

May 2 1966

NOTES 5/2/66 BALCH

B 5/3

972-5/2

S-II-T Stage - Squawks after 15-second static firing on 4/23/66 were relatively minor and pertained mostly to sidewall insulation, membrane seal, and mechanical areas. Securing procedure (MO27) was completed on 4/26/66. Preparations are progressing smoothly for second firing (150 seconds), previously projected for 5/11/66 but now planned for an earlier date if possible. Earliest possible date is 5/6/66. ✓

Data Handling - Data reduction exercises have been conducted during the past week on the recorded tapes from the S-II-T firing. Software and communications deficiencies revealed are being corrected. Calibration load sheets required to process telemetry data have now been made available by S&ID, and telemetry data can be processed at MTF. ✓

Acoustics Measuring Program - Acoustic measurements were carried out as planned during the S-II-T firing, with all six community monitoring stations recording data. ✓

S-II Test Stand A-1 GSE - S&ID has submitted the contract for GSE installation to NASA for review and approval. All actions necessary to permit start of work on this contract are being expedited. ✓

S-IC Test Equipment - Ground Equipment Test Set (GETS) received from R-TEST is undergoing inspection by Boeing to establish configuration status. Installation of modifications and shortages on Manufacturer's Support Equipment (MSE) in TCC is underway. Daily testing of RCA 110A computer is being carried out to evaluate its performance. ✓

Technical Systems, Phase II - Negotiations on cost to complete Phase II Technical Systems have been recessed for GE to develop additional information. Additional funds have been made available to GE to provide for continuing the acceleration of S-IC Technical Systems installation and for limited acceleration of S-II Test Stand A-1 Technical Systems installation effective 4/28/66. ✓

Press Coverage of the S-II-T Firing was very favorable. Only the press in the local area (New Orleans, Slidell, Picayune, Bay St. Louis and Mississippi Gulf Coast were called in to cover the event. ✓

The Mayor and Chamber of Commerce of Huntsville, Alabama were given a briefing and tour of the site on 4/29/66. ✓

NASA/Industry Press Tour - Today a group of 76 of the top space-oriented press people in the country are scheduled to visit MTF. Included will be representatives of all three major television networks, all four top news magazines, all the major daily newspapers and missile and space publications. ✓

9/18 5/2

H-1 ENGINE

During acceptance testing of engine H-7084 at Neosho, a significant shift in thrust and mixture ratio was observed approximately 40 seconds into two of the three tests. Two other engines exhibited this same abnormality. Extensive investigation of both data and hardware did not reveal any definite reason for the performance shift although there was an indication of a change in fuel system differential pressure. In order to fully explain the condition, engine H-7084 was fully instrumented and shipped to Rocketdyne/Canoga for further testing. To date, thirteen tests have been conducted both in its original configuration and with different orifices and there has not been a performance shift. This indicates that either engine performance is not shifting or that the shifts are associated with the Neosho test stand. The engine is being shipped back to Neosho for further testing. ✓

F-1 ENGINE

A complete set of five flight F-1 engines and a spare engine have been delivered to Boeing/Michoud for S-IC-4. All were delivered ahead of the Boeing contractual GFP requirements dates. ✓

Several incidents of baffle bulging which eventually develops into cracks have been encountered in R&D engines with Qualification II configuration injectors. This bulging is usually first noticed at 1000-1500 seconds. Repair methods are being investigated i. e., dilated baffle coolant holes are reamed and erosion and cracks are weld repaired. The worst case has occurred on R&D engine 027-2 where bulging first appeared after about 500 seconds with weld repairs being made at 1100 seconds. This engine now has 2150 seconds of operating time with intermittent baffle repair. This is a potential problem area that could curtail the engine Qual life of 2250 seconds. ✓

J-2 ENGINE

The Fitters and Plumbers Union strike at AEDC has been settled. There was no significant schedule delay.

A 230K engine was delivered to DAC this week for S-IVB 503. This is the first 230K flight engine for the Saturn V Program. Two 230K engines were delivered to S&ID for the Battleship program. ✓

There were no engine associated problems encountered during or after the S-II-T test April 23, 1966. The center engine LOX turbine wheel inspection and the exhaust hood swab inspection of the other four engines were accomplished without schedule impact. We cannot foresee any schedule delay to the May 9 test due to engine problems. ✓

SIS 5/2

B 5/2

1. DAMAGE TO UPPER BULKHEAD - 505 FUEL TANK

On Thursday, April 28, the S-IC-5 fuel tank upper bulkhead collapsed. This collapse was caused by a negative internal pressure of approximately 1/2 psi induced by draining operation after hydrostatic test with all tank vents "blocked." Current assessment indicates no schedule impact. An accident review board immediately convened to conduct investigation of this accident. Full report to follow. ✓

2. STATUS OF BOEING - IAMAW NEGOTIATIONS

The International Association of Machinists and Aerospace Workers (IAMAW), by full membership ratification, has apparently accepted the compromise proposal agreed upon during the negotiations in Washington, D. C., during the week of April 18, 1966. The tabulation is unofficial at this time but will be made public next week. ✓

3. VISIT BY HUNTSVILLE CHAMBER OF COMMERCE MEMBERS

Mayor Glenn Hearn and other Huntsville city officials were among the 40 members of the Huntsville Chamber of Commerce, MSFC Committee, who visited Michoud Assembly Facility on Thursday, April 28. The group was accompanied by Mr. Keith Wible and was given an orientation briefing and tour of the Michoud plant during the visit. ✓

4. F-1 ENGINE

Two F-1 engines were received this week. All S-IC-4 flight engines and spare are now at Michoud. ✓

NOTES 5/2/66 FELLOWS

5/2/66

B5/3

1. Ground Wind Load Test Program: In response to your query on my April 18 NOTES about the 3 % Saturn V-LUT combination, the following expanded information is provided:

On previous wind tunnel tests performed at Langley, both the Saturn V Vehicle and the Launch Umbilical Tower (LUT) were scaled to 3% of the full-scale version. This combined launch configuration was subjected to wind loads in the tunnel. To determine what protection the Mobile Service Structure (MSS) will afford the Saturn V vehicle as pertains to the von Karman phenomenon, a steel weldment model of the MSS will be fabricated to the 3% of the full-scale version and the entire configuration (Saturn V, LUT, and MSS) will be subjected to wind tunnel tests. This test is scheduled at Langley from May 17 thru May 27, 1966. ✓

2. R&DO Summer Employee Program: In addition to careful selection of the undergraduate students and clerical personnel to work in R&D Operations during the summer months, special attention has been given to the applicants representing the college and university faculties. Arrangements are being made with 25 faculty members representing 24 college-level institutions from 17 states. ✓

3. Saturn IB Project Support Agreement (PSA): The R&D Operations proposed Saturn IB PSA has been coordinated with all the laboratories and has been submitted to IO for approval. ✓

NAA CORPORATE QUALITY AUDIT OF ROCKETDYNE DIVISION: Results of the North American Aviation Corporate Quality Audit of the Rocketdyne Division have been received. Results of this audit and the action taken should result in a significant improvement in the quality operations at Rocketdyne. Some of the more important results of the audit are as follows:

- o Communication ties between quality management and operating level personnel will be reinforced by regularly scheduled staff meetings every week.
- o Communication ties between quality control and manufacturing will be strengthened by use of task committees consisting of personnel of Engineering, Manufacturing, and Quality Control. Five major quality problems have been selected for initial task committee action as follows: (a) soldering, (b) engine final checkout, discrepancy analysis, (c) cleaning specification clarification, (d) F-1 thrust chamber fabrication, and (e) supplier quality system.
- o The Liquid Rocket Division quality audit function will be reviewed, strengthened, and a more effective program defined.
- o Quality trend charts will be established for manufacturing operations, which will indicate trends by criticality, to provide manufacturing and management with visibility of product quality.
- o Quality control will maintain a closer surveillance of the specification release system to assure review of all process specifications by quality control.
- o The need for increased receiving inspection facilities was recognized and approval to upgrade facility was given March 28, 1966.
- o The many sources listed on the supplemental list to the Certified Special Processing List for NDT, Plating, Cleaning, etc., are being reviewed and will be reduced.
- o A program has been initiated to strengthen first level supervision for improvement in efficiency and effectiveness.
- o Communication between government inspection and Rocketdyne will be upgraded to the supervisor level to promote better communication between the company and the Government.

The overall results of the audit tend to verify what we had recognized earlier and that is, Rocketdyne needed an improvement in the management operations of their quality organization. In addition to the above audit results, a regularly scheduled meeting between management personnel of the inspection agency, Liquid Rocket Division/Quality, and this Laboratory's Project Engineer for Engines (Ed Mintz) will be conducted until noticeable improvements are made in the quality operations and delivered hardware. ✓

9/8 5/2

B 5/2

1. RELAY-VENDOR STRIKE: Potter & Brumfield, the vendor of the relays being used in the Mod II Switch Selector, remains on strike. The strike which began on March 21, 1966, is in its sixth week. IBM's supply of relays for switch selectors will be exhausted soon and the last relays will appear in units to be delivered during the first week of May. Thirty-five units will have been delivered by this time. The strike will cause approximately three weeks schedule slippage. We are investigating other relay vendors.

W. H. Doesn't quite jibe with Lee James' latest report which says Potter & Brumfield superiorists are producing enough switch selector relays to tide us over.

Sensitive info!
Union does not know this!

→

B

F-1

Tests FW-024 and FW-025 were conducted on the West Area F-1 Test Stand with F-1 Engine F-4T2 on April 27 and April 28, 1966, respectively. Test FW-025 was cut off prematurely when the flight hardware supply line to the gimbal filter manifold ruptured. This line was supplied by P&VE and was not of the flight configuration, but due to shortages in flight hardware was considered acceptable for ground test. Six hundred thirty two seconds, of which approximately 40 seconds were on the "T" bird, were amassed on this line before failure. The fire which resulted after the line ruptured caused minor damage to instrumentation wiring which will be replaced prior to the next test on May 4. The ground hydraulic supply to the gimbal filter manifold and the igniter fuel supply lines will also require replacement. ✓

S-1C

All changes scheduled for incorporation in the S-1C-2 stage prior to Post Manufacturing Checkout (PMC) have been accomplished. The stage entered PMC on April 25, 1966, and checkouts are progressing on schedule for delivery to R-TEST on May 12, 1966. Test stand renovation and checkout are being accomplished to meet this schedule. ✓

S-II-T (MTF)

A data presentation from the 15 seconds duration firing was held by S&ID on April 28, 1966. A list of changes and additions to be added to the next firing, was presented, which included:

- a. LH₂ recirculation pumps replaced.
- b. Instrumentation errors and calibrations to be corrected.
- c. Gas generator over-temp probes to be replaced or examined.
- d. P.U. programmer calibration and checkout.
- e. Gimbal programmer checkout.

Approximately 40 cracks in insulation were noted which appear to be mostly seal exterior and membrane leaks, requiring only surface patches. A target firing date of May 6, 1966, was discussed. ✓

S-IVB (MSFC)

Test S-IVB-021 was conducted at the S-IVB test stand on April 28, 1966, for intended duration of 200 seconds. Primary objective, to duplicate 203 acceptance firing condition using 203's diffuser on the fuel pressurization system, was not obtained because only .5 lbs/sec flowrate was obtained rather than .7 lbs/sec. Test will be repeated this week as one of three planned for today, Wednesday and Friday, to study this problem. ✓

S-IVB (SACTO)

DAC is approximately five days behind the scheduled May 11, 1966, firing date, due mainly to late arrival of some of the stage hardware. However, DAC is still trying to be ready to fire by May 11, 1966. Integrated Systems proofing and propellant loading proofing began April 25, 1966. The proofing of the IST tape is about 80% complete. The hardwire procedure is about 95% complete with 16 transducers short to the stage. On schedule for an acceptance firing on May 26, 1966. ✓

NOTES 5-2-66 HOELZER

985/2

B 5/3

Negative Report

NOTES 5/2/66 JAMES

9/85/2

SATURN IB/APOLLO LAUNCH SCHEDULES FOR CY-66: As I indicated in my notes last week, General Phillips had asked KSC to look at accelerating the launch schedule for SA-203 and SA-202 by approximately 2 weeks each. All of this is "keyed" to the importance ^{at} detached to AS-204 and assuring that mission this calendar year. KSC has responded favorably with a schedule which accommodates the earlier launches with a somewhat lower degree of competence of course than the previous dates.

Schedule pressure in the Saturn IB Program has mounted steadily over the past year and continues to mount. (I might add also that budget dollars have decreased steadily.) I find myself at this time in a position to support these 3 launches very well with the propulsive stages assuming the resolution of a few known problems and barring any major problems. Of course the IU's for SA-202 and SA-203 have been delivered but we have major items of flight hardware for these and other IU's yet to be delivered. Problems continue to plague us with the delivery of flight control computers, LVDA's and LVDC's, switch selectors, TV equipment for SA-203, and control signal processors, just to name a few of the major ones. Further, the lack of early definition of mission and flight control data makes software deliveries extremely tight.

A busy year lies ahead. The full resources of MSFC will be required to keep pace with the program and particularly in those "problem areas" mentioned above. ✓

AS-203 DESIGN CERTIFICATION REVIEW (DCR): We are starting our preparation for the AS-204 DCR which will probably be in July or August. This review will be patterned after the Gemini DCR's and will differ from our Flight Readiness Review in that the emphasis will be on design integrity and flight safety rather than on hardware and mission status. Dr. Mueller will chair the review and the "review team" will be composed of the Management Council members. ✓

S-IVB LH₂ TANK ULLAGE PRESSURE: Tests are in process with the S-IVB battleship stage at MSFC to simulate and evaluate the ullage pressure decay and to test the effectiveness of design modification proposed to resolve this problem. In addition, S-IV battleship tests during the first 2 weeks of May will be run to introduce slosh to determine its effect on tank ullage pressure. We have a briefing scheduled with you on this for tomorrow, May 3. ✓

5/2

B 5/3

1. S-IC-501 Problem: During the refurbishment of this stage prior to final checkout for shipment it was discovered last week that three of the sixteen 1-3/8" bolts which connect the engine mount to the cross beam were broken. Boeing design has reverified the load and stress conditions of this center engine support and examination of the bolts did not reveal any material defect or shortcoming in the manufacturing process of the bolts. The torque of the bolts at assembly is controlled by crush washers. However, it was found that the torque of the remaining bolts on -501 was much less than on the same bolts on -T. Since the cause of this occurrence has not yet been determined, a fix or solution of the problem has not been decided upon. Because of the inaccessibility of the bolts, it may become necessary to disassemble a major portion of the installations inside the Thrust Structure. The responsibility for a fix rests entirely with Boeing since this Thrust Structure was built in Michoud and we have no tooling for installation of these bolts. This stage is due for delivery to checkout prior to static firing by May 12, 1966. ✓

2. S-IC-502 Milestone Accomplishment: This stage was delivered to R-QUAL on schedule last Monday, April 25, with all of refurbishment, rework, and numerous modifications in electrical network and distributors accomplished. ✓ To meet this milestone had again required a great deal of sweat, night and Sunday work, and was only possible by the good teamwork of many dedicated people in ME, QUAL, and Boeing. ✓

1. J-2 ENVIRONMENTAL VERIFICATION TEST PROGRAM: The first hot firing of the J-2 Engine in the altitude test cell at Arnold Engineering Development Center in Tullahoma, Tennessee, is scheduled for 7-18-66. The engine has been mounted on the S-IVB battleship stage and the stage mounted in the test cell. ✓
2. S-II STAGE PROGRAM STATUS: The component qualification program is falling behind schedule due to shortage of component parts and slowness of activating test facilities. ✓
3. AAP EXPERIMENT CARRIER: In cooperation with ASO and the IO-AAP office, we are starting preliminary designs on docking carrier rack for AAP experiments. This could be used for some missions in lieu of a LEM. ✓
4. S-IVB WORKSHOP EXPERIMENT: As a result of discussions with you on the possible fire hazards resulting from meteoroid penetrations, we are preparing the information to re-submit our Meteoroid Shield Experiment to the MSFC Experiment Board. Estimated weight is 600 lb. ✓
5. HIGH BAY LOAD TEST ANNEX: With the installation (begun 4-25-66) of the two-million-pound testing machine, the static testing capability of our High Bay Load Annex is being completed. The first use of this capability will be in testing a series of 10 ft. diameter honeycomb cylinders as a research and development test for deflection theory. The cylinders were designed by P&VE and manufactured by ME.
6. (REFERENCE NOTES 4-11-66 KUERS) P&VE agreed (R-P&VE-VH-64-449) with the S&ID recommendation to change the stringer material from 7075-T6 to 2020-T6 as a weight saving method. In P&VE memo (R-P&VE-XH-66-91) dated 3-7-66, we agreed with the S&ID proposed solution to the problem which became apparent during manufacturing. This solution is consistent with what Mr. Kuers detailed in the 6 steps. However, our subsequent laboratory investigation of hardware received from S&ID has cast substantial doubt on the wisdom of continuing with the 2020-T6. One approach would be to use on S-II-4 and S-II-5 two available sets of stringers made from 7075-T6 and to re-engineer for subsequent stringers of 7075-T73 because of its superior resistance to stress corrosion cracking. Because of the obvious impact of such a recommendation, we are studying all aspects of the problem very carefully before making a recommendation. A recommendation will be made in a few days.
7. ZERO-G SIMULATION FACILITY: The 5-degree of freedom manned zero gravity simulator has satisfactorily completed initial operational checkout utilizing an aluminum slab (8 ft. wide, 12 ft. long, and 5/8 in. thick) to provide the air bearing floor. The simulator, on loan from the General Electric Company, is installed in building 4619 and will be utilized in zero-g familiarization programs for MSFC design personnel. The 5-degree of freedom simulator accommodates one man, strapped in a 2-axis gimbal system, supported by an air bearing platform. The system provides 3 rotational and 2 translational degrees of freedom. ✓

W. Kuers
FYI and
comment.
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5/2

1. DEFENSE SCIENCE BOARD TASK GROUP ON RESEARCH AND DEVELOPMENT CONTRACTING - At the request of Mr. William Rieke, NASA Assistant Administrator for Industry Affairs, Bill Hagen appeared before and presented NOMATIC (Nomographic Aid to Incentive Contracting) to the Defense Science Board Task Group on Research and Development Contracting. The presentation was held at the Pentagon on April 28 and 29. Attendees include:

- Perry Pratt - United Aircraft, Chairman
- L. Eugene Root - Lockheed Missiles and Space Co.
- George Brown - RCA
- Berthram D. Thomas - Battelle Memorial Institute
- Raymond J. Woodrow - Princeton University
- Michael Ference - Ford Motor Co.
- K. Warren Easley - Monsanto Research Corp.
- General Wm. J. Ely - Dep Dir, ODDR&E
- John M. Malloy - DOD - OASD (I&L)
- Elliott B. Harwood - ODDR&E Acting Secretary

Additional contract related presentations were made by NASA, Army, Navy and Air Force.

A comprehensive memorandum for record of the meeting is being prepared and is available upon request. ✓

2. BUREAU OF THE BUDGET FIELD TRIP TO THE WEST COAST - Mr. Franz Kretzmann, BOB Budget Examiner, will review the major NASA supported activities in the Los Angeles area during the week of May 9, 1966. He will visit WOO, the JPL, and the following MSFC contractor plants:

- North American Aviation (S&ID), Downey - S-II stage
- Douglas Aircraft Co., Huntington Beach - S-IVB stage
- North American Aviation (Rocketdyne), Canoga Park, F-1, J-2, and H-1 engines

Mr. Kretzmann is mainly interested in: (1) the contractor's project organization and their relationship to NASA; (2) their management of in-house activities such as resource requirements, schedules, and technical progress; (3) the management of sub-contractors including control procedures regarding cost, schedules, and technical progress; and (4) the project status.

Bernie Johnson will represent MSF; Bernie Maggin from Dr. Seaman's Office is tentatively scheduled to represent Headquarters. MSFC representatives who will accompany the team are Robert O. Sparks, Executive Staff, and Wallace Brown, Industrial Operations, Resources Management Office. ✓

NOTES 5/2/66 RICHARD

B 5/3

Guidance, Control, and Propulsion Utilization System Interactions.
MSFC and DAC have reached general agreement on how this overall problem will be handled. This involves the requirements for minimizing the thrust variations on our remaining flights, and how we will predict the flight thrust characteristics in advance. Through the work of R-AERO, R-ASTR, R-P&VE, I-V-SIVB, and the Dynamics and Control Working Group, the capabilities of the various systems have been iterated together to solve this problem without extensive hardware and program impact. ✓

1. MSFC/KSC Contract Supplements - MSFC/KSC agreements have been reached on the S-II Stage, S-IVB Stage, and IU supplements - except for funding levels. No agreement has been reached for the S-IC Stage supplement since KSC does not agree with our requirement for structuring of a work statement that clearly differentiates between MSFC peculiar work (Stage and Stage peculiar GSE) and KSC work to be assigned Boeing. (See attachment #1 - Saturn V Program Office position paper). ✓

2. S-IC-5 Fuel Tank Damaged - (See photograph - attachment #2 - Dr. von Braun's copy only) - On Thursday, 28 Apr 66, as a result of a partial collapse of the upper bulkhead while being drained after hydrostatic testing. A negative internal pressure of approximately 0.5 psi recorded.

An accident investigating board has been established. The Michoud organization is analyzing the extent of damage and the necessary repair procedures. It is expected that the dome of the upper bulkhead will be replaced.

No impact on S-IC-5 vehicle delivery schedule anticipated since we are approximately four weeks ahead of schedule. ✓

3. S-IC Stage LOX and Fuel Prevalves - (Ref your annotation to Notes 4/18/66 Lucas, attachment #3) - The decision for Boeing to perform random vibration tests on LOX and Fuel prevalves was based on the following:

- Marshall Spec 63-2 requires these random tests.
- No official waiver of this specification has been established by R-P&VE.
- Therefore, Saturn V is committed to meet this specification.
- In carrying out their design responsibilities, Boeing has determined that this area of testing is mandatory for qualification of this flight critical component. ✓

4. S&ID Welders Strike - (Ref your comment to Notes 4/18/66 Rudolph, attachment #4) - I have had the same concern ever since the strike started and have discussed it with Col Yarchin. He has advised me that:

- Every precaution was taken to assure that supervisory personnel were qualified.
- Welding has actually improved (improved schedule with better quality welds).
- Welders are beginning to drift back to work. ✓

5. Potter-Brumfield Strike - (Ref your comment to Notes 4/18/66 Rudolph, attachment #4) - Yes, all of NASA's labor trouble shooters are working the problem. Potter-Brumfield management is now optimistic as to settling the strike soon. ✓

6. Saturn V Breadboard Activities - 500F Program Tapes were delivered Thursday, 28 Apr 66, to KSC minus the calips switch and S-IC propellant monitoring capabilities. These two missing test programs are expected to be delivered Thursday, 5 May 66, with no impact on 500F operations. ✓

Attachments: a/s (DIR, I-DIR and R-DIR's copy only)

B 5/3

NOTES 5/2/66 SPEER

985/2

1. PRECISION S-BAND TRACKING SYSTEM: (Ref. Notes 4/18/66 Speer; copy attached). Upon our request a memo is being prepared at OMSF for Dr. Mueller's signature telling KSC to shelve the TRW study, at least until all MSF Centers and OTDA have reviewed it. The memo will direct KSC to make copies of TRW results available to MSFC and other Centers. ✓

2. HUNTSVILLE OPERATIONS SUPPORT CENTER (HOSC) PHYSICAL SPACE: Plans have been initiated to correct the space shortage experienced in the HOSC. The short range plan calls for a 500 sq. ft. trailer to accommodate the wind monitoring function; data delivery and certain maintenance functions. The long range plan is to request OMSF approval for a two story 100 foot addition to the "A" wing of the Computation Laboratory. The first floor of the addition will be justified for HOSC, the second floor for COMP Lab. The cost of this addition would be less than 250 K. Assuming approval, the total HOSC floor space would increase from 6200 to 10,200 sq. ft. within one year from now. This would permit several simultaneous conferences with both KSC and MSC, facilitate experiment support, improve our wind monitoring activities and allow space for a library of vehicle drawings and diagrams, and substantially improve the general service area. We shall need your support of this project. ✓

3. PHOTO REQUIREMENTS AND SATURN IB DATA REVIEW: The meeting was held at KSC on April 26-28 and chaired by Mr. McClanahan of Hqs. The following items affecting MSFC were discussed: (a) Photographic requirements (MSFC has reduced from 96 items on AS-201 to 60 on AS-203 and further reductions will be in order for the operational flights); (b) Post flight reporting required by the OMSF Test Office; (c) MSFC requirement for a Datacore strip out; (d) AS-500 F Wind Loads Tests; and (e) The Experiment System Engineer (ESE) Console at KSC for AS-203. Some problems associated with (c) and (d) above could not be resolved completely and will be subject of further discussions. ✓

NOTES 5-2-66 STUHLINGER

NEGATIVE REPORT.

9/25/2

B 5/3

NOTES 5-2-66 WILLIAMS

Negative.

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B 5/3

May 9 1966

NOTES 5/9/66 BALCH

S-II-T - Countdown for second static firing was started late Friday, 5/6/66. After successfully completing LOX and LH₂ tanking, circuitry problems developed in the Propellant Utilization system control logic which resulted in failure of system components and made it necessary to discontinue the countdown early Saturday morning. Resumption of countdown is now projected for early Tuesday, 5/10/66. Instrumentation for the second firing has been completely channelized and calibrated. Engine gimbaling has been successfully accomplished using tape programming, and the system is ready for use during the second firing. This will be the first attempt on the S-II program to use the automatic checkout equipment, with the CDC 924-A computer, as an active element during a static firing. ✓

S-II-T Static Test Data - cursory review of the data plots produced from the S-II-T first firing indicate that approximately 75 to 80 percent of the plots are acceptable for the Stage Contractor's data reduction efforts. Major problems encountered were the lack of adequate calibration charts, improper selection of instrumentation ranges, and faulty transducers or signal conditioning equipment. ✓

Technical Systems, Phase II - Negotiations on cost to complete Phase II Technical Systems are substantially complete. Possibilities of meeting access need dates for S-IC Technical Systems installation are being explored, and impact of prospective slippages on static firing schedules is being studied. A joint operating plan is being developed to define procedures to be followed by Boeing and GE during Phase II subsystem and system tests. It is intended that Boeing engineers and technicians will perform the tests in accordance with GE test procedures. ✓

Technical Systems, Phase III - On 5/2/66 beneficial occupancy for technical systems installation was effected in all areas of the Cryogenics Building and in several areas of the Components Service Building. Installation work began on 5/4/66. Beneficial occupancies of additional areas of the Components Service Facility are scheduled for 6/1/66, 7/1/66, and 8/1/66. ✓

Data Handling Center - Completed experimental program on receiving telemetry radiated frequency signals. The results were successful, and current plans are to receive and record all signals transmitted. Indications are that the Data Handling System software will not be complete by 5/30/66. Aetron has been requested to submit a revised schedule showing their anticipated completion date. ✓

5/9 JTB

B 5/14

J-2 ENGINE

At 11:00 p.m. on May 3, 1966, the Machinists' Union struck at AEDC. Pickets were set up on all gates, and access into AEDC has been severely hampered. ARO has filed for a temporary restraining order to have the picket removed. Depositions have been filed by both ARO and the union with NLRB. A ruling on these depositions by the NLRB is scheduled for May 10, 1966.

The Air Force has stated that the impact of this strike on the modification of the J-4 test facility for J-2 engine testing will be a day-for-day slip.

Every effort is being made to resolve this problem. Labor relations groups at AEDC, Air Force Headquarters, NASA Headquarters, and MSFC are working with the NLRB and the union at the local and national levels. ✓

C-1 ENGINE

Valve development tests at Moog are proceeding on schedule. Selection tests on the Moog and Valcor quadredundant valves are in process with selection targeted for May 20. Program Review is scheduled at RMD for May 10. ✓

GENERAL

Mr. J. P. McNamara, Rocketdyne's Liquid Rocket Division Vice President and General Manager, will visit MSFC on Wednesday, May 11, 1966. Among other things, he will discuss quality control with Mr. Rees and Mr. Grau. ✓

NOTES - 5/9/66 - CONSTAN

AB 5/9

B 5/14

VISIT OF AEROSPACE WRITERS TO MICHLOUD

Some 100 national aerospace writers toured MTF and Michoud Monday and Tuesday, May 2 and 3, under the sponsorship of the four major Apollo contractors, Boeing, Chrysler, Douglas, and North American. Dr. Mueller briefed the group at MTF Monday morning, and Dr. Seamans spoke to them that evening following dinner at Brennan's Restaurant. ✓

NOTES 5/9/66 FELLOWS

9/5/9

B5/14

Computation Laboratory Support Requirement: On May 5, as Chairman of the Source Evaluation Board for Computation Laboratory Support Services, I presented findings of the Board to the NASA Administrator. As a result of that presentation, Mr. Webb decided that competitive negotiations will be held with General Electric, Phoenix, and Computer Science Corporation, Los Angeles. The three proposing contractors who were not selected for negotiations are C-E-I-R, Inc., Wolf Research and Development Corporation, and Ling Temco Vought. Contractual negotiations are expected to begin in about a week. ✓

5/9

1. C-1 ENGINE PROGRAM: Approval has been given to Thiokol, RMD, on their Quality Program Plan. The DCASO Quality Assurance Plan is in final revision and approval is expected the week of May 9. A representative of this Laboratory is presently in residence at RMD and will approve the plan on-site. Approval of both the contractor's and government agency's plans this early in a development program is a significant accomplishment. This will provide us with ample time to prove the effectiveness of these plans prior to the manufacture of flight hardware. ✓
2. MANUFACTURING ANALYSIS: The Manufacturing Analysis Section of this Laboratory has assumed the X-ray responsibility for vehicle hardware in building 4707 effective May 1, 1966. During a 30-day phase-in period, the P&VE representative was very cooperative and most helpful in familiarizing our personnel with the day-to-day management and operation of the facility. No difficulties are anticipated in operation of the facility. ✓
3. AIR FORCE SYSTEMS COMMAND VISIT: Quality assurance personnel from the Contract Management Division (Los Angeles) of the Air Force Systems Command visited this Laboratory last week to review the quality assurance and reliability disciplines and concepts MSFC considers necessary to achieve required quality and reliability for manned space flight. This visit was part of a broad study the Air Force Systems Command is making to determine what, if any, changes should be made in its current quality and reliability approaches for upcoming Air Force manned spaceflight programs. The group had visited Michoud and KSC prior to coming to MSFC. ✓
4. MANNED FLIGHT AWARENESS PROGRAM: Dr. Farish, Director of the Manned Flight Awareness (MFA) Program, accompanied by a representative of this Laboratory, visited Defense Contract Administration Services Headquarters, Cameron Station, Alexandria, Virginia, last week to present the MFA programs. The purpose was to solicit support of that DCAS Headquarters in tying MFA to the DCAS internal Zero Defects program in order to reach DCAS personnel throughout the United States who are providing contract administration support on the Saturn/Apollo programs. The presentation was enthusiastically received and DCAS Headquarters will work with Dr. Farish and personnel of this Laboratory in implementing the MFA program within DCAS. Dr. Farish and the Laboratory representative were invited to attend a meeting of all DCASR Zero Defects coordinators to be held in Buffalo, New York, on May 19, 1966, and a meeting of all DCASR Quality Assurance Directors in New York City on May 31, 1966, as the initial implementing efforts. ✓

NOTES 5/9/66 HAEUSSERMANN

9/8/66

B 5/19

No submission this week.

5/9/66

B

5/14

S-1C

The S-1C-2 stage is progressing on schedule through post-manufacturing checkout and will be released to R-TEST this Thursday. The change-out of the center engine thrust structure bolts, total of 16, will be accomplished by Boeing when the engine is lowered following the propellant load test on the test stand. ✓

F-1

Tests FW-025 and FW-026 were conducted on the West Area F-1 Test Stand with F-1 Engine S/N F-4T2 on May 4 and 5, 1966. The primary objectives for these tests were to evaluate engine performance and simulated flight lox pump inlet pressure. These objectives were obtained and data are being evaluated. ✓

S-IVB (MSFC)

Three tests were conducted on the S-IVB Test Stand during the week of May 2, 1966. The primary test objectives were to simulate (S-IVB-203 acceptance test) fuel tank pressure conditions; test newly designed diffuser at different flowrates. All test objectives were met successfully and preliminary analysis of data indicates the new diffuser design will solve the LH₂ tank pressure decay problem. ✓✓

S-11-T (MTF)

The second S-11-T firing countdown was scrubbed at 4:30 a.m. Saturday, May 7, 1966, when the No. 1 engine P.U. valve was frozen and efforts to troubleshoot and correct the malfunction were unsuccessful. Problems were encountered in the pre-countdown sequence Friday, when the manual set-up was incorrect. Other delays were due to valve and regulator failures in the S7-41. The countdown was started at 4:30 p.m. Friday, May 6, 1966. The propellants were loaded to 100% successfully. The upper discrete probes on the lox tank were not picked up because they were above the upper limit of the capacitance probe. Several recirculation tests were performed along with boil-off topping tests. The off-loading for P.U. was underway when the valve on Engine No. 1 was found to be inoperative. ✓

Sure
looks
anything
but
good!
B

NOTES 5-9-66 HOELZER

B 5/14

5/9/66

1. THIRD GENERATION COMPUTER NEGOTIATIONS: Evaluation of proposals for our third generation system was presented to Mr. Webb on April 27. Mr. Gorman was present, representing the Center. On April 29, Control Data Corporation, General Electric Company, and Univac were selected for competitive negotiations. Computation Laboratory is working with Mr. Gorman and Purchasing Office to complete these competitive negotiations. We are now shooting for a date of 1 August to have a firm contract. ✓

2. SINGLE SUPPORT CONTRACT FOR COMPUTATION LABORATORY: The evaluation of proposals on our single support contract was given to Mr. Webb on May 4. The announcement was made on May 5 that Computer Sciences Corporation (Los Angeles) and the General Electric Company (Phoenix) were selected for competitive negotiations. These negotiations are to start immediately. Mr. Gorman and Scott Fellows represented the Center at the presentation to Mr. Webb. ✓

NOTES 5/9/66 JAMES

B514

5/9 9/66

S-IVB LOX TANK WELD PROBLEM: The conclusions of the technical review on this subject, which you attended last Wednesday, were to fly SA-203 as is and to acceptance fire SA-501 and fly as is. Additional structural testing will be completed by the first of June for decision to modify or fly as is on subsequent stages. Dr. Mueller has asked for a discussion of this problem in the next Management Council meeting. I will prepare for this discussion. ✓

LEM ENCLOSURE: Headquarters has made the decision to use the MSC proposed LEM Enclosure (SLA with MSFC nose cone cap replacing Command Module), instead of the MSFC proposed nose cone configuration. This decision apparently was based on a desire to minimize changes to launch facilities and spacecraft interfaces as well as the small number of firm LEM flights currently planned. MSC has asked us to look at the possibility of delivering a "nose cone cap" for a SA-206 mission. We feel this will be very tight schedulewise but are looking at the possibility. ✓

G. E. DOCUMENTATION: During a recent Data Management Review at G. E., it was observed that the recent reduction in the number of drawing prints and E. O. 's distributed to MSFC and KSC was significant. For example, drawing prints were reduced from 26,889 in mid-February to approximately 3,000 by the end of March. ✓

RCA COMPUTERS: The critical spare P. C. Board situation is continuing to improve, however, RCA is experiencing difficulty in bringing the production rate of reworked boards up to desired capacity. RCA has installed the reworked boards in their computer for verification testing and tests of the reworked boards started at Van Nuys Friday. ✓

Sporadic bursts of erroneous discrete outputs have been continually plaguing the checkout activities on SA-203 at LC-37B. As of today the computer is back on the line after having changed out the discrete in and out boards from a Saturn V computer. The SA-203 mandatory test tapes have been delivered to KSC and are operating with the computer at the present time. It appears however that the computer/software problem has impacted the accelerated launch date for SA-203 by about two days. ✓

5/9

1. S-IC Center Engine Mount Bolt Problem: It has been determined that the cause for the failure of the bolts on the center engine support on -501 was due to hydrogen embrittlement from the cadmium plating operation. The fix which will be effective for all flight stages consists of three changes as follows: (a) change processing of bolts to a new cadmium plating operation (increase thickness, longer soak in chromic acid solution, one hundred percent inspection), (b) increase length of bolts to accommodate a new 1/4" thick stainless steel washer to rest under the nut for a better surface (to avoid bending forces on the heads), and (c) reverse the direction of bolt installation for better accessibility for torquing operation in order to avoid disassembly of other installations in the tail section. Installation of new bolts on -501 started yesterday. ✓

2. Al 2020-T6 Hat Section Problem for S-II Structures at Tulsa: (Reference NOTES 5-2-66 LUCAS*) P&VE Laboratory's review and studies for selection of the best material for the hat sections of the S-II structures are very important and much needed. We must, however, avoid creating an impact on S-II delivery schedules. The structures (thrust structure, aft skirt, and forward skirt) for -504 will be shipped to Seal Beach by the end of this week, and delivery of these structures for -505 is due by June 24. ✓

3. Visit of McDonnell Personnel: Last week, seven group leaders of the Material and Processes Development Division of McDonnell Aircraft Corporation visited us and made short presentations on manufacturing process development in the areas of electric wiring, organic composite sandwiches, roll welding and diffusion bonding of titanium, chemical machining, etc. Interested personnel from P&VE and ASTR Laboratories participated. We have been invited to visit their Material and Processes Development laboratories. ✓

Haus Maus

4. Gondola Tests for Human Centrifuge at Houston: Agreements have been reached for performance of pressure tests for this Gondola, which is 12 feet in diameter, in our big Autoclave. Tooling for this task has been designed by us and will be fabricated by Hayes. Tests will be started at the end of July. ✓

Do we get reimbursed for this work?

Houston misses no opportunity to

*Copy attached for Dr. von Braun.

put its hand into our pocket. I think we should reciprocate.

B

NOTES 5-9-66 LUCAS

B 5/14

1. S-IVB LH, PRESSURE DECAY - As reported in NOTES 4-25-66, ullage pressure collapse was experienced during acceptance test of 203 stage. A first test on the MSFC S-IVB Battleship was run this week with a redesigned pressurant distributor. This new design appears effective and showed a significant improvement over the old one. Pressure decay was approximately 6 psi less, approximately 23 psig vs. 17 psig previously, at the critical point. A second test was run on 5-6-66, and the earlier data were substantiated. This improves the margins we have in flight. The new pressurant distributor has been installed in 203, and we are recommending its use for 202.

5/9/66

B.L.
Please explain what's meant by this term B

2. S-II COMMON ORDNANCE CONTAINERS - It was our recommendation to have Boeing, as the mechanical GSE contractor, design and furnish these containers. Due to schedule and funding problems, we have reluctantly agreed to design these containers in-house, and ME will manufacture them.

3. S-IC-501 - Approximately two weeks ago, it was discovered that 3 out of 16 bolt heads on the lower center thrust post splice plate had sheared off. This splice plate connects the lower caps of the crossbeam to the center cruciform. The results of our evaluation on the H-11 steel bolts indicate a multitude of minor problems, no one of which would be sufficient to cause bolt failures. In combination, however, these discrepancies could lead to failure. Although we are in disagreement with Boeing's reported position that the failures were caused by hydrogen embrittlement, we agree with TBC that all of the subject bolts in both S-IC-501 and S-IC-502 should be replaced with carefully selected new bolts.

Werner
Kuers
See your
NOTES
5-9-66
B

4. DAMPING TEST OF AS-500F in VAB, May 6 - 7 - Manual shaking of the AS-500F in the VAB appears to have given good data. Amplitudes of approximately ± 10 inches were reached, yielding a maximum value of 2% of critical damping. This was in and out motion relative to the swing arm axis. Perpendicular to this direction, the damping was 1.2 - 1.5%.

On the 13th run, shortly after 3:10 a.m. 5-7-66, with an amplitude of about ± 10 inches perpendicular to the swing arms, the dummy LES motor sheared loose from its attachment and dropped on the Command Module. The damage has not been assessed yet, but it appears to be readily repairable.

B 5/14

MS 5/9

1. MSF REVIEW OF MSFC R&D POP 66-2 - The MSF budget review team headed by Dr. J. Turnock and Mr. T. Newman conducted their review of the MSFC requirements POP 66-2 on May 2 and 3. The POP review followed the pattern established in previous reviews with the team probing in-depth in areas of special interest.

In Engine Project management considerable time was used to educate the review team regarding the need and use of "sustaining engineering". This was done using F-1 engine as an example. The presentation seemed to be very effective.

In Saturn IB and Saturn V much attention was given to the vehicle support account which apparently was considered a plush area.

Generally, the review team appeared to be satisfied with the presentation and the data available. It was stated that there is no chance of reinstating some of the cuts against MSFC requirements contained in MSF POP 66-1 for Apollo; in turn there is a good chance of our being reduced below the guideline amounts. No firm commitments or conclusions were offered subject to the review of MSC requirements.

As a result of this overall funding situation we will be compelled to solve a portion of our FY 67 problem by using in FY 67 some of the funds which, under normal conditions would carry over from FY 67 into FY 68. We have initiated a joint study with R&DO, IO, Purchasing Office and Financial Management Office to determine the impacts of this change and the steps necessary to accomplish it. ✓

2. IN-FLIGHT EXPERIMENTS MEETING WITH DR. J. TURNOCK - Dr. J. Turnock, MSF, met with members of the Executive Staff, Dr. D. W. Johnson and other members of MSFC to discuss the In-Flight Experiments budget requirements for MSFC in FY 67 and FY 68. Dr. Turnock was given a copy of the In-Flight Experiments Addendum to POP 66-2 and a brief explanation of its contents. He was asked to assist the Center in the establishment of a budget line item for experiments and to assure that Headquarters gives consideration to the requirements for inclusion in the MSF POP to Dr. Seamans. ✓ Dr. Turnock suggested that he set up a meeting with Headquarters personnel to discuss the total experiments program. He will notify MSFC of the time and place of the meeting. ✓ Dr. Turnock seemed to have a real interest in the experiments program and may be able to help MSFC in getting the Center's experiment program established. ✓

H.M.

← Looks like a promising approach to break

the Experiments Log Jan. B

NOTES 5/9/66 RICHARD

B 5/14

QBS/9

Meeting with MSC Personnel on Launch Interlocks. We held a meeting with MSC personnel on Thursday, May 6, to discuss their questions concerning our interlock philosophy and, specifically, the interlocks used on Saturn IB. After detailed discussions of the circuits involved, we reached complete agreement and understanding. The ground rule that says the mission begins with successful ignition command, and not liftoff, has cleared up most of the issues. ✓ This meeting and the overall criteria for launch interlocks, which the three centers and Headquarters have agreed to, should reduce the continuing last minute reviews by others of our interlocks just before each launch. ✓

SA 500F Damping Test. (Reference Notes of Dr. Rudolph and Dr. Lucas). We observed the "Cox" tests Friday night at KSC. The data from the test was clean and should be satisfactory to determine the damping of the vehicle. However, the fact that the LES failed indicates we would have lost the LES during the 500F wind test. We can repair the damage, but the Houston 500F hardware does not have flight structural capability. This must be assessed in terms of the repair and what meaning the presently planned 500F wind tests will have. ✓

mockup

mockup

1. Potter-Brumfield Strike - has ended. Normal work resumed today, Monday, 9 May 66. ✓

2. S-II-T Stage Test Program:

The scheduled 150 second test on the S-II-T Stage on Friday, 6 May 66, was cancelled at approximately 4:00 a.m., Saturday, 7 May 66, due to the propellant utilization (P.U.) valve on engine position #1 not slewing (moving) when the P.U. system was activated. The trouble was isolated and found to be a damaged pin connector on the P.U. valve.

Automatic loading and topping was demonstrated in both the LOX and LH₂ tanks utilizing the propellant utilization probes in each tank.

LH₂ recirculation was activated and no problems were encountered with the system.

A boil-off test, three (3) LOX recirculation tests, and two (2) pre-pressurization tests were accomplished.

The next test is scheduled for Tuesday, 10 May 66. ✓

3. SA-500F Damping Test (COX Technique):

"COX" Tests were run on Friday and Saturday (6 & 7 May 66), to determine damping and natural frequency of the vehicle.

Damping values obtained were scattered, however, the values in the plane perpendicular to service arms approximated 1.6% and in the plane parallel to service arm approximated 1.8%. The natural frequency obtained was approximately .68 cps.

NOTE: These values are based on incomplete evaluation of the test data.

Dr. Cox anticipated the most optimistic value of damping that could be expected would not be more than 2%.

During the 13th test run (occurring on Saturday, 7 May 66) the mock-up LES snapped at the washer (ring). The LES at this point was held together by 24 (approx 1/8") rivets. These rivets sheared due to the moment only, introduced by a forced oscillation at a lower level. NOTE: No external forces were applied to the LES.

The LES dropped internal to the four support legs impacting the boiler plate command module nose cone. The nose cone was crushed approximately 6".

Major impact that must be immediately alleviated is the replacement of the mock-up LES.

Unless a new criteria for a safe damping coefficient is determined in place of the presently established 3% damping value, the damper system must be installed for SA-500F. ✓

5/9 9/8

1. FLIGHT OPERATIONS PANEL MEETING: The meeting was held at KSC on 5/2. It was agreed to form a new Subpanel for Operations Support Requirements to insure compatibility of MSC and MSFC requirements for flight operations. H. Golden and C. Beers (MSC) are Cochairmen. Unsuccessful discussions on the scope and status of KSC's orbital support to the Mission Control Center - Houston made it necessary to meet with R. Petrone subsequent to the meeting. He reconfirmed KSC's commitment for this support. He also agreed to implement our requirement for a display console for the AS-203 Experiment Systems Engineer. An improved system of contingency balloon releases and radar assignments is being requested by KSC from the Range. Considerable discussion ensued on the potential role of ground command for guidance switchover, navigation update, and alternate missions. ✓

F.S.

I hope not with Apollo funds!

2. CIF DESIGN REVIEW: A formal design review of KSC's Central Instrumentation Facility was held on 5/3 with E. Christensen as Chairman. 5 MSFC personnel attended. The review was rather uneventful in spite of the fact that KSC is planning a major expansion of the CIF computing and processing equipment. It appears that OMSF has no further use of the former Mercury Control Center (now: MCC-K) and may turn it over to the Range. ✓

B

3. LIEF REVIEW: I gave a briefing to the R&D Council on the changes planned for the next LIEF Operation and explained the effort required from R&DO in order to fulfill our operations support commitment. ✓

NOTES 5/9/66 STUHLINGER

B 5/14

5/9/66

1. PEGASUS - No significant changes. The statistical accuracy of penetration data through all three panel thicknesses is now substantially better than the accuracy with which detector sensitivity is known, or the accuracy which is needed for reasonable definition of engineering design criteria. About 1200 meteoroid punctures were recorded so far by all three satellites. In total 14,000 commands were sent to and correctly executed by the three satellites; no other satellite system has approached this figure as yet. ✓

Milton Ames plans to hold an anniversary press conference with appropriate releases on Pegasus on May 25 (anniversary of Pegasus II).

2. MATERIAL RESOURCES PROGRAM - In a joint effort between Astrionics, ASO, and RPL, the potential role of RPL in the Natural Resources Program was discussed. We arrived at the tentative assumption that RPL may accept responsibility for the scientific definition of the following areas: gravity gradiometry; UV absorption and emission spectroscopy; IR imagery; IR spectroscopy; radiometry. Besides these activities, RPL may also be involved in several other remote sensing areas under Astrionics' or Aero's general direction. It is obvious that the entire Natural Resources Program must be more accurately defined, and the MSFC-HQ relationships more clearly delineated, before MSFC (and the individual Labs) can accept responsibility for certain areas in the program. It is expected that our Future Planning Board Meeting on May 13 will result in a better understanding of the program, and of MSFC's role in it. ✓
3. LUNAR EXPLORATION PROGRAM - As a result of Joint Task Force activities, we received (through Gray-Culbertson-Beattie) the assignment to make mission studies for five selected lunar sites and for radial traverse distances of 1; 2; ~~3; 4; 6; 8~~ km (³⁰ ~~30~~ different missions!). Fortunately, our previous mission studies can be used to good advantage. Substantial support for this work will be obtained from our Support Contractor (Brown Engineering). Completion date is July 25. ✓
4. REVIEW OF THERMAL CONTROL COATING CONTRACT - The next review meeting on our thermal control coating contract with the Illinois Institute of Technology Research Institute (IITRI) will be held at MSC on May 17. Special emphasis will be placed on the S-13 and Z-93 coatings, because both of these are being used on the radiators of the Apollo thermal control system. Experiments on Pegasus indicated that S-13 increased its α/ϵ ratio by 100% over a 12 month period; Z-93 was much more stable. ✓

NOTES 5-9-66 WILLIAMS

5/9 JB

JOINT ACTION GROUP ACTIVITIES: The "JAG" Planning Group with Gray, Disher, and representatives from the three centers met in Houston on May 3 and 4, 1966, to establish: (1) A clearer mode of operation and (2) "baseline" systems for the Mars/Venus flyby and Mars landing missions. Some progress was made on item (1), but much more is necessary. A selection was made for "baseline" systems (item (2) above); however, several iterations may be required before they settle down to a realistic system that can be used with confidence. I feel that MSFC made a fine showing at the meeting, in terms of data presented and spirit of cooperation. In general, progress is being made, but it is slow. The implications of this activity and the resulting planning document are of major significance to MSFC, and management should take an active interest in supporting and keeping abreast of the work.

May 16, 1966

NOTES 5/16/66 BALCH

B 5/18

9/25/16

S-II-T Stage - Second firing at 4:43 p.m., 5/10/66, was prematurely terminated after approximately eight seconds when an engine helium control bottle pressure went above the red line limit. The problem was traced to an improperly mated connector on the helium control bottle pressure transducer. A second attempt to carry out the firing was made at 3:52 a.m., 5/11/66, and terminated after approximately 45 seconds because of an apparent gas generator overtemperature condition. Preliminary information indicates that the problem was a faulty connection in the gas generator overtemp circuit rather than an actual overtemperature condition. The propellant utilization system functioned satisfactorily, and engine gimbaling was carried out successfully using the automatic checkout equipment as planned. One engine was not gimbaled because of a faulty hydraulic pump. Third firing was scheduled for Saturday, 5/14/66, but postponed because of problems which came to light during review of instrumentation data. Countdown for the firing is now expected to begin by noon today, 5/16/66. ✓

S-II Test Stand A-1 GSE - S&ID submitted for review a CPFF letter subcontract with Aetron for GSE installation but is reconsidering the type of subcontract that should be used to accomplish this work. ✓

S-IC Activities - Good progress is being made in the submission and review of Boeing facility test plans and procedures and GSE calibration and equipment checkout procedures. At a meeting on 5/12/66, attended by NASA MTF representatives on Boeing's CPIF Contract 5608, Quality Assurance relationships between Boeing and NASA MTF personnel with respect to these test plans and procedures were discussed and clarified. The first facilities test procedure, D5-13034-30, High Pressure Air Functional Test, was started this week. ✓

Technical Systems, Phase II - Negotiations on cost to complete Phase II Technical Systems were completed on 5/10/66. Total negotiated cost was \$3,389,226.00, of which \$79,000.00 was for fee. Total proposed cost was \$4,637,200.00, of which \$309,366.00 was for fee. ✓

Press Coverage of S-II-T Firings - There were twelve members of the press present to cover the firing, including CBS Television, Associated Press and United Press wire services, and locals. Press reports received are generally favorable. CBS indicated they will use color film footage for a special feature on testing rockets at MTF, either as a separate piece or as a filler during Gemini coverage. ✓

S-II-T 150 second testing was terminated after eleven seconds at 6:30 p.m. on May 16. Re-testing was started immediately with successful firing occurring with 150 seconds at 12:24 a.m. on May 17, 1966. All significant program objectives were met. Full duration testing is planned for this Friday.

JTS 5/17

5/16/66

B 5/18

C-1 ENGINE

Design changes to the prototype injector appear to have corrected the excessive heat rejection rates to the propellants. Program Review was held at RMD on May 10 through 12. Representatives from MSFC, MSC and Headquarters participated in the meeting. ✓

J-2 ENGINE

An injunction was issued against the Machinists' Union at AEDC May 12, 1966. Seventy-five percent of the affected workers were back at work on Friday, May 13, 1966. A revised activation schedule will be generated when the impact is evaluated by the Air Force.

The first engine for S-II 504 (230K) was delivered this week.

Partially successful tests on the S-II-T were accomplished on May 10 and 11. The first attempt on May 10 was delayed by an inactive engine P.U. valve. This malfunction was traced to a bent pin in the valve connector. The stage was successfully fired on May 10 for 4 seconds (mainstage) when a stage supplied helium tank pressure transducer gave an erroneous reading and an observer shut down the test. A second firing was made on May 11 for 44 seconds (mainstage). The programmed duration was 150 seconds; however, a gas generator overtemperature automatic cutoff was initiated by engine J-2018. The problem has been attributed to a loose connector.

A review of the S-II-T firing data revealed that the gas generator valve opened after cutoff and remained open for 15 seconds on engine 2018. The cause has been traced to a leaking fast shutdown valve diaphragm, allowing opening pressure to be applied to the gas generator valve. The faulty fast shutdown valve has been replaced and shipped to Rocketdyne for failure analysis.

The LOX turbine wheels were inspected (dye penetrant) on two additional S-II-T engines and found in satisfactory condition.

A procurement plan for nineteen J-2 engines to support AAP vehicles 213-228 was approved by Mr. Gorman on April 26, 1966. The plan is currently being revised to reflect administrative changes recommended by the Legal Office. Time consumed in staffing the plan and the subsequent restaffing to incorporate the administrative changes has added three weeks to the eight months procurement cycle. ✓

F-1 ENGINE

F-1 Engine Prenegotiation presentation was made to General Bogart and other MSF staff members on May 12, 1966. Agreement as to procuring 33 additional engines and production support (sustaining engineering) thru FY 1970 was reached and verbal approval given. General Bogart promised a confirming teletype in a few days. ✓

H-1 ENGINE

Engine H-4083 has been delivered to Rocketdyne/Canoga for use in the 205K Re-Qualification Program. The engine will be mounted in the test stand next week in preparation for engine testing. ✓

GENERAL

The welders strike at Rocketdyne has been settled. It is felt there will be no schedule impact. ✓

NOTES 5/16/66 CONSTAN

958 5116

B

5/18

Negative Report

NOTES 5/16/66 FELLOWS

9/5/16

B 5/12

1. Civil Service Commission Team Audit: The CSC Inspection Team will visit at least four R&DO laboratories this week. At AERO, ASTR, and TEST, the CSC Team will audit fifteen engineering-type positions (GS-13 and up), five from each laboratory. Some quality control positions in QUAL will be checked on; equivalent positions at Michoud will also be checked. The CSC inspectors will enter and leave the laboratories through the Laboratory Director's office to inform him of the audit and the findings. ✓

2. R&D Operations Cost Reductions: Last week, R&D Operations met and passed its FY-66 cost reduction goal of \$9 million. Cost savings from Operation Papermill have brought the cost reduction total to \$10.5 million. ✓✓

B
5/18

5/16

1. S-IVB Stage Vehicle Dynamics and Control Working Group Splinter Meeting:

This meeting was held April 28 and 29 to establish inflight propellant utilization (P.U.) system's performance capability and requirements for the various vehicles/missions with their related P.U. systems configurations. An Aero Lab representative presented the maximum acceptable thrust variations associated with the guidance requirements. Based on P&VE's and DAC's comparison of these requirements with propulsion system's performance capability, it was concluded that propulsion system's performance is generally compatible with guidance system requirements.

2. Orbital Experiments: Mr. Ballance of our Fluid Mechanics Research Office, recently talked to Dr. C. Lundquist, Smithsonian Astrophysical Observatory, about the five sphere experiment which was discussed at the recent NASA Research Advisory Committee on Space Vehicle Aerodynamics.

The primary objective of the experiment is to obtain aerodynamic data on the free-molecular and transition flow regimes, which is needed for orbital lifetime and attitude control studies. A secondary objective is the determination of atmospheric density below 200 km. Dr. Lundquist stated that a re-examination of the experiment by Smithsonian Observatory personnel has just been completed and a report is being prepared giving the associated launch vehicle performance and tracking requirements. Dr. Lundquist is planning a visit to MSFC late this month to discuss the potential program with Aero-Astrodyamics Laboratory personnel.

3. Apollo/Saturn In-Flight Contingencies: MSFC and MSC have been requested to review the status of planning for providing the capability in the Saturn V program to continue the mission (either primary or back-up) in the event of:

(a) One or two engines out in S-IC or S-II, (b) Early staging (particularly S-IVB from an S-II malfunctioned stage), (c) IU platform failure-guidance switchover. In order to comply with this request, the following schedule has been established: (a) R&DO/IO meeting (to include laboratory and program office input data for NASA Headquarters), 5/18/66; (b) MSFC management review of presentation material, 5/23/66; (c) MSFC presentation to General Phillips, 5/26/66. Our Projects Office is coordinating the R&DO input using the lead laboratory concept.

Donnie
I'd like
to attend
if possible
3

4. Visit to OSSA Concerning Manned Meteorology: On May 11, Mr. Jean and others from the Aero Laboratory staff visited OSSA, to discuss present and future MSFC participation in meteorology application programs. Management plans, manpower and funding, plus OSSA/Space Applications Office feelings about potential MSFC long range involvements were discussed with Mr. Jaffe, and members of his staff. It was interesting to discover that OSSA appears interested in getting MSFC heavily involved (perhaps as future lead NASA Center) in a program which has been historically the mission of GSFC. Mr. Cortright and Mr. Jaffe (OSSA) met during this past weekend with Dr. Mueller (OMSF) on Space Applications Office program assignments. We understand no decisions were made and Dr. Mueller requested more information from OSSA on manpower needs.

Q&S/11

B 5/18

1. S-IC-2 CHECKOUT: Prestatic checkout of the S-IC-2 stage was completed May 10, 1966, and the stage was transferred to Manufacturing Engineering Laboratory May 12 for removal of the access platforms. Transfer to the test stand is scheduled for May 16. ✓
2. J-2 PRODUCTION ENGINES UNSATISFACTORY CONDITION REPORTS (UCR's): A total of 219 UCR's were written against J-2 production engines from October 1, 1965, through April 8, 1966. These UCR's were generated during first electrical and mechanical inspection, static firing, and second electrical and mechanical inspection. An analysis of these UCR's was conducted by our resident office at Rocketdyne. The components which accumulated five or more UCR's during this period are as follows:
 - o Start Tank discharge valve 21 UCR's
 - o Transducer NA5-27323 T3 & T1 - 18
 - o Fuel turbopump assembly - 10
 - o Start tank assembly - 10
 - o Purge control valve - 10
 - o Thrust chamber body assembly - 10
 - o Oxidizer turbine by-pass valve - 9
 - o P.U. valve assembly - 5
 - o E.C.A. package - 5
 - o Transducer NA5-27215 T4 & T5 - 5
 - o Transducer NA5-27412 T2 & T1 - 5 ✓
3. ELECTROMAGNETIC COMPATIBILITY (EMC) AWARENESS COURSE: The EMC Awareness Course, sponsored by the Apollo Reliability Office and developed by GE under the cognizance of this Laboratory, was presented for the first time at Michoud recently. Critiques evaluating this initial presentation were very favorable with 75% of the attendees rating the course above average; 2% below average. The next seminar is to be presented at MSFC during the week of May 23, 1966. ✓
4. FIRST ARTICLE CONFIGURATION INSPECTIONS (FACI's): Over the past seven months, approximately 5170 manhours have been expended by MSFC personnel conducting FACI's within the contractors' facilities. Considering preparation and followup of FACI, the number of hours expended would increase by a factor of two. Results to date have been generally quite satisfactory. This Laboratory has contributed approximately 55% of the total FACI effort, and based on past experience and present FACI schedules, it is anticipated that 11 to 12 manyears of Q&RA Laboratory support will be required through mid-1967. ✓

B 5/12

5/16/66

1. RELAY-VENDOR STRIKE: (*Reference Item 1 notes of 5/2 reprinted below). The strike at Potter-Brumfield, which lasted approximately seven weeks, has ended and the plant will be at full production within a few days. Although the shortage of relays for switch selectors, being built by IBM, will cause a delay in the switch selector delivery schedule, this will not affect any of the stages. IBM will continue to search for a second source for relays to prevent such happenings in the future. ✓

*From 5/2/66 Notes

1. RELAY-VENDOR STRIKE: Potter & Brumfield, the vendor of the relays being used in the Mod II switch selector, remains on strike. The strike which began on March 21, 1966, is in its sixth week. IBM's supply of relays for switch selectors will be exhausted soon and the last relays will appear in units to be delivered during the first week of May. Thirty-five units will have been delivered by this time. The strike will cause approximately three weeks schedule slippage. We are investigating other relay vendors. ✓

S-1C

HEimburs 5/16

B 5/18

During removal of the center engine of S-1C-2, R-ME noted that one of the 16 bolts on the center engine thrust structure to be replaced had failed. The delivery of the S-1C-2 to Test Laboratory will be delayed until after a meeting in Mr. Urlaub's office May 16, 1966, to discuss the stage modification status. ✓

F-1

Four tests, FW-027 through FW-030, were conducted on the West Area F-1 Test Stand with F-1 engine S/N F-4T2 for durations of 150, 150, 52 and 150 seconds, respectively. Primary test objective for Test FW-027 was to evaluate engine performance at simulated flight lox pump inlet pressures. Primary objectives for Test FW-028 through FW-030 were to obtain baseline performance for high NPSH studies and to determine performance variations caused by conducting a second test the same day before the engine returned to ambient conditions. Tests FW-028 and 029 were successfully conducted the same day; however, the opening control line assembly failed at the fillet weld upstream of the No. 2 main lox sequence valve inlet port on Test No. FW-030, therefore, Test No. FW-031 (scheduled for 52 seconds) was cancelled. The next two tests are scheduled for May 17, 1966. ✓

S-IVB (MSFC)

Test S-IVB-025 (ignition test) was conducted on May 13, 1966. The first attempt was aborted due to the lox pre valve failing to open in the automatic sequence at X-8 seconds. The second attempt was successful and all test objectives were met successfully. ✓

S-11-T

Two unsuccessful attempts were made at conducting a 150 seconds static test on the S-11-T vehicle at MTF on May 10 and May 11, 1966. The first test was a duration of 7 seconds and the second test was a duration of 45 seconds. The countdown for the first test started at 9:52 a.m. May 10, 1966, after a PU problem occurred which scrubbed the test on May 7, 1966. The first firing was conducted at 4:34 p.m. with cutoff being initiated at T+7 seconds by redline observer monitoring the Engine No. 3 helium control bottle pressure. The measurement spiked off the chart indicating the measurement had been lost. Trouble shooting of measurement revealed the connector had been cross threaded and the safety wire had been connected backward. The second firing was conducted at 3:50 a.m. with cutoff being initiated at T+45 seconds from the GGOT on Engine No. 3. S&ID believes this cutoff was erroneous since the temperature measurement was erratic from T+5 seconds. Approximately 10 seconds of gimbaling was conducted by typing in the gimbal command manually. Data review from the 45 seconds firing on May 11, 1966, showed several problem areas:

- a. GG fuel poppet on Engine No. 1 stayed open after cutoff. Traced to a blowing leak on the P/A fast shutdown valve.
- b. Three LH₂ recirculation discharge valves leak.
- c. LH₂ GG bleed valve on Engine No. 3 leaks.
- d. Thrust on Engine No. 3 was low and thrust on Engine No. 4 was high.

Rocketdyne is planning to re-orifice these two engines in order to balance the thrust loading on the thrust cone. ✓

SWING ARM TEST PROGRAM Arm No. 9 (Command Module Arm with Environmental Chamber) will be shipped to KSC on May 18, for utilization with 500-F. Schedules did not permit complete testing. Chamber was tracked satisfactorily and arm rotation was accomplished with "jury-rigged" setup. Meeting with Dr. Debus is scheduled for Thursday, May 19. ✓

1. STRUCTURAL ENGINEERING SYSTEMS SOLVER (STRESS):

STRESS, a programming system developed at M.I.T. to facilitate the use of digital computers for the analysis of structures, has been adapted to run at MSFC. STRESS can analyze structures in two or three dimensions, with either pinned or rigid joints, with prismatic or non-prismatic members, subjected to concentrated or distributed loads, support motions, or temperature effects. STRESS can, at present, use only the stiffness or displacement method of analysis and can consider the following types of structures: (1) plane frame, (2) plane truss, (3) plane grid, (4) space truss, and (5) space frame. STRESS offers the following advantages to the user: (1) the problem may be described in engineering terms so that no conventional programming experience is necessary, (2) after a problem has been described it may be easily modified, (3) there are no arbitrary size restrictions on the problem to be solved. ✓

2. ATOLL II: The Technical Systems Office has directed Mr. Charles Bruen, of that office, to spend a quarter of his time learning and coding ATOLL II. The objective is to determine the usefulness of ATOLL II as a test engineers computer language. ✓

NOTES 5/16/66 JAMES

B 5/18

IO/R&DO PROJECT SUPPORT AGREEMENTS (PSA): You recall in the Gulfport management meeting, one of the action items was to develop a businesslike way of working between IO and R&DO on work performed by the Labs in support of Apollo. It was recognized that this effort could not be as strict as that utilized with contractors, on the other hand, it was intended that the general funds placed in R&DO by IO would act for certain numbers of people doing specific tasks. I was enthusiastic over this effort and volunteered to be the office in IO that would initiate this action. We have been working sixteen months in order to accomplish some businesslike approach. After the initial meetings, the Saturn IB office agreed to write the initial guidelines as to what we thought R&DO was accomplishing for us and let it be corrected in R&DO. After months of effort, we achieved a 2" thick document which was then sent to R&DO for staffing. It became apparent immediately that asking for numbers of individuals to do specific tasks which could be tracked against even rough dollar amounts was not going to be accepted within R&DO. After several rewrites of our original document, we have received a final draft from R&DO of a Saturn IB Project Support Agreement dated April 26, 1966. The draft prepared by the Saturn IB Program office provided "work packages" at the subsystem level, while the R&DO draft (about 1/6th the size of the original draft) is completely general and reads like a charter or job description. It isn't possible to track any level of manpower against any of the paragraphs in the document. It is also not possible to obtain a total Saturn IB manpower effort from the document. In fact, the document is general enough that it has been suggested we use the same document for both Saturn IB and Saturn V. In other words, R&DO could contract for either Saturn IB or Saturn V under the wording of this document.

I regret the amount of time that has been devoted to this effort. I conclude however that to avoid putting unnecessary documentation into our channels, I must recognize that this effort was a failure. I am, therefore, initiating a letter through General O'Connor to Mr. Weidner requesting that we terminate any further effort on Project Support Agreements.

RCA COMPUTER PROBLEMS AT KSC: I am meeting today at KSC with Mr. Arthur Malcarney, RCA Group Executive Vice President, and others from RCA, to show them and discuss with them firsthand our computer problems. I have been concerned that the problems were not getting proper attention at the corporate level in RCA. This is the primary reason I asked them to meet me at the Cape. Gen. Phillips may meet with us and since Dr. Mueller will be at KSC for the Gemini launch, I understand that there is a possibility he may join us. ✓

B 5/23

NOTES 5-16-66 KUERS

5/16 JB

1. Status of S-IC-502: Checkout of this stage prior to static firing was completed by R-QUAL on May 12. It was decided to move this stage to the new Vehicle Assembly Hangar in ME Laboratory instead of Test Laboratory in order to exchange the cross beam bolts for the center engine support and also to remove internal assembly platforms in the thrust structure. It was found that on this stage one of these 16 bolts (1 3/8" diameter) was also broken off, prior to the static firing. It is planned to have the stage ready for transfer to the Test Laboratory today. However, actual move will not be carried out before a complete status review has been made by the S-IC Stage Project Manager, which will be conducted today. ✓

2. Delivery of the Arming Tower Model: A 3% scale model of the arming tower of Launch Complex 39 was completed last week by the Hayes Corporation. This tower was load tested by P&VE and shipped to Langley Field on May 12 for wind tests for AERO Laboratory in connection with the wind load damping device for the Saturn V. ✓

3. Visit of McDonnell Aircraft Company Personnel: There was another visit of a group of McDonnell personnel to MSFC last week. This group included the Gemini Project Manager, Mr. Lindsey, and Mr. McDonnell, Jr. TEST, ASTR, QUAL, and ME Laboratories were toured on this two-day visit. This company seems to be very eager to enter into some business relations with MSFC. ✓

4. Welding Support to Ling-Temco-Vaught: In response to a call from the corporate office of this company, we reviewed EB welding problems in the production of the Army Lance missiles. We were able to help them to resolve problems of porosity and problems of "arcing" inside the vacuum chamber by use of a "Secondary Emission Suppressor", a device which was invented by one of our men. ✓

B 5/22

1. COMPOSITE PROPULSION SYSTEM - Personnel from this laboratory attended a final review at OART on "A Study of Composite Propulsive Systems for Advanced Launch Vehicle Application" (Contract NAS7-377) presented by Marquardt, Lockheed, and Rocketdyne. This is an integrated package utilizing an air-breathing and rocket engine concept. This concept appears to give substantial payload to orbit gains. The effort is to continue in the areas of structural cooling requirements, subsystem matching, lightweight nozzles, heat exchangers, and mixing. ✓

B.L.
Please arrange 30-min briefing (include Frank Williams)

2. VISIT OF PERSONNEL FROM NAVAL AMMUNITION CENTER - Mr. Adams and Mr. Colter visited this laboratory to discuss NDT techniques for inspection of 2.5 inch rockets being mass produced at that Center. We were able to provide them information and cost data on equipment which would meet their needs. ✓

3. LASER ROCKET EXHAUST MEASUREMENTS - Brown Engineering Research Laboratory personnel are participating with our Propulsion Division in a series of small solid-fuel rocket motor test firings to verify the feasibility of the Laser Doppler Velocimeter (developed in the Brown Research Laboratory) for measurement of localized velocities in rocket motor exhaust plumes. Valid velocity data have been obtained, and the device should prove a useful tool as we are not aware of any other technique which can provide such information accurately and continuously. ✓

B.L.
Suggest you establish contact between Brown and Rocketdyne, P&W, Aerojet and RM
B

4. AAP PAYLOAD RACK - The structural configuration of this rack for the Circular Payload Module application was completed. ✓

5. 500F DAMPER SYSTEM - The system has been proof-tested, accepted, and will be shipped to KSC today. ✓

6. F-1 ENGINE TESTING - Two full duration tests were conducted at MSFC last week during which flight LOX pump inlet pressures were attained for the first time on the F-1 engine. The MSFC tests were performed with a thick-walled tank and incorporated the additional pressure on the pump due to flight accelerations, which cannot be obtained completely on the acceptance test stands. No abnormal engine performance was noted. ✓

7. IU-203-ECS - The problem of insufficient coolant flow reported in NOTES 4-18-66 has been corrected. Flow test conducted at KSC was satisfactory. ✓

8. S-IC STAGE - On our recommendation, Boeing has agreed to cancel the fuel tank lower bulkhead gore cyclic test and the static testing of the remaining 501-3 configuration gores. This represents a substantial cost saving. ✓

9. PRESSURE SWITCHES S-IC - The pressure switch corrosion problem reported in NOTES 4-11-66 has apparently been solved. Welded diaphragm assembly pressure switches have passed successfully 3000 cycles and will be incorporated in the stage systems. ✓

905/16

1. POP AUDIT - By direction of Mr. Webb, a team from the NASA Audit Office has been conducting an audit of the POP system to determine its validity and value as a management tool. Other teams will perform similar audits at other centers. The Marshall team is approaching completion of its effort and expects to complete a draft report by the end of May. In informal discussions they have told us the points which they are considering as items of criticism. One major point is the need for a procedure to govern MSFC's entire operations on the POP. Another major point is their impression that our Apollo budgets contain a double contingency: one at the stage level and another at the vehicle level. We anticipate that the additional data which we are furnishing them will convince them to revise their conclusions regarding Apollo contingencies. ✓

2. VISIT OF KEY DOD OFFICIALS - We have advance notice from Captain Freitag's office that Admiral Boone has invited a group of DOD officials to visit the three MSF Centers June 7, 8, and 9. Among those invited are Dr. Finn J. Larson, Deputy Director, Defense Research and Engineering; Honorable A. H. Flax, Assistant Secretary of the Air Force; Honorable Robert W. Morse, Assistant Secretary of the Navy, Research and Development; and twelve flag and general officers including General Schriever, and his designated replacement, General Ferguson. Admiral Boone will meet with the Office of Field Center Development on May 17 and we will be advised further regarding the definite purposes and date of the visit. ✓

3. FY-68 MANPOWER CEILING - In AO POP 66-2 we requested, dependent upon the level of our participation in AAP, an increase of up to 400 spaces in FY 68. This was a tactical move designed to prevent a reduction of MSFC manpower to fill the requests of other centers. We received information through our sources on Friday, May 13, that Dr. Mueller had decided not to request additional spaces for MSF in FY-68. Mr. Neubert was told in a conversation with Dr. Mueller on May 12 that there will be no new reductions in MSFC civil service manpower ceiling during FY-67 and that we should not yet concern ourselves with the FY-68 question. We interpret these two bits of information to mean that the decision to redistribute FY-68 manpower spaces has been postponed. ✓

A.M.
Suggestion

B

B 5/23

NOTES 5/16/66 RICHARD

RS/16

Saturn IB Ground Computer Output Discrete Protection at KSC.
The modification to the discrete output rack to prevent multiple
addresses from occurring due to hardware failure has been in-
stalled and verified in the Saturn IB breadboard. It will be put
in at KSC today or tomorrow, depending on schedule. ✓

5/16/66

1. MSFC/KSC Contract Supplement - Ref Notes 5/2/66 Rudolph (attachment #1) which informed you of the problem with KSC in structuring the work statement for the S-IC Stage and Stage Peculiar GSE work to be performed by Boeing at KSC. On Tuesday, 10 May 66, we received a memorandum from Rocco Petrone (attachment #2) in which he stated that KSC planned to:

- o Provide segregated lists of MSFC and KSC equipment in a contractual exhibit to the KSC Supplement, and
- o Identify segregated costs in the Form 533 Financial Report (proration).

I cannot agree to this mode of operation - This and other contracting problems should be resolved between us soon, since General Phillips has requested a review of the KSC Supplements this month. Both Lee James and I are encountering other problems in this area and will give you a summation of the problems with recommendations after discussion with Ed O'Connor early this week. ✓

2. Lunar Landing Mission Weights and Performance - Ref Notes 4/25/66 Geissler, item #3, (attachment #3). General Phillips requested by letter, dated 5 May 66, (attachment #4) that we:

- o Reassess the launch vehicle payload capability
- o Determine launch vehicle payload limitations
- o Recommend launch vehicle and spacecraft interface definition to include loading strategy for individual missions

General Phillips' request is based on the following:

- o Current spacecraft projected weights (approx 5000 lbs above control weight)
- o Launch vehicle monthly performance reports are well above commitment (approx 6000 lbs)

General Phillips' also forwarded TWX on 5 May 66 (attachment #5) requesting a meeting in Washington on Thursday, 26 May 66, to review Saturn V planning to provide capability to continue primary mission or initiate an alternate mission in event of:

- o One or two engine failures in S-IC and S-II Stage
- o Early shutdown of "launch vehicle" stage
- o Instrument Unit platform failure

Major study project !! B

3. SA-500F - "Power on" accomplished on Friday, 13 May 66. ✓

4. S-II Welding Strike - settled and workers have returned to work. ✓

5. S-II-T Stage Test Program:

- o Tuesday, 10 May 66, firing terminated at approx 7 seconds due to over pressure indication in engine control bottle.
- o Wednesday, 11 May 66, firing terminated at approx 46 seconds due to over-temperature indication on gas generator as result of bad connection in instrumentation.
- o Next firing scheduled for today, Monday, 16 May 66. ✓

5 Attachments: a/s DIR, I-DIR and R-DIR's copy only)

NOTES 5/16/66 SPEER

9/35/16

B5/23

1. COST REDUCTION OF MISSION OPERATIONS: Dr. Mueller has requested the Center Directors to analyze the cost effectiveness of Apollo Mission Operations and to eliminate any non-essential requirements as we enter the operations phase. A meeting of the Deputy Center Directors is planned for June/July to review the results of this analysis. We have recognized the need for continual review and reduction of MSFC operations support requirements. We are reducing photographic requirements; the number of copies of telemetry and tracking data; and we are trying to identify any data which needs to be processed only if there is a vehicle malfunction. In view of these efforts and since the Saturn V R&D flights are still to come it appears doubtful that Dr. Mueller's request will uncover many new possibilities for significant cost cutting at this time. ✓

2. AS-203 FLIGHT CONTROL: Recent discussions with MSC and OMSF have led to a reformulation of the respective functions and responsibilities of the Flight Director (Hodge) and the MSFC Experiment Representative (Platt). It is now widely recognized that the LH₂ Experiment will set a precedent for MSC in handling AAP and other experiments. The main concern is the interface between the responsible experimenter and the Flight Director. OMSF appears to be determined to retain adequate controls for the experimentors. ✓

9/5 5/16

1. PEGASUS: No new developments. Dr. Shelton is presently writing a report on radiation measurements with Pegasus satellites. ✓

2. LUNAR EXPLORATION: H. Weidner and I had several discussions about your note on "Lunar Surface Action Steering Group" of April 24 (copy attached). A group almost exactly as you suggested it has been in existence for some time under the very capable, efficient, and successful leadership of Don Beattie from MSF, with representation from MSC and MSFC (several members from ASO and RPL). I would suggest that we do not form a new group, but work through the existing panel, through which we already have contact with the MSC activities. ✓ Intensification of this contact can be achieved on an informal basis. We are planning to give a full day presentation to MSFC management on status and plans of the lunar program around May 31, as a follow-on to last week's presentation on the Natural Resources Program and other earth orbit projects. The severe shortness of manpower in RPL is becoming more and more of a problem. We have been urgently requested to give increasing support to the Natural Resources Program, to other earth orbit projects, and to the Nuclear Stage Project, in addition to the lunar and planetary exploration program. It is hoped that a kind of priority listing, possibly with an indication of the desirable degree of involvement, can be established for the numerous projects.

3. EARTH ALBEDO STUDY: Preliminary analysis of Tiros IX nephanalyses (cloud charts) in conjunction with Pegasus I thermal data has given an indication of a definite correlation between earth cloud cover and our earth albedo measurements of Pegasus. Further investigation is in progress. ✓

E.S.

I'm most eager to establish such a priority list. The stumbling block is the vagueness of the entire post - Apollo funding picture and the unresolved issues of cognizance between OSSA and OMSF. All I can ask at this time is patience
B

B 5/23

9/18/116

1. Operations Research: We have given two presentations in the last week on the work we are doing in center planning and the use of operations research in this type of effort - one to Dr. Blankenship of California Tech, a consultant to Mr. Webb, and the other to Stan Smolensky, NASA Headquarters. Both were impressed and surprised at the work we are doing. According to the reports we are getting, both Seamans and Webb have started efforts to increase the use of operations research in NASA management. ✓

Frank W.
I don't understand your terminology. What is a phase 2 experiment etc
B

2. AAP Control Procedures: As a result of the meeting of the last two weeks with Headquarters, the major emphasis for the SAA Planning and Control Procedure has been placed on the phase 2 experiment procedure development. The present system (phase 1 experiment) which we have developed for Headquarters is limited to the 12 reports that are in three volumes that I believe you have seen. The phase 2 system will contain the present 12 reports in addition to approximately 18 additional reports that have been requested by interested Headquarters offices with the inherent capability to add new reports as they are defined. This flexibility will allow Headquarters to react to almost any reasonable demand in the experiment area.

The present system will remain operational until the phase 2 system is implemented, hopefully by September. From the comments we have received from OMSF, it seems that they are extremely pleased with the way the first three volumes have been accepted. With the potential success of the more versatile system, they would like for us to double our effort here at MSFC. It is my plan to try to do this additional work for them with the continued fine contributions from Comp Lab. Further, we are attempting via Bill Johnson and Stan Reinartz to use this work to create a compatible system for internal MSFC use.

3. The Advanced Planning "Joint Action Group": The third meeting of the Joint Action Group will be held at MSFC on May 19, 1966. After this meeting, we will attempt to select a baseline configuration for the Mars flyby and zero in on a baseline for the Mars landing mission. ✓

4. Mobility Test Article: The Bendix 4-wheel version of the Lunar Surface Mobility Test Article was received at MSFC on May 9, 1966, and is housed in building 4509. It has been assembled after shipment and is being checked out. We will inform you when it is ready to roll. ✓

The GM 6-wheel MTA is in a state of contract overrun, and negotiations are in progress. GM is about two to three months behind schedule. ✓

The planned MTA test program, which will be done for us by the Army, is in good shape and the required money has been transferred to the Army. ✓

5. Apollo Telescope Mount (ATM): There was a meeting on ATM at MSFC on May 9, 1966, attended by Ball Bros., Headquarters, MSC, and MSFC. Ball Bros. asked many questions primarily about the LEM. At Grumman the next day were Ball Bros., Hdqs., GSFC, MSC, MSFC, and GAEC. Grumman exhibited drawings showing proposed locations for ATM on LEM and gave copies to Ball Bros. with MSC concurrence. ✓

May 23, 1966

NOTES 5/23/66 BALCH

B 5/31

925123

S-II-T Stage - Started countdown for third static firing test at approximately 11:10 a. m. , 5/16/66. Initial firing at approximately 6:30 p. m. was automatically terminated because of a faulty transducer. Second firing at approximately 12:30 p. m. , 5/17/66, continued the full programmed duration of 150 seconds. Number four engine was disabled, and engines 1, 2, and 3 were gimballed successfully. Started countdown for 4th static firing test at approximately 2:35 p. m. , 5/20/66, and ignition occurred at approximately 7:04 p. m. The firing was programmed for full duration and was terminated automatically at 355 seconds by the LOX depletion indicator system at the 3% level dropout. Fifth static firing is projected for 5/25/66. ✓

S-II Test Stand A-1 GSE - On 5/16/66, S&ID was authorized to proceed on letter sub-contract with Aetron for GSE installation. The subcontract will later be definitized by a CPFF contract. ✓

Data Handling - Preliminary data reduction on the 150-second firing of the S-II-T, carried out jointly by the DHC and the Slidell Computer Center was accomplished 12 hours in advance of the scheduled priority time requirements. Preview of the data indicates approximately 90% of the plots were within the specification requirements. ✓

S-IC Activities - At a meeting on 5/19/66, Boeing and NASA representatives reached satisfactory agreements with respect to the manner of performing dynamic tests of the S-IC Test Stand at MTF and the type of sensors to be used during load tests. ✓

Technical Systems, Phase II - All cable installation is complete in S-II Complex (DAF to TCC and TCC to Test Stand A-1). A coordination meeting was held with GE Phase II and S&ID personnel on S&ID system need dates for S-II Test Stand A-1. ✓

Air Service for MTF - To ascertain the need for commercial air service in the immediate vicinity of MTF, Colonel John W. Dregge, Community Relations and Congressional Relations Chief for the Civil Aeronautics Board, Washington, D. C. , visited MTF along with the Director and members of the Mississippi Aeronautics Commission, the Jackson, Mississippi, representatives of the Federal Aviation Agency, Southern Airways officials, and representatives of MSFC. ✓

Facility BOD's - Took beneficial occupancy of the Mobile Equipment Maintenance Building on 5/18/66, and of all remaining areas of the S-II Vehicle Service Building on 5/18/66, and the latter without turnover of the heating system, high pressure gas system, and two overhead cranes. ✓

QD 5/23

C-1 ENGINE

Eleven firings were made to check out the RMD new R-4 test complex. Two runs were steady-state firings; the remainder were pulse trains of different pulse width to investigate engine pumping characteristics in different pulse modes. Evaluation of injector test data studying the change in combustion mode continues with emphasis on results of start transient test at elevated propellant temperatures. ✓

H-1 ENGINE

The 205K Formal Engine Re-Qualification Program is progressing satisfactorily. To date, nine tests have been conducted for a total of 1059 seconds. Engine testing is scheduled for completion on June 4, 1966. The performance shift of H-7084 previously reported, has yet not been explained although Rocketdyne has expended considerable effort in attempting to arrive at the solution. It is further planned to X-ray the thrust chamber for presence of contamination which might have restricted flow and test the engine once more after repair of two thrust chamber tube leaks. ✓

F-1 ENGINE

Engine F-5036 was accepted at Canoga Park, California on May 13, 1966.

Proposals for follow-on procurement of 33 additional engines and production support to complete Apollo Program requirements have not yet been received. This delay indicates that pending final agreements, additional long lead-time hardware for the follow-on buy may be required, again using the support hardware provisioning procedure as an interim measure. ✓

J-2 ENGINE

A rough combustion cutoff was experienced at the MSFC Test Laboratory on May 10 with engine J-2048. The engine had been fired 12 times for a total of 1735 seconds and was eight seconds into the test when the engine was cut by the vibration safety cutoff device. Rocketdyne has dispatched experts to MSFC to assist Test Division in the investigation of the cause. ✓

The Machinists' Union strike at AEDC has ended and the J-4 test cell modification crew is back at full strength.

The procurement plan for 19 J-2 engines to support AAP vehicles 213-228 was forwarded to Headquarters this week for approval.

The S-IVB 501 was acceptance fired Friday, May 20, 1966, for 50 seconds of the scheduled 153 second first burn of a restart couple. The test was terminated by an improperly set automatic redline cutoff circuit for helium ullage pressure. The countdown will be resumed this week on either S-IVB 501 or 205 depending on Stage Office schedules. ✓

NOTES 5/23/66 CONSTAN

ASB

B5/31

Negative Report

NOTES 5/23/66 FELLOWS

B 5/31

9/5/23

Apollo Support, General: Procurement requests have been submitted for several studies to be initiated in FY-66 for Apollo Support, General. The total estimated cost of those actions is \$411,000. Included in those actions are three studies in the area of astronomy and several small studies related to Natural Resources. A few additional studies may be requested in FY-66, pending technical and managerial approval.

APOLLO SUPPORT, GENERAL PROCUREMENTS
APPROVED AND FORWARDED TO PURCHASING

| <u>EXPERIMENT</u> | <u>LAB</u> | <u>COMPANY</u> | <u>FY-66 FUNDING</u> |
|--|------------|------------------------------------|--------------------------|
| Radio Astronomy Experiments: | | | |
| Gamma Ray Astronomy | RPL | Oak Ridge National Lab | 95. |
| Gamma Ray Astronomy | RPL | Oak Ridge Technical Enterprises | 3.6 |
| X-Ray Astronomy | RPL | US Naval Research Lab | 140.0 |
| Ultra-violet Photographic Survey of Star Fields & Emission Regions | RPL | To be Selected | 95.0 |
| Natural Resources Experiments | | | |
| Minor Component Procurements | ASTR | To be Selected | <u>77.5</u> |
| | | TOTAL | 411.1 |

1. Control System Symposium: ^{5/23} Aero-Astroynamics Laboratory is coordinating arrangements for a Control System Symposium to be held at MSFC in Sept. Astrionics and Comp. Lab. are also participating in the planning. Concurrently, Aero. personnel are participating in the planning of NASA's "Inter-Center Meeting on Control" for which Astrionics has coordination responsibility. It is planned to have the symposium and inter-center meeting on successive days. Purpose of Control System Symposium is to inform other NASA centers, Hqs, Industry, and Universities, of control theory efforts at MSFC: Problems, methods of approach, and results will be presented. Papers will be given by MSFC personnel as well as by our contractors. On the other hand, attendance at Inter-Center Meeting will be restricted to NASA personnel only, and presentations will be concerned with control studies being performed at various NASA Centers. ✓
2. Launch Vehicle and Missiles Committee of SAE: The objectives of this committee are to serve the launch vehicle and missile community through stimulated exchange of technical information related to those operational, support, and environmental factors which contribute to the successful design and operation of launch vehicles. The Society of Automotive Engineers (SAE) recently invited Mr. J. von Puttkamer of my staff to serve on its Launch Vehicle and Missiles Committee. He accepted the invitation. ✓
3. Status of Saturn V Ground Winds Problem: A review of the ground winds problem was held by Aero. personnel on May 19. The following points resulted from that discussion. Experiments where vehicle damping was a parameter were completed by us at Langley on May 17. On-site results of the tests indicate the damper design value of 3.0% of critical should suppress the full scale vehicle response to below the design bending moment. Tests to determine if the Mobile Service Structure (MSS) will protect the vehicle from ground winds during pre-launch preparation are scheduled to begin May 24 at Langley. Tests to determine the response of the facility checkout vehicle to surface winds are scheduled to begin at KSC May 25 and last for a two-week period. We are now supplying P&VE with predicted response based on wind tunnel data. We are also working directly with P&VE at KSC to collect and analyze the required meteorological and vehicle response data. One of the missing links in assessing the ground winds problem has been a detailed description of the winds near the earth's surface. An extensive investigation of atmospheric turbulence, steady state wind profiles, etc. is currently being conducted by our Aerospace Environment Division. The 150 m meteorological tower is providing valuable data for this investigation. Recent application of extreme value statistics by our Aerospace Environment Division indicates there is a relatively high probability of experiencing winds which will exceed the design wind condition for the facility checkout vehicle. The high risk for the facility checkout vehicle results because of the extremely long time (about 90 days) the vehicle will be exposed to surface winds without the protection of the MSS. ✓

9/5/23

1. STATIC FIRING - POSTSTATIC FIRING CHECKOUT: Evaluation of failure data shows that we can expect about six critical or major failures that could result in a catastrophe or major launch delay on the S-IVB and about eight on the S-IB, to be found and corrected during static firing and poststatic firing checkout on the next few stages to be tested. The population unfortunately is not large enough to be able to predict when these failures found during static firing and poststatic firing tests will approach zero, if ever. My concern is the push toward the elimination of these tests under the guise of cost reduction. I would consider these tests as part of the man-rating process, and object to their planned elimination before one can prove that their expected value in eliminating critical failures is zero. I don't think that the acceptance of these additional risks is justifiable on a manned vehicle.
2. S-IC POSTSTATIC CHECKOUT: The S-IC-1 stage was moved into the test cell in Building 4708 May 12, 1966, and is now undergoing electrical and mechanical status checks. Distributors are in component testing prior to installation on the stage. Application of power is scheduled for May 23, 1966. ✓
3. S-II-1 CHECKOUT: S-II-1 is presently progressing through postmanufacturing checkout at Station 8, Seal Beach. To date, there have been no major problems and we predict completion on or about June 20, 1966. ✓

LB James

Your
commentis
invited

B

5/23

B 5/31

1. SATURN APOLLO APPLICATION PROGRAM MEETING AT NASA HEADQUARTERS:

On 5/18/66 Dr. Mueller met with MSFC representatives (ASTR, Messrs. F. Digesu, E. Dungan, and D. Schultz; IO, Messrs. L. F. Belew and R. Ise). Dr. Mueller verbally made the decision that MSFC would develop, design, and build the Apollo Telescope Mount (ATM) System for integration into the LEM as an official Apollo Applications Project. ✓

This system includes the spar and mount structures as well as the coarse and fine pointing control system but does not include the basic experiments which are to be furnished by Goddard Space Flight Center. The ATM is to be hard mounted to the undocked LEM and the Langley control moment gyro utilized to fine point the entire vehicle configuration toward the sun. Present thinking calls for the first flight in late 1968. Astrionics has initiated a 1 1/2-month inhouse study to provide some of the necessary information required in the preparation of a technical program plan for this developmental effort. ✓

985/23

S-1C

The S-1C-2 stage was installed in the test stand on May 17, 1966. The propellant load test is scheduled for June 1, 1966, and the acceptance firing on June 10, 1966. The expected date for removal of stage from the test stand is June 21, 1966. ✓

F-1

Tests FW-031 and FW-032 were conducted with F-1 engine S/N F-4T2 at the West Area F-1 Test Stand on May 25, 1966, for mainstage durations of 150 seconds and 60 seconds, respectively. ✓

S-1VB (MSFC)

A re-start test was attempted on Wednesday, May 18, 1966. Test S-1VB-027 was planned for a duration of 150 seconds (1st burn), however, the test was terminated at 11.00 seconds because of rough combustion. According to our best information, this is the first time a J-2 engine ever went rough during mainstage. ✓

S-1VB (SACT) - Stage 501

An unsuccessful attempt to fire Vehicle 501 on Friday, May 20, 1966, at 1:05 p.m. ended in an automatic computer cutoff after approximately 60 seconds of mainstage duration. A safety item monitor interrupt (SIM) precipitated by an apparent high lox tank helium inlet temperature was the cause of the premature cutoff. DAC planned to re-cycle for another attempt, but scrubbed at about 7:00 p.m. due to sluggish operation of Console "B" valves. The low temperature in the console was caused by a leak in the cold helium cross-over valve. This anomaly, along with a low GN₂ supply pressure, caused the postponement. During post-test purging of the fuel fill and drain line, DAC over pressurized the line with GN₂ causing it to rupture when the relief valve failed. Some minor damage was sustained in the interstage area and electrical control panel. The damage has not, as yet, been fully assessed; however, an approximate slippage of one week is anticipated. Vehicle 205 countdown is planned to commence on Thursday, May 26, 1966. ✓

S-11-T (MTF)

A successful 354.5 seconds static firing was completed at 7:05 p.m., May 20, with a lox low level (0.5%) cutoff. All test objectives were completed during the countdown which had no "holds" and simulated as near as possible the KSC propellant loading conditions. All LH₂ re-circulation pumps functioned as well as natural lox re-circulation, and all outboard engines gimbaled as programmed. ✓

B5/31

NOTES 5-23-66 HOELZER

9/5/23

LUNAR SURFACE DRIVER: The SMK-23 visual landing simulator has been modified to accommodate the simulation of a Lunar Surface Driver vehicle and is now operational using a provisional lunar surface map. A presentation is scheduled for Mr. Weidner on Thursday, May 26, 1966, at 2 p.m. ✓

9/5/23

RCA COMPUTER PROBLEMS AT KSC: As I reported in last weeks' notes, I met Monday with Mr. Arthur Malcarney, RCA Group Executive Vice President, and others from RCA, on our RCA computer problems. Because of the seriousness of these problems and their impact on the current launch schedule, Dr. Mueller and Gen. Phillips, who were at KSC for the Gemini launch, joined us for the meeting. I believe that we succeeded in impressing Mr. Malcarney with the importance of immediately improving our situation. He has taken action which has resulted in improving the output from the rework line at Van Nuys and we shipped some 2500 repaired boards to KSC over the weekend to begin a complete changeout of the approximate 8,000 boards in the two computers of VLF 37-B. We are developing a schedule for changing out all suspect boards in our other computers. RCA has increased its support at KSC to 5 system design engineers and 5 technicians. They have also expedited the repair and rework of high voltage power supplies for the display units. The next few days should tell whether these actions will result in schedule improvement. ✓

EDS BRIEFING FOR GENERAL PHILLIPS: On Thursday, May 19, Gen. Phillips was given a briefing of the EDS system and a tour of the EDS breadboard by Astrionics. Gen. Phillips' primary interest in this area was whether or not to continue to maintain the automatic abort criteria. The decision of the briefing was to continue to maintain the automatic abort criteria for the present with consideration of later discontinuance. He stated we should consider reviewing the criteria after each launch to give us minimum possibility of a false abort. Following the briefing, Gen. Phillips commended all personnel involved in this area and considered the presentation excellent. ✓

SATURN IB FLIGHT REVIEW SCHEDULES: The closely scheduled launches of SA-203 and SA-202 and preparation for SA-204 has forced the scheduling of three major reviews into a relatively short period of time. In addition to the Preflight Review and Flight Readiness Review, we are required by Headquarters to schedule a Design Certification Review (DCR) for SA-204. The Headquarters directive for this review states that the Management Council will act as the Design Certification Board. The tentative schedule for these reviews is as follows:

| | | |
|--------|-----------------------------|----------------------------------|
| SA-203 | Preflight Review | June 9, 1966 - MSFC |
| | Flight Readiness Review | June 15, 1966 - KSC |
| SA-202 | Preflight Review | July 13, 1966 - MSFC |
| | Flight Readiness Review | July 20, 1966 - KSC |
| SA-204 | Design Certification Review | September 1 and 2, 1966 - MSFC ✓ |

NOTES 5-23-66 KUERS

B 5/31

918 5/23

1. Saturn V Facility Checkout Vehicle: During a shake test of this vehicle in the VAB, the Command Service Module and the LEM Adaptor were damaged. Since we had the structures of these modules in our shops, earmarked for the Dynamic Test Stage, we completed the assembly and modifications of these units over the last weekend. Shipment to KSC for usage on the -F stage was completed last Tuesday. ✓

2. S-IC-1 and 2: S-IC-2 was delivered to R-TEST Tuesday, May 17, after a joint review by IO, R-QUAL, R-TEST, and R-ME Laboratories of status of modifications and changes to be accomplished after static firing. Undelivered hardware for S-IC-1 has now decreased to 29 line items. ✓

3. Reimbursement of Cost for Gondola Test: (Reference my NOTES from 5/9/66, copy attached). The actual cost for material and tool fabrication is paid by MSC by a transfer of funds in the amount of \$41,000. The manpower effort for this test has been estimated to amount to 36 man-months. The actual time expended will be accounted for by use of a special code number on the time cards. This code number has been furnished by MSC. ✓

1. NUCLEAR GROUND TEST MODULE - The presentation of MSFC's recommendation for supporting development relative to cold flow tests for a nuclear stage was well received by Mr. Harry Finger and his staff. He is planning to submit a supplemental budget proposal for FY-68 to cover the requirements resulting from the MSFC study. ✓

B.L.

→ On the MSFC SIC test stand.

2. S-IVB SPENT STAGE - The results of the in-house design study effort for the S-IVB Spent Stage and Airlock are being compiled for a summary report to the R&D Council on June 10. ✓

Right?

B

3. MAN-SYSTEM TASK ANALYSIS FOR LUNAR SURFACE EXPERIMENTS - (Contract NAS8-20095) Hamilton Standard Division of the United Aircraft Corporation, contractor for the lunar surface study, completed Phase I and delivered the "Human Engineering Design Criteria Handbook for Lunar Scientific Equipment." ✓

4. S-II ULLAGE MOTOR - Qualification of these Rocketdyne produced motors has still not been possible. Recently one motor blew up during qualification testing; three others from the same batch were rejected; two motors from a different batch developed grain cracks. Similar problems have plagued other programs with the same contractor. We recommend:

- a. Stop loading and testing Rocketdyne motors.
- b. Utilize a different propellant in Rocketdyne motor, or select and modify an existing motor from another contractor, or at least select another contractor to load existing hardware. (The "genie" motor is a likely alternate.) ✓

5. S-II-T TESTING - The S-II-T All Systems Stage was successfully test fired for 354 sec. on 5-20-66. In this test, as well as in the previous 150 sec. test, all major propulsion test objectives were accomplished, which included: LOX depletion, LH₂ recirculation, LOX natural recirculation, propellant utilization, program mixture ratio, step pressurization, and engine gimbaling. ✓

Prior to the test some problems were again encountered with the PU system and the SLAM arms. These were corrected prior to the test. Another full duration firing is scheduled for 5-25-66. ✓

6. S-IVB LOX TANK TOE WELD ON SA-202 - One crater and possibly 2 parent metal cracks existed. DAC has now completed the grind-out operation of the fillet weld and the imperfections have been removed. The operation included X-ray, etching, and dye penetrant inspection. Molds of the grind-out area have been made, and measurements are being made to determine the amount of material left in the weld area under investigation.

A meeting will be held this morning to make a final determination if a mechanically fastened doubler will be added. DAC personnel who previously installed the doubler in S-IVB-503 LOX tank are on hand at KSC to repair S-IVB-202 if required. ✓

7. S-IVB-501 ACCEPTANCE FIRING - S-IVB-501 was fired for 55 sec. on 5-20-66. Cut-off came when the helium inlet temperature exceeded the redline value, which was arbitrarily set lower than normal. Next attempt will be on 5-24-66. ✓

NOTES 5/23/66 MAUS

5/23 958

B 5/31

FY-66 AND FY-67 FUNDING - The MSF position on Marshall's FY-66 and FY-67 requirements, as listed in our POP 66-2, has been received. The data for Apollo is the same as that furnished to you for the Apollo Executives meeting.

The attached chart shows the MSF position for Apollo as well as for the balance of Marshall's effort under MSF.

You should note the following points:

The cut in Apollo is approximately 13.5% of our total requirements for Apollo.

The MSF plan again shows no In-Flight Experiments funding for Marshall.

At this time MSF shows Saturn Apollo Applications funding for Marshall only for launch vehicle production and for system definition for the payload integration effort.

MSF plans, for Marshall, a reduction of \$7.0M in Apollo Supporting Development funding and an increase of \$3.0M in SAA Supporting Development.

OSSA PROSPECTUS - We have received a copy of the first working draft of the OSSA 1966 Prospectus soliciting our gross comments. MSFC comments are now being collected and will be ready for discussion at the Senior Council Meeting to be scheduled during the period June 15 through 21. ✓

NOTES 5/23/66 RICHARD

B 5/31

9/15/23

No submission this week.

B5/31

NOTES 5/23/66 RUDOLPH

RS/23

1. S-IC-1 Stage - Moved from R-ME to R-QUAL for post captive firing checkout on Thursday, 12 May 66 (10 days behind scheduled date of Monday, 2 May 66). Delay due to S-IC-2 occupying R-QUAL checkout station. No impact expected in scheduled delivery date to KSC of Monday, 29 Aug 66. ✓

2. S-IC-2 Stage - Moved to R-TEST from R-QUAL on Monday, 17 May 66 (15 days behind scheduled date of Monday, 2 May 66). Delays in checkout and parallel incorporation of all possible changes before captive firing resulted in delay. No impact expected in scheduled delivery date to KSC of Wednesday, 30 Nov 66. ✓

3. S-II-T Captive Test Program:
 - 150 second firing successfully accomplished on Tues., 17 May 66. Slam System did not release from #4 Engine, however, other three outboard engines were gimballed.
 - 355 second firing (full duration) successfully accomplished on Fri., 20 May 66, Countdown proceeded without difficulty. ✓
Gimballing initiated on all four outboard engines at ignition plus 40 seconds and was terminated at ignition plus 305 seconds.
Propellant utilization system was used. ✓
 - Next test will be on or before Fri., 27 May 66. ✓

4. S-IVB-501 Stage - Acceptance captive firing attempted on Fri., 20 May, terminated by automatic cutoff at 47 seconds in the first burn. A red-line value on LOX tank pressurizing gas temperature was exceeded due to too close a tolerance on the redline value. A recycle attempt was unsuccessful due to problems with the J-2 augmented spark igniter and the stage GSE. The fuel fill line and bellows were over pressurized and damaged in post fire purging operations and will require repair prior to the next firing. The next firing date is now estimated for Fri., 27 May. ✓

5. SA 500F Status - Spacecraft erected, pull test completed, damper arms installed, and Cox Test scheduled for third shift today, Mon., 23 May. On schedule for Wed., 25 May 66, rollout. ✓

NOTES 5/23/66 SPEER

B 5/31

5/23

1. DEPLOYMENT OF MSFC FLIGHT CONTROL PERSONNEL FOR AS-203:

Deployment of MSFC Operations Personnel for AS-203 will be accomplished during the period June 6 to 12. This will include 9 Experiment Systems Engineers (ESE), 2 Booster Systems Engineers (BSE), and 5 R-ASTR TV Specialists. Of the total of 16 personnel 5 are Civil Service and 11 are contractor (IBM, DAC, and Sperry). Deployment will be to Carnarvon, Australia; Guaymas, Mexico; Bermuda; Corpus Christi, Texas; and KSC. ✓

2. AS-203 MISSION RULES: The KSC Launch Mission Rules for AS-203 will be distributed this week. All of the MSFC inputs have been incorporated and we have signed off on the rules. ✓

3. VISITS OF MSFC OPERATIONS PERSONNEL DURING LAUNCH PERIODS:

A draft of a proposed MSFC Management Instruction governing visits to KSC and MSC by Operations Personnel during launch periods has been issued within MSFC for comments. This instruction complements a similiar MSFC Management Instruction for visits by non-operations personnel. The instruction will be issued prior to the AS-203 flight. ✓

4. FLIGHT CONTROL COMMAND TESTS FOR AS-203: Agreement has been reached with KSC on plans for testing of the Mission Control Center - Houston (MCC-H) to Vehicle Digital Command System (DCS) interface for AS-203. These tests will involve sending commands from the MCC-H to the vehicle during certain pre-launch tests, primarily during the Overall Test #2 (Plugs In), and the Flight Readiness Test. ✓

5. HOSC PHYSICAL SPACE: We have been able to obtain a 500 sq. ft. trailer from MTF as temporary relief for the over-crowded conditions in the Huntsville Operations Support Center. ✓

6. S-IVB 501 ACCEPTANCE TEST FIRING: C. Casey of our Flight Control Office at MSC witnessed the S-IVB (501) acceptance firing at Sacto on 5/20 which was to be the first reasonably realistic simulation of first burn, orbital coast, and second burn. The test was terminated about 57 seconds after 1st ignition; automatic cutoff being caused by exceeding LOX temperature redline. ✓

5/23

B5731

1. PEGASUS: Members of RPL met with P&VE members to review the S-IVB-workshop meteoroid penetration data which had been reported earlier, and which had indicated an alarmingly high penetration probability. A meteoroid flux model was carefully established, based upon Explorer and Pegasus penetration data, and on photographic and radar data as reported by Hawkins and Upton (Whipple). The wall thickness of S-IVB (0.60 cm Al equivalent) requires a considerable extrapolation of measured penetration data, and the flux model in this region must still be considered uncertain within a factor of about 5. We agreed on a conservative value close to the pessimistic side of this factor 5. At 0.60 cm Al, our model happens to agree closely with the penetrating flux assumed by MSC for the Apollo design; it is about six times more pessimistic than Whipple's "pessimistic" estimate. With this model, penetration probabilities for S-IVB in a 500 km orbit are as follows (only the cylindrical part of S-IVB needs to be considered, because the bulkhead areas will be protected by other structural elements):

- a. Probability for zero penetrations in 14 days: $p_0 = 0.9945$ ✓✓
- b. Lifetime T_0 (period for which probability of no penetration will be 3 sigma or 0.997): $T_0 = 7.5$ days ✓

This means that among 180 fourteen-day flights, only one (on a statistical average) will suffer one or more punctures. ✓

If we assume that the penetrating meteoroid flux is four times less than estimated in our model, the above figures are:

$$p_0 = 0.9986$$

$$T_0 = 29 \text{ days}$$

The existing uncertainty of the flux model at wall thicknesses as they are used in manned spacecraft makes observational data in this thickness region very desirable. A Pegasus-sized sensor with 0.6 cm Al plates would record one puncture only every three years! However, even data for 0.15 cm Al (about 10 penetrations per year) would be very helpful in verifying or improving our model. There may be other methods to get a handle on heavier meteoroids, e. g. by recording and sampling meteor tracks from a satellite. ✓

E.S.
Looks a lot better now!
B

9/18 5/23

1. Joint Action Group (JAG): A JAG Meeting was held at MSFC on May 19 with representatives from all elements except Jones/Disher shop present. The following is a very brief summary of the meeting:

a. The currently established JAG would consider only the planetary missions (flyby and landing), including the early requirements leading to the actual missions. New groups with Center participation will be established to do a similar job on the lunar and Earth-orbital missions. ✓

b. MSFC presented the launch vehicle requirements and implications for accomplishing the flyby mission based on a spacecraft weight of 120K. No selection was planned or made for a baseline configuration. I feel (and Gray agrees) that we made a good showing. ✓

c. MSC presented their spacecraft study showing weights of 120K for the flyby mission and 233 K for the landing mission (the 120K and 233 K were spacecraft weights only and had a margin of about 20% for growth). It was suggested by MSC that a baseline should also consider 180K spacecraft weight for the flyby and 350K spacecraft weight for the landing mission. These numbers are more in line with our thinking as well as that of Headquarters. Therefore, we will crank these weights thru our launch vehicle planning during the next three weeks. ✓

d. The next meeting of the JAG will be in Washington on June 9, 1966. At that time, we should be in a position to recommend a baseline launch vehicle configuration for the flyby mission. The recommendation will also consider the Mars landing, lunar and Earth-orbital missions. In view of the significance of this recommendation, I will plan on an in-house review about June 7, 1966. ✓

2. Mobility Test Article (MTA): The Bendix MTA was accepted by MSFC on May 19, 1966. Although there are some minor instrumentation discrepancies, it looks to be in good shape. Bendix has put a lot of their company money into this job, and we can handle the remainder in-house, in case they want additional money to iron out the bugs. A demonstration of the MTA, followed by a demonstration by P&VE of the LSSM mock-ups, has been scheduled for 4:00 p.m. June 1, 1966. Schooling for MSFC and Army personnel to conduct the test program is scheduled for June 1 - 3, 1966. We are having some trouble with GM on their MTA (contract overruns). We have a team of technical and contract people at their facility this week to verify the status and develop a revised plan for future work. I will report the results next week. ✓

F.W.

I'd like to attend

B

Noted. Bsh

May 31, 1966

NOTES 5/31/66 BALCH

B 6/12

5/31/66

S-II-T Stage Destroyed - At approximately 4:45 p. m. , on Saturday, 5/28/66, the stage was demolished by a rupture of the LH₂ tank caused by over-pressurization with helium during a post-firing test to check for leakage in the LH₂ feed line. Previously, a pressure-sensing line had been disconnected because of trouble with the pressure-indication system and had not been reconnected. As a result, no pressure indication was obtained as the LH₂ tank was filled with helium. On the supposition that this lack of pressure indication was caused by escape of the helium through a malfunctioning relief valve, a facility vent valve was closed causing the pressure to go beyond design limits when pressurization was again initiated. Damage to the test stand is not thought to be serious, but cannot be accurately assessed until debris has been removed. Five S&ID technicians monitoring the test received minor injuries. The Board of Inquiry convened at MTF at 4:30 p. m. , Sunday, May 29, appointed technical panel and working groups, and at 12:06 p. m. , Monday, May 30, released the impounded A-2 complex for initiation of clean-up activity. The Board has set target date of July 5 for release of final report. ✓

S-II-T Stage Test - The fifth firing on 5/25/66 was programmed for full duration but was terminated after 195.5 seconds by thrust chamber pressure loss indication for the No. 5 engine, which was caused by a fire which damaged the lead wire to the thrust pressure switch. This fire started as a result of a break in a LOX line of the auxiliary ignition start system which leads to the No. 5 engine thrust chamber and stopped burning shortly after engine cutoff, with worst part of damage limited to engine harness and engine-related hardware. At about the same time, another fire occurred on the outside of the stage in the vicinity of the pre valve in the LH₂ line to the No. 4 engine. This fire burned until dumping of LH₂ from the stage was completed and caused minor damage to insulation. At the time of shut down, the gimbaling program had been in progress approximately 165 seconds and was performing as programmed without problems. The propellant utilization system was on line, and indications were that it would have functioned satisfactorily had the firing continued for the full duration. ✓

Labor Relations - In negotiations between IAM and the five GE subcontractors for whose employees IAM is the bargaining agent, prospects for agreement seem good except for Travirca. The company insists that the balance of money in the contract will not permit more than 10 cents per hour increase. Contract does not expire until 10/31/66, but union insists on major wage increases immediately. Neither side appears to be prepared to make any major concessions. If satisfactory progress in negotiations has not been made by next Monday, 6/6/66, strike action will be taken by the union, and picket lines will be placed at MTF. ✓

5/31/66

B 6/18

J-2 ENGINE

The third 230K engine for S-II 504 was delivered during this week.

A full duration test of the S-II-T was aborted on May 25 after 195 seconds by a fire resulting from a broken Augmented-Spark Igniter (ASI) LOX line on the center engine (J-2014). The cutoff signal was given by the Mainstage-O.K.-Switch circuit as a result of fire damage in the harness. The damage was generally restricted to wiring harnesses. A stage fire also occurred from a leak in the LH₂ supply system, reportedly the recirculation system. The engine will either be repaired or replaced.

A re-start acceptance test was successfully performed with S-IVB 501 on May 26. The first burn of approximately 150 seconds, a simulated coast of one hour and fifty minutes and a second burn of approximately 306 seconds were included in the test program. A gimbal and propellant utilization program were included after the re-start.

Nothing significant has been determined as to the cause of the rough combustion cutoff at the MSFC Test Laboratory reported last week. The injector and ASI assemblies will be returned to Rocketdyne for additional dimensional checks, leak checks, and calibration verification. If no discrepancies are found at Rocketdyne, the hardware will be returned to MSFC and an attempt will be made to duplicate the conditions of the last test. ✓

H-1 ENGINE

Delivery of H-1 engines for SA-209 was completed this month.

The re-qualification testing of engine H-4083 is in progress at Canoga with a total of 1800 seconds at this time. Some difficulty has been experienced with the main fuel valve, heat exchanger and turbine exhaust duct. None of the malfunctions would have affected mission success. Failure analysis is in process.

Retrofit of LOX pump seals on engines assigned to S-IB-6 is scheduled to be completed on June 3. This will complete the total seal retrofit effort. ✓

C-1 ENGINE

Design changes incorporated in the prototype injector to reduce the heat transfer rates to the propellant appear to have solved the problem of changes in the propellant combustion mode. In preparation for conducting the first incentive endurance milestone, RMD has successfully acceptance fired four prototype engines. One Command Module yaw nozzle configuration engine will be pulse duty cycle fired for a duration of 755 seconds, and a Service Module radiation nozzle configuration will be pulse duty cycle fired for a duration of 5000 seconds. The scheduled incentive milestone completion date is May 31, which will slip to about June 2. ✓

F-1 ENGINE

With regards to my notes of May 16, 1966, in which it was reported that a prenegotiation agreement with General Bogart had been reached on Production Support (Sustaining Engineering) and the procurement of 33 additional engines; please note that the MSF mark up of the 66-2 POP is not consistent with this approved prenegotiation position. ✓

NOTES - 6/7/66 - CONSTAN

9/13 5/31

B 6/18

VISITORS TO MICHLOUD

The twenty astronauts who visited Marshall Wednesday and Thursday, visited Michoud Friday, May 27, for briefings by NASA, Boeing and Chrysler and tours of the facility. ✓

On June 4, thirty directors of the World Bank will visit Michoud for briefings and tours. This group, personally invited to visit manned space flight installations by Mr. Webb, is scheduled to visit MSFC on June 5. ✓

REVIEW OF MICHLOUD PERSONNEL PROGRAM BY CSC

Representatives of the Dallas and Atlanta U. S. Civil Service Regions will conduct a review of the Michoud Assembly Facility Personnel Management Program during the period May 31 thru June 3, 1966. ✓

NOTES 5/31/66 FELLOWS

5/31

B
6/15

1. Spent Stage Experiments: Manufacturing Engineering Laboratory is starting procurement in support of the Spent Stage Experiments by submitting requests in the total amount of \$427,000 to contract for the following tasks:

- a. Prototype high-power photographic and general purpose portable lamp for SSE lighting.
- b. Study to determine optimum lighting requirements for SSE.
- c. Vacuum compatible tape recorder.
- d. Development of an explosive cutting tool by modifying the contained detonating fuse system.
- e. Development of adhesive bonding techniques for in-flight repair of space vehicles.
- f. Tube joining in a space environment using an exothermic heat source.
- g. Self-contained electron beam welding in a space environment. ✓

2. Saturn V Breadboard Physical Space: In order to determine the best way to provide additional space for Boeing personnel in the Saturn V Breadboard Facility, a meeting was held last week with Col. Murphy, I-V-MGR, Mr. Kramer, F&D-S, Mr. Smoot, and Mr. Edmundson, R-ASTR, and R-OM. It was agreed that a project for about \$95,000 will be submitted to build two mezzanine areas above the Breadboard simulation equipment in the high bay. Since accomplishment of the work must not interfere in any way with Breadboard operation, it will be necessary for Technical Services Office to do this difficult job rather than using a facility contractor. ✓

→ Scott F.

I hope you are coordinating this with Art Rudolph. He is presently busy scrubbing down the Boeing staff for the Breadboard!

B

NOTES 5/31/66 GEISSLER

1. SA-5 Impact: The last observations prior to impact were by the Baker-Nunn site at Arequipa, Peru and a STADAN tracking site at Lima, Peru. The impact location, according to Headquarters information relayed to KSC range safety, was in Bolivia. Impact coordinates were: Geodetic Latitude: 21.4 deg South; Longitude: 64 deg West; Time: 01:56 U. T.; Date: April 30, 1966. Our own preliminary results are in good agreement with these.

E.P. They recovered some parts. I have pictures B

2. Second Propulsion Joint Specialist Conference: At AIAA's Second Propulsion Joint Specialist Conference (June 13-17, 1966, Air Force Academy, Colorado Springs), our Aerodynamics Division and its contractors will virtually furnish the whole session on Exhaust Plume Phenomena, providing 7 of the 8 papers presented. The papers present preliminary results of the various phases of our jet heating program, and deal with: Analytical prediction of temperature and density in multijet plumes at high altitudes; prediction of radiation from given inhomogeneous plumes of hydrogen - or hydrocarbon-fueled engines; heating from metallized solid propellant exhaust (e. g., retro and ullage rockets); effects of secondary combustion in jet plumes; and scaling of model test results. The vice-chairman of the session is also a member of the Aerodynamics Division. ✓

3. Iterative Guidance Mode: Our iterative guidance mode (IGM) has been checked out for applications beyond the originally assigned tasks, i. e. injection into circular parking orbit and injection to lunar transit. Deboost from hyperbolic transit into circular parking orbit, including a large plane change was performed successfully. Our IGM has performed superior to the MIT-Apollo scheme, and Houston is considering a switch to our equations. Polar orbital injection and synchronous orbital injection were checked out successfully. Rendezvous guidance for various specific situations has been formulated and checked out. Work on a general rendezvous formulation is proceeding satisfactorily. Lunar landing was the first task, to which the IGM was applied. Broadening the scope with respect to available navigational aids is under way. Ascent from lunar surface and rendezvous is expected to be a straightforward follow on. Because of its close-to-optimum performance, the IGM is now routinely used to optimize trajectories, rather than the slow and expensive calculus of variations methods. In addition to providing the specific guidance equations and settings for the individual Saturn flights, efforts are being concentrated on cleaning up the scheme and developing a general formulation which will permit shifting to any alternate mission with a minimum of inputs. ✓✓

9/15 5/31

B 6/18

1. S-IVB-206 CHECKOUT: Simulated flight test was conducted on May 21, 1966. For the first time on the S-IVB program, there were no shortages of parts on the stage and no substitute components were used during the tests. Data evaluation was completed May 24, 1966, and found acceptable. ✓
2. S-IVB-501: On Thursday, May 26 the stage was successfully static fired in a simulated restart situation. The first firing cycle had a duration of approximately 150.1 seconds with a programmed cutoff. After a simulated coast period of about 105 minutes the engine was restarted and a firing of 301.11 seconds followed. Preliminary data evaluation indicated no significant problems; however, cutoff was initiated by an observer approximately 30 milliseconds prior to fuel depletion cutoff due to the fuel pump inlet temperature going above the "red line". This condition is considered to be a normal phenomena for the mass of propellants on board at the time and is not considered to be a problem which would require retest. ✓

NOTES 5/31/66 HAEUSSERMANN

No submission this week.

RS/31

B 6/18

5/31

B 6/18

S-1C

A successful propellant load test was accomplished on the S-1C-2 stage on May 27, 1966. The acceptance static firing, 125 seconds mainstage, is scheduled for June 7, 1966. ✓

S-IVB (SACTO) - Vehicle 501

On Thursday, May 26, 1966, DAC conducted an apparently successful Saturn V restart test on Vehicle S-IVB-501. First and second burn durations were 153 and 305 seconds, respectively. Second burn cutoff was by redline observer on the LH₂ pump inlet conditions, 26 milliseconds before the programmed cutoff. A successful gimbal program was conducted during the second burn. The side load restrainer links were dropped for gimbaling after the chamber pressure was verified to be above 730 p.s.i.a. Side loads were nominal and damped out in approximately three seconds. There were no stage or engine problems. ✓

Vehicle 205

Vehicle S-IVB-205 is scheduled to be acceptance fired Thursday, June 2, 1966. ✓

Swing Arm Test Program

On May 19, Dr. Debus and Mr. Buchanan were at MSFC to discuss Mr. Buchanan's effectiveness as Swing Arm Director, due to his many other responsibilities. It was agreed that Mr. A. Allen, who has been working at MSFC for Mr. Buchanan for the last three months, would act as a sub-czar for Swing Arms. Quicker program response was promised by Dr. Debus. ✓

Arms 4 and 8 (S-II Intermediate and Service Module) of the third set were shipped from Hayes May 27, 1966. Modifications to these arms will be made prior to installation in test area. All positions in Test Area contain arms of either the first or second set at present. ✓

Presentation on the status of the Swing Arm Program to General Phillips by KSC is scheduled for June 2, 1966. Mr. Connor from Test Laboratory and Mr. Westrope from Saturn V Office will represent MSFC. ✓

NOTES 5-31-66 HOELZER

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NEGATIVE REPORT.

NOTES 5/31/66 JAMES

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RCA COMPUTER: RCA completed the rework of module boards for changeout at LC 37-B and delivered the boards as scheduled on Friday, however, a quality problem was detected on some of the boards (cracked resistors) and a complete changeout was not possible this weekend. The boards were changed out in all areas other than the memory area. KSC has indicated that they will have time available about June 5 or 11 for completing the changeout and RCA will provide the additional boards required to complete this effort.

RCA completed the systems verification of the rework "fix" at Van Nuys last week. Preliminary results to date indicate a favorable resolution of the intermittent parity problem.

The LC 37-B computers are back on the line. ✓

SA-203 SOFTWARE: I had a meeting Friday with representatives from KSC, IBM and R&DO to review the SA-203 software problem. We had recognized software delivery for SA-203 would be the launch "pacer" and have been working the problem vigorously with all elements within recent weeks. Preliminary tapes were delivered to KSC on May 25 with the final LVDC and SLCC tapes to be delivered in early June. We now have two changes which will have to be incorporated in the final tapes: a sequence change to help solve the S-IVB ullage pressure decay problem and a sequence change to provide command system updating from Carnarvon. We will deliver "updated" tapes on June 6 (final version with the exception of the two changes) and the final tapes June 16. The June 16 date appears to be slightly out of phase with KSC's working schedule, however, it is consistent with the MSF target launch date. After the meeting I discussed this approach with Col. Petrone. ✓

GENERAL PHILLIPS' BRIEFING ON INFLIGHT CONTINGENCY MISSION PLANNING, MAY 26: General Phillips agreed with the MSFC recommendations concerning the Saturn IB. These recommendations were: 1. That we plan for utilization of the vehicle one-engine-out capability after tower clearance; 2. That, based on limited mission capability, apparent problems and the very low probability of two-engines-out ($\approx .00005$) that we not perform preflight analysis to verify two-engines-out capability; and 3. That due to limited improvement in mission capability and existing problems, implementation efforts for early staging be dropped. ✓

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Manufacturing Technology Review Meeting: This meeting was conducted last week on May 24 and 25 at Michoud. It was sponsored by the Michoud Operations, Dr. Constan. The Boeing Company and Chrysler Corporation were the hosts and chaired the meetings in two parallel series of sessions. The purpose of these meetings, which are conducted semiannually, is to present and discuss innovations in manufacturing processes, specific experience in applications of generally known techniques to our tasks, and general concepts for planning and controlling manufacturing efforts in our development programs. Some highlights of topics discussed were:

- a. Weld Repair of Propellant Containers (Douglas)
- b. Contributions by Manufacturing to the Reliability Program (MSFC/ME)
- c. Bulge Forming (Boeing)
- d. Explosive Forming of Compound Contours (NAA/LAD)
- e. Out-of-Vacuum Electron Beam Welding (MSFC/ME)
- f. Manufacturing's Role after Spacecraft leaves Assembly Floor (McDonnell)

All of the major companies in the aerospace industry participated with representatives of high supervisory or management positions representing the actual experience and manufacturing know-how of their companies. Total participation was 130. The following companies participated in the meeting: DAC, Boeing, NAA, Chrysler, IBM, Grumman, McDonnell, Lockheed, Rocketdyne, MSC, and NASA-OMSF. ✓

1. MOBILITY TEST ARTICLE - During a recent briefing on the Bendix MTF to some of your staff members, Mr. Shepherd requested that a 5-minute film on current MSFC activity toward lunar surface exploration be prepared. We are trying to complete this prior to the next Management Council Meeting. ✓
2. MARS FLY-BY AND LANDING MISSIONS - Subsequent to presentation of result of inhouse studies to Joint Action Group, spacecraft injected weights have been revised significantly upward. All mission modes, including our proposal of a pressure-fed concept, are being reworked for a presentation to the Planetary Missions Steering Committee on 6-9-66. ✓
3. SAFETY AND ARMING DEVICE FOR SATURN IB - Recent testing indicated marginal performance in safe position. Accidental triggering while in safe position can result in a low order explosion of the primer cord booster; the cord itself has not been ignited on any of the tests. An inhouse designed modification has been incorporated and eliminated the above problem. The change has been submitted to the Level II CCB. ✓
4. EXPERIMENTS - A pre-proposal bidders conference was held on 5-27-66 on a Phase B study contract for our Project Thermo (Cryogenic Fluids Exp. 3 - 7). Approximately 20 companies attended. Proposals are due June 10, and we hope to be able to start negotiations for a contract during the last week of June. A companion contract to Grumman for LEM integration study has been negotiated through MSC. ✓
5. IU - The internal acoustic environments which affected the EDS system on AS-201 have been determined by Astrionics to be no problem to the internal components for the AS-203 flight. ✓
6. COMMON ORDNANCE CONTAINERS (Reference NOTES 5-9-66 LUCAS) - The S-II common ordnance containers are special handling and transportation containers incorporating special safety features. Some of the contents are: separation and fuel dispersion system shaped charges, ullage motor igniters, confined detonating fuses, etc. ✓
7. AS-203 WATER ACCUMULATORS - X-rays of the IBM procured water accumulators indicate substandard welding. Bad accumulators will be returned to the vendors for rework. ✓
8. J-2 ENGINE - Engine J-2048 experienced rough combustion at MSFC during test S-IVB-027 on 5-18-66. The test was terminated by the vibration safety cutoff device after approximately 11 sec. of mainstage operation. The cause or triggering source has not been identified. However, past experience at Rocketdyne indicates that rough combustion can be caused by (1) cracked oxidizer posts, (2) chamber tube splits, (3) ice in the injector orifices, and (4) improper purge adjustment. Inspection by Rocketdyne injector specialists indicates no damage or abnormalities in the injector or thrust chamber. The injector will be returned to Rocketdyne for a complete inspection and recalibration and then returned to MSFC for retesting. ✓
9. S-II INSULATION PRESENTATION - A thorough review of the S-II insulation effort was made at S&ID by P&VE personnel. Although most insulation areas in the S-II-501 and 502 stages appear to be superior to the S-II-T and F stages, numerous instances of poor workmanship and poor quality control were observed on the flight stages. ✓

NOTES 5/30/66 MAUS

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Negative Report

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NOTES 5/31/66 RICHARD

(12513)

500F Rollout: During the 500F rollout, the following observations were made.

a. Average strain gage reading on vehicle was 200 micro-inches with several spikes to 260 micro-inches. The vehicle has been red-lined at 920 micro-inches.

b. The damper started vibrating when the crawler reached a velocity of one mile/hour and the crawler speed was reduced to .8 miles/hour and the trip was completed at this speed. ✓

c. One of the crawler bearings reached a temperature of 200°F with the redline value being 170°F . The redline value was raised and the trip was resumed. There are 176 bearings of this type so it is expected that this overheat problem will be corrected by run-in and checking for proper lubrication. ✓

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NOTES 5/31/66 RUDOLPH
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1. SA-500F - Rollout successfully accomplished and vehicle placed on launch Pad A at 9:10 pm, EST, on Wednesday, 25 May 66.

Lightning struck the top of the LUT, Friday afternoon, 27 May 66, at approximately 5:00 pm, CST, carbonizing the break system on the "hammer head" crane, allowing the crane hook to fall.

Total damage not assessed due to inability to gain access to the damaged area. There is a tear of approximately 6" in the S-II Stage insulation in the general area of the LH₂ fill and drain valve. It appears that only the outer lamination is damaged with no honeycomb damage.

The crane will be operational by noon today (31 May 66) and at that time a more complete assessment will be made of the damage, using the crane to gain access to the damaged area and start repairs.

My Test Office will ask Ludie Richard to investigate lightning protection with KSC. ✓

2. S-II-T:

The S-II-T tanks were destroyed Saturday, 28 May 66, as a result of overpressure during a LH₂ system leak check.

The LH₂ system leak check was performed to confirm and isolate leaks around a LH₂ pre-valve which had occurred during the 195 second test. The intent was to pressure the LH₂ tank to 8 psig.

Indications are, the LH₂ tank was overpressured as a result of the LH₂ tank pressure switches being disconnected and subsequent ground override of the stage and facility vent valves to obtain the 8 psig tank pressure during the leak check test.

A board of investigation chaired by Dr. Debus started its activities on Sunday, 29 May 66, at MTF.

The facility damage appears to be repairable within the eight (8) week modification period prior to the arrival of S-II-1 at MTF.

We will develop a substitute plan for the destroyed S-II-T. ✓

3. S-IVB-501 Acceptance Firing - The flight stage was successfully acceptance fired Thursday afternoon, 26 May 66. The acceptance firing consisted of a first firing of 150 seconds, followed by a coast period of 105 minutes (to boil off 3250 lbs of LH₂ and simulate a 3 orbit coast) and a restart firing of 305 seconds. (Total burning time 455 seconds).

Other significant attainments:

- o A flight mission profile P.U. excursion.
- o The continuous vent system was active during the coast phase.
- o A gimbal program was executed during the second burn.

The 26 May 66 firing was accomplished on the first attempt and all systems appear to have performed satisfactorily. ✓

4. World Bankers (group of some 25 to 30) to visit Saturn V Program Control Center - on Sunday, 5 June 66. The Bankers are visiting the Center at the suggestion of Mr. Charles Schultze, Director BOB. ✓

NOTES 5/31/66 SPEER

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1. AS-501 and AS-502 Abort Capability: Among other actions at General Phillips' review on May 26 of real time flight contingency preparations, it was decided that ground abort command capability is required for flights AS-501 and AS-502. MSFC was directed to implement the necessary vehicle software change to provide engine cutoff from an abort command. In addition, the Electrical Networks Panel will identify the best way of implementing a ground cutoff command (without abort sequence) for 501 and 502. ✓
2. Prelaunch Wind Simulations: From discussions with Aero-Astrodynamic Laboratory, it appears possible to provide the results of the prelaunch wind simulations in wind-critical situations in essentially real time with a wind balloon ascent. Simulation of the vehicle flight through the entire pertinent 7 to 17 km altitude region would be available as soon as the balloon traverses this altitude region, which requires 35 minutes. By proper scheduling of balloon releases, a launch decision could be made in critical conditions with wind data at most 35 minutes old, as compared to approximately two hours by present methods. It is hoped that this technique can be available by AS-204. ✓
3. AS-203 LIEF Support Engineers: Nominations for AS-203 LIEF Support Engineers and comments on the proposed "problem groups", which are past due, have now been received from all except one laboratory and one stage contractor. All nominations should be available this week to permit time for adequate review, personnel briefing, and dissemination to KSC. ✓

B 6/18

NOTES 5/31/66 WILLIAMS

Ad 5/31

1. HARRY FINGER VISIT. We have set up a visit by Harry Finger to MSFC on Friday, 6/3/66, subject to unforeseen conflicts. The purpose of the visit:

- a. Review our work on the Ground Test Module
- b. Review our planned effort on the Ground Test Module
- c. Discuss overall nuclear rocket effort and MSFC's role in it.

I will get an agenda for the visit to you by Wednesday, 6/1/66. ✓

2. GOLF CART (LSSM) ACTIVITIES. The RFQ for the Phase B LSSM contract extension was released on 5/13/66. Proposals from Boeing and Bendix are due in today. We hope to have the contract signed by the end of June. ✓