

Jan 3, 1967

NOTES 1/3/67 BALCH

S-II-1 Test Program - The S-II-1 completed a full-duration (363-second) firing on December 30, 1966. Preliminary quick-look data of the flight systems apparently OK. Post Static Firing Briefing scheduled for January 3, 1967. S-II-1 scheduled to be shipped from MTF on February 5, 1967.

S-II A-1 Activation - Last major item of GSE was shipped to MTF on December 31, 1966. Continuing effort to achieve stand readiness on January 27, 1967.

B-2 Activation/S-II-T Test Program - Overall schedule still being held for January 27, 1967, static firing. Power was applied to the stage with the exception of the engine systems. Facility HPG systems continue to pace completion of B-2 activation, with GSE modification following close behind.

ORBITAL WORKSHOP

An effort has been initiated to identify elements of the McDonnell Airlock Contract that should be changed to be compatible with the MSFC portion of the Orbital Workshop effort. This information will be given to MSC to use during re-negotiation of the McDonnell contract.

Three representatives from Dr. Weis' office, Aerospace Corporation, DOD, visited MSFC December 20, 1966, to discuss latest Orbital Workshop criteria and requirements as related to corollary experiments. DOD is considering proposing additional experiments for the Workshop.

LM/ATM TASK TEAM

In a meeting with MSC personnel, the baseline mission description and LM/ATM ground rules were reviewed and MSC comments provided. MSC has developed a preliminary mission time-line which is being reviewed by MSFC. Functional and hardware sub-groups were identified and MSFC and MSC counterparts identified to proceed with mission and hardware definition. A second Task Team status meeting is planned in Houston (MSC) for January 5. We are targeting for a report to Center Management by the end of January.

NOTES 1-3-67 BROWN

J-2 ENGINE An apparently successful test of S-II/501 was conducted at MTF last Friday. All engines were operated at maximum mixture ratio for 350 seconds and total run duration was 362 seconds. The defective ignition detector probe which aborted the previous test was disassembled at MSFC on Tuesday, 12-27-66. The two wires of the replaceable portion of the probe were twisted together, causing an electrical short. This manufacturing defect was not detected by the normal electrical check given all probes. It could have been found by X-ray inspection. Since this incident all probes have been X-rayed and X-ray inspection has been made a mandatory step in the manufacturing process. Rocketdyne is conducting a statistical study relative to the advisability of flying the S-II stage without the probes installed. The results of the study should be available this week.

The tests scheduled for AEDC last Friday had to be cancelled due to a facility malfunction. One of the water control valves used to cool the steam ejector malfunctioned in the open position and partially flooded the test cell. Testing has been rescheduled for tomorrow.

H-1 ENGINE The Union Carbide "Eddy Current" Machine was successfully demonstrated at both Rocketdyne and MSFC last week. Arrangements can be made to check first stage turbine wheel blades in the field if this is deemed necessary.

The decision was made December 29, 1966 to install spare Engine H-4062 in S-IB-204 at KSC. The engine that was removed from S-IB-204 (H-4059) exhibited an unexplained increase in thrust (approximately 9.7K) after the turbine wheel change out. Engine H-4059 is being held at Neosho pending further evaluation of the random effects of changing turbine wheels on engine performance.

Delivery of H-1 engines to support the Apollo program was completed in December.

F-1 ENGINE F-1 Engine F-6050, Second Engine for S-IC-7, was delivered on dock at Michoud Assembly Facility on December 29, 1966--twenty-four days ahead of the Boeing contractual on dock date.

GEMINI ENGINE An RFQ was issued to Rocketdyne for twenty each 100-pound thrust Gemini OAMS SIVB/Saturn V APS Engines. These engines are required to support SIVB/Saturn V Vehicles SA-507 through SA-515. We expect to negotiate a Firm-Fixed-Price type contract for this production.

NOTES 1/3/67 CONSTAN

S-IC

S-IC-3 - Refurbishment continuing at Michoud following successful Static Firing at MSFC. Power has been applied in preparation for Post Static Checkout.

S-IC-4 - Awaiting shipment to MTF for Static Test Firing.

S-IC-5 - Power applied Tuesday, December 27, to commence Post Manufacturing Checkout. Some telemetry and mechanical tests have been performed.

S-IC-6 - Vertical assembly completed.

S-IC-7 - The thrust structure has been painted and is stored in a pick-up position. The forward skirt and intertank are complete, painted and stored. The fuel tank is in the hydrostatic test position and the LOX tank is complete and is awaiting availability of the hydrostatic test facility.

S-IC-8 - The thrust structure is 55% complete; the intertank is 50% complete and the forward skirt is 30% complete. Both halves of the fuel tank are complete and are being positioned for the close-out weld. The #1 skin has been welded to the upper LOX bulkhead. The lower bulkhead and all other skins are complete for the build-up of the LOX tank.

S-IC-9 - Center engine support is 95% complete. Lower fuel bulkhead is complete. The upper fuel bulkhead is awaiting the close-out gore. The skin rings for the build-up of the fuel tank have been fabricated.

NOTES 1/3/67 FELLOWS

1. Project Thermo and Thermal Hydrodynamic Research: Pending selection of experiments which collectively will become Project Thermo, approximately \$1 million has been earmarked for sustaining effort in Thermal Hydrodynamic Research. Nearly one million additional dollars are reserved for Project Thermo, itself, during this fiscal year. These moneys provide for all urgent requirements associated with this activity, including efforts to be undertaken by laboratory single support contractors and for out-of-house procurements.

2. Identification of Critical Skills: Mr. Wible recently requested specific identification of required additional critical skills through recruitment or retraining. To develop a consolidated R&DO position, this office has requested each organization to:

a. Immediately initiate requests for personnel action to fill each scientific and engineering vacancy.

b. With each of those personnel requests, submit a position profile containing experience and background requirements for each vacant position. Five priority profiles were requested from organizations currently over strength.

NOTES 1/3/67 GEISSLER

Negative Report

ENGINE SUPPORT ACTIVITIES IN 1966: Contributions to the accomplishment of major milestones in the engine programs of 1966 include the following:

a. F-1 Engine

- (1) Completion of First Article Configuration Inspection and corrective action by the contractor on detected discrepancies.
- (2) Completion of engine qualification II testing (essentially the culmination of the R&D reliability effort). Final report due in January 1967.
- (3) Completion of engine component qualification testing with the exception of one component.
- (4) Agreement on leakage limits for acceptance tests.
- (5) Completion of reliability demonstration program.

b. J-2 Engine

- (1) Completion of First Article Configuration Inspection and corrective action by the contractor on detected discrepancies.
- (2) Completion of engine qualification II testing (uprated engine). Final report presently under review.
- (3) Accomplishment of engine component qualification testing on all scheduled components. Retesting where needed is in progress. The majority of the final reports have been reviewed and approved.
- (4) Agreement on limits for fuel pump turbine seal leakage and lox pump torque.
- (5) Completion of reliability demonstration program.

c. H-1 Engine

- (1) Preparation and approval of a reliability program plan. Some revisions to it are being reviewed.
- (2) Completion of uprated engine and component requalification.
- (3) Completion of flightworthiness testing on the first of two uprated engines.
- (4) Completion of quality assurance testing of Engine 7077.

d. C-1 Engine

- (1) Addition of a quality representative to the MSFC Resident Office at the contractor's plant.
- (2) Preparation and approval of the Government Agency's quality assurance plan. Completion of Government Agency staffing and training.
- (3) Preparation, review, and approval of the contractor's reliability program plan.
- (4) Bench testing and quality evaluation of the first three ground test engines is going on.

ATM

Reference is made to your comments on my weekly note of 12/12/66, attached. The desirability of launching the CSM and the LM/ATM on one vehicle was discussed by the Solar Physics Subcommittee; however, you are correct in that the overall mission plan is firm for using two vehicles because of current weights and anticipated weight growth.

Hydrogen alpha filters for ATM experiments are of significant concern. The following actions are being taken to work around the long load time problem of birefringent filters:

1. Industrial Operations (Mr. Rein Ise) is surveying the scientific community to determine the availability of existing birefringent* filters which might be reprogrammed to ATM use. Activities being contacted include NASA Hdqtrs., MSC, GSFC, Sacramento Peak Observatory, and Harvard.

2. Astrionics is continuing to seek means of reducing lead times from the two proven sources of H-alpha birefringent filters, specifically Halle and Zeiss (both in West Germany). Currently, the most promising approach appears to be the purchase of the H-alpha telescope system from Razdow, the USA outlet of Halle, thereby obtaining faster delivery of the desired filters. This is the approach used by MSC. A source of concern is the quality of Razdow hardware. Backup hardware would be fabricated by Astrionics as was done by Sacramento Peak and MSC in the past. Zeiss is only interested in delivering optical components, not a telescope system. This avenue will also be followed if reasonable delivery dates from Zeiss can be negotiated.

3. Astrionics is discussing with Perkin-Elmer whether they can establish an H alpha birefringent filter capability.

4. Astrionics and Harvard are investigating whether interference filters can be satisfactorily applied to the ATM need, particularly within the Harvard long wave length experiment "B". Interference filters are not considered the better choice by the scientific community.

MSC currently has ten birefringent filters systems on order from Halle (Razdow) and has received delivery of two or three. Mr. Modesette of MSC has stated a willingness to give MSFC the eighth filter he receives. MSC is committed to deploying seven ground based systems for solar flare alert in connection with the mainstream Apollo. IO will negotiate whether MSC can improve their offer to make it more compatible with the ATM need dates.

*Birefringent - double refractive

for Mr. Hinkle
and Mr. Gilman } please reply!

NOTES 12/12/66 HAEUSSERMANN

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12/12 950

B
12/12

ATM

A status presentation was given by the Astrionics Laboratory and I. O. to the Solar Physics Subcommittee.

Specific areas of discussion were:

1. The ability to meet the Dec. 68 launch with all experiments being ready by that time.
2. The absolute necessity of launching at that time.
3. The availability of hydrogen-alpha filters.
4. The desirability of launching the CSM and the LM/ATM on one vehicle.

The concern about the H-alpha filters is shared by us and a subsequent note will appraise you more fully of the situation.

2 is in Houston!
B

Test Facilities

The super linear accelerator (Sulinac), applying a pneumatic mechanism for cyclic operation, is working up to the maximum drop height of 80 ft. Demonstration can be given.

NOTES 1/3/67 HEIMBURG

Negative Report.

NOTES 1-3-67 HOELZER

INVESTIGATING CONCEPTS FOR LOCAL SCIENTIFIC SERVICE MODULE (LSSM):

The first phase of experiments for investigating the handling qualities of the two concepts for the local scientific service module has been completed. The experiments utilized the SMK-23, the general purpose cockpit, and the interim lunar terrain model at the Simulation Branch of Computation Laboratory.

NOTES 1/3/67 JAMES

H-1 ENGINE TURBINE PROBLEM S-IB-4: You will recall that when the engine from S-IB-4 was recently refired at Rocketdyne after turbine blade replacement, a higher than normal thrust (approximately 10.K) was developed. To date Rocketdyne has been unable to develop an explanation for the increased thrust. In order to avoid a delay at KSC, the H-1 Engine Office has recommended that we use the spare engine on S-IB-4 instead of reinstalling the old engine. We have agreed with this recommendation and plan to ship a spare engine from Michoud on January 3. KSC agrees with this shipment date.

IU-205 RECONFIGURATION: We have completed negotiations with IBM, Huntsville, for the reconfiguration and sufficient retest of IU-205 to verify the changes made. The added job will cost approximately \$50,000.00. We plan to complete the reconfiguration on February 2, 1967; complete the retest February 13, 1967; and ship the IU to KSC on February 24, 1967.

NOTES 1-3-67 JOHNSON

No significant items to report.

NOTES 1-3-67 KUERS

1. Nose Cones: The first nose cone for an S-IB unmanned flight (206) has been completed this week and has been shipped to R-QUAL.

2. Mock-ups:

a. S-IVB Workshop: The mock-up for crew quarters is proceeding and will be ready for inspection by visitors on January 16, 1967.

b. ATM: This full scale mock-up is being built by Hayes. It will be ready for the OSSA visit also.

c. Contractor: The heavy load of mock-up and model work has exhausted our off-site fabrication contractor support hours. Additional hours will be needed for our normal work and other mock-up work which may be needed. We are negotiating this matter with our financial people.

NOTES 1-3-67 LUCAS

1. S-IB/S-IC VALVE CASTINGS: Defects have been found in the valve flange castings used on the S-IB and S-IC stages. As a result of a visit by Materials Division personnel to the Southwest Research Institute, it appeared feasible to develop a non-destructive test method to distinguish between those defects which penetrated some depth into the casting and those which are of a more superficial nature. A contract was negotiated with SRI for a two-week experimental effort to establish the practicality of using the technique to inspect existing flight hardware. Simultaneously, CCSD is to run a test program to evaluate the propagation of the casting defects under induced loads and stresses.
2. S-II-1 INSTRUMENTATION FAILURES: Analyses of the ignition detection probes which caused the premature shutdown of the S-II-1 static firing at MTF indicated that the probes were shorted out internally. The polarographic H₂ detector also failed during the countdown because of improper installation by the contractor's technicians. New probes have been checked out and were utilized during the firing on 12-30-66.
3. J-2 ENGINE: Several failures of the ASI line have occurred during S-II-T and S-II-1 static firings. The failures are vibration induced. Lines of this size are not vibration tested by Rocketdyne. Laboratory vibration tests have duplicated the field failures and established a baseline for redesign. Efforts are in progress to provide a vibration verification test criteria to determine if the redesigned line is acceptable for flight.
4. S-II STAGE - REDUCTION IN S-II FUEL TANK PRESSURE: The S-II fuel tank pressure reduction of 3 psi required to provide adequate margin of safety in the tank structure will be accomplished. The payload loss is approximately 1200 pounds. The engine start pressure, run pressure, and NPSH are also reduced. Changes and re-testing in the vent valve and control pressure switch can be accomplished within three months.
5. S-IVB APS EXPULSION BLADDER TESTS: The first full-scale bladder test at Wyle Laboratories using actual APS propellants has been completed successfully. The second test was run during the past week and it also was successful, thus completing the test program at Wyle. Post-test examinations are to be completed at Bell Aerosystems Company.
6. AIAA TECHNICAL COMMITTEE APPOINTMENT: Mr. Harold S. Manning of our Advanced Studies Office has been appointed to the AIAA Nuclear Propulsion Technical Committee for 1967. Chairman of this panel is Mr. Wayne Stinnett, Associate Director of the REON Division, Aerojet-General Corporation.
7. APOLLO TELESCOPE MOUNT (ATM): A report on the design of the ATM experiment package, gimbal system, and Rack structure was given to representatives of the Astrionics Laboratory. Principal results of the meeting were as follows:
 - a. The LM ascent stage will be moved 8.0 in. forward in the Spacecraft/LEM Adapter and the ATM Rack must accommodate this change.
 - b. Flexure pivots should be investigated parallel with conventional bearings until the suitability of conventional bearings is established.
 - c. Access requirements to the experiment package will be made known to P&VE as soon as possible.

NOTES 1/3/67 MAUS

NEGATIVE REPORT

NOTES 1/3/67 RICHARD

No submission this week.

NOTES 1/3/67 RUDOLPH

1. S-II-1 Stage - second captive firing at MTF was successfully accomplished at 3:40 pm, CST, on Friday, 30 December 66 for a duration of 364 seconds. Quick look evaluation indicated that all flight critical systems performed satisfactorily.

The S-II-1 Stage is currently forecasted for "on dock KSC" on Sunday, 12 February 67.

2. Follow-on Procurement - The master consolidated stage procurement plan for Saturn V follow-on launch vehicles SA-515 and subsequent was sent to NASA Headquarters on Tuesday, 27 December 66.

The target date for approval by NASA Headquarters is Tuesday, 31 January 67.

3. Saturn V Service Arms - Dr. Debus held a major review on Friday, 21 October 66 covering swing arms, design criteria of the LUT and launch vehicle effects such as flame impingements, wind-vehicle/LUT collision problems, etc. Several actions were identified and assigned to organizations and individuals. For those actions assigned to MSFC I forwarded interim responses on Thursday, 1 December 66 and Wednesday, 21 December 66 to General Shinkle.

I have a commitment from Ludie Richard for close-out of all remaining actions by mid January 67.

I call this to your attention since I understand that General Shinkle has alerted Dr. Debus to a need for "some moderate action at the Director's level to expedite MSFC action...".

4. AS-500D Dynamic Testing - was started in the roll mode at approximately 4:00 pm, Thursday, 29 December 66. All appears to be going well.

NOTES 1/3/67 SPEER

Negative Report.

NOTES 1-3-67 STUHLINGER

Negative report.

NOTES 1/3/67 WILLIAMS

1. LSSM Procurement Plan: Mr. Gorman and Mr. Madewell discussed the LSSM Procurement Plan at NASA Headquarters on December 29, 1966. Included in the discussion from Headquarters were General Bogart, General Jones, John Disher, and Phil Culbertson. The following action is required as a result of the meeting:

- a. MSFC will submit a procurement plan to MSF by January 31, 1967.
- b. The present Bendix and Boeing contracts will be extended through June 30, 1967 by funds coming from a variety of sources, including ASO and AAP held funds.
- c. A single contractor will be selected as a result of the SEB action to conduct a definition phase on LSSM from July 1967 through February 1968. This same contractor will handle the development phase which will begin in March 1968, if such a phase is approved. The procurement plan will state that such approval is required.
- d. An internal planning session will be scheduled to determine who directs this Phase C activity.

Jan 9, 1967

NOTES 1/9/67 BALCH

S-II-1 Test Program - Preliminary review of second static firing on 12/30/66 has been completed and OK to proceed was issued by MTF on 1/5/67. Formal presentation is scheduled for 1/9/67. Cracks were discovered in turbine wheels of turbo pumps for Engines No. 2 and No. 3, and there was evidence that the turbine wheel of turbo pump for Engine No. 5 had been rubbing. All three of these turbo pumps have now been replaced with spares. Inspection of LOX tank interior is in process. Current plans call for removal of the S-II-1 from Test Stand A-Z on 1/12/67 and shipment to KSC on 1/17/67.

S-II A-1 Test Stand Activation - Last major item of GSE has been installed. The mechanical subcontract to Aetron, the prime GSH installation contractor, is being terminated, and the remaining mechanical installation work will be performed by Aetron. The test stand is still scheduled to be ready to receive a flight stage on 1/27/67.

B-2 Activation/S-IC-T Test Program - A major effort is still being made to maintain schedule for static firing on 1/27/67, but threat of slippage increases because of late deliveries of GSE mod kits and parts and delay of stage checkout pending availability of hydraulics-pneumatics. Configuration verification of the S-IC-T stage has been completed and discrepancies noted during inspection are being worked.

NOTES 1/9/67 BELEW

AAP FLIGHT #1:

In response to Dr. Mueller's letter, regarding 504-C and subsequent LM&SS missions, effort on Racks required for these missions has been suspended awaiting a decision relative to addition of EO-Zero experiments on the Rack. In support of the EO-Zero addition study effort, MSFC is investigating the feasibility of adding an EO-Zero experimental package on the Rack and providing the required subsystems to carry the EO-Zero experiments as well as docking the Rack to the Orbital Workshop. The effort is scheduled for completion the latter part of January.

TARGET SCHEDULES FOR INTEGRATION OF EXPERIMENTS INTO AIRLOCK AND MDA:

Discussions on target schedules for integration of experiments into Airlock and Multiple Docking Adapter (MDA) were held last week between I-S/AA and R&DO. Results should produce a target schedule of significant milestones that experimentors are expected to meet, in order to get experiments integrated. This schedule will be distributed to the experimentors for use and comments.

ATM PAYLOAD CAPABILITY:

Increased ATM subsystem weights in combination with reduced Saturn IB payload capability as the result of higher orbits for longer lifetimes have resulted in a critical weight situation. At this time, based on preliminary estimates, there is only a 24 pound margin for a 12 array power system and over a 1,000 pound deficit if increased Lunar Module (LM) requirements force us to go to a 16 array solar power system. We are collecting the best available data on this for status reporting purposes.

NAVAL RESEARCH LABORATORY (NRL) EXPERIMENT:

Final analysis of NRL's request to fly a subscale design verification unit in Aerobee rockets is in progress. Expect to make decision and forward contract modification next week. Our plan is to support this additional effort.

NOTES 1-9-67 BROWN

J-2 ENGINE During post-test inspection of the LOX turbine wheels on S-II-501, it was discovered that two turbopumps had cracked first stage turbine wheels and a third turbine had a first stage wheel which had experienced excessive rubbing on the stator blades. A meeting was held 1-5-67, between R&DO and IO to determine the plan of action. The decision was made to remove the turbopumps and return them to Rocketdyne where the wheels will be replaced with the latest design thick wheels. The pumps will then be "green" run and returned to MTF and re-installed by 1-24-67. This should result in a minimum impact to the stage schedule. To preclude such a problem after the acceptance tests of S-II-502 and 503, the decision was made to rework the LOX turbine or replace with thick wheel turbines prior to stage firings. However, based on a management decision reached late last Friday, 1-6-67, to ship S-II-501 to the Cape 1-17-67, three spare thick wheel J-2 LOX pumps were shipped to Mississippi over the weekend. A meeting is in progress at MTF today, 1-9-67, to determine if these pumps should be installed prior to shipping the vehicle to the Cape. The original plan to re-install the original pumps will be followed if the decision is made to ship the stage without pumps.

There was a successful two part test at AEDC, 1-4-67. To help expedite testing at AEDC, it has been decided to run up to four tests per "air-on" period. The first test was a Saturn V/S-IVB start and restart. The first burn was a nominal S-IVB first burn for 30 seconds duration. After a simulated orbital hold, the restart test was attempted with a hot turbine crossover duct and a wide open propellant utilization valve. It was first noted that the crossover duct would be warm for a restart after evaluating the orbital data from the SA-203 flight. The temperature of the crossover duct has a large influence on the relationship between the fuel pump speed buildup and the oxidizer pump speed buildup; and consequently, on the gas generator combustion temperature during the start transient. After a successful first burn test of 30 seconds duration and a simulated orbital hold the restart run was cutoff at 900 milliseconds by an overtemperature condition in the gas generator. It was contemplated that the P. U. valve would reduce the GG temp spike during transition to compensate for the hot duct. The temperature spike was reduced by 200°F; however, the test was still terminated by GG overtemperature. The last test was a successful five second Saturn V/S-IVB first burn. A meeting was held last week at MSFC with Rocketdyne, R&DO, and IO for the purpose of realigning the test plans at AEDC to place maximum emphasis on the hot duct restart problem. Also, last week I went to AEDC to discuss with Gen. Gossick what he could do to further accelerate this program. Gen. Gossick was appropriately impressed with the severity of the problem and assured me he would give this program the highest priority.

NOTES 1/9/67 CONSTAN

S-IC STAGE

Stress corrosion cracking of splice angles on the upper and lower rings of the thrust structure has been discovered. The cracking occurs at the corner of the angle. It is necessary to have the stage in the vertical position in order to remove the angle and replace it with splice plates. Therefore, S-IC-1 and 2 will require this work to be performed at the Cape. S-IC-3, 4 and 5 will go back into the vertical assembly fixture at Michoud for this changeout. We do not expect any schedule impact, although Boeing may well have lost a portion of their delivery incentive fee. Boeing will not be able to remove the forward handling ring while the vehicle is in the vertical position, thereby gaining access to the forward skirt to perform work on some engineering changes. Heretofore, these forward skirt changes had to be scheduled for the Cape since the area requiring work was inaccessible with the handling ring installed.

NOTES 1/9/67 FELLOWS

Live TV from MSFC for AS-204 Launch: In accordance with plans laid out by Bart Slattery for live, real-time, color TV coverage at MSFC during the AS-204 launch, a Saturn IB vehicle will be assembled in a horizontal position in ME Laboratory (building 4705). An additional IU will be available separately from the vehicle so that its functions might be indicated while 204 is in flight. In a different ME building (4755), mock-ups of the ATM and S-IVB Workshop will also be available for remote camera coverage, if desirable. R-OM has assisted Mr. Slattery in coordinating efforts among the laboratories for any necessary refurbishment or modification of vehicle components and placement in the vehicle in building 4705. The vehicle for TV use will be composed of the S-IB-D, Interstage, S-IVB-F, Interstage, IU-F, CSM-F, SM-F, SLA-F, and LES-F. Technical Services Office has agreed to repaint vehicle components, as necessary. Mr. Slattery is arranging with KSC and MSC for shipment to Marshall of the items presently located there. Our target date for having everything ready for the TV people is February 15, to allow them ample time for their final preparations before the launch date.

NOTES 1/9/67 GEISSLER

1. Clear Air Turbulence Program: We are participating in the Air Force's Clear Air Turbulence program by working with personnel at Pennsylvania State University, Wright-Patterson Air Force Base, and White Sands Missile Range. Our participation will consist of (1) acquiring FPS-16 radar/Jimsphere wind profiles at White Sands; (2) assisting the project manager in determining where regions of clear air turbulence should be encountered, and directing the aircraft into these regions; and (3) assisting in the preparation of a report summarizing the findings. The program will consist of flying an F-104 aircraft, instrumented for turbulence measurements, for a five-day period over southern Utah where an FPS-16 radar facility is located. We consider this to be a valuable program, and it will not require excessive personnel time since the program is underway. Dr. Scoggins has been invited to make a presentation at a Clear Air Turbulence meeting to be held at Scott Air Force Base, Illinois, on January 16 and 17. His presentation is about the use of detailed wind profiles in determining the onset and decay of clear air turbulence.

1. LSSM QUALITY REQUIREMENTS: This Laboratory has recently completed preparation of quality requirements for the Phase D LSSM effort, and for the first time the concept of "Phased Project Planning" has been implemented at MSFC with regard to quality requirements. Quality requirements were written for Phase A of the LSSM and expanded as necessary through the preliminary design, definition, etc., phases. Although several other MSFC projects are being phased as above, the LSSM is the first in which quality requirements have been provided for all four phases. This method of operation has proven successful on the LSSM as the quality assurance effort has progressed consistent with other development efforts on the program.
2. FIRST ARTICLE CONFIGURATION INSPECTION (FACI): The recent FACI of S-IU-502 at IBM Huntsville marks the conclusion of our major efforts as lead Laboratory in support of IO directed First Article Configuration Inspections. To date, efforts have consisted mainly of baselining all major stages and associated hardware configurations and, consequently, the institution of formal engineering change control. The principle effort remaining for this Laboratory is the support of IO in the performance of FACI's of the major difference of subsequent vehicle stages.
3. CRITERIA AND STANDARDS BOARD: We have established a Laboratory level Criteria and Standards Board which, after approximately six months of operation, has proven to be beneficial to the Laboratory, MSFC, and other outside agencies by providing: (1) a central point to focus problems encountered with multiapplication specification, standards and procedures; (2) control of efforts devoted to the preparation of such documents within the Laboratory; (3) a unified Laboratory position on technical content of these documents; and (4) a single contact point for other Laboratories. Other organizations might find a similar board of benefit. We will be glad to provide the SOP which we have developed to interested parties.

NOTES/1-9-67/HAEUSSERMANN

1. SURVEYOR TV SYSTEM: Reference your note of December 13, 1967 through R-DIR to Mr. Hamilton, R-ASTR, Subject: Surveyor TV study for coverage of the transposition maneuver. Without question, televising the transposition maneuver will provide a vivid display of this critical operation. It will aid ground personnel in performance evaluation and provide a secondary warning system to the astronauts of impending troubles. There are fundamental problems in using the Hughes Surveyor System for television observation:

- a. The Surveyor camera is slow-scan, and would not provide rapid observation due to a time lapse to read-out data.
- b. Scan conversion will probably degrade resolution.
- c. Some package modifications will be necessary.

These same objections extend to the Apollo Camera. However, its scan rate is considerably higher (10 frames per second) than Surveyor.

The use of the Unified S-Band (USB) link does not appear feasible because:

- a. Use of Command and Service Module (CSM) transponder would eliminate all communications such as voice, telemetry tracking, during a critical phase.
- b. Use of Lunar Module (LM) transponder is not possible because its channel is assigned to the I. U. until final separation.

The proposal from Hughes Aircraft has not yet been received. As requested by Mr. Shepherd, OMSF (Mr. Ivan Mason) has been contacted.

We would like to recommend the use of the same camera and transmitter as used on AS-203. Operating frequency should be modified for 1700 mc to be compatible with the STADAM Network. Resolution would be equal to results of AS-203 and the system is fully compatible with standard network television.

2. ATM: The second meeting of the LM/ATM Task Team was held at MSC on 1/5/67. Excellent cooperation and technical progress resulted in a number of areas; however, severe problems exist in other areas.

Seemingly adequate space was identified in the LM for ATM displays/controls and progress was made in identifying instrumentation/communication responsibilities of the two Centers. MSC will be responsible for the antenna modifications to the LM and MSFC for ATM rack antennae.

In the electrical subsystem, MSC cannot yet identify load profiles needed by MSFC to proceed with detail design. MSC is still studying the LM thermal situation when clustered and is unwilling to commit to a power profile until this study is complete, possibly not until mid or late February. As a result, electrical subsystem design for ATM must be suspended. Your assistance in additionally emphasizing to MSC one time-critical need for a power profile commitment would be helpful. MSC promised to provide MSFC a schedule of their plans on this subject this week.

NOTES 1/9/67 HEIMBURG

POWER PLANT TEST STAND

Test P1-488 was conducted with H-1 Engine H-7057 on January 6, 1967, for a duration of 15 seconds. This was the fourth successful pre-valve shutdown with this engine.

SATURN V PRIMARY DAMPING SYSTEM

The Damper Arm was received December 15, 1966, and was installed in the Test Facility on December 17, 1966. During the week of December 19 through 24, instrumentation was installed and calibrated. Structural tests were performed the following week (December 27 through 30) with satisfactory results. Since January 3, we have been attempting to check out the mechanical hook system with little success. Two hook cylinders have been damaged while trying to operate the system.

At the present, it appears that a change will be required in the hook design to make it work. Because of the problems, we are approximately one week behind schedule. We are working on this with P&VE.

NOTES 1-9-67 HOELZER

1. REPLACEMENT OF GE-235 AT PROPULSION AND VEHICLE ENGINEERING LABORATORY: Computation Laboratory, in cooperation with Propulsion and Vehicle Engineering Laboratory, is working on the replacement of GE-235 computers used for structural testing. In the new system, the third generation computer which will be located in Building 4663 (Computation Laboratory) will perform most functions of the existing computers. Only a small computer used for the acquisition of the data will be required at the test facility. Since a fairly fast computer is needed for these tests during very short periods of the total testing process, the sharing of the central facility on an interrupt basis is the ideal solution. This new system will result in expanded capabilities at a savings of approximately \$20,000 per month. Plans call for implementation by December 1, 1967.
2. ADDITION TO BUILDING 4491: The new computer room in Building 4491 has been accepted and the air conditioning system appears to be functioning properly. Considerable trouble was experienced with this air conditioning system earlier. The second 7010 (the on-line computer) has been moved into the new addition relieving previously crowded conditions, and contributing to better operation in the Data Center Division.
3. LIEF CONTROL PROCESSOR MODIFICATION: The LIEF system is presently being modified to include several items necessary to support the increased data capabilities. The Collector/Distributor Computer has been modified to allow a dual redundant central processor which was installed and presently in a 30-day acceptance test period. During this 30-day period, the operational LIEF software will be used to verify the expanded system. Additional display (i.e., meters, light and display generators) capability being placed in the system will allow an adequate participation of Center engineers in all launch and checkout events. Software to operate the system at full capacity for the expanded system is being developed and will be operational within the next several months.

NOTES 1/9/67 JAMES

AS-204: KSC completed erection of the spacecraft on Saturday, January 7, 1967, six days ahead of the current schedule. The pull test to verify calculated missile reaction to wind loads was also completed. Preliminary assessment is that the data are good but that the deflections were slightly less than anticipated.

²⁰⁵
AS-204 PAYLOAD CRITICALITY: The recent Saturn IB mission change and the associated heavier payload (38,100 pounds versus 35,300 pounds), the possible requirement to add heaters and a battery to the IU, and the loss of payload due to increased S-IVB residuals has resulted in a significant reduction in the amount of S-IVB propellants available for Flight Performance Reserve (FPR). The -3 sigma FPR requirement is approximately 1300 pounds. The current estimates indicate we can barely make this minimum requirement provided there are no additional dry weight increases to the vehicle. This is an item that we must watch very closely and scrutinize any changes that will add weight to the vehicle. We are pursuing the possibility of re-adding the S-IVB cutoff timers in the event we need to regain the payload that was lost when we deleted the timers.

AS-206 PAYLOAD CHANGE: The recent ^{MSC} ~~MSFC~~ decision to remove non-essential flight systems has reduced significantly the payload requirement for the AS-206 (from 38,600 pounds to 36,300 pounds). This reduction poses no problem and will be incorporated into the new operational trajectory to be released shortly.

FOLLOW-ON EFFORT: Chrysler will have the engine and tail area cable mockup for S-IB-13 and subsequent stages available for inspection next week. The configuration of the follow-on vehicles is fast being set in concrete. We are preparing a TWX to Headquarters reminding them of the necessity for an early decision on the release of the follow-on program.

NOTES 1-9-67 JOHNSON

1. Project THERMO - Reviewing the Project at MSFC on 1-4-67, the MSF Experiment Review Ad Hoc Group, chaired by Mr. Doug Lord, concluded that the proposed experiment would not be ready to seek flight approval in the 3/67 MSFEB meeting, because of problems in the following areas: payload weight, power requirements, attitude control system, and integration and operational aspects.

The group indicated that the present Form 1138 (Apollo Earth Orbital Scientific Experiment Proposal) left the following questions open: (a) why is this experiment being done, (b) what is the practical application of the information obtained, (c) what are possible long and short term technical utilizations, (d) what additional experiment could be performed on the first and follow-on flights. All these questions are to be considered, when the Form 1138 is updated and finalized. P&VE plans to have this action completed by 3/1/67. It is intended to implement Phase C of the experiment starting 3/1 in line with Mr. Weidner's decision after the THERMO presentation in Nov.

In the THERMO Panel Meeting on 1-5-67, P&VE as lead lab, concluded that the planned presentation to Dr. Mueller (sometime in Feb.) will present the best possible approach for securing approval of the project. I discussed such a presentation with Dr. Mueller recently and he was receptive to the arrangement.

2. X-Ray Mapping (Hq's Experiment # SO-27) - Design Review was conducted 1-6-67, ninety-eight days after contract was let with the University of Wisconsin. A number of action items were identified and completion dates established. These items included:

Information on view angle and mounting to be furnished by P&VE by 1-9-67.

Information concerning calibration of experiment to be furnished by R-ASTR-BU by 1-13-67.

Formalization of a General Test Plan - the outline to be completed by R-ASTR-BU by 2-15-67 with the final form by 3-15-67.

Space Craft, Inc. documentation submittal, qualification test plan, acceptance test plan and etc., to be reviewed by QUAL. Review to be completed by 1-20-67.

ECR proposal for integration in I. U. to be submitted by IBM by 1-16-67.

3. Crew Quarters (MSFC Experiment # 38) - In a management and funding clarification meeting on 1-5-67 between representatives of R-EO, R-P&VE, and I-S/AA it was decided that because the design of the Workshop inherently includes the features of this experiment, Crew Quarters as such, would be dropped as a "corollary experiment" and included in the detail design of the Workshop.

NOTES 1-9-67 KUERS

1. Damper Arms: Tests were started this week at R-TEST on the first arm. Present indications are that extensive redesign and rework will be necessary. Our planning and shop personnel are on site to coordinate work requirements.

2. LM Models: We have completed this week a full-scale LM model for display at the Montreal Fair. This model

a. is waterproof and weather resistant.

b. is fitted internally with instrument panels and signal lights. The signal lights flash in a most realistic manner!

c. has a plexiglass side through which the interior of the LM may be viewed.

Two more such models are being built: one for the Paris show and the other for the Smithsonian Institute.

1. THERMAL CONTROL OF ATM: Per your suggestion on December 8, 1966, we have investigated aircraft-type windshields and thin film heaters for use on ATM experiment mounting structure. Neither glass nor fiberglass reinforced plastic spars are feasible. Aircraft windshield type thin film heaters appear very attractive for thermal control of both the experiments and the spar, due to minimum space requirements and ability to conform to irregular shapes. This type heater is being considered for all experiments and components within the experiment package, and for local areas of the spar such as at heat leak points (gimbal attach points, etc.). A possible problem area on which information is not available is that of outgassing under hard vacuum. We intend to investigate this in the laboratory as required.
2. S-II IN-FLIGHT HELIUM INJECTION: As a result of MSFC direction, North American has submitted ECP 4083E to provide for helium injection in the LOX recirculation system. The change is considered mandatory. The fix will be verified prior to S-II-1 flight during S-II-2 static firing. S-II-1 through 4 will be retro-fitted at MTF, S-II-5 and subsequent in line. Estimated cost of the change is \$1.2 million.
3. S-II CONTROL PRESSURE DECAY PROBLEM: The 350 psi/min pressure decay that has been experienced on S-II-1 during cryogenic operations has been traced to LH₂ recirculation valve actuator flange leakage. After addition of "invar" thermal compensation spacers on the bolt circle of the actuator flange, system pressure held at an acceptable level throughout the stage operational sequence under cryogenic conditions.
4. J-2 ENGINE TURBINE WHEEL INSPECTION: S-II-1 post-static inspection has revealed damaged turbine wheels on J-2 Engine positions 2, 3, and 5. Two first stage wheels were cracked; there was evidence of severe rubbing and wear on the manifold housing and stator blades of a third.
5. RACK/PAYLOAD MODULE: As of January 4, 1967, all R&DO effort in support of the RACK/Payload Module, AS-504C, was terminated. Cessation of activities was due to withdrawal of requirements for AS-504C mission. Further program definition will be published in the near future. All RACK/Payload Module project engineers have been informed.
6. 501 DAMPER: The structural testing of the ML-1 Primary Damper System was completed successfully on January 3. Damper System installation began on January 4. We are currently six working days behind schedule; however, we believe this can be overcome by working overtime to meet the on-dock delivery date to KSC of February 1, 1967.
7. Ph.D. STUDIES COMPLETED: R. L. Gause of our Materials Division successfully defended his Ph.D. dissertation, entitled, "Investigation of Elastic Distortional Wave Birefringence due to Crystallite Preferred Orientation and Stress in Anisotropic Polycrystalline Aluminum", at Oklahoma State University on December 19, 1966. This completes all requirements for his degree in Engineering Mechanics.

NOTES 1/9/67 MAUS

FY 68 MSF R&D BUDGET - The following tabulation, showing a breakdown of FY-67 and FY-68 MSFC funds, was received from MSF via telecon on January 6, 1967. MSF representatives believe that these amounts are very close to the amounts that will appear in the FY-68 Budget.

	<u>Budget Estimates</u> (\$ in Thousands)		<u>MSFC</u> <u>POP 66-3</u>
	<u>'67</u>	<u>'68</u>	
MSFC			
Saturn IB	199,800	129,900	140,900
Saturn V	1,051,800	1,019,700	1,074,700
Engines	49,800	24,500	24,500
Supt. Dev.	12,696	14,000	34,000
AAP*	37,445	199,600	449,200
Adv. Studies	2,600	3,100	14,000
Total MSFC	<u>\$ 1,354,141</u>	<u>\$ 1,390,800</u>	<u>\$ 1,737,300</u>
Houston		1,392,000	
KSC		232,000	
Hdqrs		54,100	
Goddard		100	
Total MSF		<u>\$ 3,069,200</u>	

* AAP FY-68 \$199.6 includes \$124.1 for launch vehicle procurement. The MSF AAP estimate in POP 66-3 was based on a wish list.

POP 67-1 - MSFC POP 67-1 is due in headquarters on January 23. The Director's Review is scheduled for January 19.

ORGANIZATION & PERSONNEL CHANGES - Dr. Gilruth's proposal for a Science and Applications Directorate at MSC (same level as Faget) was approved by Mr. Webb on December 23, 1966.

NOTES 1/9/67 RICHARD

S-IB Prevalve Shutdown: The present status on SA-204 of the prevalve electrical control is that: (1) for flight operation the prevalves are closed if a cutoff command is present and if two out of three of the Thrust OK pressure switches indicate low thrust and (2) for GSE control the stage must have received a cutoff command.

Recent tests by the Test Laboratory have indicated that the H-1 engine can be cut off promptly with the prevalves.

SA-204 has been modified to the above interlock ground rules. A decision has been made by the IB Program Office to do no more modifications to the stage or GSE in the prevalve area. This is acceptable to all parties concerned. KSC is implementing a special test to verify one stage circuit that cannot be verified in a system test for SA-204.

NOTES 1/9/67 RUDOLPH

1. S-II-1 Stage - post firing data evaluation meeting being held at MTF, today, Monday, 9 January 67.

Current planning is for the S-II-~~2~~ stage to come off the stand at MTF this week, Thursday, 12 January 67, to be shipped from MTF on Tuesday, 17 January 67 and to arrive "on dock KSC" on Tuesday, 24 January 67.

2. S-IC Stage - secondary method of thrust termination is considered a mandatory requirement since cutoff by pre-valve closure during a single F-1 engine captive firing resulted in an explosion that would have caused loss of stage had it occurred during a captive stage firing or the loss of a vehicle had it occurred during launch operations.

A secondary means for activating the F-1 engines main valves has been developed which will also assure that the pre-valves will not close prior to main valve closure.

Since incorporation of this change effects S-IC-2 stage delivery date to KSC, General Phillips approval was obtained.

Incorporation of this change delays the S-IC-2 stage "on dock KSC" date from Monday, 27 February 67 to Monday, 13 March 67 (2 weeks). S-IC-1 stage can be modified with no schedule impact to SA-501. No schedule impact anticipated to S-IC-3 and subsequent stages.

3. S-IC-T Stage - pre-firing review scheduled for Wednesday, 25 January 67, at MTF. Firing scheduled for Friday, 27 January 67, at MTF.

NOTES 1/9/67 SPEER

1. HOSC PRESENTATION TO CHRISTENSEN: A presentation on current LIEF/HOSC development planning and budgeting was given General O'Connor on January 4, preparatory to a similar presentation requested by Christensen (MSF) on January 16. Christensen has become aware of our addition to the HOSC and changes in the display system and has requested more visibility of LIEF plans and costs. We do not expect any specific problems resulting from his review of our plans, but we do expect a continuing closer review by MSF.
2. ATLANTIC VERSUS PACIFIC RECOVERY FOR SATURN V: Gen. Phillips has determined based on a MSC study, that AS-501 and 502 will be planned for a Pacific recovery. The advantages of changing the prime recovery area from the Pacific to the Atlantic on subsequent Saturn V missions have not been completely defined and a decision is expected later.
3. ORBITAL REENTRY DEBRIS HAZARD ANALYSIS: We have been notified by Headquarters (Christensen) that a complete debris analysis on a mission by mission basis is no longer required. Instead, Headquarters is asking that we perform additional studies (for earth orbit cases) only when major changes in hardware or flight paths occur. However, MSFC has been requested to perform a study on the behavior of the S-IVB/IU when abandoned on nominal lunar missions. We have asked R-AERO to perform this study.

NOTES 1-9-67 Stuhlinger

1. ONE-YEAR WORKSHOP: Mr. Downey and Mr. Duncan, together with several astronomers of SSL, have been working with Mr. Jean Olivier, of ASO, concerning astronomy tasks for a one-year, low altitude orbital workshop. This is in connection with an ASO contract to study the mission and preliminary design for such a workshop. It would essentially parallel the Orbital Astronomy Support Facility work, in more detail, but for only a one-year time period. We are working with ASO in defining "representative" type astronomy experiments on which to base workshop design. The following possible experimental areas were outlined for consideration:

- a. X-ray, approximately 10" aperture
- b. UV, 20-40" telescope
- c. IR/MM, approximately 10' dish
- d. X-ray, approximately 1^o resolution

Existing design modules will be investigated, in view of the time and cost elements (e.g. - ATM, EMR, OAO modifications, etc.).

2. NAS FELLOWSHIP: Dr. R. B. Lal, a National Academy of Sciences Postdoctoral Fellow from India, has just completed two years of research in our Space Thermophysics Branch and will be with the group for approximately ten more months before returning to India. Dr. Lal has made excellent contributions to our research on thermal control surfaces. His results have been directly applicable to the solution of knotty problems on UV degradation of thermal coatings on the PEGASUS satellites. He has blended very well into our in-house research activity in solid state physics, using our equipment for electron paramagnetic resonance (EPR), magnetic susceptibility, etc. Scientific papers were published under his own name, or in many cases as co-author with our own scientific people. The publications have found wide interest. One of these, co-authored with Gary Arnett of SSL, has had more than 50 requests for reprints from more than 10 different countries. The National Academy of Sciences seems to be well pleased with Dr. Lal's performance, and we feel that he is a real asset to our Laboratory.

3. STATUS OF PEGASUS PANEL RETRIEVAL: A meeting was held with Bellcomm and OART personnel to review the status of the retrieval of the PEGASUS thermal and meteoroid panels. Bellcomm made a compatibility analysis and came out with a strong recommendation in favor of the experiment. Because of the importance of the results, they would like to fly it as early as AS-207. MSC will be brought in by MSF for a compatibility analysis.

NOTES 1-9-67 WILLIAMS

Negative Report.

Jan 16 1967



169-2/e

NOTES 1-16-67
WITH COMMENTS

MR. GORMAN'S COPY

No DEP-A comment.

OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	<input type="checkbox"/> ACTION	<input type="checkbox"/> INFORMATION

1. Bennett *1/24*
2. ^{abm} ~~Ed~~ 1/24
3. Nancy

REMARKS

Due to the large amount of paperwork accumulated during Dr. von Braun's absence, he has decided not to make pencil comments on the Notes of 12-27, 1-3, and 1-9. These notes are being filed here and will not be returned to you.

CODE	DIR	NAME	DATE
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NOTES 1/16/67 BALCH

B 1/18

1/16 JVS

S-II-1 Stage - Inspection of LOX tank interior revealed that repairs previously made to the aft bulkhead were still in satisfactory condition. Formal data presentation for second static firing test was made on 1/9/67. Review of data showed test was satisfactory. The stage was removed from the A-2 stand on 1/12/67 and was shipped to KSC early this morning, 1/16/67. ✓

S-II, A-1 Test Stand Activation - During the past week, revised completion dates were received from the Corps of Engineers on high-pressure gas and propellant systems. These dates reflected slippages ranging from about seven days in the high-pressure gas systems to as much as 27 days in the LH₂ system. Some slippage in these areas was anticipated in connection with closeout of the contract, and workarounds and plans for working concurrently on follow-on activities had been devised to counteract the impact of the slippage. These plans are now being implemented, but the slippage is indicated. Present plans call for the stand to be ready to receive a stage about 2/12/67. These plans were fully coordinated with S-II Stage Office personnel during their status review of the S-II A-1 test stand at MTF during the past week. ✓

B-2 Activation/S-IC-T Test Program - First static firing has now been rescheduled from 1/27/67 to 2/9/67, with RP-1 tanking set for 1/30/67 and LOX tanking the following day. Major problems which necessitated this rescheduling were late delivery of CSE mod kits and parts, late availability of hydraulics/pneumatics required for stage checkout, deficiencies in high-pressure gas systems and associated technical systems, and interface problems with government-furnished GSE. Rescheduling of S-IC-T first firing does not impact schedule for acceptance test firing of S-IC-4 stage. LOX flow test was successfully conducted on 1/15/67 verifying the structural integrity of the system and demonstrating the capability of the system to maintain design flow in excess of 10,000 gpm with the LOX being supplied by five remote-controlled LOX barges in full operational test mode. ✓

ORBITAL WORKSHOP: A meeting was held January 11, 1967, with Douglas Aircraft Company (DAC). R&DO has established a design criteria for the meteoroid bumper and DAC presented an ECP for their bumper design. It was decided that the primary method of elimination of LOX and fuel residuals would be the use of non-propulsive vents; engine dumping will be pursued as a backup method.

The DAC neutral buoyancy quick opening hatch has been received at MSFC. The DAC hatch, together with the MSFC designed hatch, will be evaluated in underwater tests scheduled to start January 16, at MSFC.

The Crew Evaluation Airlock Engineering Meeting was accomplished on January 9, 10, 11, 1967, at McDonnell. Both R&DO and IO participated. MSFC received four action items out of fifty. The Revisitation and Rehabilitation Meeting was held on January 10, 1967, and covered the configuration studies, mission operation, component and material review, tests, change recommendations, and major efforts to date. ✓

ATM: Discussions at the LM/ATM Task Team meeting last week indicated severe problems in integrating the entire AAP 1-4 mission module.

Specifically critical were electrical power demands, thermal balance, instrumentation and communications, docking dynamics and payload/performance. One of the suggestions from MSC was to discard the option to fly the LM/ATM free or in combination with the CSM only. This is not acceptable since it would restrict the ATM mission option too severely.

In conclusion, we have not been able to make timely design decisions on the ATM since the November cluster go-ahead primarily due to the complex MSFC/MSD design interaction on the cluster operation. This difficulty has been impacting and continues to impact the ATM schedule. MSD continues to work on the broad engineering investigations to adapt Apollo hardware but it doesn't appear that final answers will be made available to meet the present ATM design schedule. I will send you further information on these developments in the near future.

MULTIPLE DOCKING ADAPTER (MDA): We received a letter from John Disher providing the direction to proceed with the MSFC design and fabrication of an MDA which would be cantilevered from the top of the Airlock Module. We were also directed to perform systems engineering analysis on the Orbital Workshop to assure compatibility with the new baseline configuration. ✓

INTEGRATION CONTRACT GUIDELINES: Presentations on the Phase "D" Payload Integration contract guidelines were made to Messrs. Hueter and Weidner on January 6, 1967, and to Mr. Rees on January 10. The intent was to phase the contractors into on-going effort at MSFC by providing support on 209-210 and then assume greater responsibilities on new starts in later phases. ✓

LOCAL SCIENTIFIC SURVEY MODULE: A teletype sent to Headquarters requested funding to allow both Bendix and Boeing to continue their Phase B definition efforts on LSSM through this fiscal year. It also requested one million dollar program authority be provided for the final definition phase. This final definition will be awarded to one contractor starting in July 1967 and will continue for eight months. ✓

Lee B.
!!
What do you suggest?
B

1/16 JTB

B
1/12

J-2 ENGINE There were four tests planned for the "air-on" period Friday, 1-13-67, at AEDC to evaluate the hot turbine crossover duct restart problem. The first test, a 30 second test, at restart conditions except for a cold crossover duct was successful. During the test a fire was observed in the area of the ASI spark plugs. This fire was later confirmed by leak tests and color movie observation and was determined to be a leaking ASI spark plug seal. This was the first time this problem has occurred since the early days of the development program. The ASI assembly was changed over the week-end and four tests are planned Wednesday, 1-18-67.

S-IVB Stage 208, the first Saturn IB to utilize a 230,000-pound thrust engine, was successfully acceptance tested on 1-12-67, for approximately 425 seconds. The test program included gimbaling and 350 seconds of engine operation at propellant utilization conditions. The acceptance test of S-IVB is scheduled for 1-18-67. ✓

The engine modification and checkout work planned on S-II-501 at MTF was completed 1-13-67. The work transferred to KSC has been identified and work planning is underway by Rocketdyne and KSC. ✓

All five LOX turbopumps on S-II-2 have been replaced with turbopumps having thick turbine wheels. ✓

F-1 ENGINE On 1-9-67, an R&D turbine manifold failed while driving an experimental turbopump. This manifold was interim configuration and had about 3962 seconds and 66 tests prior to the failure. There are no similar turbine manifolds in the field. Test stand damage was very minor. All of the first and second stage turbine blades were thrown from the wheels and a six-inch long crack with as much as 1/8-inch gap was found in the inner nozzle to torus weld 180° from the turbine inlet. The turbopump is being returned to Canoga for more extensive analysis of the failure. Present evaluation is that the failure was a result of using overage, experimental hardware, and no significant impact on the F-1 Program is anticipated.

A review of the status of the F-1 engine redundant cutoff system has revealed, that with expediting, shipment of six retrofit units from Rocketdyne for SA-501 will be made on 2-10-67 and six units for SA-502 on 2-17-67. Coordination of these delivery dates with KSC and MSFC indicates that kit installation and checkout can be accomplished on 501 prior to moving-to-pad. Installation can be accomplished on 502 prior to shipment from MSFC, however, checkout must be accomplished at KSC.

H-1 ENGINE The replacement of first stage turbine wheels at Neosho is on schedule. Four engines were tested after the turbine wheel replacement. The thrust remained within model specification requirements.

Five prevalve shutdown tests have been conducted at Test Lab. The object of these tests is to determine the effect on H-1 engines of a prevalve shutdown in flight. No difficulties have been encountered that would affect flight. ✓

NOTES 1/16/67 CONSTAN

1/16/67

B 412

Negative reply.

NOTES 1/16/67 FELLOWS

1/16/67

B 4/18

Single Support Contract Administration: A problem was recently identified by the Computation Laboratory in administering single support contractor travel for recruitment purposes. The "Support Contractor Management Manual" required that every trip, recruitment or otherwise, had to be approved in advance by the Responsible Official. The impracticality of that requirement was brought to Mr. Buckner's attention with a request that the language in the travel chapter of the manual be modified to exclude recruiting travel from prior approval and that that type of travel be controlled by allocation on a Schedule Order of funds for a specified period. Mr. Buckner, being in agreement with that request, moved very quickly and effectively in preparing a manual modification which was issued last week by DEP-A. ✓

1. Meeting on Low Density Aerodynamics and Upper Atmosphere Research: Last Tuesday Dr. R. Smelt (Chief Scientist of Lockheed and Chairman of the NASA Research Advisory Committee for Space Vehicle Aerodynamics) and Professor S. Bogdonoff (Princeton University) visited us to receive a review of our activities in Low Density Aerodynamics and Upper Atmosphere Research and a status report on our High Reynolds Number Facility. We presented: (1) Concept of AAP Cluster Mission (Orbital Workshop, ATM etc.) and aerodynamic problems posed thereby; (2) Our Orbital Lifetime Prediction Techniques; (3) Our High Altitude Atmospheric Research Program (sounding rockets and satellite experiments); (4) Our Low Density Aerodynamics Research activities. The visitors were quite impressed with the depth and scope of our activities and Dr. Smelt suggested that we conduct a special symposium covering Orbital Lifetime Prediction, Low Density Aerodynamics, and Upper Atmosphere Research, inviting not only U.S. researchers in the field, but also people like King - Hele and G. E. Cook (R.A.E. Farnborough). They endorsed the concepts of our orbital experiments on Low Density Aerodynamics which are in the planning stage (Odyssey and others) and Dr. Smelt felt strongly that we should plan some of these measurements as early as possible (on the Workshop Flight rather than on 212). Our new theoretical approaches to low density aerodynamics problems have enabled us to quantitatively explore discrepancies between direct density measurements obtained with probes on rocketsondes versus values obtained indirectly from satellite orbit decay. ✓ Those discrepancies which amount to factors from 2-5 have shown up consistently in several programs (e.g. Explorer 17 and Russian measurements) without adequate explanation. In the second part of the meeting, during the High Reynolds Number Facility status report, Dr. Smelt informed me that he feels that an "Economy Version" of the Facility should be built at MSFC and that he had discussed this with Mr. Pearson of OART and found him agreeable. This confirms certain statements which Mr. Pearson made to me and we can be assured that no further attacks will be raised from outside if we can find the funds necessary for our "pilot-facility." Ref. item 1 in Notes 10/24/66 Geissler, copy attached. ✓

2. LM/ATM Task Team: A status meeting of the MSFC/MSFC LM/ATM Task Team was held at MSC on January 5, 1967, along with the initial meeting on January 4, 1967, of the Mission Planning and Analysis Sub-Group co-chaired by R-AERO (Mr. McNair). Several MSFC/MSFC interfaces were identified at the sub-group meeting, e.g., possible crew radiation dosage/orbital altitude tradeoff, common MSFC/MSFC set of cluster weights, and ATM control moment gyros dumping requirements. MSC identified a critical RCS (reaction control system) budget problem independent of use of the RCS for back-up deorbit considerations. MSC and MSFC agreed to study a cluster rendezvous scheme consisting of two rendezvous, i.e., taking both resupply module and LM/ATM up simultaneously to the workshop with the GSM, in addition to the current three rendezvous mode, in order to conserve RCS and SPS (service module propulsion system) propellant. The sub-group requested the Task Team to resolve the workshop lifetime requirements (both one and two years have been quoted) and to initiate action to resolve docking port assignments as soon as possible. ✓

NOTES 10/24/66 GEISSLER

1. NASA Research Advisory Committee on Space Vehicle Aerodynamics:

On Oct. 17 and 18, Mr. Dahm and I attended a meeting of the above committee at MSC. Several presentations were made which confirmed and emphasized my previous presentation on the need for exploration of High Reynolds Number problems. In addition to problems for large launch vehicles, examples were also quoted pertinent to the development of subsonic, transonic, and supersonic aircraft (especially with respect to the chord-wise location of shock waves on wings which is critically dependent on Reynolds Number). Mr. Dahm reported about our design studies on a Ludwig Tube type facility which is economically superior to a blow down tunnel. A somewhat more modest facility than our recently proposed Hi-Re-No facility could eventually be built for as little as \$250-500K. It was also pointed out by Dr. Smelt, that the quality of the flow in this type facility could be expected to be better than in a conventional blow down tunnel. A resolution was finally passed (with only one dissenting vote) that the committee endorses the need for simulation facilities of higher Reynolds Number.

Mr. Pearson from OART, who is our official contact in matters of this facility, told me privately that he feels we at MSFC could and should go ahead with a pilot facility of the cost level mentioned above which would not require congressional approval. ✓

2. XVIIth International Astronautical Congress: The paper entitled "Adaptive Guidance for Saturn Vehicles," prepared by Mrs. D. Chandler, Mr. W. Deaton and myself, which was presented by Mr. W. Deaton at the above meeting, was very well received by the audience of approximately 200 people. The presentation lasted about 14 minutes, and the question and answer period took about 10 minutes. Perhaps the highlight of the presentation came at the end of the question and answer period when Roland Cosaert (a representative of E. L. D. O., European Launch Development Organization) asked for the floor and gave about a 5 minute talk on how well the iterative type formulation worked on their radio guidance system. A copy of our paper has been sent to you. ✓

3. Gravity Simulation Workbench: Based on a suggestion by Dr. Mueller, a "gravity simulation workbench" experiment has evolved as a possibility for the S-IV Workshop. As principal investigators by appointment from R-EO, we are preparing to conduct preliminary tests and develop the necessary documentation for submission of the experiment to the MSFEB in January 1967. Briefly, the experiment is to evaluate the practicability of using aerodynamic drag as a substitute for gravity when assembling devices. An electric fan underneath a perforated work surface provides the required unidirectional gas flow which is to settle and hold loose parts and tools against the table. ✓

4. Fourth Annual DOD/NASA/FAA Symposium on Navigation, Guidance and Control: This symposium was held Oct. 11-12 at WPAFB, Ohio, and featured presentations on navigation, guidance and control goals of the military, NASA and FAA, by the directors of research in these fields of the various agencies. Among eight invited presentations, Mr. J. R. Redus, of our Astrodynamics and Guidance Theory Division, presented NASA's technical paper on launch vehicle control problems and research. A copy of this paper has been sent to you. ✓

E.G.
Let's discuss a specific plan
B

1/16 983

1. S-II PROGRAM: This Laboratory's support to the S-II Program is being increased further. Two to three Quality Control Representatives will be on continuous TDY to provide evaluation of X-ray film, and four additional personnel are being assigned to Seal Beach (temporary or permanent reassignments from other field stations). Key Laboratory supervisors are also being assigned full time to provide support and evaluation of the S-II Program.
 - o The S-II-2 stage, located at Seal Beach, is being prepared for shipment to MTF on January 23, 1967. Turnover meeting is now scheduled for January 18, 1967. A determination has not been made at this time as to whether the requirement for change-out of five lox pump turbine wheels (resulting from the cracks detected on the S-II-1 lox turbine wheels at MTF) will be performed at Seal Beach or MTF. ✓
2. INSTRUMENT UNIT PROGRAM: The S-IU-205 Instrument Unit has been extensively modified since systems checkout was completed. The unit is now scheduled to go through limited retest due to the modifications. IO has elected to rerun the tests proposed by IBM rather than the more encompassing tests recommended by this Laboratory. IU-205 will go into the checkout station as soon as IU-207 checkout is completed (about February 1, 1967). ✓
3. COLLABORATION OF IO CONTRACTS OFFICE AND Q&RA LABORATORY: An agreement has been formalized between this Laboratory and the IO Contracts Office. This agreement sets forth the responsibility and interface requirements of both organizations in integrating quality and reliability requirements into procurements per NASA procurement regulations and dealing with government agencies. It should do much toward precluding operational problems in these areas between our groups. Similar agreements are needed with other MSFC elements in order to completely close the loop and we will work these out as soon as possible. ✓ These agreements should not only permit us to do a more effective job but are features that NASA Headquarters personnel will be looking for on upcoming surveys of MSFC procurement and quality assurance operations. ✓

B 1/18

1/16 983

1. DIFFICULTIES WITH ST-124M GYRO SPIN AXIS BEARING: Bendix has two vendors for these ball bearings. One is New Departure, a subsidiary of General Motors. You may imagine that New Departure is more interested in giving good service to AC Spark Plug; however, information from MSC indicates that they also are having problems with bearings. The other manufacturer is Marlin-Rockwell which, about a year ago, was bought by TRW. We have the impression and verbal assurance that they will do their best to deliver us good quality. In recognition of these deficiencies and also the low interest (due to their small MSFC dollar volume) of both groups to set up very stringent and screening laboratory in their own factories, we have discussed with Bendix that they make a proposal to set up a screening laboratory in their plant. The cost for such a laboratory was estimated at \$350K. Based on the completion status of presently contracted-for hardware, as well as the lack of authorization for follow-on IB/V hardware, the Saturn V Office did not approve the establishment of the screening lab. Since there will be at least follow-on Saturn V, we have discussed this with Ludie Richard and will take it up with IO again and hope to get new support. There is a 6 months lead time from the spin axis installation to the full evaluation of the gyros, and every re-work is time consuming and costly. It doesn't take too many reworked gyros to accumulate \$350K worth of effort and the lab would alleviate any potential schedule problems.

2. GYRO GUIDANCE BACK-UP MODE: MSC has decided not to use manned guidance back-up mode for Apollo. Lack of memory in the Apollo guidance computer and the interfacing difficulties with our Launch Vehicle Data Adapter contributed to this decision. ✓

3. APOLLO: The early design concepts for LM/ATM resulted in several thousand pounds of payload margin. With the growth (weight and volume) experience in the telescope packages, the electrical power increase, the requirements for the vernier gimbal and the roll orientation of the telescopes, our payload margin is rapidly disappearing. We are reassessing all weight figures and the designs. We will provide a realistic status next week. ✓

4. ST-124M SLIP RING PROBLEM: We are also experiencing slip ring problems on the recently delivered stabilizers. For AS-204, we are rotating the two 360 degree gimbals approximately 10 times in each direction every time the platform is activated to clean the slip rings. Astrionics Lab is equipped to perform a run-in test on slip ring and will request, through IO, that we perform such run-in test here before installation at Bendix. If this turns out to be of benefit, we may ask IO to allow Bendix to procure such equipment (cost about \$75K). We are also in close contact with the vendor, Poly-Scientific, Blacksburg, Virginia, to analyze the cause of the difficulty.

5. DR. DRAPER'S VISIT TO RUSSIA: Dr. R. C. Duncan, MSC, reported to me that Dr. Draper had been invited to Russia to give five presentations the middle of December 1966. Dr. Draper, who had been a guest of the Russian Academy of Science during his visit, enjoyed this conference; he summarized in a top level meeting at MSC for 2 hours his experiences and results. He learned that the Russians are very confident to probably land on the moon in this year by a direct landing method without rendezvous in space. However, they will use a lunar supply module to be landed first. May I suggest that you invite Dr. Draper to give us a similar resume very soon so that his impressions are still very fresh and uncolored.

Jim Shepherd

Please prepare a "dear Steve" letter. B

Ed
O'Connor

I think
this is
a very
serious
hazard.
We
should
give
this
bearing
problem
all the
support
we
can!
B

NOTES 1/16/67 HEIMBURG
1/16/67

B 1/23

POWER PLANT TEST STAND

The fifth successful H-1 engine pre-vent shutdown test, PI-489, was conducted at the Power Plant Test Stand on January 11, 1967. All parameters appeared normal. However, damage to the thrust chamber was noted post-test. This chamber has approximately 2300 seconds test time and was in very bad condition prior to this test. It is felt that the pre-vent shutdown did not cause this chamber damage. ✓

F-1

Test FW-057 was conducted on the West Area F-1 Test Stand on January 10, 1967, with F-1 engine S/N F-5038 for a planned mainstage duration of 40 seconds. The Parker S-1C lox vent and relief valve was cycled twice as planned with no abnormalities. ✓

S-1VB-208

A successful full duration static acceptance test firing of Vehicle 208 was completed on January 12, 1967, at the SACTO Test Center. The firing lasted for a duration of 428 seconds and was cutoff by propellant depletion indication. All preliminary data indicates that all objectives were successfully accomplished. A lox leak which was noted in the pre-vent area and sluggish talkback from the lox vent valve were the only anomalies observed. Data qualification is complete and a detailed data analysis is underway. ✓

S-1VB-503

The 503 stage simulated countdown will be completed early this week in anticipation of a possible static firing date of January 20, 1967. The S-1VB-208 acceptance firing (item above) was the pacing item restraining 503 activity. ✓

SATURN V PRIMARY DAMPING SYSTEM

We reported last week that we were having considerable difficulty in obtaining satisfactory operation of the mechanical hook system. During the past week, working with P&VE, several modifications were made to the system in an attempt to make it work. The modifications seemed to help considerably as we had several hook ups that were successful; however, on Saturday, January 14, after a test run it was discovered that the two hook cylinders were broken during the test. We are still pursuing this problem with P&VE.

The test completion date scheduled for January 24, is now scheduled for February 6 and the system must be on dock at KSC by February 20, 1967. ✓

1/16/67

B 1/23

1. HIGH DENSITY TAPE CERTIFIER: Over the past years the computer industry has increased the bit packing density of magnetic tape from 200 BPI (Bits Per Inch) to 556 BPI to 800 BPI; and, today, there are many computers that use 1600 BPI/3200 FCI (Flux Changes per Inch). This Laboratory has recently installed a new magnetic tape tester which will check magnetic tape at 556 BPI, 800 BPI, and 1600 BPI/3200 FCI on seven channel - 9 channel or full width coverage of the tape. This allows the Laboratory to make sure that the vendors' magnetic tapes are acceptable to the computers, thereby eliminating a great deal of computer down time due to defective tape. In addition, this certifier enhances the ability of the Laboratory to recertify and reclaim old magnetic tape that might otherwise have to be destroyed. This service is available to all MSFC Laboratories and offices using this type magnetic tape. ✓

2. NEW COMPUTATION LABORATORY SUB-STORE: In conjunction with the Technical Materials Branch of the Technical Services Office, the Computation Laboratory is to have in operation by February 1, 1967, their new TMB manned supply sub-store in Building 4663. Doubtless, this supply activity will offer an excellent service to the Laboratory. Coordination and cooperation of the Technical Materials Branch thus far indicates real success of this new sub-store. ✓

3. THIRD GENERATION COMPUTER PREPARATION:

Site surveys have been completed for all remote stations to be installed in Phase I. Facilities preparation continues in Building 4663 for the UNIVAC 1108 central site installation. Equipment layout plans are being developed and a Third Generation Operations study is underway. This study will determine the operational manpower requirements, develop operational procedures, propose alternate organizational structures for operations personnel and examine facilities requirements.

All 1108 equipment is reported on schedule for Phase I installation (July 1, 1967) with the exception of FH 1782 drums. UNIVAC has asked permission for substitution of FH 432 drums. This request has been studied and found to be acceptable from a technical standpoint. ✓

NOTES 1/16/67 JAMES

B 1/23

1/16/67

S-IVB WORKSHOP: The DAC designed quick-opening door for the LH₂ dome will arrive at MSFC late this week for a series of neutral bouyancy tests together with the standard 72-bolt hatch and the MSFC designed quick-opening door. The tests will begin with local personnel as operators but later this month one or two Astronauts will participate. ✓

The problems of adding a non-propulsive vent to the S-IVB Stage and providing the capability to dump residual propellants through the engine are still being studied. A request has been made to attempt a propellant residual dump through the engine on AS-206 after the prime mission has been accomplished. Astrionics will define the necessary changes by January 19, 1967, for impact. ✓

AS-204 CREW BRIEFING: A briefing was given to the AS-204 backup crew (Schirra, Eisele and Cunningham) at KSC on January 10, 1967. Deke Slayton and Ed Givens of the Astronaut Office and flight and range support personnel from MSC and KSC also attended. The presenters (from R&DO) did their usual fine job and all questions were answered on the spot with no open action items. The crew was well pleased and commented that MSFC seemed to have taken care of all potential problem areas. ✓

AS-204 TV COVERAGE: We completed arrangements for movement of the necessary vehicle components for display at MSFC for the TV coverage here during the AS-204 launch. The service module was moved here on the 13th of January, the SLA will be moved today, and the S-IVB facilities stage will be moved on the 24th. We will use an IU spacer which is already here. DAC personnel will mount an engine on the S-IVB stage prior to its movement here. ✓

IU ENVIRONMENTAL CONTROL SYSTEM LOW TEMPERATURE PROBLEM:

Analysis and testing have confirmed the adequacy of proposed changes to solve the low temperature problem. The changes include the addition of heaters (which require another battery), low emissivity tape on the cold plates and components, and shrouds over the mounted components. Two ECP's have been approved which will provide these changes on IU-205 and IU-207. Further studies are being pursued with the object of removing the heaters on later units. We have not determined what must be done on AS-208 which is our worst case thus far defined. The heaters will not be necessary on IU-206 because of the short (56 minutes) duration of the flight. This will give us the opportunity to evaluate the effect of the other fixes without the heaters. ✓

LBJ

Request a short briefing on this problem B

NOTES 1-16-67 JOHNSON

1/16/67

B 1/23

1. Evaluation of Thermo Control Coatings (MSFC Experiment #2) - The flight hardware for AS 206 testing was completed on 12-30-66. Flight squib installation remains to be accomplished in order to meet the shipping date of 2-15-67 to KSC. The squibs to blow off protective covers are due from the manufacturer w/in 10 days. The manufacturer has had difficulty in meeting MSFC test requirements, but is now fabricating squibs which can meet relaxed specifications. ✓
2. Supporting Development Program Meeting at MSC - There will be a meeting 1/17/67 in Houston with Ed Gray and his staff and representatives of the three MSF Centers to formulate a basis for structuring a Supporting Development Program for FY-68. In the last two years, this area of our SRT program has become more difficult to defend. An attempt will be made to relate it to forthcoming MSF projects so that it will stand out separate from the ART (Advancement of the state-of-the-art) and yet not overlap into the mainstream effort. Funding levels in this program have dropped from \$20,670,000* in FY-65 to \$9,450,000* in FY-66 to \$2,675,000* in FY-67. Due to illness, I will not be able to make the trip, but Mr. Miles will. ✓

* Excludes C-I Engine Development.

B 1123

1/16/67

1. S-II-3 Bulkhead Weld: In December, it had been decided to replace the LH₂ dome of S-II-3 which was severely damaged by the access ladder accident. The replacement dome was to be taken from S-II-5 which had excessive offset in the girth weld. This weld of dome number 5 to S-II-3 has been accomplished last week with the encouraging result that practically no offset occurred beyond what was allowed by specification (.027"). This weld still has a relatively high incidence of porosity requiring approximately 21 repairs. This has been a most difficult welding job considering the fact that a previously used bulkhead had to be matched and rewelded to a different container. The good control of offset can be attributed (1) to the use of the NASA strap clamps for alignment, (2) to higher speeds in welding, and (3) to a very conscientious job of accurately locating the tack welds. The S&ID/ME team for planning and controlling this job has worked together in a similar manner as we had worked with Boeing on the S-IC program. ✓

2. Chinook Helicopter Rotor Blades: In forming the main longitudinal spar of rotor blades for the Chinook helicopter, Boeing-Vertol, Morton, Pa., is in trouble because small dents occur in the unit; also the cross section profile sometimes changes during heat treatment. Such distortions introduce stress concentrations in the blades and consequently their operating life is substantially reduced. Each blade is some 50 feet long and is formed from a seamless tube with wall tapered from 0.140" to 0.090". The material is very high strength steel. Until now, no technique tried by Vertol for correcting the distortions has been successful. At Vertol's request, two of our engineers are visiting the Boeing-Vertol plant to investigate the problem. Various potential solutions such as magnetomotive forming (magnetic hammer) and explosive forming will be examined to try to solve this problem. ✓

3. Laser Test of Minuteman III Ablative Materials: Our personnel are working with the General Electric Company, Valley Forge, Pa., who are under contract to the Air Force Systems Command, Ballistic Systems Division, Norton Air Force Base, San Bernardino, California, in using the ME Laboratory 240 kilojoule pulsed ruby rod laser to test ablative materials being considered for use on re-entry nose cones and other parts of the Minuteman III ICBM. Some 35 samples of 5 different compositions will be tested and evaluated. Samples are about two inches square and are carefully weighed on a micro-balance. After being "shot" by the laser, the sample is again carefully weighed. Selected samples will be "shot" several times each with the residual weight being determined after each shot. A measurement of laser beam energy is being made for each "shot" since this value changes from shot to shot. The EC&G radiometer is being used for this measurement. ✓

W.K.
Suggest
to pass
this info
on to
the
heatshield
people at MSC
B

1. S-II HIGH FORCE TEST PROGRAM: Final tests were successfully completed on the High Force Test Program at Wyle Laboratories on January 6, 1967. Formal test reports (final) including data analysis and data summations are due from NAA to MSFC within six months of the January 6, 1967 date. Some components have been redesigned, successfully retested, and incorporated into 501. Provided it is built to specifications, preliminary results indicate: (a) The S-II stage is structurally adequate to withstand anticipated flight dynamic environments, with the exception of electrical container inserts which are being evaluated by MSFC and S&ID. (b) Vibration specifications (IN-P&VE-S-63-2) are reasonable predictions of anticipated flight environments at the component level. (c) Test methods and techniques dictated by and developed for use on this program have proven to be technically correct. ✓
2. S-IC SPLICE ANGLE BRACKET FAILURES: Failures have occurred in the splice angle brackets on the thrust structure of S-IC-D and S-IC-T. These failures were caused by stress corrosion. Originally, these brackets were designed by our Structures Division as separate flat plates (7075-T6). A Boeing redesign resulted in a single 90° angle replacing the two separate flat plates. Considerable sustained stress at the apex of the angle caused stress corrosion cracking. The problem is being alleviated by returning to the original design of these brackets for all vehicles. ✓
3. H-1 ENGINE TURBINE BLADES: The Oak Ridge National Laboratory has demonstrated an eddy current probe that can be used to distinguish between 316 stainless steel and Stellite 21 turbine blades in H-1 Engines. The miniature probe is specifically designed to permit the non-destructive inspection without major disassembly of the engines. The probe has been sent to KSC for use on SA-204. Plans call for a check of 5 blades per turbine wheel. This will establish, without any doubt, the material composition of the turbine blades on all H-1 engines installed on SA-204. Tests were completed. Data will be evaluated by January 17 to know if O.K. ✓
4. MOBILITY TEST ARTICLE (MTA) TEST PROGRAM: The 1/6-g Flight test of the Brown Engineering-built Local Scientific Survey Module (LSSM) powered mock-up has been completed successfully. The mock-up now has been requested by NASA Headquarters for testing with the MTA's on simulated lunar landing sites by Yuma Proving Ground, Yuma, Arizona. A demonstration, on these sites, of the MTA's and the mock-up for Mr. E. Z. Gray and other key NASA Headquarters personnel has been arranged for January 23, 1967. ✓
5. ORBITAL WORKSHOP: MSC has officially requested MSFC to provide hardware for a neutral buoyancy trainer and for a one "G" trainer. Make-or-buy recommendations have been discussed with ME Laboratory with the following results: (a) Neutral buoyancy hardware will be provided by ME Lab; this hardware will be essentially identical to that provided for neutral buoyancy testing at MSFC. (b) The one "G" trainer will be purchased from DAC. A survey of available hardware, cost estimate, and schedules are being prepared. ✓
6. NUCLEAR GROUND TEST MODULE (NGTM): A first draft version of the NGTM end item specification was reviewed by MSFC, SNPO-C, Aerojet General Corporation, and Westinghouse representatives. Comments and suggested changes were made, including a recommendation that the specification should contain more definitive requirements. Also, it was agreed by all parties that a top level specification would be upgraded to describe and specify the overall Ground Test Module systems, support equipment, other requirements, and delineate the responsible organizations. Two representatives, one from SNPO-C and one from Aerojet, will assist MSFC in-house in the preparation of the document. Representatives from Westinghouse and the NERVA Engine/Stage/Test Stand Task Force will also be available for assistance. ✓

1/16 965

B123

POP 67-1 - The MSFC POP 67-1 will be reviewed in total by Mr. Gorman at 9:30 a.m., January 19. The exact date for the MSF review of the POP is uncertain. Separate reviews of AAP, Apollo, and Administrative Operations will be conducted. MSF has indicated a desire for relatively informal reviews which stress areas of their particular interest, i.e., minor contracts in Apollo, overtime, personnel compensation, and travel for Administrative Operations. Due to the interest in minor contracts, expressed by MSF, a special effort is being made by R&DO to support their Apollo funding. ✓

VOYAGER FUNDING LEVELS - OSSA and JPL current planning show MSFC Voyager funding levels as:

	<u>FY-66</u>	<u>FY-67</u>	<u>FY-68</u>
	(Dollars in Thousands)		
Spacecraft Sys.	0	500	\$16,800*
Spacecraft Experi- ments	0	0	3,000
Launch Vehicle Systems	<u>\$210</u>	<u>500</u>	<u>1,500</u>
	\$210	\$1,000	\$21,300

*Includes 10 M for Phase C prime contractor ✓

ADMINISTRATIVE OPERATIONS - FY-67 - The MSF response to your recent letter regarding our AO problems is in the final stages of preparation in MSF Program Control. The response will probably give the following responses to the three areas of concern:

Personnel Ceilings and Funds: The letter will acknowledge the agreements between MSF and MSFC that MSFC should plan for an end of fiscal year staffing of 7177. The letter will be carefully phrased but will essentially say that funds to cover this staffing level are expected from those now allocated to KSC as a result of an expected inability on KSC's part to fill their spaces.

Overtime: The letter will give no encouragement on our request for relief on the overtime ceiling of \$2.150 M.

Fy-68 AO Funding: The MSF response will show pessimism for any increase in the FY-68 AO plan (\$126.3 M). ✓

NOTES 1/16/67 RICHARD

B 1/23

SA-501 Restart Status: As a result of our meeting last week with Dr. Rees and Dr. Rudolph, we are investigating the possibilities of a real time command delay of one orbit in the restart of the S-IVB. This would be used in the event we have indications on the ground that the planned restart attempt will be unsuccessful due to an unexpected out of tolerance condition in the vehicle. The concept would be to salvage a restart even though the rest of the mission might be jeopardized. ✓

NOTES 1/16/67 RUDOLPH

B/122

1/16/67

1. S-IC-T Stage - B-2 Position Systems Demonstration Test at MTF - now scheduled for Wednesday, 8 February 67, instead of Friday, 27 January 67 as previously reported (Notes 1/9/67 Rudolph).

Delay is due to problems found in the interface of facility systems to stage. Delay will not impact the scheduled date of Friday, 17 February 67, for installation of the S-IC-4 Stage in the B-2 Test Stand.

The Pre-Static Firing Review scheduled for Wednesday, 25 January 67, will be re-scheduled for either Friday or Saturday, 3 or 4 February 67. ✓

2. S-II-1 Stage - departed MTF at 6:00 am, today, Monday, 16 January 67 via the Poseidon for KSC.

Forecast "on dock" KSC is Sunday, 22 January 67.

The S-II-1 Stage was shipped prior to completion of planned MTF post-static checkout and planned Master Change Record (MCR) work. KSC checkout will include tests that would have been accomplished at MTF and remaining MCR work will be accomplished during low bay checkout at KSC. ✓

3. S-IVB-F (Facilities) Stage - will be returned to MSFC from KSC during week of 23 January 67 for use in a "press show" at MSFC during the flight of AS-204. ✓

Dummy J-2 Engine will be installed at KSC under DAC supervision. ✓

DAC has agreed to perform any necessary work involved in this transfer of stage to MSFC without additional contract coverage. ✓

NOTES 1/16/67 SPEER

1/16 98A

3
1/22

1. MEETING WITH KRAFT: On January 9 I talked to C. Kraft at MSC on several aspects of MSFC participation in future flight control activities. I have made arrangements to discuss this in detail with you later this week. ✓

2. GOSS CONFIGURATION MANAGEMENT SYSTEM: The proposed configuration management system for the Ground Operational Support System (GOSS) has been staffed at MSFC and comments submitted to Headquarters (Christensen). The MSFC comments are summarized as follows: (1) Significant effort will be required to establish a GOSS baseline configuration, (2) MSFC finds it unacceptable for implementing Centers (rather than OMSF) to review MSFC requirements for justification, (3) the GOSS configuration management should follow the Apollo system as closely as possible, (4) the new system must be compatible with the existing vehicle configuration management, and (5) all configuration changes must be controlled regardless of cost in order to maintain effective control. ✓

3. HEADQUARTERS APPOINTMENT: John Edwards, former Director of Gemini Flight Operations, has been appointed as Director of AAP Flight Operations. ✓

NOTES 1-16-67 Stuhlinger

B 1/23

1/16 95A

1. LUNAR DRILL: Mr. Beattie and Dr. Hanley of OMSF visited MSFC last week in connection with the lunar drill efforts. They met with personnel from Test Laboratory, and with Mr. Bensko and others from SSL. An interesting development is that the Principal Investigators for the AAP lunar surface science program are now organizing on a team basis. We had predicted the necessity of this approach because of the complex nature of the lunar exploration program. Arrangements were made for Mr. Bensko to serve on the Geology Team, which is being organized by the Astrogeology Branch of USGS. The acceptance of any proposal submitted by the Geology Team seems assured because of the reputations of persons on the team and the circumstances leading to the team's formation. The Geology Experimenter Team will be approximately a ten-man group, including several nationally recognized scientists. ✓

2. RADIATION HAZARDS FOR ORBITAL WORKSHOP: At the request of the P&VE Project Office, SSL is performing an analysis of the radiation effects hazards for the Orbital Workshop in the clustered configuration for a thirty day mission. ✓

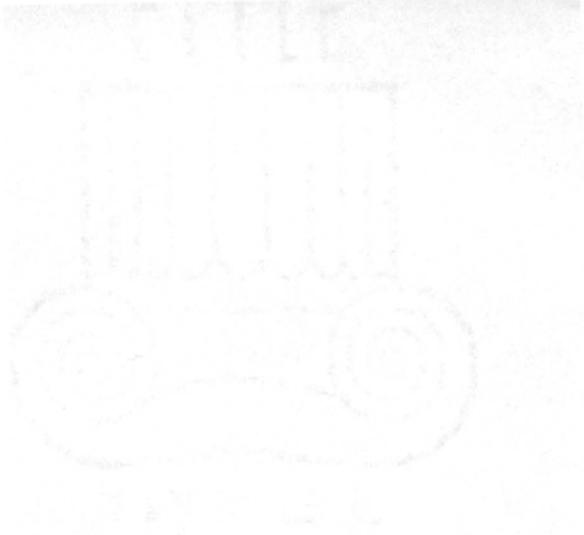
3. SUPPORT CONTRACTOR: The support contract for SSL is Brown Engineering Company, which was recently acquired by Teledyne Company. Dr. Singleton, the president of Teledyne, visited SSL on January 10. He came together with Mr. Moquin, the president of Brown, and with Mr. Milton Cummings and Dr. Ray Watson. We discussed the effect of the pending acquisition of Brown by Teledyne. Dr. Singleton assured us that the subsidiaries of Teledyne would have autonomy to a large extent and that he appreciates the business of NASA, especially SSL. Another subsidiary of Teledyne is Geotech in Pasadena, the company working very closely with Bendix on lunar passive and active seismometers. Brown will be one of the largest and most important plants of Teledyne. ✓

NOTES 1/16/67 WILLIAMS

1/16/67

B
1/23

1. Project Able: The need for a final Project Able presentation has greatly subsided. The odds are that we will not do one at this time. The Institute of Defense Analysis (IDA) report to DDR&E showed that Project Able is not cost-effective when compared to other ways of producing artificial illumination (airplanes, flares, etc.); therefore, its application for existing military applications is not considered too desirable. The longer range thinkers in DDR&E and the USAF appear to be interested in Able applications farther out in the future. Thus, there will be no decision at the present to implement a Project Able hardware project. We plan to continue two systems' studies that will spend some time in optimizing a 400-foot diameter design; primary emphasis will be on supporting technology aspects, however. This continuation is at the request of Ed Gray who feels that we should not wait for a top management decision since there are many things we need to do in the interim. We agree. ✓
2. LSSM: Final reports (drafts) of Bendix/Boeing LSSM are being reviewed by MSFC. The final presentations are being held at MSFC on January 24 (Boeing) and January 26 (Bendix). The re-draft of the Procurement Plan is complete and will be submitted to Mr. Gorman during the week. ✓
3. Synchronous Earth Orbit Mission: Mr. Ernest Ott of OSSA, Physics and Astronomy, and Dr. Norman Ramsey of Harvard, Physics Department, and their party visited MSFC on January 9 and 10 for a coordinated briefing with the MSFC Synchronous Earth Orbital Mission Working Group to discuss the Hydrogen Maser Clock Relativity experiment and the Launch to Synchronous Orbit Flight Profile and Environment. It was a most successful meeting and Mr. Ott indicated that he would press to have additional meetings, similar to this, in the near future. ✓
4. Voyager: A group of 10-15 people (including D. Newby, plus RDO and IO people) are being physically co-located in building 4202 to work the Voyager project under Dave Newby's direction. We hope that a firm decision from Headquarters will come through right away and that our momentum can be further increased. ✓
5. Planetary Joint Action Group (JAG): The planetary JAG will resume activities this week with a kick-off type meeting at MSC on January 17. Dr. Mueller has requested a more complete report on a Planetary Program by May 1967, and the prime purpose of this next few months activity will be to prepare that report. ✓



Jan 23, 1967

SCIENCE
EXPOSITION

167-2/a

NOTES 1-23-67
WITH COMMENTS

MR. GORMAN'S COPY

No DEP-A comment.

NOTES - 1/23/67 - BALCH

B 1/25

1/23/67

S-II-1 Stage - The final group of Contractor Nonconformances (CNC's) and Government Nonconformances (GNC's) which were required to accompany the data package for the stage were signed off on 1/15/67, and the data package was shipped to KSC on 1/16/67. Endorsement No. 3 to the Certificate of 1/16/67. The stage arrived at the KSC Vertical Assembly Building on Saturday morning, 1/21/67. ✓

S-II-2 Planning - The S-II Stage Office has informed us that a decision has been made to use the A-2 stand for S-II-2 acceptance testing. Present plans call for shipment from Seal Beach to MTF on 1/27/67, arrival at MTF on 2/1/67, and first static firing on 3/24/67. ✓

S-II A-2 GSE Modification - This work is scheduled to be complete on 1/29/67. Some mechanical modification work will be carried over until after the stage is installed in the stand because of common interfacing modifications. ✓

S-II A-1 Test Stand Activation - GSE modification and checkout continues. High-pressure gases for GSE checkout are being provided by interim system arrangements, but permanent on-stand systems are expected to be on line by the time major requirements for high-pressure gases develop. Cold shock of the LOX system is expected about the end of January. Cold shock of the LH₂ system is now expected the first part of March, but this would not constrain installation of a stage in the stand. ✓

B-2 Activation/S-IC-T Testing - First static firing of S-IC-T is still scheduled for 2/9/67. Most critical prior event is the propellant load test, now scheduled for 1/31/67 and 2/1/67. Start of this test is directly constrained by completion of stage systems checkout, which will require approximately one week after the pneumatic and hydraulic systems are applied to the stage. Both these systems are due on line by 1/24/67. Any slip beyond this date will impact the start of the propellant load test and subsequent static firing. ✓

S-IC-4 Test Program - Review of stage automatic test procedures and the End Item Test Plan is under way. A considerable amount of work apparently remains to be done on the End Item Test Plan. Arrangements have been made for assistance from R&DO laboratories in this area. ✓

Labor Relations - A meeting was held in Gulfport, Mississippi, on 1/18/67, to consider the renewal of the MTF Project Stabilization Agreement. Representatives of various construction contractors, building trades unions, and NASA/MTF were present. No conclusion was reached, but another meeting is to be held within two weeks to discuss the matter further. ✓

NOTES 1/23/67 BELEW

1/23 STS

B 1/25

SATURN V SYNCHRONOUS ORBIT CAPABILITY:

Change Board action for approval of minimum in-line modifications to S-IVB stages was delayed pending a formal request from I-S/AA for these modifications. A memorandum has been sent to Dr. Rudolph requesting that action be initiated to obtain approval of the modifications. ✓

EARTH ORBITAL MISSION MODULE (EOMM):

A contract is presently being negotiated with DAC for a seven-month study of the second generation spent stage Workshop and the ground fitted mission module. R-AS-P will be the COR for this contract with support from a group made up of members from the various laboratories, other R-AS offices and I-S/AA. It is planned to get the study under way about February 1, 1967. ✓

EMR AND PROJECT THERMO:

As indicated in a recent NASA Headquarters TWX, EMR and Project Thermo are not funded for development in FY 68 in the current plan. Studies are now being conducted by P&VE and RPL to investigate the feasibility of breaking Thermo and EMR into smaller separate experiment packages. A presentation to Dr. Mueller on Thermo is scheduled by P&VE for February 15 at NASA Headquarters. ✓

ATM CONTROL WEIGHTS:

Since the AAP-4 injection altitude has increased from 120 n.m. to approximately 260 n.m., the allowable payload weight has decreased about 10,000 pounds. We have discussed with Astrionics Laboratory the implementation of ATM control weights, and they will initiate this within two weeks. ✓

REPRESENTATIVE AT BALL BROTHERS RESEARCH CORPORATION (BBRC):

In response to Dr. Mueller's question concerning an MSFC representative at BBRC, we have prepared a letter to him stating that we do plan to have a full-time representative there. The letter is being staffed through R&DO and should be available for your signature shortly. ✓

ORBITAL WORKSHOP:

Mr. W. A. Ferguson attended the S-IVB Quarterly Review at Huntington Beach on January 17 and a presentation on the Orbital Workshop was made. ✓

The Airlock contract with McDonnell Company has been redirected by MSC to conform to the clustered mission concept. ✓

NOTES 1-23-67 BROWN

B 1/25

1/23 9PS

H-1 ENGINE Several human errors have been discovered on the rocket engines which were recently returned to Neosho for turbine wheel replacement. These errors included such things as the LOX bootstrap line interchanged with another engine, a heat exchanger orifice installed backwards and a fuel bootstrap seal plate installation which resulted in a large fire at Neosho on Engine H-4073 (out of AS-207). All of these errors appear to have occurred during field use of the engines. These cases coupled with similar cases of field goofs on F-1 and J-2 have me greatly concerned relative to the field procedures and handling of engines after delivery to the stage manufacturers.

I'm currently reviewing all of the recent incidents in more detail and will probably have a recommendation for you and Dr. Rees in a couple of weeks.

BB
Me!
too!
B

F-1 ENGINE The construction of a retaining wall is progressing at the Rocket Engine Test Site, Edwards AFB, California. Additional slides on this hill have occurred during the construction period. As a result of the most recent slide on 1-11-67, it was felt advisable to direct the contractor to work premium time finishing the concrete placement. Concrete placement in the critical area east of the valve pit will be completed this weekend. Steel erection in this area will begin early next week. The three million gallon water tank appears in no immediate danger at this time, however, additional rainstorms or earth tremors could change the situation.

J-2 ENGINE An attempt is being made to paint the crossover duct on AS-204 with a "black" paint having high emissivity to evaluate its effect on the cool down rate of the duct during orbital coast. There is some concern about the LOX impact sensitivity of the paint; however, we will try to resolve it this week. It is planned to do as much as we can in this area, without impacting the launch schedule.

Coordination has been initiated among MSFC, DAC, and Rocketdyne to provide the capability to force cool the crossover duct on S-IVB Stage 501 with helium from the stage. This is a parallel effort to the engine changes being evaluated at Rocketdyne and AEDC to guarantee restart at 501 conditions. Evaluation of possible engine changes should be complete approximately 3-1-67.

GENERAL We seem to be running into a new staff of people in Headquarters these days in the AAP area, unfamiliar with the engine programs. This became obvious to me when we almost had to reopen a major contract negotiation on the H-1 due to a "Monday morning quarterback" type of decision. In discussing the matter with John Disher I've agreed to brief he and his key people on the engine projects in Washington on 1-27-67, with the specific objective of bringing them "up to speed" on the past, present, and future plans in the engine area and their interrelationship. It appears this sort of thing is necessary if we are to expect smooth sailing on our next procurement plans (F-1 in Headquarters now), and negotiations.

adc.
it's not
pick any
more
construction
money into
Edwards if
we want
to move
out!
then is
the
program's
final
study
due?
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NOTES 1/23/67 CONSTAN

1/23/67

B 1/25

Nothing of Special Significance.

NOTES 1/23/67 FELLOWS

B 1/25

1/23 9TS

Program Operating Plan (POP) 67-1: The Executive Staff has advised that NASA Headquarters representatives, in their early February review of POP 67-1, expect to probe more deeply into R&DO activities than they have in previous POP reviews. The result of several meetings with Executive Staff and IO is that, although IO will, as usual, justify the major portion of the Saturn Program, R&DO is to be prepared to speak for itself on its technical support planning. We are tying FY-67 activities with the justification for the FY-68 program, using as a bridge between these two years the results of the Ludie Richard-identified "softspots," the unplanned add-on requests by IO during this fiscal year, and the major activities of the laboratories during this year and those planned for next year. ✓

B/25

1. Guidance Implementation Problem: We have indications that there are strong moves afoot within MSC to take over the guidance during second burn of the S-IVB stage from orbit towards translunar injection. Their prime arguments are: (1) Since the S/C guidance has to work anyway for accomplishment of the mission, it might as well be used as primary system; (2) The turn around time for retargeting is only 1 - 3 weeks for the S/C vs. 18 to 24 weeks for the L/V guidance system; (3) They claim that a considerable saving in MSFC and MSC manpower could be realized by elimination of the L/V guidance after orbital insertion. There is an intensive effort underway between R-AERO and R-ASTR to reduce the mission turn around time from 24 weeks to about 8 weeks. This time is needed for preparation of the guidance system, starting with a new mission definition and ending with a final flight tape verification at the Cape. Five days of this period will be used by AERO for retargeting. Also, once in orbit, we will have a target updating capability within 10 minutes. We have serious doubts that the S/C guidance laws are sufficiently flexible to permit plane changes. Those are necessary in all cases as long as we work with the split launch window philosophy, needed to increase payload capability. We are presently putting a set of S/C guidance laws into our simulations to evaluate their performance. Elimination of our guidance system for translunar injection would probably either reduce performance or seriously reduce overall flexibility. Our guidance system has particular advantages for rendezvous missions. Also, MSC's guidance system may not be compatible with our stage systems. The efforts in manpower required on our side to provide more flexibility are well spent in view of general needs for other missions; we feel that the MSC arguments concerning manpower savings are largely political. Elimination of our guidance system from the post orbital phase may finally lead towards its complete elimination. (A copy of an internal MSC document on this subject is included, but should not be quoted at this time since it was obtained unofficially.) A special briefing on this subject can be given if desired. ✓

2. Risk of Ground Winds Overstressing the Saturn V Vehicle: We (AERO/P&VE) estimate that a 35.6 m/sec peak wind at 18.3 m reference level will overstress the Saturn V vehicle when following conditions exist: (2) MSS in place, (b) Damper attached, (c) Vehicle empty, and unpressurized, (d) Safety factor of 1.0, and (e) Referenced to wind envelope employed in design studies. Based on wind tunnel test results, with MSS in place, there is only a 30° azimuth toward the east and toward the west from which wind may strike vehicle. Under these conditions, the probability of vehicle being overstressed with MSS in place is only about 1/6 of calculated risks relative to non-directional wind considerations; e. g. 0.6% for 30 day exposure period, and 1.0% for 90 day exposure period starting in March. Current estimates from KSC indicate the MSS will not be in place for two periods of ≈ two days each. Vehicle will then be overstressed for the 35.6 m/sec peak wind from any direction at the reference level. The calculated risk for a two-day exposure period during March is less than 0.3%. Over the past four months, AERO and P&VE have had regular meetings on ground wind-vehicle response related activities. These meetings were quite worthwhile, and have increased communications and understanding between and within our two organizations. ✓

E.F.

Yes, please B

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Note:

We have to continue all our injection guidance work anyhow, for all unmanned Saturn flights, such as Voyager.

No saving of workload at MSFC!! B

mobile service structure

1/23 9¹⁵

1. SUPPORT TO KSC: Beginning January 23, 1967, our first contingent of five people will be on extended TDY to KSC in order to aid Dr. Gruene with his quality problems. Dr. Constan has been extremely cooperative in developing the required support, and will furnish approximately 10 of the 25 specialists who will ultimately be on location at KSC. ✓

2. S-II PROGRAM: MTF engineering changes continue to be worked on S-II-2 at Station VIII in Seal Beach. The turnover meeting is now scheduled for January 23, 1967, and the proposed shipping date to MTF is January 27, 1967. A major problem concerning MTF deferred work must be resolved. Early management estimates cited approximately 3,000 man-hours of work to be transferred to MTF. The current estimate shows about 10,000 man-hours of work to be performed on the stage. ✓
 - o Five components, three criticality I and two criticality II, remain to be qualified on the S-II-1 stage. ✓

3. S-IVB PROGRAM: A meeting was held recently at MSFC with DAC personnel to review the qualification test requirements for S-IVB-204 and 501. All mandatory component testing has been completed for 204 and only three components have not completed mandatory tests for 501. ✓

4. BROWN ENGINEERING COMPANY QUALITY SURVEY: A quality survey was made of the Huntsville facilities of Brown Engineering Company. The inspection system was found to be inadequate in regard to MSFC contracts in a few areas; most notably, the areas of drawing change control and inspection records. The manufacture of TV cameras under KSC Contract NAS10-3945 is very poorly controlled. Much of the trouble appears to be related to recent personnel layoff and changes resulting from workload decreases. A representative from KSC participated in the survey and corrective action has been initiated. ✓

B 1/25

1. ATM

1/23 985

a. Solar Array: We have decided on the following design approaches for the array:

16 sections to provide deliverable power of 3,200 watts

Deploy in one plane with four sections forming a four wing cruciform; once deployed, the array will remain deployed and no means shall be provided to refold or redeploy. It will be locked by spring loading; however, positive locking may be necessary to minimize coupling with the control system. ✓

A flexible shield may be provided between each wing to achieve contamination protection. ✓

A smaller section on two of the wings will probably be necessary for the antenna locations. ✓

b. Payload Margin: Present projection of weights indicates 23,500 pounds for LM/ATM. Main contributors are: solar array - 4,650; rack structure - 2,250; experiment shroud, spar and insulation - 2,365; experiments - 2,005; batteries - 1,920; LM ascent stage - 4,385; CMG's - 1,140. Based on a total payload (above the IU) capability of 29,400 pounds for a 240 n mi circular orbit, the LM/ATM payload margin is less than 500 pounds. Further exercising of these numbers with P&VE and AERO will be necessary to ascertain the LM/ATM payload margin. All LM/ATM designs and requirements shall be closely scrutinized with respect to holding the line on weight. ✓

c. Power Profile: The 16 section (3,200 watts) solar array has been based on providing 700 watts for the LM ascent stage. Physical volume for the array and the marginal weight status do not allow more array power for the LM. MSC has stated more power is required for the free-fly mode. We are considering that free-fly or tethered operation is an experiment and any additional power would be provided by non-rechargeable batteries. ✓

d. Docking: MSC indicated that docking the LM/ATM to the side of the CSM stabilized workshop would place severe loads on the CSM docking collar. One solution considered was with LM/ATM in line docking and CSM side docking. This configuration would place the axis of minimum inertia out of the orbital plane and thus the excessive vehicle torques would require momentum desaturation more than once per orbit. Another possibility would be with a cold gas reaction system (on the multiple docking adapter) which would allow LM/ATM side docking first and then CSM in-line docking. Will advise further on the selected scheme. ✓

2. S-IVB CHILLDOWN INVERTER: On January 4, 1967, a review of the S-IVB chilldown inverter design was conducted at DAC. This review was initiated after MSFC had determined the inverter had experienced many catastrophic failures (approximately 80) since the design was completed. The most recent failures occurred during checkout of SA-204 and 501 at KSC where all four inverters were destroyed (one on the vehicle and three during bench checkout). No failures have been reported while the inverter was furnishing power to the motor for the chilldown pump.

Although the results of failure analyses are often questionable, DAC has completed analysis of these failures and has resolved all but two which cannot be explained thus far. The results of these analyses indicate the major causes of the failures are the result of poor quality control, poor manufacturing techniques and improper checkout of the inverter. No major design deficiency has been identified. R-QUAL and R-ASTR are continuing this investigation. ✓

NOTES 1/23/67 HEIMBURG

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1/23/67

F-1

Test FW-058 was conducted at the F-1 Test Stand on January 18, 1967, for a planned duration of 40 seconds. This was the second engine firing with the Parker vent valve installed on the lox tank. ✓

S-1B-9

Stage S-1B-9 departed the Michoud Assembly Facility on January 19, 1967, and is expected to be installed in the STTE on January 26, 1967. The short duration test, SA-42, is tentatively scheduled for February 21, 1967. ✓

SATURN V PRIMARY DAMPING SYSTEM

Subsystems checkout and manual and automatic coupling and uncoupling to a stationary vehicle simulator is complete. Dynamic system tests and damping tests (vehicle simulator in motion) are underway. If no major problems are encountered, we should complete the test program on the ML-1 arm (for SA-501) by February 4, 1967.

The hooks still intermittently hang up at times, but we are going ahead with the test and living with this condition for the time being. P&VE is now working on a redesign in this area. ✓

NOTES 1-23-67 HOELZER

1/23/67

B 1/25

SMK-23 VISUAL SIMULATOR: On January 13, 1967, a group from MSC visited the Simulation Branch to learn about the operation of the SMK-23 visual simulator. They plan to obtain such a system from the U. S. Air Force for training astronauts to fly the LEM simulator. ✓

NOTES 1-23-67 JOHNSON

B 1/25

1/23 JCS

1. Project THERMO - A TWX was received 1-17-67 from Ed Gray stating that Dr. Mueller's last statement was that "THERMO should be handled in-house at MSFC, particularly during the definition phase. Therefore, no further funding should be obligated on industry contracts in support of Project THERMO unless and until Dr. Mueller gives such authorization." This will delay Phase "C" effort getting underway, i. e. extension of "DAC type" effort. Discussions with P&VE indicate that even if we are prohibited from DAC-type out-of-house contracting, consideration should be given to supporting some of the other effort which is justified in support of the Saturn Program. A letter to Ed Gray is being prepared for your signature. ✓

2. Quarterly Review of Supporting Development Program - Mr. Miles attended a Quarterly Review of the Supporting Development Program at Houston on 1-17-67. The state of affairs was described by Mr. Beckwith, after which he gave a preview of their expected FY-68 budget. Mr. Tom Haynes (SAAP/MSF) made a presentation on the immediate requirements of the AAP Program. Ed Gray addressed the group for about 45 minutes. The 905 and 908 Programs now appear to run together because of the ill-defined AAP Program and the nebulous Advanced Manned Missions Program. Planning beyond Saturn/Apollo support will be by missions. It is already too late to "support" the calendar year 1968 Flight Program, which is the only upcoming mission that is well defined. The 905-908 programs will be used to support potential missions beyond 1968. Initial guidelines will show about \$10M total to MSFC for FY-68, with an additional 2 to 3.0M for C-1 engine continuation. Absolute maximum estimate of funds to MSFC is \$13M, plus the C-1 engine. ✓

3. Crossed-Beam Technology - First calibration tests of the crossed-beam breadboard model. which will be used in the extension of Contract NAS 8-20107, "Crossed Beam Resolution of Ground Winds at Launch Sites," presently negotiated with IITRI, are scheduled in Huntsville for 5-1 through 6-30-67. ✓

4. Research Achievements Exhibit Area - The work to update and repair display materials for the Exhibit Area in the Space Orientation Center is now complete. ✓

NOTES 1-23-67 KUERS

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Activities of S-II Manufacturing Task Force: In pursuing the review of all manufacturing processes and tooling which are of major importance or appeared critical in the S-II manufacturing program we have formed 12 sub-teams for review of specific areas such as assembly welding, insulation, fabrication of LH₂ elbows, etc. Each team consists of a few S&ID and ME Laboratory people who are in charge of the operation and/or have the specific knowledge required for the task. The first reports of all 12 sub-teams are now available and have been reviewed by Mr. Ruud and the members of the Task Force. These reviews have resulted in a number of improvements and changes in manufacturing processes and procedures which are being implemented now. The results will be followed up and reviewed again by the same groups and again reported. It is most important to maintain on both sides an unbiased attitude in order to seek objectively for the best and most reliable techniques. The most critical and difficult task is, of course, the assembly welding of the LH₂ containers. Here, we had again a good success last week: the girth weld of the LH₂ dome to cylinder No. 6 for S-II-4 has been accomplished. According to preliminary evaluation the off-set in this weld is again within a few thousandths of an inch of the allowed tolerance. ✓

NOTES 1-23-67 LUCAS

B 1/25

1/23 985

1. S-II LH₂ ELBOWS: The S-II task team at Downey, at the direction of General Phillips, has agreed to test the S-II-4 type aluminum elbow with the 22-bolt fix and fillet weld for usage on S-II-5, S-II-6, and S-II-7. We have agreed to test this elbow on the S-IC-S test tank to an ultimate factor of safety of 1.3. It is necessary to test three elbows to qualify for flight. We will try to support a 30-day schedule for testing. ✓

2. S-II AFT LOX BULKHEAD: The S-II-6 aft LOX bulkhead to be used on the S-II-5 vehicle was subjected to a hydrostat test. Fifty of the eighty segmented doublers on the dollar weld leaked (approximately 130 bolts). This was the first hydrostat of the new seal configuration. The first bolts leaked at 40 psi with all leaks being apparent at 68 psi. The same configuration is on S-II-2 through S-II-5. Materials Division is currently discussing possible fixes with S&ID. ✓

Ludie Richard
+
Ernst Seiwiler
Really ???
3

3. S-IC STAGE: The Boeing Company's proposal for guiding the Saturn V vehicle during the first thirteen inches of travel to prevent collision with the Launch Umbilical Tower (LUT) is being evaluated. Collision data used were the result of a study by The Boeing Company, and indications are that, even without winds, there will be upper tower interference during lift-off unless a lift-off trajectory bias is used. Also, holddown arm interference with airscopes is a distinct possibility. Control system sensitivity appears to be less than was originally estimated. All interface problems are being reviewed and fixes are being considered for SA-501. ✓

4. J-2 ENGINE TESTING - AEDC: Three of four planned tests to demonstrate a Saturn V restart were conducted on January 19, 1967. A burned out ASI ignition detector probe prevented the attempt of the fourth test. Tests 1 and 3 were Saturn V first burn simulations utilizing the S-IVB/501 fuel pre-valve sequence with the exception that the pre-valve at AEDC was not retimed to match the pre-valve on S-IVB-501. This will be done prior to the next test period. Program duration of 30 seconds was achieved on both tests. The second test was a worse case S-IVB/501 restart test conducted with the propellant utilization valve in the full open position at engine start. The effect of the valve position on gas generator over-temperature is currently being evaluated. Program duration of 5 seconds was achieved. ✓

5. INSTRUMENT UNIT SUBLIMATOR TESTING: P&VE will have to test at least 12 more sublimators. R&DO had planned for this testing to be done by the prime contractor or by the vendor. Hamilton Standard will not quote on the new acceptance test procedure until six sublimators have been tested. By that time the program will almost be finished. IBM does not have the capability to do the type acceptance test we want without expensive modifications to their equipment. Quality and ME Laboratories have agreed to the P&VE effort. ✓

6. SA-204 REDLINE VALUES: In a meeting held at KSC, our revised redline value philosophy was presented to the Mission Director for AS-204. (General Bolender). A general concurrence in this philosophy was obtained. ✓

7. AIAA APPOINTMENT: Mr. A. G. Orillion has been appointed by the AIAA as a member of the Technical Committee on Launch Vehicles and Missiles. ✓

1/23/67

B 1/25

POP 67-1 DIRECTOR'S REVIEW - A summation of major points brought out during the review are as follows:

R&D Programs - Based upon current Apollo cost over-run to date at MSC and under-run at MSFC, additional FY-67 Apollo reductions are expected.

Receipt of total FY-68 requirements as stated in POP 67-1 is not expected in either AAP or Apollo programs. Contingency planning should be initiated immediately for anticipated reduced funding.

Because MSF has indicated a desire to review minor contracts in depth, additional effort will be required in preparation of justifications for both tasks and level of effort. This additional effort applies particularly to R&DO minor contracts. ✓

AO Program - No relief is to be expected in FY-67 and an even tighter situation in FY-68 is indicated. ✓

Saturn V Unit Costs - Saturn V unit costs for the follow-on effort will show a marked increase as a result of guideline changes to include engine production support (sustaining engineering) in the vehicle base price. Strong justification for these increases must be made and we can expect strong opposition from MSF when data is formally submitted with the Apollo Cost Study update. ✓

H.M.

Have we appraised the SAITB 502 incident in Sacto?
a) Facility
b) 1 more stage + engine needed?

B

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1/25

NOTES 1/23/67 RICHARD

1/23 958

Sustained R&DO Effort on S-IC-T: The R&D Operations S-IC-T Test and Operations Plan was transmitted to the S-IC Project Office on Jan. 10, 1967. A reply was received on Jan. 13, 1967 endorsing the plan. The necessary arrangements and coordination efforts, required prior to the return of S-IC-T to MSFC, are continuing. ✓

Cluster Mission Requirements Document: Efforts are being put into establishing the design and verification requirements for the cluster mission. Present intentions are to release a top control document defining these requirements by Feb. 3, 1967. Although the ultimate requirements cannot be defined at this time, this release will provide a method of adding further necessary requirements. ✓

NOTES 1/23/67 RUDOLPH

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1/23/67

1. S-IVB-503 Explosion at Sacramento:

o Stage was demolished and test stand extensively damaged about 4:24 pm, PST, Friday, 20 January 67.

o Explosion occurred during pre-firing countdown at a point; 10 seconds prior to simulated vehicle liftoff or 8 minutes prior to S-IVB Stage ignition.

o Board of Investigation, Chaired by Dr. Kurt Debus, started operations today, Monday, 23 January 67, at Sacramento, Calif. ✓

2. S-II-1 Stage:

o Unloaded "on dock" KSC at noon, Saturday, 21 January 67.

o On Thursday, 19 January 67, S&ID presented plan for accomplishing the 23,000 hours of stage modification work at KSC.

o Most of work will be accomplished in Low Bay.

S-II-2 Stage:

o 49 modifications originally scheduled for accomplishment at MTF were accomplished at Seal Beach.

o Stage now scheduled to leave Seal Beach on Friday, 27 January 67, and be "on dock" MTF on Saturday, 11 February 67.

3. S-IC-T Stage:

o First captive firing at MTF rescheduled from Friday, 27 January 67 to Thursday, 9 February 67, due to late completion of: Facility propellant lines, GSE, and Stage checkout, etc.

4. A third-burn requirement for S-IVB - has been coordinated by Mr. Belew, I-S/AA-MGR, with the Washington Apollo Applications Program Office (Mr. Taylor and Mr. Disher). A "requirements" Engineering Change Request (ECP) was submitted to Washington on Friday, 20 January 67 (Gen Phillips, with copies to Mr. Mathews, Mr. Taylor and Mr. Disher), requesting approval for the incorporation of long lead time in-line changes for the S-IVB-510 and subsequent. This requirement, when incorporated, will permit mission flexibility through kit modification route to accomplish the synchronous (3-start mission) without jeopardizing the basic Apollo Mission. Mod Kits requirements are not included in this Change request. ✓

1/23/67

1. AS-204 MISSION RULES REVIEW: All mandatory launch constraints documented in the Launch and Flight Mission Rules were reviewed by Gen. Phillips, Gen. Bolender, and Mr. Christensen on 1/18 at KSC. The MSFC presentation was given jointly by IB Program and Mission Operations. Major categories included wind restrictions, redline measurements, in-flight measurements, ground support instrumentation, vehicle and ground systems, and communications. In very approximate numbers, MSFC has about 100 launch vehicle mandatory items while MSC has about 200 mandatory S/C items. No major changes in these items resulted from the 10 - hour review, however, I consider the exercise very valuable in achieving better consistency among the three Center inputs. One item of particular concern is a 15.5 knot surface wind restriction from the East to protect against S/C land impact in case of abort from the pad or during first 15 sec of flight. This restriction applies to the last 30 min prior to liftoff and also to the Countdown Demonstration Test (CDDT). The probability that the crew may have to egress during CDDT or launch appears to be relatively high, especially as we approach the end of the launch window (10:00 to 15:30 EST). KSC stated on a related subject that 4 1/4 hr is required to move back the Service Structure. This would eliminate this approach for vehicle protection in case of approaching thunderstorms leaving us with no solution for winds higher than 46.1 knots.

2. HOSC PRESENTATION TO CHRISTENSEN: A presentation on current LIEF/HOSC development planning and budgeting was given here on 1/16 to Mr. Christensen and several members of his staff. Christensen had become aware of our addition to the HOSC and changes in the display system and had requested a thorough briefing on all ongoing and planned modifications. Our presentation was well received. We could show that all modifications are well justified and cost-effective and obtained full agreement to go ahead as planned. Our present vulnerability to power loss or transients was noted. Joint efforts with F&D and COMP are underway to find practical solutions to this problem. We were requested to update these HOSC plans on a regular basis and keep OMSP informed. ✓

3. RADAR REMOVAL FROM KSC: It is my understanding that one of the three C-band radars in the Cape area will be removed upon urgent request by DOD. Support planning for Apollo has included the TPQ-18 at MILA and operations will be affected by the removal. We have found no sufficient reason for MSFC to object to this plan, however, KSC has made an appeal to Dr. Mueller. ✓

4. HOSC ADDITION: Progress in construction is very good and is being reviewed on a weekly basis. We are now approximately 54% complete as compared to 30% in the original planning. F&D's interest and attention given to this project have been essential for the progress made. ✓

NOTES 1-23-67 Stuhlinger

1/23/67

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No submission this week.

B 1/25

NOTES 1/23/67 TEIR

1/23/67

RETROCKET HOTSPOTS: During qualification testing of the Recruit retrorockets, hotspots appeared on the motor cases of three of the eleven motors tested. After investigating, we have concluded that these resulted from debonding between the liner and the case caused by poor quality control. We have placed additional emphasis on quality control and x-rayed all motors to insure there is no debonding present. We now consider them flight-worthy. ✓

S-IVB-503 MISHAP: Early reduction of S-IVB-503 accelerometer data indicates that there was an energy release in the aft end of the S-IVB stage just prior to the main explosion. The source of this energy is not known at this time. However, as a precautionary measure while more data are being reviewed, KSC has been requested not to pressurize titanium bottles above 500 psi on any of the stages at the Cape. ✓

NOTES 1/23/67 WILLIAMS

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1. Logistics Study Presentation to Headquarters: Our presentation on Logistics Systems (which you were given) was given to Ed Gray and other Headquarters personnel on January 19 in Washington. The presentation was well received, and Gray seemed to get the main message that what is needed are better definitions of programs and their requirements before logistic system decisions can or need to be made, and that the IB vehicle "as is" looks good. Del Tischler was the main dissenting voice in that he thought our conclusions were stated too strongly. He was obviously concerned about the 260" solid. ✓
2. Saturn Improvement Studies: A study kick-off meeting with The Douglas Aircraft Company on the study "Use of Large Solids Motors in Booster Application", NAS8-21051, was held on January 17 and 18. The contractor has a good understanding of the study requirements and it appears that we are off to a very good start. ✓
3. Lunar Cargo and Personnel Delivery Systems: The "Improved Lunar Cargo and Personnel Delivery Systems" study has finally been approved for negotiation with the selected contractor. This is FY 66 money and will be about 400K. The extent to which we will investigate personnel delivery will depend upon the extent to which MSC wishes to participate. A meeting between ourselves, MSC, and Headquarters MTL will be held in the near future to resolve this. Approval of this study leaves little justification for a similar effort in FY 67 in view of the "tight" money situation.

Jan 30, 1967

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NOTES 1-30-67
WITH COMMENTS

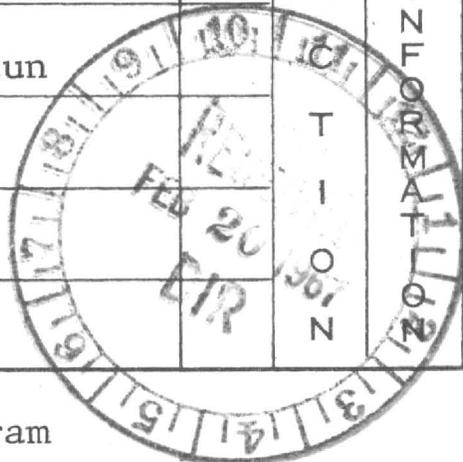
MR. GORMAN'S COPY

No DEPA comment

2005

MSFC ROUTING SLIP

	CODE	NAME	INIT.	<input type="checkbox"/> A	<input type="checkbox"/> I N F O R M A T I O N
1	DIR	Dr. von Braun			
2					
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REMARKS

SUBJECT: AAP Experiments Program

Reference is made to Mr. Williams' NOTES of 1/30/67 and your notation (copy attached).

Enclosed is a computer set of the Experiment Program Reports: Executive Summary; Source Data; and Analysis.

The Source Data is a printout of all data included in the Experiment Data Bank. It consists of 3 pages per experiment with the information arranged as follows: (1) Page 1 identifies the experiment and gives technical data about the experiment, as well as listing investigators, monitors, and associated organizations, (2) Page 2 is a summary of the milestones associated with the experiment, and (3) Page 3 is a summary of current and planned funding of the experiment.

The Executive Summary consists of 1 page per experiment. This page is the same as the 1st page of the Source Data with a short funding summary added.

The Analysis is a combination of several smaller reports. It has the experiments scheduled for MSFEB. Also included:

Nancy -
lets hold this for
antib -

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	CODE	NAME	INIT.	<input type="checkbox"/> ACTION	<input type="checkbox"/> INFORMATION
1	DIR				
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REMARKS

-2-

1. Experiment - Mission Assignment, Gemini and Apollo.
2. Experiment - Mission Assignment, Apollo Applications - Alternate Apollo
3. Experiment - Mission Assignment, Apollo Applications - Follow-on
4. Experiment Summary by Flight
5. Experiment - Planned Work and Resources - Summary
6. Experiment Planned Work and Resources - Detail.

*enclosures
(3") returned
to Huber 5-11-67*



W G Huber

CODE R-AS-S	NAME William G. Huber	DATE 2/17/67
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NOTES 1/30/67 WILLIAMS

1/31/67

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1. Nuclear Program: Personnel from P&VE & ASO met in Washington, Jan. 25, to plan details of a review for Dr. Mueller and possibly Dr. Seamans on the overall Nuclear program with special emphasis on the Ground Test Module (GTM). M. Kline^{lein} and others attended from Mr. Finger's office. A dry run will be held in Washington on Feb. 21. The Mueller/Seamans pitch will be in early March. You (Dr. von Braun) and Mr. Weidner will be invited to attend. ✓

The current nuclear budget picture via M. Kline is: NASA - - \$46.5M, AEC - - \$63.4M, for a total of \$109.9M. This is strictly a technology type budget and is regarded as a program "phase-out" plan. H. Finger is optimistic that he may get an additional "contingency budget" of \$85M, which would allow us to start moving on such items as: Nerva engine development, NRDS facilities, GTM program, S-IC stand mods, and flight stage SRT. The consensus of people with whom I have discussed it indicates a total of \$140M to \$150M (about the past few years' level) or about half of the additional \$85M, and that money would go into the engine and facility and, at best, some small amount in the GTM with little to no \$ in the stand mods or SRT. ✓

2. Early Extra-vehicular Engineering Activities: The early EVA contract has been signed with NAA and work has been initiated. An orientation meeting was held on January 26 and MSC personnel were in attendance and actively participated. Our plans are to have a MSC man (Mr. Norman Prince) as alternate COR. ✓

3. One-year Space Station: We will start contract negotiations with the successful bidder on our one-year space station study in about ten days. The contract value will be \$400K (hopefully plus an additional \$100K for the associated experiment definition activities). We plan a sizeable inhouse effort to compliment the contractor's effort. On Jan. 16, I met with Bill Stoney and Ed Olling (Ed will run the MSC space station studies) and reached an agreement with them that we would jointly develop criteria, guidelines, assumptions, etc. which both MSC & MSFC contractors will use in conducting the studies. Mr. Olling and one of his men came to MSFC last week. We had a productive meeting which indicated we are well along the road to having these joint study guidelines ready by early to mid-February. ✓

4. AAP Experiments Program: ASO has just completed the up-dating of the AAP Experiments Program Report and delivered it to Headquarters for distribution to the MSFEB members and other individuals and organizational elements involved in the program. If you would like a copy, which shows status and information on all AAP experiments and flights (on the basis of current planning), we will be happy to forward a copy to you. ✓

5. LSSM: Mid-term reviews on LSSM were held the week of January 23. Both Boeing and Bendix reviews were well received and indicate very good in-depth coverage of the system. ✓

F.W.

Yes,
please
B

NOTES 1/30/67 BALCH

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S-II-2 Test Program - The stage was shipped from Seal Beach to MTF on 1/27/67 and is scheduled to arrive at MTF on 2/11/67. First firing is still planned for 3/24/67 on the A-2 test stand. ✓

S-II A-2 Test Stand - Most of the GSE modification work is now expected to be complete by 2/5/67, with some extended to 2/11/67. Corresponding S-II-2 stage modifications are expected to be complete on 3/2/67. ✓

S-IC-T Testing and B-2 Activation - Because of continuing problems with hydraulics/pneumatics, propellant load test is currently being rescheduled, and this will definitely impact the first static firing. Definite dates for start of propellant load test and first firing have not yet been established. Pneumatics and hydraulics have now been applied to the stage, and stage systems checkout is proceeding. Dry run of S-IC-T Static Firing Presentation Review was presented by Boeing on 1/26/67, and the second S-IC-T Critical Design Review was held the same day. ✓

S-II A-1 Activation - All high-pressure gas systems have now been turned over by the Corps of Engineers, but none are very fully operational because of deficiencies. These deficiencies are being worked off, and all systems are expected to be brought on line as they are required for GSE checkout. Cleaning of LH₂ system was started on 1/27/67. Proof-loading of both auxiliary and main derricks has been accomplished, and squawks are being worked off. Turnover of both cranes is expected early this week. Cold shock of LOX system with LN₂ was accomplished on 1/29/67, and no major problems were encountered. ✓

S-IC-4 Test Program - Representatives from R&DO laboratories met with NASA MTF personnel on 1/25/67 with regard to the End Item Test Plan, and NASA MTF personnel have since met with appropriate Boeing Personnel on the same matter. General understanding seems to have been reached, and it now appears that an acceptable End Item Test Plan can be formulated within the next few days. ✓

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AAP 1-4 CLUSTER: Reference your question on January 16 notes relating to integration problems of the AAP 1-4 cluster. An AAP Meeting was called by Mr. C. Mathews on January 23 for discussion of AAP major items which were: (1) Mr. Mathews wants to terminate LM/ATM Task Team with reports to be provided about Feb. 15; (2) The interface between the Centers will be handled with AAP panels; and (3) On Feb. 15, LM/ATM Task Team report plus other "baseline" information will be compiled into a baseline cluster specification (including design mission profile and orbital operations) by a few people from each Center and Headquarters. (Ludie Richards and George Hardy also attended the meeting.)

We are looking to Technical Systems Office for establishing a cluster baseline configuration and mission. We plan to brief Mr. Rees and you the week of Feb. 6 on the Task effort and status of preparations for the Headquarters meeting on Feb. 13. ✓

PAYLOAD INTEGRATION CONTRACTORS: Progress reviews were held at the Contractors' plants on Jan. 25 and 26. It was evident to the attendees that both Lockheed and Martin were very heavily involved in cluster systems analysis which is being used to determine cluster compatibility. We can schedule a summary briefing by Lockheed and Martin for you if you like. I would propose that such a briefing cover the cluster systems engineering work that the Contractors are doing. Martin has a full scale/cluster mockup you might want to see. ✓

Lee B.
let's talk about best time for briefing and/or visit.
B

PAYLOAD INTEGRATION SEB: The Source Evaluation Board (SEB) has approved the Phase D request for proposal. The guidelines will be released by Contracts Office this week with proposals due April 7. Discussions will be initiated shortly with the Labs to obtain detailed phase-in scope of work agreements and mission task assignments. ✓

H-ALPHA FILTER: We have obtained an H-Alpha filter on loan from MSC/Goddard. The filter belongs to MSC but was being used at Goddard in support of an MSC solar patrol project. ✓

DOD EXPERIMENTS: An informal meeting was held January 25 and 26, with DOD for discussions on Integrated Maintenance, Suit Donning and Sleep Station Evaluation, Alternate Restraints, and experiments respectively. ✓

WORKSHOP: Arrangements have been made with the MSC Orbital Workshop Project Office to have biweekly management and coordination meetings. These meetings will be held alternately at MSFC and at MSC. ✓

NOTES 1-30-67 BROWN

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J-2 ENGINE The S-IVB Stage 503 incident is apparently closed relative to engine problems. Rocketdyne is conducting a thorough review of the manufacturing and inspection procedures of the helium and hydrogen start bottles to assure no minor problems exist. ✓

Engine work on S-II/501 at KSC is progressing satisfactorily and is currently ahead of schedule. ✓

The crossover duct on AS-204 will not be painted as proposed in last week's notes (TWX). Obtaining duct temperatures without the insulating paint will verify the temperatures calculated from the gas temperatures obtained from the 203 flight. A "painted" duct may be utilized on a later flight. ✓

F-1 ENGINE F-1 engine F-6052, 4th engine for S-IC-7 was delivered on-dock at MAF on 1-27-67, 26 days ahead of the Boeing contractual on-dock date.

The water tank at Edwards AFB, Calif. is in no immediate danger. Work on the water tank hill retaining wall is progressing satisfactorily. No additional slides have occurred. All reinforced concrete has been placed. Eighteen of the 23 structural steel "A" frames have been erected. Precast concrete wall plank placement is scheduled for Wednesday, 2-1-67. The contractor has begun soil backfill. ✓

H-1 ENGINE Union Carbide personnel inspected the first stage turbine blades of the H-1 engines on S-IB-204 on 1-12-67. The inspection instrument was developed and produced by Union Carbide, and works on "eddy current" principle.

We have determined from X-ray examination that there are no wheels with mixed blades in the S-IB-204 engines. The object of the "eddy current" inspection is to provide further assurance that none of the first stage turbine wheels are made entirely of stainless steel blades. Results of the inspection provide this assurance.

"Eddy current" inspection of vehicles S-IB-209 (at MSFC) and S-IB-206 (at KSC) is scheduled for January 28 and January 31, 1967, respectively.

The following is a status of turbine rework engines. All four engines from SA-208 returned to Michoud ahead of schedule. The two engines from SA-207 were shipped on January 28, 1967. The four rework spare engines are scheduled for shipment in February as scheduled. ✓

NOTES 1/30/67 CONSTAN

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REPUBLICAN NATIONAL COMMITTEE MEMBERS VISIT MICHLOUD

Sixteen officers and members of the Republican National Committee - in New Orleans for a pre-Republican National Convention meeting - visited the Michoud assembly facility Tuesday (January 24) for briefings by NASA, Chrysler and Boeing and tours of the S-IB and S-IC assembly areas. ✓

NOTES 1/30/67 FELLOWS

1/31/67

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High Reynolds Number Test Equipment: Mr. Cook and Dr. Geissler met with Messrs. Gorman, Neubert, and Shepherd on January 23, 1967, to review the justification for the High Reynolds Number Test Equipment and obtain a policy decision. Mr. Gorman directed the design of equipment and an R&A Project for a building to house the equipment be started immediately. The test installation will be used initially to obtain data on Saturn V Load Distribution at large angles of attack. Funding for the equipment and the building will be worked out with Industrial Operations. ✓

1. High Reynolds Number Equipment: Re: your request for specific plans for obtaining High Reynolds Number Simulation Facilities (Notes 10/24/66 Geissler). We made a presentation on our proposed High Reynolds Number Equipment to Messrs. Gorman, Neubert, Shepherd, Huth, and Cook, on Monday, Jan. 23. Presentation consisted of design concept, preliminary cost estimates, housing, and siting. Plan of action that resulted from meeting is: (1) Final design of required test equipment is to be accomplished through an existing contract with FluidDyne Engineering Corp.; (2) Facilities and Design Office will proceed with design of a multi-purpose test building to be used to house test equipment and help alleviate presently overcrowded laboratory space. Estimated cost of this building is \$75,000; (3) Mr. Cook will present technical need for this facility in his "Soft Spot" presentation to I.O. Necessary \$500,000 for test equipment would come from Saturn V "Soft Spot" program. We hope the equipment will be available soon enough to give us valuable insight into the operational limitations associated with the Saturn V and AAP programs. Design and construction of the equipment could be completed 15 months after the funds are approved. ✓
2. NASA Fluorine Working Group: Personnel of our laboratory attended subject meeting at Hq on Jan. 18. Representatives from other centers and the Air Force also attended. Topics discussed were: (1) NASA's investigations of high energy propellants, (2) LeRC efforts pertaining to F_2-H_2 and FLOX, (3) JPL's studies on FLOX - Monomethyl Hydrazine/Diborane (OF_2-MMH/B_2H_6), (4) GSFC's work on engine design for use of F_2-H_2 fuel, (5) MSFC's work on atmospheric diffusion problems related to use of toxic propellants, (6) KSC's studies of ecology and toxicity relative to use of fluorine and, (7) Air Force's FLOX program. Prior to the meeting, MSFC personnel, at Hq's request, presented a plan to conduct full-scale diffusion tests to determine hazards related to release of fluorine and fluorine by-products into lower atmosphere. Mr. A. O. Tischler and others of NASA Hq. heard the presentation. Final comments on proposal are anticipated soon. ✓
3. Upper Atmosphere (110-320 km) Measurement Program: Combined MSFC/ Univ. of Michigan Upper Atmosphere Measurement Program was initiated at Cape Kennedy Jan. 24. A unique series of six NIKE/Tomahawks was successfully launched in a 24 hour period, probes of which contained instrumentation to measure diurnal variations of number density of molecular nitrogen and oxygen, total electron and ion density, temperature, and neutral particle temperature. All probes returned excellent telemetry results. Minimum apogee was 315 km, maximum was 331. Preliminary data analysis should be complete in four weeks. ✓
4. Terrain Selection for MTA Demonstration: On Jan. 23, Mr. H. Vaughan of our laboratory, briefed Mr. E. Z. Gray, Director, Advanced Manned Missions Program, and others, during demonstration of Boeing and Bendix MTAs, and Brown LSSM mockup at Army Proving Ground, Yuma, Arizona. Mr. Vaughan explained that the particular test site, which he had selected based on his lunar surface studies, represented the apparent roughness of a smooth rayed mare site as seen in the Orbiter II photos. Mr. Gray expressed satisfaction with MTA demonstration and test terrain selection. We are working with Frank Williams' Office on this program. Mr. Gray re-emphasized the need for the rover-type and the flyer-type vehicles for lunar exploration programs. ✓

1/31/68

1. S-IVB PROGRAM: S-IVB-208 was on Beta 1 test stand when S-IVB-503 exploded on Beta 3 test stand. There was no apparent damage to the 208 stage; however, a thorough inspection of S-IVB-208 will be conducted to verify its condition. DAC plans to remove 208 from the stand and install it in the VCO facility for inspection and testing. ✓
2. S-II-3 STAGE: Pneumastatic testing of the stage was successfully completed January 21, 1967. The stage is currently in Station IV, Seal Beach, where the LH₂ feedlines are being reworked. The pneumastatic test verified the structural integrity of the stage with the replacement LH₂ tank forward bulkhead. ✓
3. ENGINE PROGRAMS: A meeting was held recently at Rocketdyne to discuss changes to the R-3950A Quality Specifications Document as applicable to an ECA package block change. Rocketdyne also presented a summary of work that they had been performing in the area of welded modules, with the intent of receiving a "go ahead" from MSFC to replace the existing PC board ECA package with a welded module concept. Based on experience gained through our problem areas with Rocketdyne performance in manufacturing PC boards, we foresee many more problems if Rocketdyne is authorized to proceed with their welded module concept.

 - o A common reliability assessment procedure covering the F-1, J-2, and H-1 engine programs has been negotiated between Rocketdyne and MSFC. This procedure sets the basic ground rules for general assessment, but specific requirements for definite demonstration and incentives will have to be negotiated separately by program. It sets the basis for company reliability figures on a common ground. Once approved, it is intended that it will substitute the present contractual procedures now in use.

Bill Brown

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ATM

Some of the most significant areas which are being worked with MSC are:

- (1) Power Profile for LM during free-fly mode.
- (2) Raising of Ascent Stage for ATM gimbal spar clearance.
- (3) Docking to passively stabilized workshop and structural effects on the CSM docking collar.
- (4) LM RCS impingement effects on the solar array and other ATM equipment.
- (5) Film Retrieval. Present thinking is side retrieval by EVA is more feasible than by IVA through the Ascent Stage engine will.
- (6) Thermal conditions and required implementation.
- (7) Momentum desaturation requirements for the RCS of LM and CSM.

The LM/ATM Ad Hoc Committee will meet at MSC on February 3. Resolution of many of these problem areas is moving slowly in relation to the ATM schedule requirements. ✓

1/31/67

F-1

F-1 engine S/N F-5038 was removed from the West Area F-1 Test Stand for a new thrust chamber and the latest available hardware modifications (in-house). Engine S/N F-4024 was installed and is scheduled for a calibration test on February 3, 1967. ✓

POWER PLANT TEST STAND

H-1 engine test PI-490 was conducted at the Power Plant Test Stand on January 24, 1967, for a duration of 15 seconds. This was the sixth successful prevalve shutdown test of this series. ✓

S-IVB-208

S-IVB-208 has been removed from the stand and installed in the VCL for post-static checkout. ✓

S-IVB-504

S-IVB-504 arrived at SACTO Thursday and was being prepared for installation into the Beta 1 stand. ✓

S-11-2 (MTF)

S-11-2 was shipped from Seal Beach on Friday, January 27, 1967, and is scheduled to arrive at MTF on February 12, 1967. ✓

S-1B

Stage S-1B-9 was received and installed in the Static Test Stand East on January 26, 1967. The short duration test SA-42 is scheduled for February 21, 1967. ✓

TAIL SERVICE MASTS (AS-501)

Special tests were completed Thursday, January 26, 1967, to determine if close proximity of the existing AS-501 vehicle to the lox and fuel tail service masts would result in interference between the masts and vehicle at lift off. Vertical rise tests of simulator showed no interference conditions detrimental to vehicle launch. Extreme wind conditions, presently being discussed, were not considered. Results have been discussed with P&VE and KSC. ✓

SATURN V PRIMARY DAMPING SYSTEM

Test program, as originally planned, should be completed this week. We are presently conducting the dynamic system tests which are the last tests in the procedure. ME Laboratory is fabricating the redesigned hook system which has been the main problem in the test program. It is scheduled for completion by February 6. Additional time is needed in order to test the new system. We are working with P&VE on test schedule delay of one week. ✓

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NOTES 1-30-67 HOELZER
1131 JTB

1. COMPUTER GRAPHICS SYMPOSIUM: The Computation Laboratory and the Army Missile Command are jointly sponsoring a symposium on "The Growth of Computer Graphics" to be held March 1 - 3, 1967, in the Morris Auditorium. The purpose of this symposium is to convey an awareness of the far-reaching implications and rapid growth of computer graphics, and to analyze hardware and software developments. ✓

About 400 key engineering, scientific, and management personnel from the Army Missile Command and MSFC and their contractors will attend. Approximately 75 of the country's most renowned leaders in the development of computer graphics will be invited. You are scheduled to welcome the group at 9:10 a.m., March 1. ✓

2. AUTOMATIC CHECKOUT STATION: In a cooperative effort with Quality Laboratory, the Computation Laboratory is developing an automatic checkout station to be located in Building 4708 which communicates with the third generation computer located in Computation Laboratory, Building 4663.

This station will allow the use of the central computer, under monitoring controls by a human test conductor during an automatic checkout process. This makes a computer, with approximately 50 times the computational power of the present checkout computer (RCA 110A), available for checkout. However, this fast computer will be utilized only during very short burst of intensive computation, thus making these services economically feasible. The new system will enable Quality Laboratory to monitor tests closer, change test procedures through a conversational computer language, and analyze test failures and results immediately through supplementary computer programs within the large central computer. ✓

H.H.
Yes, I'll
be glad to,
How can
I best get
a 1-hr
condensation
on
computer
graphics?
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NOTES 1-30-67 JOHNSON

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1. Surveyor Television Camera - According to Mr. E. C. Hamilton (R-ASTR) a formal proposal of the Hughes study to adapt subject camera to the Saturn V mission was delivered to P&C on 1-20-67. As suggested by Mr. Shepherd, Mr. Hamilton has discussed the possibility of utilizing the camera in the Apollo Program with a representative at OMSF. However the representative did not make any commitment and suggested that you should present the subject to the Management Council Meeting. Briefly reviewing the technical part of the proposal, Mr. Hamilton concluded that the camera operation appears feasible, but that he has some reservations about the deployment and data recovery schemes proposed. ✓

B.J.
I can do
that only if
we have
a hard
(and sound)
proposal.
Suggest you
discuss
possible
merits with
Lucas and
Feissler
B

2. X-Ray Mapping Experiment (Headquarters # S-027) - The Research and Development Plan (RDP) has been presented to Mr. Weidner for approval. Program authorization release for 100K of funds has been received from I. O. This represents a total of 750K available for FY-67. as of today PR's have been initiated for 597K. The remaining funds will be used for procurement of tape recorders, housing, mounting bracket qualification, and supporting electronics. ✓

3. Gravity Gradient Stabilization Program - Dr. Nurre (R-ASTR) has originated three experiment proposals which make up the above program. Two of these, MSFC # 63, "Extendible Rod," and MSFC # 64, "Passive Gravity Gradient Stabilization of the S-IVB," have been defined on NASA Form 1138. The third proposal, "Passive Gradient Stabilization of the LM," is in the definition phase, the finalization of which is dependent upon the results of the "Extendible Rod" experiment and a damper systems study, presently being conducted by G. E. Forms 1138 for MSFC # 63, and # 64 will be submitted to Headquarters' ECP next week. ✓

4. Research Achievements Review # 6 (Second Series) - The review of "Chemical Propulsion" was held at the Morris Auditorium on 1-27-67. Representation by personnel from Headquarters, other Centers and attendance from MSFC personnel was very good. ✓

5. Gravity Substitute Workbench Experiment (MSFC #57) - Efforts are being made by R-EO to combine a forced airflow experiment concept on which R-AERO is working with an Electrostatic Field Concept recently demonstrated to MSFC personnel by Chrysler. R-ME will also be involved since their "Space Manufacturing Aid Experiment" is utilizing the same electrostatic principle. ✓

Interesting!
B

NOTES 1-30-67 KUERS

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Neutral Buoyancy Facility: We have a heavy workload and tight schedules for our existing neutral buoyancy facility for the next 6 to 8 months. These schedules cover only our immediate short term requirements such as Design Verification of Hatch Removal, LH₂ Tank Entry and Inspection, Habitability and Experiment Package Transfer, ECS Installation, Tank Preparation, Crew Quarters Installation, etc. Many of these programs are joint programs with P&VE, partially in support of their GE space maintenance contract. Not yet included in our schedule are projects for ATM, MDA, Resupply Module, M&SS, etc. We are already now seriously hampered by the size limitation of our existing tank. Approximately a year ago I had submitted a proposal for a Neutral Buoyancy Facility which would be big enough for full size simulation of these projects. After Mr. Schwinghamer's presentation of this subject in the MSFC Facility Board Meeting in January last year I concluded from comments of the Board and from your personal remarks that (1) such a facility would, indeed, be very desirable to have and would be considered a valuable tool for development of AAP experiments, and (2) that it was not advisable to submit this project as a new facility to NASA but rather to plan it as an alteration to an existing facility in order to reduce cost and to obtain this tool as fast as possible. Well--- a year has gone by and the only positive action that has been accomplished to date is that we have made available our Mock-Up Building for this purpose and have removed all hardware and equipment from this facility. Without this tool we cannot do our engineering homework as required. Since we have made no progress in obtaining it should we plan to transfer the verification of designs and concepts for AAP projects to the Houston Center?

1/31/67

B2/2

1. LH₂ INSULATION EVALUATION FOR S-II AND GTM: The LH₂ tank insulation for the Nuclear Ground Test Module will undergo LH₂ fill and drain cycling and thermal evaluation before and during exposure to the nuclear reactor environment within the next two months. The tank is insulated on one side with the cork insulation system for comparison with the CPR-368-3 polyurethane spray-on insulation system on the other side. The new spray-on system, representing several improvements in processing and foaming techniques, is identical to that which NAA-S&ID has proposed for future S-II stages. It can now be sprayed on large tanks here at MSFC by ME Laboratory. This evaluation will provide important information for both S-II and GTM insulation systems. ✓
2. APOLLO TELESCOPE MOUNT: In-house design work has stopped on the gimbal system since Astrionics Laboratory has chosen the flexure pivot as the primary gimbal bearing. The gimbal system will be a contracted effort with the contractor supplying the gimbal bearings, rings and caging mechanism. ✓
3. AS-204 SEQUENCE CHANGE: A request has been transmitted to Mission Operations Office (I-MO) to initiate the J-2 engine pump purge by ground command near the end of the AS-204 mission. This purge is used during orbit on Saturn V to cool the J-2 engine turbine and crossover duct temperature prior to restart. The test on AS-204 will verify whether or not the purge as planned for Saturn V is adequate. The feasibility of incorporating this test in the flight sequence program was investigated; however, it was determined the best mode of implementation at this late date is to use existing ground command capability. ✓
4. S-IC STAGE UMBILICAL: Testing on the S-IC aft umbilical/tail service mast (TSM) system 1-2 was completed on January 25, 1967. Purpose of the test was to determine if the existing configuration and location of the aft umbilical/TSM systems on Mobile Launcher (ML) No. 1 are satisfactory for launching SA-501. The test was based on a nominal distance of 30.8 inches between the vehicle umbilical plate and umbilical/TSM interface considering a possible vehicle horizontal shift of 2 inches at liftoff. Results of the test were satisfactory and indicated no interference problems. ✓
5. RACK: Preliminary study of the RACK design as related to SAA-1 will be completed this week. Four RACK configurations are being considered in response to the MSC request of January 10. The concepts under consideration are as follows: (a) Using full RACK, (both upper and lower RACK) with docking collar top end and docking collar on side, EO-O/LO-O mounted on RACK, RACK/SLA separation, RACK/PM/EO-O/LO-O into orbit. This configuration includes cold gas stabilization system. (b) RACK like #1 except docking collar at each end of RACK and no side docking collar, RACK/SLA separation. (c) RACK essentially as presently designed, EO-O/LO-O mounted as integral part of PM, RACK/PM separation, docking collar top and side of PM. (d) Docking collar each end of PM, EO-O/LO-O integral to PM, PM higher in RACK, RACK/PM separation as in #3. Results of the studies including impact on MSFC resources and schedules are being prepared for presentation to Headquarters January 31 and February 1, 1967 in Washington. ✓
6. MOBILITY TEST ARTICLE/LSSM MOCK-UP TESTING: The Brown Engineering's LSSM Mock-up was demonstrated, in conjunction with the two MTAs, to NASA Headquarters personnel on Monday, January 23, 1967 at Yuma Proving Ground. The LSSM Mock-up and both the Bendix and the General Motors MTAs successfully negotiated a simulated lunar landing site test course. All three vehicles were driven by the NASA Headquarters personnel attending. The test program should be completed January 27, 1967. MTA test fund limitations preclude additional testing. ✓

NOTES 1/30/67 MAUS

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TEAGUE VISIT - The date of the Manned Space Flight Subcommittee hearings at MSFC have been changed from February 2, 3, and 4 to February 9, 10, and 11. Although the tragedy at KSC was a factor in the slip, Mr. Teague also wanted to hold these hearings at a time when Congressman Hebert could personally be in attendance. Mr. Hebert will definitely accompany the Subcommittee on February 9. The dry run for the hearings has been re-scheduled to February 7, tentatively. ✓

S-IVB - 503 INCIDENT - IMPACT ON POP 67-1 - The assessment of the S-IVB - 503 incident will not be completed in time to include the results in POP 67-1. A statement to this effect is included in the narrative portion of the POP. If the decision is made to repair the Sacramento test stand and to build an additional S-IVB stage, both the FY-67 and FY-68 funding requirements will increase. The assessment will be completed in approximately six weeks. ✓

NOTES 1/30/67 RICHARD

1/31/67

B_{2/2}

No submission this week.

1. S-IVB-503 Explosion at Sacramento:

o Investigation to date indicates that nine (9) ambient helium bottles manufactured by Airtek Dynamics, Inc., were welded with pure titanium filler rod rather than the correct alloy rod.

o Due to lower strength of the pure titanium filler rod a failure might result under sustained operating pressures. If test underway verifies this failure mode, it is believed the cause of explosion of the stage has been determined.

- o The serial numbers of the nine (9) suspected bottles are known:
- Five were on S-IVB-503.
 - One is in simulated stage test at Sacramento.
 - Search is underway for the remaining three (3). ✓

2. S-IVB-504 Stage:

- o Stage arrived at SACTO on Wednesday, 25 January 67.
- o Acceptance firing presently planned for early April 67.
- o Douglas has been directed to replace 503 with 504 and to have the "new" 503 ready for shipment to KSC on 15 June 67.
- o Technical review is underway to determine and initiate instrumentation modifications necessary to supplement 504 operational instrumentation. ✓

3. S-IVB Restart:

o Outcome of engine testing to solve hot crossover duct problem will not be known until 15 March 67.

o As a contingency, DAC is being requested to provide engineering, hardware and software identification, etc., for a stage supplied helium purge. ✓

4. S-II-1 Stage at KSC:

o Inspection of the LH₂ tank was completed at 7:00 am, Thursday, 26 January 67.

- No major repair problems found. Only a small number of cracked gussets supporting the horizontal ribs and a small number of elongated holes in the splice plates were found.
- These repairs are considered to be minor and should not impact the schedule. ✓

5. S-II-2 Stage:

o Stage was loaded aboard the Point Barrow at 1:10 pm, PST, Friday, 26 January 67 and departed the Seal Beach dock at 4:10 pm.

o Forecast "on dock" MTF, Saturday, 11 February 67. ✓

NOTES 1/30/67 SPEER

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1/31 JES

1. ACCIDENT AT KSC: We were monitoring the AS-204 Overall Systems Test on 1/27 through LIEF when the S/C accident occurred. We were immediately aware of the seriousness of the accident and I informed available MSFC management. All recorded LIEF data were impounded by KSC direction. The MSFC failure investigation plan was not called up. We could retain voice contact to C. Casey at Houston Flight Control. ✓

2. APOLLO SECURITY: MSFC inputs to a Headquarters study concerning all security aspects of the first Apollo lunar landing mission were presented by R-ASTR to Dr. Rees and Capt. Middleton on 1/27. A complete briefing to Gen. Phillips by all Centers involved was scheduled for tomorrow and will now be rescheduled. ✓

3. GROUND WIND PROCEDURES: We are preparing in conjunction with Structures Division a proposed procedure for action to be applied on AS-204 and subsequent flights if the specified ground wind structural limits are exceeded during the countdown. The Launch Mission Rules already contain rules to give maximum protection against exceeding acceptable limits, but KSC is unable to guarantee protection in all cases. The procedure presently being worked will spell out data requirements, inspection requirements, and LIEF personnel required to assess in real time the ability to proceed or necessity to scrub and inspect more closely. After MSFC coordination, we will get together with KSC and MSC on this. In addition, ground wind bending moment and other contingency displays in the Huntsville Operations Support Center will be provided for our people. Our request for realtime pad anemometer data has been turned down by KSC, but we are pursuing the requirement with them. ✓

4. MISSION RULES GUIDELINES: The MSF management instruction providing basic guidelines and procedures for preparation of Apollo mission rules has still not been agreed to by all Centers concerned, after several drafts and months of coordination. MSFC and MSC are essentially in agreement with OMSF, but KSC has requested another meeting. ✓

1/31/67

- ES.
I know
B
1. ADMINISTRATOR'S PROGRAM REVIEW: During the OART presentations on Space Power Systems and Electric Propulsion, Mr. Webb made a number of remarks recommending the stimulation of industrial in-house efforts in research and component development, without big government funding from the very beginning. He said that NASA must be a catalyst not only for new scientific and technical ideas, but also for new ways in which R&D work can be done jointly between industry, DOD, and civilian government organizations. A detailed trip report is available from my office upon request. ✓
 2. LUNAR DRILL: Mr. Phil Culbertson of OMSF visited MSFC last week to discuss the LSSM and the lunar drill. Mr. Downey and Mr. Bensko of SSL and personnel from Test Lab reviewed the lunar drill work with Mr. Culbertson. He seemed satisfied with the progress being made, and with the present arrangement. Test is leading the project, and SSL is strongly contributing to the effort on a continuing basis. ✓
 3. STUDY OF PHOTOGRAPHIC PLANETARY MISSIONS: Mr. Larry Wood of SSL presented a paper entitled "Photographic Exploration of Mars with Solar-Electric Propulsion" at the AIAA Fifth Aerospace Sciences Meeting in New York last week. The paper was well received. It was co-authored by L. Wood, W. P. Prasthofer of R&VE, and Dr. R. I. Vachon of Auburn University (a summer employee of SSL); it is the result of a team effort between AERO, P&VE, ASO and SSL. A presentation to you is now scheduled for February 13. ✓
 4. SYMPOSIUM ON LUNAR SURFACE: I attended a symposium on "The Lunar Surface" held by Dr. Kuiper of Arizona State University. It was attended by Dr. Newell and a large number of lunar experts from NASA and other research organizations. Among the interesting points made by the speakers were the following: the rear side of the moon does not contain maria, for yet unknown reasons. Most of the surface material consists of fine grains, about 1/10 millimeter size. The surface is "broken up" to a depth of at least 3 m, perhaps 15 m. The oldest craters and maria are not older than about 500 million years. All older craters have been completely obliterated by a thorough "working over" by impacts. It appears possible that many large craters, including Copernicus, were produced by volcanism. About 1000 "hot spots" on the surface were found during a recent eclipse with temperatures of several degrees to several tens of degrees above normal. Heat source for all of them is probably the sun. The vicinity of Copernicus should be considered as one of the early Apollo landing sites. Most geological studies must wait until man, equipped with some mobility device, can observe directly. ✓

B
2/2

1/31/67

S-IVB FUEL DEPLETION CUTOFF ARMING: I noted in Dr. Geissler's note of last week (January 23, 1967) that there is a strong move afoot in MSC to take over guidance during the second S-IVB burn. We have had a similar evidence of increasing interest by MSC in launch vehicle guidance functions. Chris Kraft has questioned the MSFC philosophy of using the propellant depletion sensors to cutoff the S-IVB in the event of a failure of the normal velocity cutoff. He has stated preference for a manual astronaut cutoff. We are standing firm on the requirement for the backup low level fuel sensor cutoff.

Yes, to protect stage from blowing up if astronaut fails to act. B

B.T.
Why not manual checkout cut-off as an additional option? May indeed simply post cut-off recovery problem!
B

SA-206: Development of the 206 flight program tape is running late and could become the pacing item for the 206 launch. This is attributable to: (1) S-IVB-206 had to undergo a second static firing (because of the turbo pump changeout) which resulted in late propulsion data for the development of the operational trajectory, and (2) MSFC and MSC were late in agreeing on the final in-flight venting sequences and orbital time lines.

We will have a meeting this week with R&DO and IBM and develop our best possible schedule. We may still be able to work within the umbrella of the LM.

SATURN IB LAUNCH SCHEDULE: In order to be prepared to respond to any program adjustments, as a result of the SA-204 incident, we are evaluating possible spacecraft and mission assignments and their effect on the launch vehicles.

H-1 ENGINE: (Reference is made to Mr. Brown's note of January 23, 1967) CCSD has established a committee to be headed up by Mr. Ralph Loomis which will review existing engine checkout and handling procedures with the objective of further disciplining CCSD workers to conform with procedures and to assure the procedures are adequate. CCSD is also investigating recent human errors which could have been committed by CCSD or Rocketdyne personnel.

Bill T.

Please take up with Ludie Richard
B

1. Nuclear Program: Personnel from P&VE & ASO met in Washington, Jan. 25, to plan details of a review for Dr. Mueller and possibly Dr. Seamans on the overall Nuclear program with special emphasis on the Ground Test Module (GTM). M. Kline^{Klein} and others attended from Mr. Finger's office. A dry run will be held in Washington on Feb. 21. The Mueller/Seamans pitch will be in early March. You (Dr. von Braun) and Mr. Weidner will be invited to attend. ✓

The current nuclear budget picture via M. Kline is: NASA - - \$46.5M, AEC - - \$63.4M, for a total of \$109.9M. This is strictly a technology type budget and is regarded as a program "phase-out" plan. H. Finger is optimistic that he may get an additional "contingency budget" of \$85M, which would allow us to start moving on such items as: Nerva engine development, NRDS facilities, GTM program, S-IC stand mods, and flight stage SRT. The consensus of people with whom I have discussed it indicates a total of \$140M to \$150M (about the past few years' level) or about half of the additional \$85M, and that money would go into the engine and facility and, at best, some small amount in the GTM with little to no \$ in the stand mods or SRT. ✓

2. Early Extra-vehicular Engineering Activities: The early EVA contract has been signed with NAA and work has been initiated. An orientation meeting was held on January 26 and MSC personnel were in attendance and actively participated. Our plans are to have a MSC man (Mr. Norman Prince) as alternate COR. ✓

3. One-year Space Station: We will start contract negotiations with the successful bidder on our one-year space station study in about ten days. The contract value will be \$400K (hopefully plus an additional \$100K for the associated experiment definition activities). We plan a sizeable inhouse effort to compliment the contractor's effort. On Jan. 16, I met with Bill Stoney and Ed Olling (Ed will run the MSC space station studies) and reached an agreement with them that we would jointly develop criteria, guidelines, assumptions, etc. which both MSC & MSFC contractors will use in conducting the studies. Mr. Olling and one of his men came to MSFC last week. We had a productive meeting which indicated we are well along the road to having these joint study guidelines ready by early to mid-February. ✓

F.W.
Yes,
please
B

4. AAP Experiments Program: ASO has just completed the up-dating of the AAP Experiments Program Report and delivered it to Headquarters for distribution to the MSFEB members and other individuals and organizational elements involved in the program. If you would like a copy, which shows status and information on all AAP experiments and flights (on the basis of current planning), we will be happy to forward a copy to you. ✓

5. LSSM: Mid-term reviews on LSSM were held the week of January 23. Both Boeing and Bendix reviews were well received and indicate very good in-depth coverage of the system. ✓