M-CP-P (R31)
MARCH 26, 63

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

MSFC
MANNED SPACE FLIGHT
PROGRAM STATUS
FOR
MARCH 26, 1963
MANAGEMENT COUNCIL MEETING

National Aeronautics and Space Administration

MSFC

MANNED SPACE FLIGHT

PROGRAM STATUS

FOR

PRESENTATION TO THE

MANAGEMENT COUNCIL

March 26, 1963

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Note:

This is material prepared in support of Dr. von Braun's presentation for the March 26, 1963, Management Council Meeting - Agenda Item 3, "MSFC Status Report."

Presentation material consists of slides, a film report and narrative back-up information to support the presentation.

OUTLINE

MSFC MANNED FLIGHT PROGRAMS

		Number of Slides
1.	SATURN	
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2.	MICHOUD OPERATIONS	Film - 10 Min.

SLIDES

1. SATURN I Dynamic Test Program
2. S-IV Battleship Testing
3. Status of S-I-5
4. Status of S-IV-5
5. Bonus Payload SATURN I Block II Vehicles
6. Micrometeoroid Experiment

SATURN I

SATURN I DYNAMIC TEST PROGRAM

- S-I STAGE, BLOCK II, DYNAMIC TESTING AT MSFC COMPLETED ON MARCH 7. BOOSTER SHIPMENT TO AMR SCHEDULED FOR APRIL 3.
- S-IV STAGE DYNAMIC TESTS TO CONTINUE AT MSFC USING BOTH JUPITER NOSECONE AND APOLLO SPACECRAFT CONFIGURATION.
- DYNAMIC TESTING OF COMPLETE VEHICLE WITH APOLLO CONFIGURATION TO BE RESUMED IN EARLY JULY 1963.

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S-IV BATTLESHIP TESTING

- FIRST HOT FIRING TEST OF BATTLESHIP STAGE WITH RL10A-3 ENGINES CONDUCTED ON JANUARY 26, FOR DURATION OF 468 SECONDS.

- SECOND FIRING CONDUCTED ON FEB. 25, FOR 6.5 SECONDS, SMALL FIRE CAUSED EARLY CUTOFF. THIRD FIRING ON MARCH 2, FOR 121 SECONDS, LOW-CHAMBER PRESSURE ENGINE #4 CAUSED EARLY CUTOFF.

- FOURTH FIRING CONDUCTED ON MARCH 20, FOR 0.5 SECOND, ENGINE #1 FAILED TO IGNITE.

- TEST PROGRAM EXTENDED THROUGH APRIL TO MEET TEST OBJECTIVES.

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STATUS OF S-I-5

- PRE-STATIC TEST CHECKOUT COMPLETED JANUARY 28.
- SUCCESSFUL 30-SECOND STATIC TEST FIRING ON FEB. 27.
- FULL DURATION FIRING 143 SECONDS, COMPLETED MAR. 13.
- DATA ANALYSIS SHOWS SOME PROPULSION SYSTEM DEFICIENCIES. DEFICIENCIES BEING CORRECTED.
- ADDITIONAL STATIC FIRING SCHEDULED FOR MAR. 27 TO CONFIRM FIXES AND INCREASE FLIGHT CONFIDENCE.
- ARRIVAL AT AMR THREE WEEKS LATE—NOT PACING ITEM.

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STATUS OF S-IV-5

- PRE-STATIC CHECKOUT – APPROXIMATELY 50 % COMPLETE. DELAY DUE TO PARTS SHORTAGE.
- SCHEDULED TO ARRIVE SACTO APRIL 15 – FOUR WEEKS LATE.
- LAUNCH OPERATION PROCEDURES AND CHECKOUT REQUIREMENTS UNDER STUDY.
- LAUNCH WILL SLIP AT LEAST FOUR WEEKS EVEN WITH "SUCCESS" SCHEDULE AT SACTO. S-IV STAGE IS PACING ITEM.

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BONUS PAYLOAD SATURN I BLOCK II VEHICLES

- SATELLITE TO PROVIDE ACCURATE CALIBRATION OR STANDARD FOR RADAR TRACKING IN SPACE PROPOSED FOR SATURN I VEHICLE SA-7.
- PROJECT DEVELOPMENT PLAN TO BE FINALIZED BY APRIL 1, AND SUBMITTED TO HEADQUARTERS FOR APPROVAL.

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MICROMETEROID EXPERIMENT

- CONTRACT AWARDED FEBRUARY 27, TO FAIRCHILD STRATOS CORPORATION FOR THREE SATELLITES.
- DELIVERIES TO BE MADE ON MARCH 1, APRIL 1, AND JUNE 1, 1964.

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SATURN I PROJECT NARRATIVE

Slide
1. SATURN I DYNAMIC TEST PROGRAM

S-I stage, Block II, Dynamic Test Program (Phase I) begun at MSFC January 8, was completed on March 7. Upon test completion, the booster was hydrostatic pressure tested; no structural defects were noted. The booster is being prepared for shipment to AMR, where propellant loading tests will be conducted. Booster shipment is scheduled for April 3; checkout of Launch Complex 37B is scheduled to begin April 17 and continue through June 17, 1964. At MSFC, S-IV stage dynamic tests will continue using both the Jupiter nosecone and APOLLO spacecraft configuration, which is due to arrive at Marshall on April 8. Upon return of the S-I-D booster to Marshall, dynamic testing of the complete vehicle with APOLLO configuration will be resumed in early July 1963.

Slide
2. S-IV BATTLESHIP TESTING

The first hot firing test of the Battleship stage with RL10A-3 engines was conducted at SACTO, on January 26, for a duration of 468 seconds -- to LOX depletion. Technical problems and weather delayed the tests until February 25, when the second of the new series was conducted for 6.5 seconds. Early cutoff was caused by a small fire at the vent collector manifold. A third test, for a 121 second's duration on March 2, was terminated due to low-chamber pressure in engine number 4; this was caused by a malfunction in the thrust chamber controller. On March 7, the number 6 engine was found to have a thrust chamber leak; the engine was removed and replaced. On March 20, the fourth Battleship firing in this series was terminated after .5 second because engine number 1 failed to ignite. An investigation is underway to determine the reason for the ignition malfunction. Since initiation of the RL10A-3 program, problems such as inadequate engine purging, water contamination, checkout difficulties, and late hardware installation have been encountered. To meet the test plan objectives, the firing program has been extended through April. Program extension will change S-IV-6 acceptance firing date with no delay expected in the overall S-IV-6 schedule.

Slide
3. STATUS OF S-I-5

The S-I-5 completed a planned 30-second static test on February 27 and a planned full duration static test (143 seconds) on March 13. Analysis of the test data and inspection of the stage revealed several deficient areas in the propulsion system. These included:

1. Excessive cycling of GOX Flow Control Valve.

2. Engine #4 performed out of specification (199 K).

3. Fuel leaks at turbine to gearcase seal on all 8 engines.

4. LOX vent valves "close indication" malfunction - both firings.

5. Turbine exhaust ducts upper weldment damaged internally.

6. Two heat exchangers (#5 and #6) revealed break in coil supports.

7. LOX fill and drain valve #3 did not close properly.

The GOX control valve will be replaced and some reorificing accomplished. The other defective parts will also be replaced. Since these deficiencies affect the total propulsion system, it is necessary to substantiate the corrections by additional static test, scheduled for March 27. This test will provide additional assurance that the first stage flight will be successful. To accomplish the additional static test, and in conjunction with its present status (one week late), the S-I-5 will be delivered three weeks late to AMR. This schedule is well within the present S-IV schedule (four weeks late to SACTO for acceptance firing). The S-IV is clearly the pacing item of the SA-5 launch. At this time, it is apparent that a launch slippage of at least four weeks will be incurred. A firm schedule cannot be set until completion of the S-IV-5 acceptance test.

Slide
4. STATUS OF S-IV-5

The S-IV stage is in the Santa Monica checkout area and checkout is approximately 50% complete. Checkout has been hampered by parts shortage. The continuity, electrical control and electrical power checks have been completed to the extent allowed by missing parts. The stage will be four (4) weeks late in arriving at SACTO, and on this basis must be considered the pacing item of the SA-5 launch vehicle. The stage will be placed on Test Stand 2 at SACTO.

Slide
5. BONUS PAYLOAD SATURN I BLOCK II VEHICLES

At the request of NASA Headquarters and in co-ordination with MSC, MSFC is investigating possible bonus payloads on Block II launch vehicles. Information is now being gathered for preparation of a Project Development Plan covering a secondary satellite payload for SA-7. Carried in the Service Module, the satellite, a highly polished sphere about two-three meters in diameter, would provide an accurate calibration or standard for radar tracking in space. The experiment is scientific, and requires no checkout, instrumentation or telemetry, nor support at launch. Support is being given the project by Office of Applications and Massachusetts Institute of Technology. The Project Development Plan is expected to be completed by April 1, then submitted to NASA Headquarters for approval.

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6. MICROMETEOROID EXPERIMENT

On February 27, a contract was awarded the Fairchild Stratos Corporation, Hagerstown, Maryland, for the manufacture of three micrometeoroid satellites. The contract calls for delivery of the satellites on March 1, April 1, and June 1, 1964. The contract also covers associated ground support equipment and launch support. Marshall will design and build those modifications necessary to accommodate the satellite in the Service Module. This will include Service Module separation system.

SLIDES

1. Contract Status S-IB Stage

2. Contract Status S-IVB Stage

3. SATURN IB Payload/Instrument Unit Interface Definition

SATURN I-B

CONTRACT STATUS S-IB STAGE

- NASA HEADQUARTERS APPROVED PROCUREMENT PLAN FOR MODIFICATION OF BASIC CHRYSLER CONTRACT ON FEBRUARY 20.
- CONTRACT SCOPE CHANGED TO REQUIRE 12 S-IB STAGES, 8 S-I STAGES, AND CONTRACT TO BE EXTENDED TO DECEMBER 31, 1967.
- CCSD NOW PREPARING A DEFINITIVE PROPOSAL, WITH NEGOTIATIONS EXPECTED TO BEGIN DURING APRIL.

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CONTRACT STATUS S-IVB STAGE

- MSFC PROCUREMENT PLAN FOR 4 ADDITIONAL S-IVB STAGES SUBMITTED TO NASA HEADQUARTERS ON MARCH 6.
- NEGOTIATIONS ARE EXPECTED TO BEGIN EARLY IN MAY, WITH A TARGET DATE OF JUNE 11 FOR CONTRACT APPROVAL.
- NEGOTIATIONS WERE COMPLETED MARCH 15 ON THE DAC INTERIM PROPOSAL COVERING S-IVB ACTIVITY PENDING APPROVAL OF MAIN CONTRACT SUPPLEMENT.

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SATURN IB PAYLOAD/INSTRUMENT UNIT INTERFACE DEFINITION

- LACK OF PAYLOAD CONFIGURATION DEFINITION COULD AFFECT SATURN IB DESIGN CRITERIA RELEASE.
- MSFC DESIGN ASSUMES PAYLOAD/INSTRUMENT UNIT INTERFACE WILL SUSTAIN A DISTRIBUTED LOAD, RATHER THAN POINT LOADING FROM LEM LANDING LEGS.
- DOUGLAS ASSUMING CONVENTIONAL SHELL LOAD DISTRIBUTION ACROSS S-IVB/INSTRUMENT UNIT INTERFACE.
- DEVIATIONS FROM ASSUMED LOAD CONDITIONS COULD AFFECT ESTABLISHED FUNDING AND SCHEDULES, AND VEHICLE DESIGN CRITERIA NOW BEING DEVELOPED.

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SATURN I-B PROJECT NARRATIVE

Slide
1. CONTRACT STATUS S-IB STAGE

On February 20, 1963, NASA Headquarters approved the procurement plan for modification of the basic Chrysler contract, CCSD/NAS-8-4016. The scope of the contract will be changed to require 12 of the S-IB stages and 8 of the S-I stages. The modification will extend the contract to December 31, 1967, and will outline Chrysler design responsibilities. The Request for Quotation and Technical Work Statement have been forwarded to Chrysler. The contractor is preparing a definitive proposal, and negotiations are expected to begin in April.

Slide
2. CONTRACT STATUS S-IVB STAGE

The MSFC Procurement Plan for an additional 4 S-IVB stages for SATURN IB R&D launches was submitted on March 6 to NASA Headquarters and is now being reviewed. The plan is supplementary to the basic design and development contract, which procured ground test stages and flight stages for the SATURN V program. Negotiations on the forthcoming proposal are expected to begin early in May, 1963, with a target date of June 11, 1963, for completion of negotiations and contract approval.

Negotiations were completed on March 15 on the DAC interim proposal, which will provide coverage of S-IVB activity until the main contract supplement is negotiated and approved.

Slide
3. SATURN IB PAYLOAD/INSTRUMENT UNIT INTERFACE DEFINITION

Early definition is required of the payload and payload/instrument unit interface for the SATURN IB vehicle. Development of design criteria for all stages of the SATURN IB has progressed to the point where firm payload definition is necessary, particularly concerning the Lunar Excursion Module mounting and containing structure. MSFC design is proceeding on the assumption that the LEM will be contained and supported within the structure forward of the Instrument Unit, and that the interface of the IU and spacecraft will be required to sustain a distributed load, not point loading from the LEM landing legs. Douglas, assuming conventional shell load distribution across the interface between the S-IVB and the instrument unit, is scheduling initial release of

structural drawings of the S-IVB forward skirt in mid-March. Instrument unit structural drawings are scheduled for release by MSFC in mid-April. Deviations from the as sumed load conditions imposed by the spacecraft could have a direct impact on the funding and schedules presently established and the vehicle design criteria now being developed.

SATURN V

SLIDES

1. SATURN V/S-IC STAGE

2. SATURN V/S-II STAGE

SATURN V S-IC STAGE

- FIRST BOEING - MICHOUD PRODUCED V-RING ARRIVED AT MSFC ON MARCH 4 AND HAS SUCCESSFULLY PASSED QUALITY INSPECTION.

- MSFC HAS AUTHORIZED BOEING TO DEVELOP, AT HUNTSVILLE, AN ENGINEERING LABORATORY FOR EVALUATING AND TESTING S-IC STAGE TEST AND CHECKOUT STATION DESIGN.

- DESIGN AND TOOLING SCHEDULE PROBLEMS, WHICH MAY ENDANGER GROUND TEST STAGE MANUFACTURE SCHEDULES, WERE NOTED BY BOEING IN S-IC QUARTERLY REVIEW.

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SATURN V S-II STAGE

- EXPLOSIVE FORMING ACTIVITIES WERE INITIATED BY S&ID AT THE EL TORO FACILITY ON MARCH 1. SATISFACTORY STAGE SEGMENTS WERE OBTAINED.

- MSFC HAS REQUESTED S&ID TO DETERMINE METHODS AND COSTS OF INITIATING THE S-II STAGE ALL-SYSTEMS TEST PROGRAM FIVE MONTHS EARLIER THAN PRESENTLY SCHEDULED.

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SATURN V PROJECT NARRATIVE

Slide
1. SATURN V/S-IC STAGE

On March 4, 1963, MSFC received, by barge, the first complete S-IC Stage Y-ring manufactured at Boeing-Michoud. The ring, which is fabricated from three aluminum alloy billets welded together and machined to the "Y" configuration, has completed quality inspection and is being prepared for storage until construction of the MSFC S-IC structural test vehicle begins.

In late February, MSFC authorized Boeing to develop, at Huntsville, an engineering laboratory for evaluating and testing S-IC Stage test and checkout station design. The work that will be performed by Boeing in the facility includes, electrical and electronic breadboard testing of telemetry and digital circuitry design and evaluation of compatibility between the automation concept and mechanical ground support equipment design. Renovation of an existing plant area, located outside the MSFC complex has begun. Boeing will begin using the facility in early April.

In the March Quarterly S-IC Review, Boeing stated that their S-IC design documentation efforts are about six weeks behind schedule. This is endangering the MSFC ground test stage manufacturing schedules by introducing probable delays into the subassembly efforts scheduled at Michoud and MSFC. Boeing is attempting to regain the schedule by accelerating the buildup of engineering personnel and utilizing a 56-hour work week in critical areas. In addition, an MSFC/Boeing Documentation task force is investigating means of reducing the documentation delays.

Slide
2. SATURN V/S-II STAGE

On March 1, S&ID began operations at the El Toro S-II Stage explosive forming facility. The initial segments formed, LO_2 tank equatorial gores, were rejected because of material failure; however, segments formed by a modified explosive die appear to be satisfactory. On March 7, a thin gore section was successfully formed. Full-scale activation of the facility is scheduled for April 1, 1963.

In late February, MSFC requested S&ID to determine methods and costs of initiating the S-II Stage All-Systems test program at Santa Susana five months earlier than presently scheduled. The purpose of this analysis is to provide as much time as possible between the beginning of the all-systems test program and the launching of the first live S-II flight stage. Under the present schedule only 16 months exist between these two milestones. S&ID is considering several different possibilities and is scheduled to complete the study by March 31, 1963.

MICHOUD OPERATIONS

FILM - MICHOUD OPERATIONS

MICHOUD OPERATIONS FILM

This ten minute film covers the progress at Marshall Center's Michoud Operations. The major activities at Michoud are construction projects, and S-I and S-I-C stage production work. Progress at Michoud is on schedule and is providing a significant industrial base for the SATURN programs.