | .49 |
| Sanders Assoc. Inc. | 5,465 | .42 |
| Vitro Corp. of America | 5,439 | .42 |
| Hayes International Corp. | 5,161 | .40 |
| Northrop Corp. | 5,089 | .39 |
| Air Products & Chem. | 4,849 | .37 |
| Management Services | 4,745 | .36 |
| All Others | <u>153,171</u> | <u>11.74</u> |
| Total | \$1,304,900 | 100.00% |