3/6/67 w/comments

NOTES 3-6-67
WITH COMMENTS

MR. GORMAN'S COPY

No DEP-A Action

NOTES BALCH 3/6/67

B 3/8

S-IC-T Testing - First static firing of the S-IC-T at MTF was accomplished late Friday afternoon, 2/3/67. Automatic cutoff occurred at the end of 15 seconds, as programmed, and no major problems were encountered. Current plans call for a second firing of the S-IC-T on 3/15/67, with a duration of 40 seconds.

S-II-2 Testing - Stage Power Checkout was completed on 3/5/67, and no major problems were encountered. Pre-static modification effort is slightly behind schedule, primarily because of late mod kit deliveries. However, through work-arounds and rearrangement of work schedules, it is expected that major impact on S-II test program can be avoided. First static firing is still scheduled for 3/25/67.

S-II A-1 Activation - Corps of Engineers is installing the insulation for the LH_2 dump and vent system and working off the remaining constraints to cold shock of the LH_2 system, which is still planned for 3/12/67. GSE checkout is still expected to be complete by 3/15/67. Checkout of the A-1 stand with the H7-17 fit-up fixture was started on 3/4/67 and completed on 3/5/67.

S-II Fit-up Fixture - Both the S-II Vertical Checkout Building and the S-II A-1 test stand have now been checked out with the H7-17 fit-up fixture, and the fit-up fixture is ready to be shipped back to KSC today.

S-IC-4 Planning - Current plans call for shipment of S-IC-4 stage from Michoud to MTF on 3/20/67 and installation in the B-2 position of the S-IC test stand on 3/21/67.

NOTES 3/6/67 BELEW

3/6/67 B 3/8

ACTION ITEMS FOR MSFEB: As requested by Mr. Mathews, we are making an assessment of the compatibility of the following experiments with the 1968 cluster mission and are conducting an evaluation of the trade-offs associated with flying these experiments as presently configured vs. redesign and relocation to the MDA or LM/ATM to permit reuse: (a) S009 - Nuclear Emulsion; (b) S017 - X-Ray Astronomy; (c) S018 - Micrometeorite Collection; (d) S019 - UV Stellar Astronomy; (e) S020 - UV X-Ray Solar Photography; (f) T004 - Frog Otolith Function. This has to be furnished to MSF by March 10.

ATM: It is expected that Chuck Mathews and John Disher of Hqs. and Bob Thompson of MSC will attend the ATM review on March 8, tenth floor, bldg. 4200. The review will concentrate on the technical design status.

MSFC personnel from Astrionics, Research Projects, and this office received a detailed briefing from Mr. Carson from Rye Canyon Research Facility on the characteristics of the interference type H-Alpha filter. The briefing indicated that the interference type filters should prove entirely adequate for the ATM application. As a result, we are presently re-examining the need to pursue development of a birefringent type H-Alpha telescope in parallel with the objectives to avoid this additional expense if possible.

AAP INTER-CENTER PANELS: The Centers involved are in substantial agreement on the charters for all panels except in the areas of flight mechanics, flight operations, and overall systems and mission integration. Chuck Mathews' activation of the Mechanical, Electrical, and Instrumentation and Communications Panels is believed imminent. R&DO has designated Co-chairmen (Boone, Fichtner, Hoberg) who are already working the problems.

MULTIPLE DOCKING ADAPTER/AIRLOCK MODULE INTERFACE: We are meeting with MSC and MAC at St. Louis this week to proceed with the development of detailed interfaces between the MDA and the AM. These interfaces will be developed on the basis of "baseline" agreements reached at MSF on Feb. 23-25. These agreements include a structural interface in the 10 foot diameter section (nominal) about four feet above the forward end of the AM tunnel. We will build the MDA and completely outfit it with experiments, equipment, plumbing, wiring harnesses, etc. for delivery to KSC. MAC will do likewise for the AM including the 4 foot long-10 foot section (the structural transition section).

CLUSTER STRUCTURAL DYNAMICS ANALYSIS: As I reported to you in the briefing in the MSF cluster "baseline" meeting, MSFC has been assigned responsibility for the overall cluster dynamics. We have met with R&DO (Tech Systems Office and Labs) to initiate action. Martin and Lockheed have done some work in this area already and will continue to support this effort.

LOCAL SCIENTIFIC SURVEY MODULE: We are coordinating hardware development schedules for the LSSM with MSF and MSC to assure that the LSSM carrier, as well as cargo to be carried on the LSSM, will be ready for a 1971 mission. A "baseline" AAP lunar schedule was derived as a basis for these discussions.

Supplementary statement to weekly notes for week ending March 3, 1967, on Orbital Workshop Micrometeoroid Shield Meeting.

To implement the actions identified in the February 27 meeting on meteoroid bumper problems associated with the Workshop, several actions have been taken.

DAC has been directed to design, test, and manufacture a flight type meteoroid shield for the S-IVB Workshop. The meteoroid shield will be installed on the S-IVB as a kit. Action has been taken to implement studies with DAC on materials for an alternate internal insulation for the S-IVB. Also, we are exploring, through some in-house discussions, the possibilities of an external insulation that could be used as an emergency backup. The S-IB Program Office has been requested to take the necessary action to set aside the S-IVB-212 to be held for the Workshop. If a new insulation becomes available at an early date, then it might be installed after stage assembly on 212 (prior to its shipment to SACTO).

A complete evaluation program is being planned to verify the effectiveness of the aluminum foil internal liner as a fire retardative. Both in-house and contractor efforts will be utilized to provide a comprehensive program.

NOTES 3-6-67 BROWN

3/6 JDS

B 3/8

J-2 ENGINE In the notes of 2-27-67, we stated that the Electrical Control Assembly failure at AEDC had been attributed to an ignition phase solenoid failure outside the ECA, which in turn caused a transistor in the ignition phase circuitry within the ECA to fail.

The ECA in question was disassembled at Rocketdyne, Wednesday, 2-22-67, in the presence of I-E and R-QUAL representatives. Those present, including Rocketdyne, concluded that an ignition phase solenoid failure did cause the ECA transistor failure. On Monday, 2-27-67, an extensive inspection of each circuit board in the ECA was made. During this inspection a piece of safety wire was discovered welded to the circuit involved. It is concluded that this piece of wire found its way into the ECA during manufacture. During the last test at AEDC it shorted the ignition phase circuitry. The ECA had been removed from the engine the test before for replacement of another component. All ECA's are vibrated without the cans in the presence of a vacuum cleaner to remove any manufacturing debris. However, the last manufacturing operation requires safety wiring the exciter leads. This accounts for the piece of wire in this particular can. Rocketdyne has incorporated a plastic covering for the ECA during this operation.

The helium tank weld sampling procedure has been revised due to recommendations received from R&DO; primarily from the Qual Lab. The procedure now requires an Eddy Current check of both the start and helium tank weld joints. A revision to Engine Field Inspection Request 21, was issued immediately and S-II-1 tanks were inspected 3-6-67 and found to be ok. The S-II-2 tanks were inspected 3-2-67 at MTF. The inspection requires the removal and repair of a 2-inch square section of start tank insulation material, the removal of the start tank vent and relief valve, tank drying and leak checks. The S-II-2 inspection was reportedly performed in eight hours so KSC impact should be minimal.

F-1 ENGINE During inspection of the SA-501 engine reported last week, a 3/16-inch by 3/4-inch hex-head bolt was found on the back face of the injector in engine 3015. The bolt was removed and identified as being manufactured by Air Industries to a Boeing Company Specification No. MBB 30C-3C5. This type bolt is used in the LOX tank antivortex assembly and instrumentation probe support on the S-IC stage. The bolt appears to never have been installed into a threaded fitting, and may have been dropped into the engine system after the screen had been removed from the T/P LOX inlet. The two pieces of teflon reported last week appear to be the same type used as a sleeve to protect the bolt mentioned above. Further analysis is being made to determine the extent of damage that may have been caused by the bolt. Preliminary results indicate that disassembly of the engine will not be required.

The purge system lines on all SA-501 engines have been purged and inspected for metal particles, as a result of the GSE line failure previously reported. No metal particles were found.

NOTES 3/6/67 CONSTAN

3/6/67

UTILITIES CONSERVATION PROGRAM

In September 1966, a committee composed of representatives of the prime contractors was formed at the MSFC/Michoud Assembly Facility. The objective of this "Utilities Conservation and Control Group" is reduction of utility costs. Through the efforts of this committee considerable savings have already been realized with greater savings projected for the future. The Office of Manned Space Flight was impressed by this program and has suggested its adoption by other NASA centers and field installations.

STATUS OF METAL TRADES UNION AGREEMENT WITH MASON-RUST

Mason-Rust, Michoud Support Services Contractor, has been negotiating with the New Orleans Metal Trades Council to renew the agreement which expired March 3, 1967 - Although the two parties reached an equitable agreement on February 24, the agreement was rejected by the membership of the bargaining unit of Mason-Rust employees in a vote taken February 25. Further negotiations were resumed and continued the week of February 27. The final ratification vote was held at 4 p.m., Friday, March 3. Final results were 193 against ratification, 124 in favor. Pickets appeared just after midnight Saturday morning, March 4, 1967.

NOTES 3/6/67 FELLOWS

B 3/8

3/6 9AS

R&D Operations Saturn/Apollo Funding Status: R&D Operations had Saturn/Apollo guidelines of $99.0 million at the beginning of February. Additional funding in the amount of $6.7 million has been received from IO to date, making a revised availability of $105.7 million. The total FY-67 requirements for the support contractors have been initiated. As of March 3, 1967, R&DO had a balance of $1.5 million available for Saturn/Apollo procurements in addition to approved Repair and Alteration Projects, minimum Supplies and Materials, and Propellant requirements. There exist high priority requirements of approximately $12 million against this $1.5 million balance. A meeting is scheduled this week between R&DO and IO (Cook/Hueter) to discuss the amount of additional funds that can be made available to R&DO this fiscal year.

NOTES 3/6/67 GEISSLER

3/6/67 B 3/8

1. Tether Dynamics: Two interesting preliminary findings have resulted from studies of suitable orbital maneuvers for soft-tether operation of the LEM/ATM. First, if the body with the higher drag deceleration (LEM/ATM) is placed behind the main body (the workshop), it will try to catch up with the workshop, due to higher drag. If a soft-tether line connects the two, and at approximately the point of closest approach, but prior to passing, a discrete pull on the tether is applied, energy will be transmitted from the heavy to the light body, and the light body will go to a slower, higher energy orbit, and fall back further. The consumption of energy will make it catch up again and the game will be repeated. A typical example shows that with a tug every 3 1/2 orbits, the separation distance between the two bodies will vary between ≈ 20 and 80 meters. The radial difference is negligible. Extension from the present open loop feasibility study to a closed loop system is underway, and this should be followed up by engineering implementation studies. A second study investigated the possibility of retrieving the LEM/ATM by means of tether only. Feasibility was proved by a two-dimensional linearized simulation, using two tether ropes driven by four winches. The initial rotational impulse of the combined system has to be negligible, or compensated by propulsive means. The system compensates for the relative motion of the bodies to each other (rotation and translation). Manual control and simple automatic control were found feasible. Two pertinent references are: "Combined Workshop/ATM Soft Tether Station Keeping" by Barton S. Perrine (R-AERO), and "Preliminary Analysis of a Cable Retrieval Technique for the Tethered ATM-Workshop" by Eugene Worley (R-AERO).

Mtg 4/17

E.G. Please arrange for some one giving me a short briefing w/ a few sketches B

2. Project Odyssey: Re: your question in Notes 2/20/67 Geissler: What is Odyssey? ODYSSEY (acronym formed from "Orbital Dynamics of Spherical Satellites Experimentally") is an experiment designed to study free molecular and transitional aerodynamics, surface-gas molecular reflection, density in the 160 to 200 km region, and to improve geodetic knowledge. Additional knowledge about these parameters will provide more sophistication in our satellite and spacecraft orbital lifetime predictions. Dynamics of the 5000# spherical satellite ensemble, injected into an elliptical orbit from an S-IVB orbit, will be determined by Baker-Nunn camera tracking.

3. Orbital Lifetime: Our orbital lifetime prediction program was described by a representative of the Flight Test Analysis Division, February 17 at MSC. MSC personnel were enthusiastic about receiving the program, and expect to use it in their real time operations. We are helping them get the program operational on their computers. MSC also expressed interest in obtaining aerodynamic characteristics from us on future spacecraft configurations. Request to obtain the program was also received from Bellcomm.

NOTES 3-6-67 GRAU

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3/6/65

1. IU-501 CCS TRANSPONDER: Numerous failures experienced in the qualification testing of the Command and Communication System (CCS) Transponder will require recycling of at least seven units, including the flight and spare units from IU-501, to Motorola for repair of staked component connections. The number and type of failures indicate some design and quality problems, the cause of which will be thoroughly investigated during a survey at Motorola, Inc. this week.

2. S-IC DISTRIBUTOR PROBLEM: During the "contaminated" relay changeout of the S-IC-2 distributors it was discovered that the potting-foam material (sta-foam) had expanded significantly causing terminal board bending and crowding of printed circuit cards. A similar situation was first discovered in distributors of IU-500FS, which underwent thermal vacuum testing, and the distributors presently in S-IC-1 at KSC may be in the same shape. A representative of this Laboratory will participate in the S-IC-1 inspection. Boeing is working on this problem looking for a way to post-cure the foam and save the distributors. Considering the age of the S-IC-1 distributors, we may have a major problem.

NOTES 3/6/67 HAEUSSERMANN

B 3/8

1. Navigation/Traffic Control Satellite. ERC has been given the lead assignment in this program. According to Mr. Eugene Ehrlich of OSSA, this assignment was primarily due to ERC's willingness to establish an organizationally separate task force for handling the work. MSFC was, for a number of reasons, unable to form such a group. Mr. Ehrlich is still interested in having MSFC carry out investigations in two subtask areas - the applicability of the AROD system to the NAV/TC problem and the furthering of the interferometer concept through study and research.

Considering our Voyager commitment, ATM, and other responsibilities, and noting that ERC now has the lead assignment of NAV/TC studies and investigations, we are forced to conclude that the long term interests of Marshall would be best served by expending a minimum of effort in the NAV/TC area.

We are examining the two subtask areas to determine if these research funds can be used to further some of our needs in other programs while still providing useful information to the NAV/TC program. No work that would imply commitment to a continuing or growing effort relative to NAV/TC will be undertaken. For the present, we propose to offer Mr. Ehrlich our experience and capability on a consultant basis in the two areas of interest and to provide information in our specialities to those carrying out his work.

2. Results of Saturn V Configuration I Dynamic Tests. (Reference Rudolph Notes 2/27/67 Item 2) The results of Saturn V Configuration I (total vehicle) dynamic tests performed by the Boeing Company (TBC) resulted in a NO-GO condition for AS-501 due to excessive pitch attitude rate gyro motion caused by local deformation of the upper portion of the IU. The consequence is an unacceptably low stability margin in pitch at second bending mode from lift-off to maximum dynamic pressure region of first stage flight.

Concerted effort is being made to remedy this NO-GO situation for AS-501 and subs by:

a. Physical relocation of the control rate gyros, preferably within the IU or possibly to the SIV-B aft section.

b. Changing the stabilizing filters in the control computer.

Dynamic retesting by TBC is planned to start Tuesday, March 7, 1967 to increase confidence in the planned alternate locations of rate gyros prior to final selection.

(Touch base first with our NAV/TC study manager in Astronics)

Jim Shepherd

Suggest you sound out Ed Cottingham how he would feel about MSFC terminating our work in the Nav/TC area after completion of present study. Looks like it will be unmanned after all, with little that manned activity could contribute. B

B 3/8

NOTES 3/6/67 HEIMBURG

3/6/67

F-1

The lox pump on F-1 Engine S/N F-6049 which was found contaminated during receiving inspection at Test Laboratory, was partially disassembled and cleaned prior to installation in the West Area F-1 Test Stand on March 2, 1967. One 60 second test is tentatively scheduled for March 10, 1967. Primary purpose of this test will be to evaluate the effects of truck delivery on flight engine performance.

S-IVB BATTLESHIP (MSFC)

Loaded LH_2 to check out O_2/H_2 burner. Due to a leak found in the facility hydrogen vacuum jacketed line, the hot O_2/H_2 burner test has been re-scheduled for Thursday, March 9, 1967. All titanium spheres installed on the S-IVB Battleship and in our storage have been checked by the eddy-current method and were found satisfactory for use.

S-IC-T (MTF)

The S-IC-T stage was successfully static fired for 15 seconds at MTF by Boeing on March 3, 1967. The second firing for 40 seconds duration is scheduled for March 15, 1967.

S-IB

A short duration test, SA-43 was conducted on stage S-IB-9 on February 27, 1967. The test was terminated at 35 seconds upon completion of the scheduled duration. Functional performance of all systems and engine thrust levels were satisfactory. No facility or stage damage was sustained. The duration test, SA-44, is tentatively scheduled for March 7, 1967, at 3:40 pm.

NOTES 3-6-67 HOELZER

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NEGATIVE REPORT.

NOTES 3-6-67 JOHNSON

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3/6 JS

Project THERMO - Because of the conflict in your calendar forcing cancellation of your participation the THERMO briefing to Dr. Mueller on 3/2 was cancelled. It will be rescheduled, probably late in April, when a convenient time can be found on both calendars. Because of other commitments by P&VE (Voyager, ATM, etc.) THERMO effort is being slowed down. In some respects this status change is to MSFC's advantage, since it will probably result in the development of somewhat more basic experiments and measurements than would have been developed on the first proposed (tighter) schedule.

Gravity Substitute Workbench - This experiment, consisting of comparative evaluation of the forced airflow concept and an electrostatic field concept (recently demonstrated by Chrysler)as an aid in conducting maintenance and repair tasks in the Workshop, has been accepted by OMSF for sponsorship.

SRT Funding Status - Initiations in all program areas last week amounted to $505 K.

Additional authority was received from OART in the amounts of:

$50 K for Nuclear Rocket Propulsion Supporting Research.

$1,410 K for Chemical Propulsion Engineering in the area of "System Dynamics Investigations".

Procurements can not be initiated with this authority until OART has reviewed and approved a "Technical Development Plan" indicating the future years work and funding required to continue the program through completion of breadboard hardware. These funds, therefore, will have to be carried forward unobligated into FY 68, since the time to obtain approval of such a plan and to complete contracting actions will be greater than 120 days.

NOTES 3-6-67 KUERS

B 3/8

1. S-II Spray Foam Insulation: I reported in my NOTES of 2/13/67 that we are engaged in a program parallel with that of S&ID to develop spray foam insulation techniques. Fundamentally, S&ID had worked with a spray gun where the spray is carried by high pressure air as you had witnessed at Seal Beach two weeks ago. At this time you had also asked why the spray foam insulation had not been used earlier in the program for insulation of LH_2 containers. The answer is: (1) engineering data for insulation values, bonding strength, tensile strength and brittleness at cryogenic temperature were not available a few years ago and (2) the spray foam equipment was not sufficiently developed to produce the precision quality, as to consistent density and minimum of voids in the foam. We have worked with an airless spray gun manufactured by the Binks Company which uses a pumping system in combination with a heating device in the spray gun. In accordance with a recent agreement with S&ID, we shipped to Seal Beach a complete set of Binks airless spray foam equipment. Three engineers from this Laboratory accompanied this equipment to Seal Beach on March 1 and successfully demonstrated its superior performance in applying spray foam insulation. This equipment performed so well that S&ID has decided to replace their own equipment with ours and placed on order March 2 five sets of the Binks equipment. This result is an outcome of the coordinated efforts made by our Manufacturing Task Force.

2. LEM Access Platforms for KSC: R-ME has completed this week on schedule some platforms for installation between the S-IVB forward dome and the LEM. These platforms will permit work on the LEM after stacking at KSC.

NOTES 3-6-67 LUCAS

1. S-II-TX-280 ULLAGE MOTOR: Preliminary indications are that the TX-280 ullage motors can be used for the S-II stage. The propellants will seat with the thrust generated from the TX-280 motor. The structure will accept the motor; however, qualification of the mounting brackets is necessary. We have requested Aero-Astrodynamics Laboratory to investigate the effect of increased sloshing on vehicle performance. We have also requested Astrionics Laboratory to investigate the effect of telemetry "black cut". A meeting has been scheduled on March 8 to formulate an R&DO position concerning the usage of the TX-280 ullage motor.

2. TITANIUM HIGH PRESSURE SPHERES: The Air Force has determined that two Airtek spheres essentially identical to our S-IVB sphere were fabricated using CP filler wire. One of these spheres flew on a Titan; a second was found installed on a Titan. It has been replaced. This brings to 12 the number of known defective spheres delivered by Airtek.

3. AS-204 INVESTIGATION: Our three panel members on the AS-204 investigation returned here March 3, 1967. Two of them are returning to the investigation, the third is staying here to help us get more GOX compatibility testing done. It was suggested by his panel chairman that he can be of greater service here since he has essentially completed his actions at KSC. Those few actions not completed by him will be handled by one of our other two participants. It now appears that the remaining two participants will return here on or about March 12, 1967.

4. S-II ENGINE DEFLECTION: A film analysis of the second static test of S-II-1 revealed that engine position #3 canted inboard approximately 3° after release of the restraining arms. Engine #3 contained special instrumentation for this analysis. The other three outboard engines are assumed to have canted inboard by the same amount. Space and Information Systems Division (S&ID) had expected approximately a one degree cant which was compensated by shortening the actuator lengths. In a meeting on March 2, 1967, S&ID agreed to investigate the problem and report recommendations by March 8. They also agreed to furnish 8 new actuators to KSC for S-II-1 with proper precant settings. The effect of the excessive inboard cant would be: (a) possible overstressing of the engine scissor bellows during dry gimbaling, (b) possible direct impingement on the center engine thrust chamber exit.

5. APOLLO TELESCOPE MOUNT: Film retrieval techniques and preliminary definition of MSC/MSFC interfaces relative to flight crew simulation and training requirements were discussed with MSC/ATM program personnel and the astronauts on February 27, 1967, at MSC. Film retrieval from the LM end of the experiment canister was not acceptable to MSC without modification to the Rack structure. The impact on Rack structural design must be determined.

6. AIRSCOOP/FLOW RELEASE MECHANISM INTERFERENCE: Problem on 501: This problem was discussed during the Saturn 501 Systems Meeting, and action was assigned to this Laboratory for remedial action. Boeing reviewed their analysis and discovered errors. The corrected analysis shows ample clearance for a nominal lift-off and only marginal clearance assuming 3σ lift-off conditions. As a result, a fix is no longer considered necessary for 501, 502, and 503. Due to the slower lift-off velocity of 504, the interference problems will be analyzed again. A reasonable solution appears possible.

7. AUXILIARY HYDRAULIC PUMP MOTOR PROBLEMS: Four auxiliary hydraulic pump motors were removed from S-IB-9 because of overheating indications. However, tests of the removed units showed that the indications were false and that the thermal switches were at fault. The motor manufacturer, Western Gear, had substituted an inferior thermal protector manufactured by Elmwood Sensors. This substitution was carried out without the knowledge of either Chrysler or MSFC. Chrysler is attempting to procure the proper switches from Texas Instruments for installation on S-IB-9.

NOTES MAUS 3/6/67

3/6/67

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MSF/MSFC DATA LINK - General Phillips recently requested that Executive Staff coordinate the establishment and demonstration of a data link between Marshall and MSF Apollo Program Control as a follow on to the PERT and Cost Correlation Technique (PACCT) study. This request resulted from Dr. Mueller's desire for a step forward in information storage, retrieval, and reporting and from an effort to demonstrate the feasibility of allowing Headquarters to use Center computer capability rather than establish large-scale computer capability at Headquarters.

As a result of General Phillips' request, the data link has been established with a terminal located at Apollo Headquarters and an MSFC terminal located in the Executive Staff. Our objectives in addition to remaining knowledgeable of Headquarters developments and trends in the area of data storage, retrieval and reporting is:

1. to develop and extend knowledge and capability in on-line information retrieval and reporting,

2. to promote a better understanding within Marshall of the potential and capability of on-line information systems and,

3. to provide MSFC with an integrated on-line information system which economically and practically fulfills the information needs of the Center and fully utilizes third generation equipment capabilities.

The data link currently is operational and being demonstrated for retrieval and reporting of selected PACCT data. A salient feature of the data link is a built-in lock that prevents the syphoning of raw data by using elements.

Good!! B

NOTES RICHARD 3/6/67

B 3/8

3/6/67

Crew Safety Panel Position on Pad Abort and Emergency Egress Requirements - As a result of the AS-204 accident the Crew Safety Panel has reconsidered the requirements for crew safety in the pad area. Modifications will be necessary in the swing arms to enable better emergency egress procedures. The following criteria has been forwarded to the 204 accident investigating committee as the Crew Safety Panel's recommendations.

a. After the crew has been installed in the spacecraft the emergency egress route must be time compatible with the proposed rapid escape modifications to the hatch of the capsule. (Recommended hatch opening time - 2 sec.) This will require open door operation of the clean room plus flame proof curtain.

b. After the pyros are armed at X-30 minutes, a dual escape path must be provided. The following are needed:

1. An immediate abort capability by the use of the LES.

2. An emergency egress route whereby the ingress-egress arm should be available to the crew immediately on opening the new rapid hatch.

In another area, the Q-ball cover should be in place up to immediately prior to liftoff. The cover must be redesigned in such a manner that an abort can be made without the removal of the cover. Tests are being made on the Q-ball to determine its susceptibility to rain, but since the Q-ball is a primary abort cue during maximum dynamic pressure range of flight, it is the opinion of the Crew Safety Panel that every precaution must be taken to have it is optimum condition.

LR. One possible solution:
Vent air outward thru all Q-ball holes while sitting on the ground. Then you need no Q-ball cover at all. Feasible?

B

NOTES 3/6/67 RUDOLPH

1. AS-501 Launch Vehicle at KSC:

- Electrical harness has been damaged in spacecraft ~~and~~ erection, which was scheduled for Wednesday, 1 March 67; will be delayed until damages have been corrected.

- Service arms #6 and #8 (both S-IVB) are retracting too fast and modification to de-acceleration valve is required.

- NASA Headquarters has slipped the launch of AS-501 by 15 days. Roll-out, which had been scheduled for Thursday, 30 March 67, will probably be delayed until 15 April 67 or later.

- The R&DO analysis of S-IC-1 stage/engine flex line failure contamination problem indicates no need for additional disassembly therefore, stage/engines will be "buttoned-up."

- There are only 2,000 manhours of work remaining to be accomplished on the S-II-1.

- Primary damper system for LUT 1 (AS-501) was delivered on dock KSC Wednesday, 1 March 67; however, documentation was inadequate and there were about 100 open UCR's that accompanied the damper.

- KSC has agreed to Monday, 13 March 67, on dock date for AS-501 flight computer program in lieu of Monday, 6 March 67.

2. S-IC-T Systems Demonstration Test at MTF: The captive firing (15 seconds) was successfully accomplished at 5:22 pm, Friday, 3 March 67. Next firing (40 seconds) is scheduled for Wednesday, 15 March 67.

3. AS-500D Dynamic Testing: It is believed the anomaly which is occurring in the EDS/Control Rate Gyro during pitch testing can be corrected by a relocation of the gyro. If this is not adequate, redesign of flight control computer stablization network (filters) may be required.

4. Beta III Test Stand Repair at Sacramento: The teletype sent to Gen Phillips last Monday, 27 February 67, which requested a go-ahead on the repair of the stand, has not been answered. We must obtain full authorization soon in order to meet our planned operational date.

5. The Boeing Company - Incentive Contract: (Reference Notes 2/27/67 Geissler, copy attached). We agree with Dr. Geissler that the administrative requirements of the Boeing contract are excessive. We have met with Aero Lab and Contracts Office representatives and agreed to contract revisions which will greatly reduce the administrative workload of both Boeing and the Government.

Attachment: Notes 2/27/67 Geissler - (DIR, I-DIR, & R-DIR's copy only)

XERO COPY XERO COPY XERO COPY

NOTES 3/6/67 SPEER

B 3/8

3/6/67

1. STEVENSON VISIT: Gen. Stevenson, MSF Director of Mission Operations was here on 3/2 for an all-day briefing on MSFC mission operations activities. Also included in the agenda was a briefing on meteorological research by R-AERO. All presentations were well received. It appears that Gen. Stevenson is planning a number of significant changes in his organization and scope of activities. We were requested to submit our recommendations for improving OSRO's (Operations Support Requirements Office) efficiency. There are efforts underway to establish a flight safety effort outside the Program Offices as an independent review activity. Functions and responsibilities of the Mission Directors are being defined and negotiated. We discussed MSFC's flight control activities at MSC and found Gen. Stevenson was responsive to the position established with you on 1/31.

2. LIEF COMMUNICATIONS: In the context of reviewing the NASCOM (NASA Communications Network) Data System Development Plan for the next five years OTDA has requested MSFC to re-evaluate the needs for LIEF communication circuits. While OTDA is in agreement with our stated requirements during a mission period, we are requested to consider temporarily disconnecting certain communications circuits when major time gaps occur between missions. Potential savings would depend on the length of these gaps and their predictability. We are working with MS-C to determine the benefits and problems of this approach and to answer OTDA's request. We expect some savings may be possible.

3. SECURITY OF IU COMMANDS: We have reached tentative agreement with MSC (Sjoberg) on the need to make ground commands to the IU more secure by putting the crew into the loop (either directly as in the case of abort command or indirectly by manual opening or closing of the command channel). The Electrical Integration Panel is to define the best implementation mode. Some S/C modifications will also be required. A progress report to Gen. Phillips is due on 3/15.

NOTES 3-6-67 Stuhlinger

B 3/8

1. EMR: OSSA has apparently accepted EMR (ElectroMagnetic Radiation payload) for inclusion in the astronomical satellite program. It is possible that it will be called "Stellar ATM" or "ATM-C", names which we had proposed earlier. The AAP Office in IO was verbally requested by OSSA (Jesse Mitchell) to have integration studies made by one of the AAP integration contractors. This verbal request is being followed up by a formal letter from OSSA, a draft of which we have seen. At OSSA's request, we are studying several astronomical experiments which had been proposed for the EO-1 payload to evaluate their possible inclusion in the EMR payload.

2. SPACE ELECTRIC POWER SYSTEMS: A presentation on space electric power and electric propulsion program plans was given here by OART personnel on March 2. The OART representatives were William Woodward, Dr. Fred Schulman, James Lazar, and Arvin Smith. Mr. Woodward, Deputy Director of Nuclear and Space Power System Division, stated that he was disappointed that users of space electric power had not stepped forward and indicated their future needs, particularly in the range of power levels beyond 50 kwe. Space electric power funding has failed to increase largely for this reason. Advanced Systems Office, Astrionics, and Space Sciences Laboratory presentations to the OART personnel described applications for all power ranges, and OART was urged to consider an early start on a thermionic reactor system suitable for missions requiring 50 - 100 kwe beginning about 1975. !

3. RADIATION DANGER FOR ATM FILMS: The problem of possible photographic film fogging due to the high energy proton radiation at the planned ATM mission altitude and inclination, mentioned in my last week's notes, continues to receive serious attention. Studies are underway to determine dose rates at other orbital altitudes and inclinations. These data, plus an early experimental program to expose each type film to this type of radiation, will provide a basis for recommending either design or orbital modifications. We expect to use the Oak Ridge facilities (Isochronous Cyclotron with 20-65 MeV protons) for irradiation experiments.

4. ATM ACTIVITIES: SSL will be represented at two significant ATM meetings this week. Dr. Dozier will attend an ad hoc committee meeting on the optical contamination environment and its effects on astronomical experiments. This meeting was called by Dr. Dubin, OSSA, and will be hosted by Dr. Newkirk, Boulder, Colorado on March 8 and 9. Mr. Heller will participate in a "flare prediction" meeting on March 10. This meeting, also in Boulder, Colorado, was called by MSFC for the purpose of tying together the various solar flare-prediction efforts in the ATM project.

EIS.

Guess in case of a major solar flare the AAP crews must be called home at once. Right? B

3/6/67 NOTES 3/6/67 TEIR

MANUAL S-IVB CUTOFF: In my notes of February 17 regarding S-IVB propellant depletion sensors, you commented that the astronauts should have the capability of manual S-IVB cutoff. That option presently exists. The astronauts can terminate launch vehicle thrust at any time after T+40 seconds with the abort handle. Toward the latter phase of flight this results in engine cutoff with or without spacecraft separation at the crews option. Kraft fears the S-IVB propellant depletion sensors could cause an early inadvertent cutoff resulting in a low time-to-free-fall value prior to re-entry. The sensors are voted 2-out-of-3. We have discussed this with the Crew Safety Panel and they reaffirmed that the sensors are required for protection of a possible unsafe shutdown on J-2 if a propellant depletion occurred. The crew manually protects against a guidance cutoff failure using the abort handle to protect against overspeed. On Block II spacecraft an inertial ΔV is displayed to the crew so that ground callup is not required. We have discussed this subject in detail with Ludie Richard's office.

FOLLOW-ON PROCUREMENT: We have just received information that the program approval document for the Apollo Applications launch vehicles has been approved by Dr. Seamans. This authorizes completion of assembly for the four vehicles for which we have initiated procurement of long lead time components and materials. It also includes approval for long lead time items for 217-219 except the IUs. We should get the signed copy this week. We also have approval from Headquarters to request proposals from our contractors for the total sixteen vehicle follow-on program.

BETA III STAND/GSE REPAIR: A TWX (O'Connor to Phillips) again requesting go ahead on Beta III stand/GSE repair was sent on Monday, February 27, 1967. (Original request was transmitted on February 9, 1967) Informal conversation between Col. James and Col. LaHatte this week indicates a negative position still being taken by Headquarters due to budget and schedule stretchout considerations. Preliminary activities are underway and we are fast approaching the point where full authorization is required to meet the planned operational date.

AS-206 NOSECONE DELIVERY: Nosecone #1 for AS-206 was loaded on the Guppy Thursday and delivered to KSC Friday.

H-1 ENGINE CONTAMINATION PROBLEMS: In addition to correcting the specific engine problems we have encountered, Mr. Lowrey has appointed a committee to investigate the reported problems and the total engine handling effort. This committee has developed a table which lists the frequency of opening the various engine systems, exactly what is opened, and the specific procedures which require the action. They also are preparing recommendations for changes to the test procedures to reduce the possibility of introducing contaminants. These recommendations will be reviewed by the Government and appropriate action taken. Mr. Lowrey is also appointing Mr. Meldrum as Chairman of a Saturn Systems Safety Panel which will be an action panel and operate nearly full time for the next month or more to review the entire S-IB stage effort.

B 3/8

NOTES 3/6/67 WILLIAMS

1. Nuclear Budget: On the nuclear budget picture, Carl Schwenk (SNPO) told Will Jordan that the nuclear budget request before Congress is now $200.9 M. The NASA budget is $96.5 M and the AEC's $104.4 M ($10 M of which the AEC would hold as a pad against their actual cost type contracts). MSFC's request was for $20.8 M in FY-68 and should be possible since the President's budget request is about what was needed. However, this money does not necessarily have to be committed to MSFC; the actual amount received will be determined on the basis of the strength of the case MSFC presents. SNPO is optimistic about Congressional approval since they feel the President floated a trial balloon with the contingency gambit and felt the nuclear pulse beat strongly among key Senate/House leaders.

2. LSSM: On March 1, a meeting of the LSSM Ad Hoc Committee was held. A course of action was decided upon and will be presented shortly to Mr. Weidner and Mr. Neubert. Initial efforts have been started by the representatives of each laboratory to prepare a draft work statement for the RFP.

3. Early Orbital Space Station: As a result of discussions at NASA Headquarters on March 2, 1967, we have decided to increase the penetration of the Douglas work on the EOSS. The additional areas of coverage include advanced subsystems R&D, detached module analysis, additional effort in oceanography and meteorology, and increased subsystems analysis. It is probable that additional funds will be used to supplement our coverage in this area.

4. Unmanned Planetary Spacecraft: We have been requested by OSSA, (Mr. Pitt Thome of Mr. Oran Nicks' office), to manage system studies of unmanned planetary spacecraft. Specifically, OSSA is desirous of investigating requirements for Voyager-type spacecraft for Venus and Jupiter missions in the middle or late 70's to determine what, if anything, would be appropriate to interject into the '73 Voyager Mars design. We have told Mr. Thome that we would be interested in working with OSSA and managing these studies, and Hal Becker visited Mr. Thome in Washington, last week, to initiate appropriate action.

F.W.
I think we should go all-out on these studies. Voyager should have a multiple capability: While near-optimum for Mars mission, modular changes should permit Venus, Jupiter, Jupiter-Sun (Thomae profile) and Grand Tour missions B

OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	☐ ACTION	☐ INFORMATION

REMARKS

All Recipients of Weekly Notes:

Dr. von Braun did not make any annotations on the Weekly Notes of March 13; therefore, they will not be reproduced and distributed.

CODE	NAME	DATE
DIR	J. T. Shepherd	4-10-67

MSFC - Form 495 (Rev August 1963)

NOTES BALCH 3/13/67

S-IC-T Testing - Second static firing of the S-IC-T is now scheduled for 3/17/67, with a planned duration of 60 seconds. No constraints are known to exist that would impact this firing as scheduled.

S-II-2 Testing - Prestatic modification effort is substantially complete and is not expected to impact test schedule. Detailed Test Plan for S-II-2 is scheduled for release today, and first static firing is still scheduled for 3/25/67.

S-II A-1 Activation - Corps of Engineers completed insulation of LH_2 dump and vent system on 3/7/67, as scheduled, and worked off remaining constraints to cold shock of LH_2 system. LH_2 system cold shock was started and completed on 3/12/67, and no major problems were encountered. Checkout of all GSE except that which requires the stage to be in the test stand has been completed. Modification of the GSE to accept the S-II-3 stage is under way and is expected to be complete by 4/5/67.

S-IC-4 Planning - The S-IC-4 stage is now expected to be on dock at MTF on 3/23/67 and to be installed in the test stand not later than 3/28/67.

Alleged Damages to Private Property from S-IC-T Firing - Three inquiries were received with respect to alleged damages to privately-owned buildings, one home and one commercial building at Picayune and one home near Bay St. Louis. None appear to be legally supportable claims.

Award Ceremonies at MTF - Ceremonies were held at MTF on 3/9/67, at which Special Service Awards were presented to Col. R. C. Marshall, District Engineer of the Mobile District, Corps of Engineers; Col. Roy Beatty, head of the Corps of Engineers Area Office at MTF; Col. R. R. Wessels, former Mobile District Deputy District Engineer for NASA activities; and Gordon Artley, NASA MTF Assistant Manager for Activation. Gen. O'Connor presented the awards to the Corps of Engineers employees in your behalf, and I presented the award to Mr. Artley. Mr. Gorman presented the award recipients with miniature models of the Saturn V. Col. Wessels was not present, but his award was accepted by Major Gen. George H. Walker, Division Engineer, South Atlantic Division, Corps of Engineers, who was present to see the men in his command honored.

NOTES 3/13/67 BELEW

DOUGLAS AIRCRAFT PRELIMINARY DESIGN REVIEW (PDR) MEETING:

A meeting on PDR's with the DAC was held on March 10, 1967, to discuss requirements and schedules on S-IVB modifications for the Orbital Workshop.

PDR schedule is as follows:

MSFC Dry Run at DAC - April 17 - 19, 1967
Ready to ship mockup to MSFC - April 21, 1967
Astronaut walk through - April 28 - 29, 1967
Preliminary Design Review - May 2 - 4, 1967

LOCAL SCIENTIFIC SURVEY MODULE:

We are formulating ground rules for the request for proposal on the LSSM with an eye toward specifying characteristics of the vehicle to the greatest extent possible. The procurement plan has not been approved to date. Its late approval is resulting in a very tight procurement schedule and could cause a delay in the date of selection of a single contractor (originally scheduled for June, 1967). Program planning for the LSSM development has been supplemented to consider an optimum use of testing facilities and organizations at various locations; and the study of the addition of various kits such as a communications kit and a navigation kit which can be added to the LSSM to provide modular flexibility to the vehicle.

LUNAR FLYING VEHICLE:

There are indications of renewed interest, both at MSC and MSF, in a lunar flying vehicle to be used in conjunction with the LSSM on later dual AAP missions. This would be perhaps a smaller one-man version with limited cargo capability which could be carried on the stripped LM or the LSSM.

Attachment: Dr. von Braun/Mr. Rees/
Mr. Weidner/Gen. O'Connor/
Dr. Lucas/Mr. Kuers

Answer to comment on Notes 2/20/67 Belew: MAR 13 1967

UNDERWATER NEUTRAL BUOYANCY AT MSFC:

Underwater neutral buoyancy has been generally accepted as a valuable means of simulating human motion in a weightless environment for those tasks requiring space suits, and to a lesser extent for "shirt sleeve" weightless situations. We do not consider the neutral buoyancy activity at MSFC as crew training, but as a method of verifying the MSFC developed hardware is safe, simple to handle, accessible, and trouble-free.

The neutral buoyancy work at MSFC will contribute to the development and deployment verification of the S-IVB Airlock hatch, cabling, circulation ducts, circulation fans, instrumentation and control. Current activities are centered around the evaluation of two "quick opening" hatch designs in the existing tank. The existing tank is 25 feet (7.62 meters) in diameter x 15 feet (4.57 meters) deep. The new simulator system to be located in Building 4706 will be 75 feet in diameter and 41 feet high and the filled weight will be about 9,600,000 lbs.

The underwater simulations will be performed by MSFC employees until most of the "bugs" are eliminated from each element of hardware but participation by the astronauts will be included. Two of the astronauts are expected to participate for the conclusion of the current hatch evaluation program. In addition to astronaut participation, the MSC is providing assistance in the form of medical, crew quarters, and safety consultations. This participation has grown from early interest and initiative on the part of Astronaut Alan Bean.

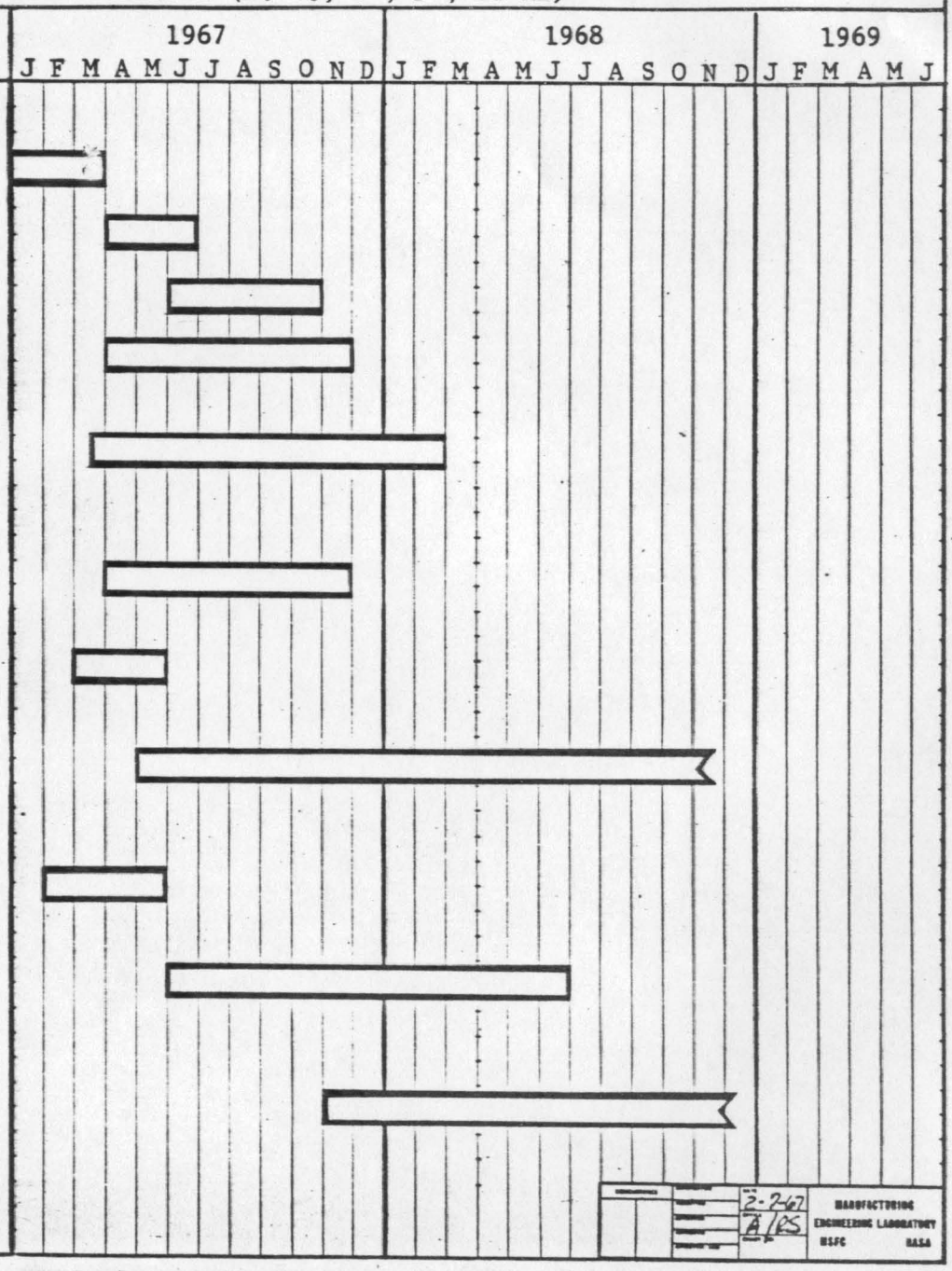
The simulated deployment and performance of corollary experiments will be carried out to identify special tools, mobility aids, accessibility, etc. It appears that many operations will need to be carried out with one hand while the other hand is used as a firm constraint. Simulation of a complete sequence of activities for the cluster will probably be necessary as the logistics of deploying the experiment from the MDA to the workshop, unpackaging, mounting, storing the boxes, and recording data, must be predetermined. Contingency or alternate sequences of experimenting will need to be simulated as the probability of going through complete sequence on twenty-five experiments is a remote possibility.

The KC-135 airplane has been used for weightless simulation for Mercury, Gemini, and Apollo, and is available for Workshop testing. The KC-135 provides about one-half minute of weightless simulation and may be valuable in determining whether or not equipment and handholds inside the Workshop has been properly oriented for astronaut task operations. We may be able to simulate, to some extent, the effects of moving air in a weightless environment.

The attached Planning Schedule provides some added examples of the types of things that we may do in neutral buoyancy facilities.

NEUTRAL BUOYANCY TESTING

M. E. LAB MASTER SIMULATION SCHEDULE (N. B., 6°, 5°, ET AL)



S-IVB MODS

1. DAC-MSFC - STANDARD HATCH EVALUATION
2. LH_2 TANK ENTRY, INSPECTION, & SEALING TESTS
3. HABITABILITY & EXPERIMENT PACKAGE TRANSFER
4. CREW QUARTERS INSTALLATION

COROLLARY EXPERIMENTS - MSC, AIR FORCE & MSFC

5. EXPERIMENT PACKAGES - INSTALLATION, STOWAGE, USE (ELECTRON BEAM JOINING, ST-124, ET AL)

MULTIPLE DOCKING ADAPTER

6. MDA HUMAN FACTORS - INGRESS, EGRESS, ARRANGEMENT, ETC.

G. E. CONTRACT

7. SUPPORT TO P&VE ON G. E. CONTRACT

SPACE TOOLS & SYSTEMS DEVELOPMENT - ME LAB

8. TOOL KITS, STEMS, SERPENTUATOR, SPACE PULSE POWER SIMULATION, CHECKOUT, ETC.

ATM

9. PHASE III ATM TASKS - FILM PACK HANDLING, PARTIAL INGRESS, EGRESS, ETC.
10. GENERAL ATM DESIGN VERIFICATION AND ASTRONAUT PARTICIPATION

APOLLO MISSION SUPPORT

11. CSM-LM ACTIVITIES IN ME'S LARGE TANK

MSFC-FORM 1116 (REV APRIL 1968)

NOTES 3-13-67 BROWN

REFERENCE 2-27-67 NOTES The following is submitted in answer to your comments concerning the H-1 engine and the F-1 engine:

H-1 Engine The H-1 gas generator control valve contamination resulted from inadequate CCSD procedures. We have removed all eight gas generator control valves from S-IB-6 at KSC, and returned them to Michoud for analysis. Five of the eight had RP fuel in the LOX injector, two were clean, and one is still in inspection.

Investigation has determined that the fuel bootstrap lines and the gas generator control valves were not adequately cleaned after the static firing at MSFC. Subsequent pressure checks on the control valve at Michoud allowed the fuel to flow into the combustor. During shipment of the stage to KSC, some of the fuel seeped back into the LOX injector. The CCSD post static decontamination procedure has been revised to correct this problem effective with S-IB-9. Rocketdyne is evaluating a freon flush procedure to be applied to S-IB-204, 205, 207, and 208. If the freon flush is not approved, the gas generator control valves and fuel bootstrap lines from these vehicles will be removed and cleaned.

F-1 Engine The contamination found in engine 6049 LOX pump inlet has been definitely traced to the special pump inlet cover used for truck shipment. Modification will be made to this cover to prevent recurrence of contamination from this source, prior to additional F-1 engine truck shipments.

J-2 ENGINE In the notes of 2-20-67 we mentioned that inspection of two batches of turbine stator blades revealed 57 blades of the wrong material. Rocketdyne has completed an analysis of this discrepancy and has concluded that there is negligible probability that improper alloy material is present in any J-2 oxidizer or fuel turbine wheel, or in the fuel stator and they recommend no further investigation of these items. Evidence of improper material is confined to the LOX pump stator vanes. Rocketdyne has established that the operating stresses in the LOX stator are very low (4870 psi) and all the alloys cast by the discrepant vendor (Austenal) would perform satisfactorily in this service. We are asking the materials people in P&VE to verify this investigation before any final decision is made.

Four tests were completed at AEDC satisfactorily 3-10-67. The first was a simulated S-IVB first burn flight condition with the greatest tendency toward high-level pump stall and cold ASI. The test was prematurely terminated by an observer due to low LOX inlet conditions. The second was a 30-second simulated S-IVB restart test with the same characteristics as the first test. The third was a 5-second S-IVB restart test simulating conditions which are worst for gas generator overtemperature (warm chamber - hot crossover duct). The fourth, also an S-IVB restart test, was for 30 seconds and simulated the conditions most likely to result in too hot an ASI. The next four tests are planned for Wednesday, 3-15-67.

NOTES 3/13/67 CONSTAN

After further negotiation on March 6 and 7 between Mason-Rust, Michoud Support Services Contractor and the New Orleans Metal Trades Council, another vote was taken among union members on the forenoon of March 9, 1967, which resulted in a turn-about vote of 222 in favor of ratification and only 73 against. Some of the workers had returned to their jobs by 1 p.m., March 9, with a full complement expected for the second shift beginning at 5 p.m., and all workers expected at the beginning of the day shift, March 10, 1967. No additional monetary concessions were made by Mason-Rust.

NOTES 3/13/67 FELLOWS

S-IVB Static Testing: As a result of the S-IVB-503 incident at SACTO and as a consequence of the findings of the Investigating Board, IO identified a number of actions which MSFC should accomplish. A primary action impinging on R&D Operations was the "possible elimination of a dual burn for S-IVB/Saturn V as an acceptance test requirement. A thorough technical review of reasons for and against a one burn vs. a two burn was made by P&VE, TEST, and QUAL. While it is desirable to simulate orbital conditions to the extent practicable, the hazards of the two burn firing outweigh the additional data which might be acquired. Therefore, Mr. Weidner, by memorandum of March 13 to General O'Connor, recommended that acceptance firing of S-IVB-503 and subsequent stages be a single burn. It was also recommended that all test objectives, such as H_2O_2 burner, gimbaling, etc., be accomplished simulating orbital conditions as nearly as practical.

NOTES 3/13/67 GEISSLER

1. Effects of Solar Flares on the Lower Ionosphere: In the January 1967 briefing by ESSA, interest was expressed by Dr. Davies in ionosphere measurements from orbit, establishing the effects of solar flares on the D-region. You suggested this as a natural adjunct for the ATM mission. We have obtained the experiment write-up, have reviewed it, and have concluded that it is a worthwhile experiment which we would like to investigate further, if experiment funds can be made available. The principal investigators from ESSA's Institute for Telecommunication Sciences and Aeronomy will visit us March 20 in this connection. We shall keep you informed of our progress.

2. Basic Meteorological Services Subcommittee of the Federal Coordination Committee for Meteorology: Our Aerospace Environment Division was contacted by Mr. Louis Fong of Dr. Tepper's office, OSSA, to determine our interest in providing the NASA representative to subject subcommittee. Quite likely, Marshall will be asked to participate, inasmuch as Dr. Newell is sending a letter request to Dr. Mueller asking OMSF to provide a NASA representative. I believe we should participate, inasmuch as we have been working on an ad hoc group of this subcommittee. Approximately two or three meetings a year are anticipated.

3. Guidance Switchover Activities: Astrionics and Aero-Astrodynamics personnel are presently preparing a revised schedule of activities for analyses pertinent to the verification of the committed back-up capability of guidance switchover during earth orbit coast mode (switchover from L/V to S/C guidance system in the event of failure of the L/V platform prior to S-IVB second burn). As you are aware, we had previously worked on guidance switchover capability for S-II stage burn, S-IVB first burn, orbital coast, and S-IVB second burn. All of this activity except switchover during the orbital coast mode, was dropped as a result of the "Real-Time Contingency" presentation to General Phillips in May 1966. The reason given by MSC for deleting guidance switchover during powered flight was S/C problems of programming the L/V IGM equations in the S/C computer. The problem of switchover in the orbital coast mode only is now being worked under the groundrule that if the L/V platform fails a switch will be made to the S/C system and the S-IVB second burn is to be done via S/C guidance. It should be noted that this is a backup for the L/V platform only and not the entire L/V system. Pending internal MSFC agreement on each phase of the schedule, we shall propose it to MSC through the Flight Mechanics Panel. The earliest possible effectivity would be AS-504 because MSC has stated that the S/C system will not be able to backup the L/V platform on AS-503. We will keep you informed of developments in this activity.

NOTES 3-13-67 GRAU

1. QUALITY MAINTENANCE PROGRAM: One month ago we proposed and are working up the details for an extensive quality maintenance program with each prime contractor and also independent checks by the government. Our 14-point program includes items such as vendor hardware audits, bench functional component testing at receiving inspection, requalification testing, sample testing by ourselves, additional government surveillance, failure analysis of selected items by MSFC, etc. These programs take additional resources--dollars and people; we still do not know whether these resources will be provided.

   This program should also include policies to avoid risky decisions; improve morale, motivation, and incentives; centralize quality; and equate human resources to workload.

2. AAP CLUSTER: In a recent memo to Mr. L. Belew, I advised that it is of critical importance to achieve mating of all cluster flight hardware before launch into the on-orbit configuration. It may not be possible to get prototypes of all major hardware items, but this should cause only an intensified effort to provide simulation for them and not an abort of the attempt to mate. The mating can be performed in this Laboratory.

3. DAMPER SYSTEMS: A list of 66 discrepancies was received from KSC on the first Saturn V damper assembly shipped from MSFC on February 24. For proper shipment, some disassembly should have been made and parts or assemblies properly packaged for shipment. P&VE packaging and shipping requirements were waived by P&VE. The assembly at time of shipment had a number of outstanding defects including system contamination. The shipment of the assembly was totally unacceptable to this Laboratory and was so noted on the Shipping Document, MSFC Form 57. However, we were overruled again and this "junk" was shipped to KSC, so MSFC can expect severe criticism from KSC.

NOTES 3/13/67 HAEUSSERMANN

1. Resistor Failures in the Launch Vehicle Data Adapters (LVDA's). (Reference Notes 2/20/67 Haeussermann) The analyses of the LVDA SN11 field failure have uncovered a significant problem with the Silver-Palladium resistors used in the ULD's. It has been found that if the resistors are exposed to H_2 they can change in value up to 90%. Also, if they are exposed to a static discharge, a significant change can be expected. It has been shown that a significant amount of H_2 comes from the reaction between the IU coolant (methanol-water) and the structural materials used in the system, namely magnesium-lithium and aluminum. The H_2 diffuses through the Flex-tite (teflon lined) hoses used in the LVDA. This would explain why there have been only failures in the LVDA and not in the LVDC. The following actions are being acted on or investigated:

a. Evaluation by P&VE of the coolant used to determine if a change can be made to eliminate the generation of H_2.

b. Replace the Flex-tite hoses in the LVDA with convoluted stainless steel hoses.

c. Incorporate H_2 sensors in the LVDA and LVDC.

d. Take measures to protect against static discharge at all installations where the LVDA's and LVDC's are used or stored.

e. Detailed studies to evaluate the time and concentration effects of H_2 on resistor change; the effects of out-gassing of organic compounds on resistor change; relationship of resistor change due to static discharge and H_2 reduction.

As an interim solution, investigate the probable use of an H_2 absorbing material (for example, a palladium compound) by means of a replaceable filter in the coolant lines. Also, explore the possibility of a continuous gas purge within the LVDC/LVDA enclosures. Of the six prototype and seventeen LVDA production units delivered to date, two of the prototype units and production units #1, 11 and 14 have been affected by this problem.

2. ATM Ascent Stage Raising. Based on the quarterly review and subsequent discussions with MSC personnel, the status of raising the ascent stage eight inches is as follows:

a. MSC states that it is technically feasible and the violation of the clearance envelope can be relieved by rework of the SLA panels or perhaps modification of the interfering components.

b. Rework of the work stands for on-pad servicing presents a cost impact of approximately $500K to $1.0M and MSC intends to advise OMSF this week for OMSF funding authorization.

c. MSFC (P&VE/ME Labs) will also explore whether or not the work stands should be redesigned and fabricated "in house".

An alternate approach which has been explored is to add a section between the IU and SLA and comparable in size to the IU. This approach would be considered only if the raising of the ascent stage was not acceptable to MSC or Headquarters.

NOTES 2/20/67 HAEUSSERMANN

2/20 RB

1. LAUNCH VEHICLE DATA ADAPTER - RESISTOR CHANGE. (Reference Notes 2/6/67 Haeussermann, copy attached). In a review on 2/15/67 with IBM-Owego personnel (with Mr. Art Cooper participating), the most probable cause for the resistor change up to 60% was given as electrical discharge. I did not find this explanation satisfactory and I am quite alarmed about the matter. Mr. Cooper, who is also alarmed, has agreed that IBM and MSFC should assign additional personnel to further investigate the causes for the resistor change such as the possibility of a chemical reduction of palladium oxide. Dr. C. Pschera (P&VE), Dr. A. Holloday (ASTR), and a man from QUAL will go to IBM-Owego on 2/27/67.

2. ATM. We have reassessed our in-house capacity to design and fabricate hydrogen-alpha telescopes for ATM and are proposing to the IO ATM Project Office a modified approach to the situation.

Two significant factors have been recognized since we committed to Harvard College Observatory to provide hydrogen-alpha telescopes through in-house effort: (1) direct experience in implementing the GSFC X-ray telescope in-house has sized the magnitude of this type work to be beyond that originally anticipated and is over-taxing our capacity; and (2) examination and testing of a borrowed hydrogen-alpha birefringent filter, designed for ground observatory use, indicates such units must be "space hardened" for application to ATM.

We are considering, therefore, to advertise the hydrogen-alpha telescope design and fabrication to obtain the experience of qualified optical contractors. We will retain the efforts for the TV and photographic camera portions of the telescope and do the maximum work in these areas in-house. Further detailed discussions with Mr. Ise are scheduled this week.

3. MOD II SWITCH SELECTOR. As a result of our "soft spot" single failure mode investigations, we have detected a failure possibility on the Mod II Switch Selector when the output is overloaded or shorted to ground. Tests were performed with another type of transistor. Initial results of these tests have shown promise in resolving the existing problem. A meeting will be held with Saturn IB and Saturn V Office February 28, 1967 to define the task to IBM for the fastest solution to remedy the present shortcoming of the Mod II Switch Selector.

NOTES 3/13/67 HEIMBURG

S-IVB (SACTO)

S-IVB-209 arrived at Sacramento Test Center on March 9, 1967. The vehicle will be stored in the VCL until after the acceptance firing of S-IVB-503 (new). S-IVB-503 (new, formerly S-IVB-504) is scheduled for acceptance firing April 19, 1967. A meeting was held on March 2, 1967, with Douglas at Sacramento to implement and take action to protect Beta I Test Stand from blast, shrapnel and fire.

S-IC

The second static firing of the S-IC-T stage at MTF, scheduled for 60 seconds is planned for March 17, 1967. S-IC-S fuel tank was installed in the SSTF on March 10, 1967. Work has begun to prepare the tank for an ultimate hydrostatic pressure test in approximately two weeks.

F-1

Test FW-060 was postponed due to inclement weather and re-scheduled for March 13, 1967. The primary purpose of this test will be to evaluate the effects of truck delivery on flight engine performance.

S-IB-9

Stage S-IB-9 was prepared for a full duration test, SA-44, for 3:45 pm, March 7, 1967. Test preparations were normal and ignition command was given near the scheduled time. Cutoff occurred, however, after approximately three seconds of operation. The cutoff signal was initiated in the Beckman digitalized data acquisition system; an instrumentation GSE system in the blockhouse. It was found that a patch panel connection had not been installed securely and a circuit was thereby broken sometime prior to the test. This broken circuit appeared as an erroneous redline indication to the Beckman Automatic Cutoff System, thus terminating the test. After correcting the faulty patch wire, the stage was re-cycled and test SA-45 was conducted at 6:21 pm, for the planned duration of 143.4 seconds. Preliminary data from both tests appeared normal. Stage S-IB-9 is scheduled to depart MSFC on March 14, 1967.

NOTES 3-13-67 HOELZER

NEGATIVE REPORT.

NOTES 3-13-67 JOHNSON

Initiation and Obligation of SRT Funds - (Reference my Notes 2-27-67, copy attached). Briefing on the status of SRT funds will be included in the Review of SRT and Flight Experiment Programs scheduled for 3-30-67, 8th Floor Conference Room, from 2:30 to 4:00 p.m.

Status of SRT Program as of 3-10-67:

	Authority	Initiated	Change for Week
OMSF*	2,675	1,537	190
OSSA	795	455	-120**
OTDA	773	584	+ 90
OART	17,410	13,177	1,060
	21,653	15,753	1,220

* Does not include $9,000K C-1 Engine Funding
1,021K Experiment Development

** Due to withdrawal of technical approval of two tasks in Meteorological Systems Program. Funds retained.

ATTACHMENT: NOTES 2-27-67 JOHNSON (Copies to Dr. von Braun and Mr. Weidner only)

NOTES 3-13-67 KUERS

<u>In-House Welding Development in Support of S-II Stage:</u> This Laboratory has, for the past three months, been pursuing an intensive program to optimize horizontal welds in 2014 Aluminum alloy in thicknesses typical for the S-II structure. The objectives of the program are to minimize offset, distortion and porosity and to attain or exceed specified weld strength and elongation at cryogenic temperatures.

Initially welds were made in six flat panels of uniform thickness instrumented to measure movement of the upper panel relative to the lower one. No significant relative displacement was seen. Thermocouples at various distances from the weld detected no temperature difference between the upper and lower panels. The same panels served to reconfirm that only machining or single-edge scraping give the potential of very low defect incidence; all other methods of cleaning horizontal welds are suspect. It was also shown that by the technique of using the TIG method and of making a tack, a penetration and a filler pass all from the same side acceptable welds can be produced.

Subsequently 11 ft. diameter cylinders with the usual preliminary certification panels were used for the other weld tests. A carefully instrumented cylinder welded by the TIG method described above and also used at S&ID for LH_2 to cylinder # 6 welds revealed that some offset can occur even after the parts have previously been joined by a tack or a penetration pass.

This observation led us to investigate the possibility of welding cylinders by tacking from the outside then welding with a 70% penetration from the inside, then routing from the outside being careful to cut into the first weld (confirm by X-ray that no crack is left) and then completing the circumferential weld from the outside. This method has been used with both TIG and pulsed-arc MIG, each at two different speeds and current levels. The evaluation of this last effort is still proceeding but initial results appear extremely promising in all regards. (High tensile strength and elongation--very low porosity, offset and distortion.) We are getting ready to weld a 33 ft. diameter cylinder on our turntable.

S&ID are aware of this program and have been invited to witness our next significant weld.

NOTES 3-13-67 LUCAS

1. ORBITAL WORKSHOP: The Emergency Destruct System (EDS) Ordnance is under scrutiny for redesign so no ordnance will remain on the S-IVB Stage following separation. A scheme using "break" wires on the skin of the interstage was discussed and agreed on as being a feasible approach. Mr. Smith, R-TO, has arranged a meeting with the Range Safety personnel to present this approach for their preliminary approval.

2. JOINT NASA-NAVY WORKING GROUP ON UNDERSEAS TEST FACILITIES: Our Human Factors personnel represented MSFC at a meeting at NASA Headquarters on March 7, of the Joint NASA-Navy Working Group on Underseas Test Facilities. (Reference letter to you from E. Z. Gray, dated February 13, 1967). The meeting consisted primarily of a buy-off of the statement of "Working Group Objectives" and the Statement of Work for proposed NASA-directed studies to provide data for the assessment of the feasibility and practicality of NASA using existing or planned (Navy) underseas facilities to obtain psychological and physiological data, which could be extrapolated to manned space flight. The studies, to be run by NASA Headquarters-MSF with panel assistance from Navy and MSF centers, will be approximately three months in length.

3. NOSE CONES: R&DO completed Nose Cone #1 ahead of schedule and would have met the IO target delivery of February 25, 1967, official delivery March 1, 1967. However, IO notified us on February 24 that KSC did not need Nose Cone #1 on the above dates and requested MSFC to ship when the Guppy is in Huntsville with enough room for the Nose Cone. This is the first flight item delivered under the lead laboratory concept of management. It was completed within schedule and costs.

4. APOLLO TELESCOPE MOUNT (ATM): A demonstration of the ATM film replacement at the LM end of the experiment cannister by a pressure-suited test subject was observed by astronauts Engle and Pogue on March 8, 1967. This demonstration in the P&VE Task Analysis Facility (TAF) utilized a sectionalized mockup which can be readily modified to reflect Rack structure modifications.

5. S-II LOX VENT LINES: The LOX vent line failure on the S-II-F/D has been investigated for the past 10 days. Dynamics data, X-rays, and other pertinent information have been evaluated in an effort to determine the possible effect on S-II-1 and S-II-2 lines. Final decision on whether to inspect or replace the LOX vent line in S-II-1 will not be made until the 3-17-67 component qualification mtg. At that time, all the available data will have been evaluated, and a sound decision can be reached. It is apparent that the weld offsets in the 17 manufactured lines exceeded the specification. Had the appropriate inspection techniques been observed as called for by the specifications, the S-II-F/D failure probably would have been prevented.

6. NUCLEAR GROUND TEST MODULE (NGTM): (a) Representatives from P&VE met with cognizant SNPO test stand design representatives to discuss and settle common design problems. All questions and issues, except the engine emergency cooldown line (strictly a facility item), were settled. (b) Experimental requirements for scale model propellant heating data due to nuclear radiation are being developed and will be combined into one request for submission against FY 68 funding by P&VE. A precedent for assessing the validity of this type of scale model data and equipment does not exist. The NGTM hot fire data from NRDS will provide the first full scale data.

NOTES MAUS 3/13/67

PSAC REPORT - We have received word that Congressman Teague's sub-committee might ask several questions during this week's hearings with MSF concerning the differences between the PSAC report and NASA's present course of action. Dr. Mueller's staff is preparing and coordinating NASA's official position with respect to PSAC in anticipation of some of these questions.

We will endeavor to make these NASA position statements available, for your information, in Ray Kline's briefing package prior to your March 22 testimony before the Karth sub-committee.

ECONOMIC IMPACT STUDY - In October MSFC submitted to OMSF statistical data effecting Huntsville, MTF and MAF.

Two weeks ago, we received a draft document produced by OMSF which consolidated the total Nation Apollo Economic Impact Data. Preliminary investigation by MSFC indicated that Huntsville and MTF data as submitted was essentially incorporated into the document. Michoud data was grossly changed to indicate a major impact on the New Orleans economy as a result of Apollo Phase-Out.

Dr. Holman, Dr. Mueller's economist, had tended to ignore New Orlean's prominent role as a seaport, tourist and petro chemical center and adhered to the theory that economic growth or decline is typically slaved to the manufacturing base. Her analysis contended that since Michoud comprises such a large part of the New Orleans manufacturing base that its close-out would produce an economic slump similiar to the late 1950's.

After discussion and review of the data with MSFC representatives, Dr. Holman agreed to rewrite the Michoud section and forward a new draft for official MSFC comments.

NOTES 3/13/67 RICHARD

AAP Systems Engineering: In line with our plans to organize our operation by project, the Technical Systems Office is now organized in the AAP systems engineering area. Six men have been assigned to this effort. Briefly, we intend to monitor the AAP efforts of R&D Operations affecting systems engineering and coordinate and guide those efforts resulting from systems engineering effect upon the Cluster modules.

In line with these activities, we are coordinating studies on the relocation of AM solar panels to the S-IVB interstage, auxiliary Cluster attitude control systems, Cluster dynamics, and others.

Voyager System: At a Voyager meeting on March 9, 1967, this office presented a proposed scope-of-work, or charter, for a proposed Voyager Planetary Vehicle Prelaunch Test Sub-panel. This sub-panel would function as a part of the Mission Design Team now being organized. This is a temporary team to operate from the present until probably some time this summer when a full-blown Apollo-like panel structure would go into effect.

Related to this is the concern about the facility aspect of Voyager. It is my understanding that a facilities task team will be formed by the Voyager project manager. It is also my belief that the sub-panel mentioned above should concentrate on the test flows and required facilities to accomplish those test flows. We are planning a trip to JPL to get familiar with the Quality and Reliability Test Programs used on Mariner. This information would be used as a basis for the evaluation and implementation of these programs on Voyager.

Saturn V Yaw Bias: General Phillips has tentatively agreed to the yaw bias on SA-501 provided the center engine misalignment cannot be taken out. MSFC was asked to investigate the practicability of realigning the engine to reduce the need for the yaw bias. If it is not practical, the proposed yaw bias will be implemented on SA-501. The bias correction will be in the software program, and the capability exists to remove the bias if not needed. MSFC will recommend a final decision by April 1.

The bias is tentatively in for subsequent vehicles. Dr. Debus is much in favor of it.

NOTES 3/13/67 RUDOLPH

1. AS-501 Launch Vehicle at KSC:

   - AS-501 rollout will be delayed until Tuesday, 23 May 67 (at the earliest).
   - Primary cause of delay: spacecraft and LUT service arm problems.
   - Pre-rollout review and my Pre-Flight Review are postponed accordingly.
   - Flight Computer Program was delivered to KSC, Wed, 8 Mar 67.
   - On Tuesday, 7 Mar 67, a detailed review of the Facility/S-IC Stage engine contamination was held with R&DO/IO participation. A unified position was established as documented in 7 Mar 67 memo from P&VE, TEST and QUAL Labs (copy attached). KSC was notified in writing on 8 Mar 67. Questions were raised during meeting at KSC on Friday, 10 Mar 67, and a re-evaluation of position is established for Tuesday, 14 Mar 67.

2. AS-502 Launch Vehicle:

   - S-IC-2 is scheduled to arrive on-dock KSC, Monday, 13 Mar 67.
   - S-IVB-502 is in low bay checkout at KSC.
   - S-IU-502 is scheduled on-dock KSC, Friday, 17 March 67.

3. S-IC-T Stage Systems Demonstration Test at MTF:

   - The second captive firing has been rescheduled from Wednesday, 15 March 67, to Friday, 17 March 67.
   - Firing will be of 60 seconds duration in lieu of 40 seconds previously planned.

1 Attachment: Memo R-P&VE-PA-67-M-257 dtd 7 Mar 67 (DIR, I-DIR & R-DIR's cy only)

NOTES 3/13/67 SPEER

1. REAL TIME LAUNCH WIND TRANSMISSION: We have reached agreement with KSC on a technical plan to transmit balloon radar tracks to MSFC in real time. Implementation will require 3 months. This will significantly improve our launch support to KSC in case of marginal winds. With regard to ground winds, KSC has not yet approved our request for transmission of anemometer readings. It appears doubtful that we can obtain these real time data on a routine basis; however, they will be sent when needed.

2. AS-501 LIEF PREPARATIONS: We are presently conducting a series of systematic briefings for all Saturn V Stage Managers, Stage Contractors and other key personnel in preparation for the first Saturn V LIEF operation. During the past 2 weeks we have held eight such briefing sessions; the program is almost complete.

3. LIEF MANAGEMENT: We have prepared the draft of a formal document defining and regulating the various interface areas between R-COMP, MS-C, and I-MO. in the operation and management of LIEF/HOSC. Dr. Hoelzer was briefed on the proposed document and principal agreement was reached. After receiving and incorporating detailed comments we shall forward the agreement to Mr. Weidner and Gen. O'Connor for approval.

NOTES 3-13-67 Stuhlinger

1. RADIATION DAMAGE TO ATM FILMS: Space Sciences Laboratory is still investigating the problem of radiation damage to ATM films (mentioned in my Notes 2-27 and 3-6). We have made arrangements with the Photo Lab to store our test film under refrigeration and to mount it prior to irradiation tests. Photo Lab will set up a special area to process the exposed film, and will maintain vigorous quality control during processing. We have already exposed some Polaroid film to Colbalt-60 radiation to check our experimental set-up. A well-defined 1/4" diameter spot was obtained; this should be sufficient for good readings on the densitometer. We will continue to run tests to check out the entire procedure, i.e., exposure, development, and densitometric analysis.

2. EMR: Preparations for a balloon flight of the Oak Ridge National Laboratory gamma-ray detector are nearing completion. Flight equipment is being assembled in SSL. Thermal vacuum testing is scheduled this week. The plan is to conduct a complete, full-time simulated flight in the chamber (4 hours after reaching 100,000 ft.) then go through several up and down cycles to test operation of systems under varying pressureconditions. If our luck prevails and no major problems develop during this testing, then the gondola will be carried to Texas via truck next weekend for launching late this month. The preparation of this balloon flight has been very much of a "shoestring" affair, making maximum use of surplus equipment from ORNL and MSFC.

NOTES 3/13/67 TEIR

EIGHTEENTH QUARTERLY REVIEW OF S-IB STAGE CONTRACT: This was the best CCSD Quarterly Review that has been held during the last year. Most of the day was devoted to reviewing recent quality problems, including engine problems, and the efforts being taken by CCSD to improve quality. Much of the data covered at this review will be summarized by Mr. Lowrey during his briefing for Dr. Rees and General O'Connor now scheduled for Friday, March 17, at 2:00 PM in the Saturn IB Control Room. After the CCSD Review, Mr. Chuck Lewis of Houston expressed his satisfaction with our emphasis on the need for improved quality of our equipment. He stated that the astronauts were very concerned with this and would be pleased that it was being stressed to such an extent.

SATURN IB PAYLOAD CAPABILITY: The current AS-205 trajectory is being revised to arrive at the operational trajectory. This revision will incorporate new propulsion data which will result in a positive payload margin of about 280 pounds; however, the addition of the 4 1/2 cubic foot control helium sphere and the flutter kit on the S-IVB Stage will eliminate this margin. As it stands now, our present payload capability is fully committed. The Saturn IB Systems Engineering Office is now set up in the concurrence loop for any stage associated change which will result in a weight change to insure that the 3 sigma performance flight reserve is maintained. Control weights for AS-207 and subs are now being revised to assure that a positive payload margin will be maintained.

ULD RESISTOR DRIFT PROBLEM: (Reference is made to Dr. Haeussermann's notes of 2/6/67 and my notes of 2/20/67.) Evidence to date overwhelmingly supports Paladium Oxide reduction (resistor paste chemical alteration) as being the cause of the ULD resistor drift problem. Corrective measures are being actively pursued. The LVDC/LVDA equipment was removed from the 204 launch vehicle and run through functional and thermal cycling tests. The equipment failed the "Ladder Test" (minor out of specification condition) but there was no indication of the resistor drift problem. A waiver is being processed to cover the out of spec condition and the equipment is being returned to the vehicle for continuation of 204 vehicle testing.

NOTES 3/13/67 WILLIAMS

1. LSSM: The LSSM Ad Hoc Technical Committee has prepared a recommended approach (to the SEB) for the Phase C procurement and will present it to Mr. Weidner and Mr. Neubert this week.

2. One-Year Orbital Station Study: An orientation meeting with DAC on the Advanced Workshop Study was held March 8/9, 1967. We agreed on a scope of work and study plan. The matrix below reflects the coverage of critical items that we expect as a result of this contract.

	AWS-LO-B (1)	AWS-LO-C (2)	AWS-SO (3)	EOSS (4)
Mission Description	X	X	X	X
Representative Experiments	X	X		X
Configuration Definition	X	X		X
Utility of Workshop	X	X	X	X
Program Requirements		X		X

A large number of configurations will be studied during this time. MSFC will review the potential configurations at Douglas on April 3/5 and select six or seven approaches for conceptual design; these will be reduced by early June to two or three concepts for more detailed definition of program requirements.

(1) Advanced Workshop - Low Orbit-B (B = minor updating of config. & sub-systems)
(2) " " - Low Orbit-C (C = major updating of config. & sub-systems)
(3) Advanced Workshop - Syn. Orbit
(4) Early Orbital Space Station.

3. Orbital Station Task Group: In addition to the previously announced Voyager Task Group for R&DO coordination, we have also established an Orbital Station Task Group for the coordination of all associated MSFC efforts leading to the definition of a one-year orbital station module. Konrad Dannenberg will head the Task Group which will be a functional element (office) in ASO, and Jim Madewell, as his deputy, will be the COR of the DAC contract which will be approximately $750 K. We expect to get an official MSFC charter approved for this operation, and are, in the meantime, operating on this basis.

March 20, 1967

NOTES 3-20-67
WITH COMMENTS

MR. GORMAN'S COPY

No DEPA action

NOTES BALCH 3/20/67

3/22/67

S-IC-T Testing - Second static firing of S-IC-T was accomplished on 3/17/67 as scheduled. Planned duration was 60 seconds, and automatic cutoff occurred in 60.8 seconds. Preliminary data review indicates all test objectives were met. More extensive data review and analysis is under way. Removal of stage from the test stand is scheduled for 3/27/67.

S-II-2 Testing - Detailed Test Plan has been approved, and final release and acceptance of static firing countdown procedure has been accomplished. No major problems are apparent that would constrain the first static firing, still scheduled for 3/25/67.

S-IC-4 Planning - Current plans call for arrival of S-IC-4 stage at MTF on 3/25/67 and installation of the stage in the B-2 position of the S-IC test stand on 3/28/67. S-IC-4 End Item Test Plan has been received for review.

S-II A-1 Activation - High pressure air system checkout, the final facility operations checkout procedure required for activation was completed on 3/15/67. S&ID is currently performing post activation tests and modification of GSE to accept the S-II-3 stage. Integrated test of facility and GSE, with simulated stage, is scheduled for 4/15/67.

Static Firing Damage Claims - Two additional claims for damages caused by S-IC-T static firings have been received and are being investigated.

Publicity on Static Firing Noise Effects - A press release designed to dispel erroneous opinions as to the effects of noise generated by static firings has been prepared and distributed.

NOTES 3/20/67 BELEW

3/22 JB

B 4/24

AAP LUNAR PLANNING AD HOC COMMITTEE: A meeting of AAP lunar planning Ad Hoc Study Team was held on March 13 with representation from MSF, MSFC, MSC, KSC, Bellcomm and SS&A. Subgroups were established to work the areas of Mission Objectives, Mission Profiles, Payloads, Spacecraft and Launch Vehicles and Operations. MSFC is to chair the launch vehicle effort and we have representation on the Profiles, Payload and Spacecraft groups. Prior to the next meeting, which is scheduled the first week in April, MSFC and MSC will come up with an overall AAP lunar schedule for consideration of the group.

LUNAR FLYING VEHICLE: Advanced Systems Office is initiating action to continue to study the lunar flying vehicle in the form of a one man POGO vehicle. This effort will study propulsion and guidance concepts as well as alternate missions that could be executed by this configuration. This vehicle would be complementary to the LSSM, could be carried on the LSSM and used as an emergency return vehicle.

MULTIPLE DOCKING ADAPTER (MDA): In response to results of the OMSF "cluster baselining session" the last week in February, an interface baselining meeting was held at McDonnell Company (MAC) among MSFC, MSC, and MAC personnel on March 7 for the identification of hardware needed by MSFC and by MAC, and definition of structural interface and radiator configuration.

A meeting was held with representatives of MAC and P&VE on March 16 to define hardware to be supplied by MSFC for structural, dynamic, and altitude chamber tests; and to be supplied by MAC to MSFC for structural and dynamic tests.

PAYLOAD INTEGRATION CONTRACTS: Revised guidelines for proposal preparation were delivered to Martin Company and Lockheed Missiles and Space Company on March 10. These were previously promised by March 1; however, a major change requested by Chuck Mathews required further discussion with NASA Headquarters before transmittal. This change involved reduction of AAP flights assumed to be assigned to MSFC for integration from 33 to 19 of the total 38 planned.

SOLAR ARRAYS ON THE S-IVB (OWS): At the request of Chuck Mathews, we are conducting a feasibility study of mounting solar arrays on the Orbital Workshop (OWS) as the primary electrical power supply for the Airlock Module. Lockheed is participating from the solar array standpoint, and Douglas Aircraft Company is involved in determining the impact involved on the S-IVB Stage. R&DO is following the effort very closely in order to determine the concept feasibility; particularly, R-AERO is looking at the dynamics and control impact during powered flight.

AAP PANELS: Chuck Mathews has tentatively identified three more AAP panels: Mission Integration, Systems Integration, and Crew Safety. Discussions between this office and R&DO indicate that MSFC can support the Mathews' proposal, although details of the panels' specific functions remain to be worked out. Mr. Rees and I will discuss AAP panels with Mr. Low and Mr. Thompson this week at Headquarters.

NOTES 3-20-67 BROWN

J-2 ENGINE Four tests were completed satisfactorily 3-16-67 at AEDC. The initial test was a simulated S-IVB restart with the thrust chamber heated asymmetrically to the expected worse case condition. The second test, a S-IVB restart for five seconds with a hot crossover duct and a worse case thrust chamber temperature. A maximum second orbit start bottle energy condition also existed on this test. The third test a S-IVB first burn simulation for 30 seconds with the start bottle at minimum energy conditions and the thrust chamber at the coldest expected temperature. The last test was a five second test with worse case conditions for all parameters, hot crossover duct, minimum fuel pump inlet pressure, maximum LOX pump inlet pressure, and heated ASI fuel line.

The results of these tests greatly improves our confidence in the engine's ability to perform its mission on 501. The three fixes which precipitated from AEDC for 501 S-IVB, restart are: start with PU valve open, retimed main LOX valve and controlled start tank energy. The test program will continue at AEDC at something less than the maximum rate to further increase our confidence in 501 and verify the engine's operation for 502 and subsequent vehicles.

The last engine for S-II-508 and the first engine for S-II-509 were delivered this week.

The S-II Battleship firing was aborted at 29 seconds of a scheduled 365 seconds last Friday due to an indicated gas generator overtemperature cutoff. Preliminary investigation revealed a damaged ASI chamber pressure instrumentation line which apparently burned the electrical cable carrying the GGOT signal; consequently, causing cutoff of the engine. Fire damage was restricted to the engine and another firing is planned following engine repair.

F-1 ENGINE In a meeting at KSC on 3-10-67 with General Phillips, an action item was given to MSFC to reevaluate the possibility of damage by the 3/16 by 3/4-inch bolt found on the interface of the injector on 501 engine 3011. A meeting with Dr. Rees, R&DO, I.O., and Rocketdyne was held on 3-15-67. The undivided opinion of the group was that no further disassembly and inspection of the engine should be performed.

H-1 ENGINE Rocketdyne has completed testing of the thrust chamber fuel return manifold baffle. This manifold baffle eliminates the minor thrust shift problem which has been occasionally evidenced on H-1 production engines. An ECP is being submitted to MSFC for approval with a proposed effectivity for SA-215 and subs.

GENERAL Engine Program Reviews at Rocketdyne March 28 through March 30, 1967.

In order to cover the Quality and Contamination Aspects of the engine programs and at the same time prevent repetition in each of the three engine program reviews, the H-1 engine review will now be held on March 28, together with the Qual & Contamination Review followed by the F-1 review on March 29, and the J-2 review on March 30.

B 4/24

NOTES - 3/20/67 - CONSTAN

3/22/B

S-IC-3

The stage was officially accepted by the Government on Wednesday evening, March 15, 1967, which was in advance of the Contract Plan VIIIA date of April 10. Considering that the "On dock" KSC requirement is not until May 31, 1967, it is anticipated that some of the Engineering Change Proposals (ECR's) that were committed to be accomplished at KSC will be rescheduled for incorporation at Michoud.

S-IC-4

The stage is stored in the factory prior to going to MTF for static firing.

S-IC-5

The first incentive milestone for this stage, Simulated Static Firing (SSF), was successfully completed and inspection records were submitted to the Government on March 7, 1967. This is six weeks in advance of the maximum incentive fee date of April 17, 1967, and twelve weeks in advance of Plan VIIIA schedule of May 1, 1967. The stage will have to be held in storage until the S-IC-4 complete static firing.

NOTES 3-20-67 COOK

3/22 NS

B 4/24

DAMPER ARM SYSTEM, DELIVERY TO KSC: Reference is made to Mr. Grau's NOTES, same subject. Mr. Cook met with Messrs. Trott, Henritze, Kuers, and Siebel and members of their staffs on March 18, 1967, to discuss the NOTES and the various aspects of this shipment and receipt by KSC. The use of the descriptive adjective to characterize the shipment is regretted as there was no intent to detract from the "bang-up" job done by all the labs and offices involved in getting the damper arm designed, fabricated, tested, ready for shipment, and delivered to meet the earliest possible "on-dock" delivery for KSC.

The 66 discrepancies prepared by Boeing on receiving inspection and the subsequent disposition participated in by P&VE personnel were also reviewed. There is nothing in the list to reflect on the integrity of the design, manufacture, test, or qualification of the hardware. In the main, they are diminutive and serve primarily to place an unwarranted reflection on MSFC. The items known to Marshall prior to shipment and planned to be accomplished at KSC were completed with about 30 man-hours of effort.

However, the list and discussion served to cause recognition that on all subsequent shipments to other Centers or contractors of equipment accomplished in-house by MSFC, in our desire and drive to meet promised delivery dates, we must not overlook the need to provide for the required in process and final inspection by R-QUAL prior to shipment. Only in this way can we be in a position to defend outselves on future shipments, particularly those passing through receiving inspection by contractor personnel that result in the type mentioned above.

MSFC Administrative Regulation 20-29, dated October 5, 1966, covering Inspection of Government Property for shipment from MSFC is being reviewed to see if any modifications or clarifications are necessary, particularly as to waivers by MSFC personnel prior to shipment, advance notice to the receiving element and agreement as to the shipment and concurrent delivery and understanding of documentation. In addition, Mr. Weidner is meeting with the Laboratory Directors involved to discuss the various aspects and arrive at a policy and requirements to be followed in the future.

NOTES 3/20/67 FELLOWS

3/20 JB

Prelaunch Test and Checkout (PLT&CO) Documentation: IO and R&DO met last week to explore ways of improving the status of the prelaunch test and checkout documents received for technical review and to facilitate the timely accomplishment of that review by R&D Operations. We agree that baselining the data so that only changes need be reviewed thereafter and a cross-indexing of "provisions" of each document with relevant "provisions" in related documents would substantially relieve those problems and reduce the manpower presently required for technical review. In preparation for an April 12 meeting with KSC on this subject, Mr. Weidner and General O'Connor will be briefed jointly by Saturn IB, Saturn V, and R&DO representatives on April 5, so we might approach KSC with their joint instructions on policies and management relationships required to improve our implementation of the MSFC/KSC sub-agreement for prelaunch test and checkout.

NOTES 3/20/67 GEISSLER

1. Orbital Workshop Active Control System: At a recent R-TO meeting on this subject, representatives from Aero-Astrodynamics Laboratory identified the following potential uses of such a system during the AAP Cluster Missions: (a) Serves as a backup to S-IV B APS if the M&SS module and CSM docking cannot be accomplished in the first 7 1/2 hours; (b) Assists in obtaining the Orbital Workshop initial gravity gradient stabilization, if stabilization cannot be achieved by CSM; (c) Serves to stop Workshop tumbling and regain gravity gradient stabilization if Astronaut motion during the 23-day mission is sufficient to start a tumble, and re-stabilization cannot be accomplished by CSM; (d) Helps maintain gravity gradient stabilization during the six-month orbital storage period, if undocking disturbances from CSM cause Workshop to tumble; (e) Stabilizes Workshop during LM/ATM docking; (f) Dumps control moment gyros during 56-day LM/ATM mission; (g) Stabilizes Workshop during docking for subsequent revisits.

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2. Orbital Workshop Passivation: Present MSFC planning for passivating the LOX and the LH_2 tanks of the Workshop consists of J2 engine dumping combined with non-propulsive vents. Request to perform partial passivation of the S-IV B stage of AS-206 was made to CCB on February 17, based on need for flight data prior to launch of Workshop. CCB granted tentative approval pending acceptance by other NASA agencies. We stated in the CCB meeting that MSC approval would be pursued by the Flight Mechanics Panel. MSFC planning was then transmitted to MSC via Flight Mechanics Panel. In turn, MSC agreed with us on the desirability of the experiment but listed certain constraints. Implications of these constraints are now being studied by R-AERO, R-ASTR, and I-MO. Recent IB mission changes prevent the passivation experiment from being on AS-206, since 206 is now planned as part of a dual launch. Efforts are being made to try to find another vehicle on which this experiment can be flown.

3. High Reynolds Number Research: As you will recall, personnel of Aero-Astrodynamics met with members of OART in Washington in March 1966 to discuss the proposed MSFC High Reynolds Number Aerodynamic Test Facility. It was agreed at that meeting that we would formulate exploratory experiments to investigate potential effects of Reynold's Number deficiency on launch vehicle aerodynamics. These experiments were to be conducted in existing OART facilities. We prepared this list and submitted it to OART in September 1966. At the request of Mr. M. B. Ames, Jr., OART Director of Space Vehicle Research and Technology, a meeting was held at Ames on March 6, 1967, to discuss the proposed program with members of OART and MSFC inasmuch as the facilities at Ames are being considered for this program. Representatives from Langley were also present to discuss research related to High Reynolds Number aircraft problems. It was agreed that Ames would be responsible for investigating effects of Reynolds Number on the extent of flare induced separation with fully turbulent boundary layers; also, our laboratory would be responsible for research on body lift distribution at angle-of-attack. Testing will be handled in the Ames 11 foot unitary wind tunnel. This Ames facility has the highest Reynolds Number test capability of any OART facility. However, it is far below the proposed range of the MSFC High Reynolds Number Facility. Meeting attendees asked of our progress on the MSFC High Reynolds Number Facility and indicated possible use of it in continuing these areas of research for both launch vehicles and aircraft.

NOTES 3-20-67 GRAU

3/22 9Ts

B 9/24

1. S-IC QUALITY MAINTENANCE PROGRAM: Mr. Harold Frost, the Boeing/Michoud Manager of Quality & Reliability Assurance, was recently briefed on the proposed S-IC quality maintenance program. Mr. Frost provided visibility on progress made by his organization in this regard. The highlight of his discussion was an introduction to a vendor remotivation program to be conducted by key Boeing design and quality personnel. The remotivation program for engineering flight critical vendors will begin March 20, 1967, and will continue through April 14, 1967. Key Quality and Reliability Assurance Laboratory participation in this program was solicited by Mr. Frost. We plan to have Laboratory representatives accompany Boeing on a sampling basis. Michoud/Quality will participate on a sampling basis also.

2. S-II PROGRAM: An audit was performed of the Material Review (MR) system at NAA/LAD (Los Angeles Division) recently. The MR system was found to be very weak and poorly organized. Results of the audit were presented to LAD quality control personnel and the Government Agency (Los Angeles Air Force), and later presented to NASA-O and NASA resident quality assurance personnel at S&ID. In light of the many deficiencies in the MR area, we are not formulating plans for a complete quality assurance survey at LAD on both the contractor's program and the Government Agency's program.

3. ENGINES: As a result of recent findings of contamination within engine systems, we are recommending injector borescope inspection of F-I and H-I Engines until such time that we are assured that the contamination problems are under control. We are still studying the J-2 to determine whether this can be done without removal of main lox valve. We are also working on a policy document to be imposed on all primes which would force control of access to the stages.

NOTES 3/20/67 HAEUSSERMANN

1. NERVA Instrumentation Development Review. While attending the NERVA Instrumentation Development Review last week in Sacramento, Astrionics Laboratory personnel investigated the liquid level gage used by Los Alamos Scientific Laboratory (LASL) for the hydrogen tanks during the Pheobus 1B reactor hot runs. The device is called a "Time Domain Reflectometer", which emits a pulse down a coaxial cable located inside the LH_2 tank. When the pulse reaches the liquid level, some of the pulse is reflected. The time required for the pulse to travel down the cable and return is measured and this time indicates the liquid level.

The device used by LASL is practically the same as the device built on our contract by IBM (NAS8-11774). The effort started in 1964 and a breadboard model was delivered. We call ours "RF Transmission Liquid Level Gage". We are investigating this method of liquid level measurement and present indications are that this technique does have possible flight applications.

2. Astronaut EVA for ATM. Astronauts Engel and Pogue visited here last week and suited up to evaluate the problems associated with film retrieval. This evaluation was performed in the P&VE mock-up area (Building 4335) and it gave insight into several areas and will result in rack/experiment package design modifications. Another area to be considered for astronaut EVA is black box redundancy by cable switching. Discussions with MSC personnel (D. Jacobs/R. Machell) indicate that present connectors (standard round and flat cable) are not suitable for EVA switching and different design approaches will have to be investigated.

3. LM RCS Impingement. With the relatively long burn times (10 seconds or more) for the LM rendezvous to the cluster, severe heating of the ATM rack and its components will result. Two general solutions to this problem are:

a. Cant the longitudinal thrusters 20°, provide thrust deflectors and retain the solar array in the stowed condition.

b. Relocate the longitudinal thruster to the lower end of the ATM rack.

MSC and MSFC are actively studying this problem for an early resolution.

NOTES 3/20/67 HEIMBURG

3/22 PTS

B 4/24

F-1

Test FW-060 was conducted on the West Area F-1 Test Stand on March 13, 1967, for a mainstage duration of 40 seconds. Primary purpose of this test was to evaluate the effects of truck delivery on flight engine performance. Preliminary data evaluation indicates satisfactory engine performance. This same engine will be rerun for 40 seconds again on Thursday, March 23, 1967.

S-IB-9

Stage S-IB-9 was removed from the Static Test Tower East on March 14, 1967, for shipment to MAF aboard the Barge Palaemon. Stage S-IB-10 is currently scheduled for arrival at MSFC on April 5, 1967, with the first test on April 26, 1967.

S-IC-T (MTF)

The S-IC-T stage was successfully static fired for 60 seconds at 3:16 p.m. on March 17, 1967. This was the second and final static firing of the S-IC-T stage by Boeing at MTF. The stage will be returned to MSFC the latter part of March, 1967.

S-II-2 (MTF)

The S&ID test readiness review will be conducted Tuesday, March 21, 1967, at MTF. The first static firing on S-II-2 is scheduled for March 25, 1967.

S-IVB (SACTO)

A decision was made this week to allow DAC to rebuild the Beta III Test Stand. A meeting will be held next week to consider a back-up facility at MSFC should another catastrophe occur at DAC before rebuild is complete.

Dr Seamans has not approved as of 3/21 PTS

AUXILIARY DAMPING SYSTEM

The Saturn V Auxiliary Damping System is used in lieu of the Primary Damper System when the Mobile Structure is at the Launch Pad. The system was tested at the GSE Test Facility between February 1, 1967, and March 14, 1967. All unsatisfactory conditions discovered during the test program were eliminated and the system is functionally and structurally adequate to perform its intended function.

The hardware was delivered to M.E. Laboratory on March 15, for refurbishment and preparation for shipment to KSC.

B 4/24

NOTES 3-20-67 HOELZER

3/22 JS

NEGATIVE REPORT.

B 4/24

NOTES 3-20-67 JOHNSON

3/22 JTS

Replacements for the Pegasus Coupon Retrieval Experiments - Mr. Novik, OART, expressed an interest in having MSFC generate one or more experiments similar to the ones planned with the Pegasus Coupons that can be conducted on currently planned missions without added rendezvous and EVA requirements. Mr. Ed Miller, RPL, is currently working up such experiments to test Apollo and Lunar Orbiter Thermal Control Coatings after short (two week) exposure to space. An experiment which would yield the data anticipated from the Pegasus Coupons (extremely long exposure time in unmanned space) does not seem completely possible under the current constraints. However, the problem is being studied and if a practical alternate is found it will be developed.

ATM Contamination Experiments - OART looks upon these experiments as a part of their flight program in Space Vehicle Technology (Environments). We have proposed 3 different experiments for as early as possible flight. The results should determine the magnitude of the problem associated with ATM. One is a photometeric experiment measuring intensity of light scattered from the particle field about a spacecraft as a function of angle of reflection. It will be a "first cut" type of measurement and more sophisticated experiments may be done later. Another is to measure the effects of the environment, including plated out materials, on typical optical components. The third is a rerun of a P&VE experiment to entrap and recover materials in small fritted class discs for later laboratory analysis.

OART promises funding to "define" these experiments.

NOTES 3-20-67 KUERS

3/22 JTS

B 4/24

No significant items to report.

NOTES 3-20-67 LUCAS 3/22 9/29

1. ORBITAL ABORTS (REFERENCE NOTES 2-27-67): Our recommendation is to test the dynamic behavior of the excess propellants in the S-IVB. We believe there is no real risk to the success of the primary mission objectives. The test would be performed after separation of the CM/SM from the IU. However, major software changes will have to be made by MSC and MSFC, e.g., shortening the S-IVB second burn, introduction of continuous venting until CM/SM separation. The slosh baffle location in the S-IVB is not ideal and might cause a problem. The technical feasibility is now being coordinated within R&DO and MSC before making an official request to the Program Office.

2. AS-209: AAP-2 ground purging analysis indicates a need for additional GN_2 into the Nose Cone. This will require a fly-away umbilical and dispersion system in the Nose Cone for 50-100 lbs/min GN_2 depending upon the size of the S-IVB forward skirt vent for AS-209 (AAP-2). Action has been placed for a preliminary impact of providing such a system. Vent sizing for AS-209 (AAP-2) has not been initiated due to lack of information available for the analysis.

3. RACK/PM: We have been directed by IO to resume work on the RACK/PM using the 1-5-67 design as baseline leading to the delivery of five items. Simultaneously, we were directed to conduct a study and impact a RACK redesign using a payload weight of 6250 lbs versus latest PM weight of 4185 lbs. The RACK was designed originally to carry 2882 lbs.

4. PAINTING OF S-IB ACTUATORS: Contractual action to have CCSD paint the actuators is slowly being generated. The main problem now is the availability of paint. In January, paint from the S-IC program was available at KSC - today nobody seems to be able to locate it. Another delaying action is that CCSD, in conjunction with their design responsibility, insists on performing a test program with test panels at Michoud. P&VE can probably supply enough paint for the test program so that it can get underway without further delays. The actual painting of the S-IB-4 and -6 actuators won't be completed until late April, at the earliest, with the present rate of progress. In the meantime, exposure to the environment continues.

5. NUCLEAR GROUND TEST MODULE (NGTM): During a meeting at Oakland, Calif., we agreed to provide Space Nuclear Propulsion Office (SNPO) with an updated piping criteria based on the latest fluid requirements by 3-20-67 and to provide a preliminary design concept of the service arm retract system by 5-1-67. This includes the retract mechanisms and retract pneumatic control system. SNPO agreed to allow the facility shield to be cut so that the lower umbilical can be placed on the aft skirt and to provide MSFC with an exact location of the upper and lower pneumatic complexes by 3-27-67.

6. S-II STAGE SEQUENCE, INTERLOCKS, AND REDLINE VALUES: We have reviewed the preliminary S-II-501 stage sequence, interlocks, and redline value chart submitted by S&ID. It was found that numerous interlocks and interlocked functions had been omitted and general arrangement of chart could cause misinterpretation. Plans are being made for S&ID personnel to visit MSFC to resolve differences in data content and means of presentation.

7. F-1 ENGINE: Another case of the use of incorrect material in an engine has been found. A-286 was used where Rene' 41 was specified for several segments in the turbine nozzle area. Four engines were affected, one of which is in "T" vehicle; the others were retired R&D engines. All of these engines have a great deal of firing time, up to 6880 seconds, with no failure in this area; therefore, the material is apparently satisfactory for this application. We have requested a few more lab tests by Rocketdyne, however.

NOTES - MAUS - 3/20/67

3/22 KS

B 4/29

MSF MARK FOR POP 67-1 - Dr. Mueller signed the mark on March 17 and completion of the MSF POP is due on March 27, 1967. Guidelines for preparing this POP provide project control levels for all AAP projects listed under the AAP coding structure proposed by MSF. They also provide controls at systems level for MSF Experiments Definition, Experiments Development, and AAP Supporting Development projects. Breakdown to selected major contracts for AAP will be required for this POP.

The transmittal again stressed the need for realistic major contract manpower and cost estimates so that tracking of actuals against plan and evaluation of weekly status reports by Headquarters will be meaningful. MSF shows a reduction on Apollo funding from the MSFC requirement submission in FY-69 and FY-70 in addition to the known changes to FY-67 and FY-68. We have been advised by Bill Lilly's office, however, that we need not be concerned at this point since this reduction was made to keep the Apollo runout total within the "Margaret Chase Smith" number. Attached is a comparison of the MSFC POP 67-1 and the MSF mark.

The AAP portion of the POP will not include plans beyond FY-68.

NOTES 3/20/67 RICHARD

3/22 [illegible]

B 4/24

S-IVB Destruct System - MSC requested through the Crew Safety Panel that the S-IVB destruct system be removed from the stage prior to manning on the workshop missions. R-ASTR, R-P&VE, and R-TO have worked together to develop a scheme to accomplish this.

The Eastern Test Range will allow the removal of the S-IVB destruct charges from the stage provided that there is an automatic destruct system sensing vehicle breakup prior to the S-IB/S-IVB separation.

A preliminary design has been made which uses three pancake charges just aft of the S-IVB separation plane. These charges are operated by either the S-IB range safety receiver or an interstage breakup sensing system mounted in the forward end of the S-IB.

This design was presented to the ETR safety personnel on March 15, 1967. The ETR personnel gave their verbal approval to the proposed system. KSC (Mr. Art Moore) is preparing a memo outlining the proposal for ETR concurrence, written confirmation of the meeting, and approval.

R-ASTR and R-P&VE personnel are preparing the necessary ECR's to initiate all contractor actions to design and build kits for workshop type launches.

This proposal has been coordinated with the Saturn Program Office at MSC, MSFC, + KSC. ✓

NOTES 3/20/67 RUDOLPH

3/22 TB

B 4/24 A.R.

1. AS-500D - Dynamic Test Vehicle at MSFC:

o A vertical beam in the service module cracked on Friday, 17 Mar 67, during yaw testing of AS-500D vehicle, which necessitated termination of all testing.

MSC been advised? B

o Astrionics Lab has indicated that the available data is sufficient to analyze the IU rate gyro anomaly (and relocation problem) and that additional Configuration I (complete vehicle) testing will not be required.

2. S-IC-T Stage Systems Demonstration Test at MTF:

o The second and final captive firing (60 seconds duration) of S-IC-T was successfully accomplished at MTF on Friday, 17 Mar 67.

3. AS-501 Launch Vehicle at KSC:

o Because of spacecraft and LUT service arm problems, the rollout of AS-501 has been officially re-scheduled to Tuesday, 13 June 67; however, KSC is working to improve this date.

o The Pre-rollout Review and my Pre-Flight Review of AS-501 will be held on 17, 18, & 19 May 67.

o Questions were raised at KSC meeting with Gen Phillips on Friday, 10 Mar 67 concerning:

- the bolt found on S-IC center engine LOX dome (engine position #5); a review of details with Dr. Rees, Gen O'Connor and others on Wednesday, 15 Mar 67, reaffirmed the MSFC position to do no more teardown inspection on S-IC-1.

- The S-II-1/J-2 engine misalignment due to structural deflection while under operating thrust; a determination was made to increase the engine cant angle from 1.0° to 1.8° by adjusting the servo actuator length. This action was reported to Gen Phillips and KSC by TWX, Friday, 17 March 67.

4. S-II-2 Stage at MTF:

o The first captive firing of S-II-2 is scheduled for Saturday, 25 Mar 67.

5. Repair of Beta III Test Stand at SACTO:

o MSF has concurred in the MSFC plan for repairing the Beta III test stand to full capability. We are now awaiting final authorization from Dr. Seamans.

NOTES 3/20/67 SPEER
3/22

B 4/24

1. FAILURE INVESTIGATION COMMITTEE: We are participating in the Ground Communications Sub-committee (Failure Investigation Committee) at KSC initiated after the 204 accident. The Sub-committee is attempting to identify critical and unsatisfactory conditions in the ground communication systems (voice systems, transmission systems, interfaces, etc). A set of recommendations will be prepared for submission to General Phillips upon completion of the study. Target date is 3/24. Several problems and potentially hazardous conditions in ground communications have already come to light.

2. APOLLO SECURITY STUDY: The Electrical Panel has determined a satisfactory method of implementing a safeguard for the IU Digital Command System. As a result we have recommended to General Phillips to establish an MSF requirement for this change. MSC is in principal agreement with our proposal, but is withholding a final commitment until obtaining a firm impact of the hardware change from NAA. We are proposing an effectivity for AS-503 and all subsequent Apollo-Saturn V flights and do not anticipate any schedule impact nor significant costs.

3. SECOND BURN INHIBIT: During the 7th Range Safety Subpanel Meeting, March 15-16 at KSC, it was agreed that procedures should be implemented between the Houston Control Center and the Range Safety Officer to allow use of the range safety command system as an additional possible mode to inhibit the AS-501/502 S-IVB second burn. Studies are underway to determine what circumstances, if any, require the use of this capability. If the study shows that the capability is required, Flight Mission Rules procedures will be established for its usage and KSC/ETR will be instructed not to safe the destruct command system after orbit insertion.

4. NEAR PAD IMPACT PREDICTOR (ODOP): KSC has a new study contract with TRW to evaluate (for the second time) the most efficient method of close-in impact prediction. A previous study had identified ODOP as best source of data; however, this was not accepted by Dr. Mueller. Preliminary TRW results are expected by April 15, 1967, and a conclusion by May 15. This schedule, if strictly adhered to, is compatible with MSFC's need for a decision concerning the continuing utilization of ODOP on follow-on Saturn IB vehicles. We have asked OMSF to recognize mid-May as the decision point on ODOP.

NOTES 3-20-67 Stuhlinger

3/22 [illegible]

B 9/29

1. UNIVERSITY OF ALABAMA RESEARCH INSTITUTE: Dr. Shelton of SSL is working closely with Mr. Shepherd to obtain continued financial support for the UAH Research Institute. They traveled to Headquarters on March 9 to meet with members of the OSSA Office of Grants and Research Contracts to discuss the latest UAHRI proposal and NASA's goals for the University. A letter to Headquarters is now being prepared defining MSFC's position regarding the development of the UAH. ✓

2. SOUTHEASTERN SEMINAR ON THERMAL SCIENCES: This Laboratory has worked with Auburn University to make arrangements for MSFC and Auburn to co-sponsor this year's Southeastern Seminar on Thermal Sciences. The seminar will be held May 8 - 9 in Morris Auditorium. MSFC attendees will be unlimited, and solicitations have been made for MSFC presentations. Outside attendees, mainly from universities, will be invited jointly by Auburn and MSFC. ✓

NOTES 3/20/67 TEIR

3/22 RB

B 4/24

SA-204: MSF TWX received last week assigning SA-204 for the LM-1 mission. All contractors have been directed to proceed with necessary engineering effort and changes to meet the MSF scheduled launch date in mid-summer. Indications earlier were that the LC-37B ESE changes would be the pacing item for this launch date but this was based on approximately two weeks being required to define the LC-37B ESE changes to support the AS-204 launch. Approximately 95% of the ESE change definition was accomplished last week and indications are now that this activity is on schedule to MSF launch date. KSC plans to start SA-206 de-erection on March 23 and SA-204 de-erection on March 31. SA-204 erection on LC-37B is projected to start the week of April 3.

BETA III TEST STAND REPAIR: Approval to repair the test stand has been received from General Phillips. Prior to giving Douglas the go ahead, additional authority is required from the Facilities Office at NASA Headquarters and we understand that this requires and is awaiting written approval by Dr. Seamans. This matter is being discussed with Headquarters personnel to determine additional action required.

BETA I BLAST PROTECTION: On your visit to SACTO you discussed blast protection measures for GSE. The subject has received considerable attention since that time. Curved plate deflectors have been considered; however, it has been determined that use of the curved plate deflectors is not feasible due to inducing excess loading into the basic structure. A meeting has been arranged with the test stand designers to investigate other means of protection and to determine whether it can be installed prior to the next scheduled acceptance firing on April 19, 1967.

SATURN IB LAUNCH VEHICLE FOLLOW-ON AAP PROCUREMENT: Preparation of Requests for Quotation (RFQ's) for the sixteen follow-on AAP vehicles is progressing satisfactorily. The RFQ for the S-IVB stages was forwarded to Douglas last Friday and the RFQ for the S-IB stage will be forwarded to Chrysler this week.

ORBITAL WORKSHOP CONTRACT CHANGE ORDERS: During March, contract change orders have been issued to Douglas for the following work: (1) Design, fabricate and test three sets of floors; (2) Design, fabricate and evaluate one meteoroid bumper; (3) Provide support to the AAP Office for a Preliminary Design Review for S-IVB stage orbital workshop mods; and (4) Fabrication of an S-IVB stage mockup containing orbital workshop items.

NOTES 3/20/67 WILLIAMS

B 4/24

3/22 TS

1. Voyager:

D. Hearth's plans regarding formation of (interim) inter-Center working groups were reported to you last week. The "Management Working Group" and the "Mission Design Working Group" will meet in Pasadena next week (March 22-24). David H. Newby and C. Chambers will represent MSFC in the first; G. Woodcock and L. Spears (Spacecraft) and Charles Chambers/A. Boyanton (Launch Vehicle) will represent MSFC in the second; with a few additional MSFC people in the second day.

March 27, 1967

3/27/67 w/comments

NOTES 3-27-67
WITH COMMENTS

MR. GORMAN'S COPY

No DEP-A

INDUSTRIAL OPERATIONS - MSFC

2075

CODE	NAME	INIT.	☐ ACTION	☐ INFORMATION
DIR	Dr. von Braun			

REMARKS

omit & file
Dr VB leaving
this - 5/15

BR

/ Bennington

& notes pile
3/27

In reference to your comment on NOTES 3-27-67 KUERS, the attached memo gives the agreement reached in a special meeting called on this particular subject.

Hans Hueter/5-8-67

RECEIVED
MAY 9 1967
DIR

CODE	NAME	DATE

MSFC - Form 495-2 (February 1964)

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

TO Mr. Rees, DEP-T DATE May 8, 1967

FROM Deputy Director, Industrial Operations, I-DIR

SUBJECT Weld improvements on S-II stage

In view of the new Apollo schedule, a meeting was called by Mr. Weidner and General O'Connor to develop a Marshall position for improvement of the welding methods for the S-II stage with regard to the expected Apollo schedule changes. The question in particular was whether to introduce pulse-arc welding with S-II-7 even if it would cause a longer delay. The following facts became apparent during the meeting:

1. The two courses available for improvement of these welds (the primary problem is in welding cylinder #6 to the forward LH_2 dome) are

a. a design improvement which would result in better welds with even the present method. This improvement is being implemented, but will not be available before S-II-11.

b. The pulse-arc welding method which appears to be superior to the present method (TIG).

2. Pulse-arc welding

The welding method has been developed and tested on full-scale diameter cylindrical test samples by ME Lab. S&ID is making the necessary preparation for introduction of the pulse-arc weld method on the cylinder #6 to forward LH_2 dome weld, but has indicated 2 1/2 months for implementation and testing. To this, Mr. Kuers feels that implementation of the new weld method should not require more than four weeks from the purely manufacturing point of view.

3. P&VE/Material Test Lab is not yet through with the qualification of the new welds and requires at least another six weeks, including cryogenic testing. (Kingsbury)

4. Colonel Yarchin is certain that any delay in start of welding of S-II-7 will impact the delivery, not only of S-II-7, but also of -8, -9, and -10. The new schedule, as far as is known to us, does not give any relief.

5. The average delay for repair of welds on previous stages was two to three weeks caused by the well-known difficulties.

6. Stages S-II-1 through S-II-6 have been accepted as flightworthy, including manned flight, in spite of the fact that welding results are not up to specifications. R&DO is still firm on this position. This is important because any request for delay of delivery for S-II-7 by about two months will bring up the question of "why introduce the new method with S-II-7 since MSFC could accept all previous stages welded by the old method as flightworthy and manrated."

After lengthy discussions which brought out the above facts, the following course of action has been agreed upon:

Since the start of weld of S-II-7 will begin about May 24 and Colonel Yarchin would like to have a final decision on the weld method by May 15, he will discuss an earlier implementation of the pulse-arc welding with S&ID management calling on ME Lab and P&VE for technical support. Hopefully, by May 15 more test data will be available and also the implementation time of two months will have been reduced to something comparable with the delay to be expected with the old welding method. Under those circumstances, 1) no milestone slip may occur; 2) if a milestone slip is inevitable, negotiations with Headquarters can proceed and will be easier.

Hans Hueter

CONCURRENCE:

Hermann K. Weidner, Director
Research & Development Operations

cc:
DIR, Dr. von Braun
R-DIR, Mr. Weidner
R-P&VE-DIR, Dr. Lucas
R-ME-DIR, Mr. Kuers
R-QUAL-DIR, Mr. Grau
I-DIR, General O'Connor
I-DIR, Dr. Mrazek
I-V-MGR, Dr. Rudolph
I-V-SII, Colonel Yarchin

NOTES 3-27-67 KUERS
3/27/67

4/23

S-II Manufacturing Task Force: Our main attention and efforts in this Task Force are still directed at the most critical area: the horizontal welding of the structure at Seal Beach. Last week one more of the most difficult welds of this kind, the LH_2 dome to cylinder #6 weld, for the S-II-7, was accomplished. The results are encouraging and show improvement in the quality of the weld. However, we as well as S&ID are not entirely satisfied with the results. The progress of improvement is relatively slow because it is the result of a combination of two factors which are difficult to separate: the technique per se being used and the execution of the technique, i.e. the art and skills and understanding of all people involved in the operation. For this reason we discuss and agree for each major weld the technique in detail and have our personnel on the floor in the shop at the time of performance. Mr. van Leuven, S&ID Manufacturing, who now personally participates in these activities, has stated to me after the last weld that the effect of our participation in the shop is being felt beneficially. For this specific LH_2 dome weld we feel now that the present technique is marginal and will not consistently produce zero defect welds--even with application of the utmost skill and care. We are, therefore, working on a back-up technique, using the pulsed-arc welding and opposed nugget (welding from two sides) process. P&VE Materials Division is with us in this program evaluating the properties of weld samples after natural aging and at cryogenic temperatures. Up to now this new technique looks very promising and we hope to make a 33 ft. diameter weld on our turntable in approximately two weeks from now.

URGENT

→ I.O. — DIR

In view of the increasing storage time for Sat V. launch vehicles (as a result of the spacecraft delays) it would really be smarter to stop welding more SII stages in the [illegible] manner and use the time most available to introduce the more promising pulse-arc welding method. I know that it is still looking the idea of delaying delivery schedules, but maybe the Lewis report on the SII structure will cause him to reconsider, at least the SII deliveries. Please give me your views. 4/3

NOTES BALCH 3/27/67

3/27/67

S-II-2 Testing - First static firing, scheduled for 3/25/67, was cancelled on 3/23/67 when it was determined to be necessary to enter the LOX tank to make repairs to the LOX vent system. The LOX tank was entered on 3/25/67, and repairs to the LOX vent system are almost complete. Closeout of LOX tank is expected late today, and tentative plans call for first static firing on 4/1/67.

S-IC-T Planning - Proof testing of test stand main derrick was scheduled for 3/25/67, preparatory to removal of S-IC-T from stand today. However, proof testing of main derrick has been delayed because of trouble with motor generators. Shipment of S-IC-T to MSFC, via Michoud, was scheduled for today or tomorrow. Impact of trouble with main derrick has not been evaluated.

S-IC-4 Planning - Plans are to transport the S-IC-4 from Michoud to MTF on the same shuttle barge that takes the S-IC-T from MTF to Michoud early this week, after off-loading of the S-IC-T at Michoud for further shipment to MSFC. Latest schedule calls for placing the S-IC-4 in the B-2 position of the S-IC test stand on 3/29/67. However, this schedule could be impacted by delay in removal of S-IC-T from test stand caused by trouble with main derrick.

S-II A-1 Test Stand - S&ID is continuing post-activation tests and modification of GSE to accept the S-II-3 stage. Integrated test of facility and GSE, with simulated stage, is still scheduled for 4/15/67.

Labor Relations - Approximately 120 members of Ironworkers Local 58 refused to work on various jobs on 3/24/67. This work stoppage was apparently the result of a dispute between the Ironworkers and Martin Brothers, a subcontractor to Carpenter Brothers on Corps of Engineers Contract No. 9006. The dispute involved the rejection by Martin Brothers and Carpenter Brothers of a demand by the Ironworkers that members of their union be assigned to rigging anf flagging operations incidental to lifting certain piping on the S-IC test stand. The ironworkers returned to work today, and it is assumed the dispute is being resolved. So far, program impact is negligible.

NOTES 3/27/67 BELEW

3/27 TPS

B 4/4

AAP LUNAR PLANNING AD HOC COMMITTEE:

Tentative agreement has been reached with MSC on the basic mission modes for the first AAP Lunar Missions. The first two flights in 1970 will be manned single missions planned to demonstrate as many characteristics of the dual landing as possible ("unmanned" landing and surface rendezvous). The 1971 missions will be a dual-launch with the LSSM carried on a "stripped LM," and an "extended life" LM as a personnel carrier. Some LM augmentation may be possible within the existing LM payload margins for the 1970 missions.

Sounds good to me B

LUNAR FLYING DEVICE:

Bell Aerosystems Company is demonstrating the ability of a suited test subject to control a small flying device in 1/6 g environment. MSC appears to support the concept of allowing MSFC to continue this effort, at least through the program definition phase.

MULTIPLE DOCKING ADAPTER (MDA):

As agreed in the first Airlock Module/Multiple Docking Adapter (AM/MDA) interface coordination meeting, McDonnell has compiled a "first cut" AM/MDA interface specification.

CLUSTER DYNAMICS ANALYSIS:

R&DO is progressing with a "first cut" of the cluster dynamics analysis based on some assumed masses and inertias. This analysis should be available the week of April 10, 1967.

SOLAR ARRAYS:

Based on a presentation of a feasibility analysis performed by Lockheed, Douglas, and MSFC at Headquarters on March 21, MSFC has been given the task of mounting solar arrays on the S-IVB stage as the primary power source for the cluster.

APOLLO TELESCOPE MOUNT (ATM):

We visited KSC last week and discussed the ATM activities required at KSC. We had a good exchange of information and plan to prepare an "agreement for operations" draft for review by both centers.

Mr. Forsythe and Mr. Halpern of OSSA will visit the ATM Office Monday, March 27, to review the ATM development history. They are interested in the changes in ATM (and specifically the experiments from a scientific standpoint) since the experiments management was transferred from Goddard to MSFC. They are doing this in preparation for the meeting Dr. Mueller has requested for April 4 with the Principal Investigators concerning pointing requirements.

EXPERIMENTS:

At present, a tool kit is being planned for each experiment. A tool requirements list is being worked to eliminate the possibility of having excess tool kits.

NOTES 3-27-67 BROWN

3/27

4/4

F-1 ENGINE We have received word from our MSFC representative at KSC that engine field inspection requests (EFIR) 22 and 23 are at variance with KSC philosophy in that KSC prefers component replacement rather than inspection in place, and will not give approval to allow Rocketdyne to perform the requested inspections. EFIR 22 requests inspection of the igniter fuel valve on engine 3015 (vehicle 501) for corrosion. EFIR 23 requests an inspection of the 4-way control valve spool on vehicles SA-501 and 502 engines for possible cracks. These inspections can be accomplished by Rocketdyne personnel in approximately two hours per engine. Removal and replacement is much more complex and time consuming (involves breaking numerous connections). In order to have the highest assurance the F-1 engine will perform its intended mission, we feel that engine inspection requests prepared by the responsible contractor and requested by the project office should be implemented unless there is some overriding consideration known only to KSC. These are just two of the more recent typical problems which we hope Dr. Debus's future response to your letter on the engines to stage interface at KSC will help resolve. The EFIR system is quite routine at all locations except KSC, where a disproportionate amount of management attention goes into the implementation of almost every other one.

B.B. I've discussed this with Debus and he promised to look into it and straighten it out. Please keep me posted B

H-1 ENGINE During the recent S-IB-II pre-static checkout, regular LOX seal "swab checks" disclosed water in the four outboard engine LOX seal cavities. Water has also been found in the LOX seal drain line of an outboard engine that recently completed CCSD post modification checkout. An intensive investigation is being conducted at Michoud to determine the source and extent of the water contamination. All engines at Michoud will be checked. Rocketdyne is conducting tests on an R&D engine to determine if the LOX seals can be dried with a purge, or if the seals will have to be removed from the engines.

J-2 ENGINE The unused ASI chamber pressure static test instrumentation line failure on the S-II-B/S, which was reported last week, was caused by an inadequate braze joint. All of the ASI Pc lines on S-II-502 at MTF have been X-rayed and two lines were found questionable. These two questionable lines have been shortened, crimped, and welded. This instrumentation line has been eliminated from all J-2 engines for S-II-505 and subsequent. Consideration is being given to shortening these lines on all affected S-II engines.

GENERAL H-1, F-1, and J-2 Engine Program Reviews are being held this week at Canoga Park, California.

NOTES 3/27/67 CONSTAN

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B 4/4

Visits to Michoud Assembly Facility

Mr. Frank Rand, professional staff member of the National Aeronautics and Space Council was briefed and conducted on a tour of Michoud Assembly Facility during his visit on Tuesday, March 21. During the course of his tour, Mr. Rand showed a great deal of interest in all phases of the operations of both the S-IB and S-IC, was particularly interested in some of the tooling and processes, and, all-in-all, I would say he was very impressed.

Dr. Mueller has scheduled an ~~Apollo~~ OMSF Executive ~~Meeting~~ Session in New Orleans from April 6 to April 9. The group, which will meet at the Sheraton-Charles Hotel, will visit Michoud and MTF on April 7. Michoud will provide the necessary transportation and related support for the party while in New Orleans.

S-IB Request for Proposal

Request for Proposal for completion of stages S-IB-13 through -16 (long lead time hardware currently under contract) with option for 12 additional S-IB stages was issued to Chrysler Corporation Space Division on March 24, 1967.

S-IC Request for Proposal

The Request for Proposal for long lead time materials, parts and components, including engineering services, for Stages S-IC-16 and S-IC-17 issued to The Boeing Company on March 9, 1967, with request for submittal no later than March 28, 1967. The Request for Proposal for Stages S-IC-16 through -25 is being prepared for issue approximately March 27, 1967.

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4/4.

NOTES 3/27/67 FELLOWS

3/27/67

Evaluation of Single Support Contractors for Determination of Award Fee: One of the objectives of the award fee contracts is to assure that the contractor is properly motivated to perform and manage to the highest degree obtainable. The contractor must measure the impact of and accomplish certain performance trade-offs in order to achieve the overall highest performance and award fee. In a continuing effort to maintain relative weights assigned to the performance areas so that the government will obtain maximum benefit from the contractor's trade-offs as he strives to obtain highest award fee, the Computation Laboratory Performance Evaluation Board met last week to review emphasis presently placed on the various factors by their relative percentage weightings. The Cost Control factor has assumed increasing importance in evaluating contractor performance. Therefore, the relative award fee weight of this factor has already been increased for the Computation Laboratory single support contract. Criteria are being revised so that additional emphasis can be placed on Cost Control in the performance evaluation of the other single support contractors.

NOTES 3/27/67 GEISSLER

3/27 9T3

B 4/9

1. S-II Stage Separation: At the October 1966 meeting of the S-II Stage Vehicle Dynamics and Control Working Group, we requested NAA/S&ID to conduct an S-II/S-IC separation study based upon S-II stage thrust structure compliance. The study utilized data obtained in the hot flow test conducted here at MSFC in the summer of 1966. The S-II stage outboard engines are installed with a 1° outward cant to compensate for thrust compliance of the stage such that during full thrust, each of the engines is at the null position. Significant study findings are: (1) Nominal separation clearance distance between the engine bell and interstage during second plane separation is 42"; (2) In the worst single actuator failure (hard over) case, the engine bell clears the interstage by 27.1"; (3) In the worst single engine failure case, the #4 engine clears the interstage by 2". This case is for the #4 engine failing at 2 - 2.5 seconds prior to second plane separation. However, as a result of recent S-II-1 test firings at MTF, it has been determined that an additional 0.8° precant is required on S-II-1 (total 1.8°) to compensate for thrust structure compliance. A NAA/S&ID representative stated that a possibility of engine collision with the interstage during second plane separation exists because of the additional 0.8° precant. Worst case conditions simulated (#4 engine failing at 2.5 sec prior to 2nd plane separation) results in collision. Solutions to the problem are being investigated by P&VE, Astrionics, and Aero., in conjunction with NAA.

E.G. How serious would you say is the overall risk to the mission? B

2. Terrestrial Ionospheric Measurements: A meeting to discuss Satellite Ejection Packages for Terrestrial Ionospheric Measurements was held in our laboratory on March 20, 1967. Representatives from ESSA, Ball Brothers, Inc., and Aero-Astrodynamics Laboratory were in attendance. A joint proposal is being made by the Institute of Telecommunication Science and Aeronomy (ITSA) of ESSA and Ball Brothers, Inc., to construct a series of packages to be launched downward from an AAP type orbiter for the purpose of studying the ionosphere. Special emphasis will be placed on in situ measurements of electron density profiles, auroral phenomena and measurements of composition. The packages would be jettisoned from the carrier at intervals determined by observed times of interest such as auroral displays or at times when data are obtainable from a new geographical position such as the polar regions. The packages could be ejected and retro fired to provide extensive temporal data (several orbits) on the atmosphere between approximately 90 and 200 kilometers. In view of the desirability of having such a system and the unusually high competence of the principal investigators from ESSA, we are attempting to obtain the required funding for this proposal.

3. Early Shutdown of J-2 Engine: Early shutdown of the J-2 engine in S-IV B of Saturn V can lead to possible control problems. These control problems arise from the motion of liquid in the tanks. Activation of the propulsive hydrogen vent at the end of LOX blow-down should eliminate these control problems by keeping the liquid propellants seated in the tanks. The possibility of activating hydrogen vent at this time is being studied by P&VE and MSC. If we can obtain a constant propulsive vent, then we anticipate no slosh problems.

NOTES 3-27-67 GRAU

B 4/4

3/27/67

1. ROCKETDYNE/CANOGA PARK QUALITY AND RELIABILITY SURVEY: A quality and reliability survey was recently completed at Rocketdyne, Canoga Park, California. Problems of major significance were found in the areas of Test Inspection Planning, Vendor Surveys, Management Visibility, Component Test Accomplishment, and Contamination Control. Results were reported to the Government Agency and to Rocketdyne, and were well received by resident MSFC personnel. Rocketdyne was well represented at the critique by Mr. John Young, NAA Corporate Director for Quality, and several corporate officers at the director, vice-president level. It is anticipated that we will have to have top level MSFC involvement to obtain some of our recommendations since they pertain to Rocketdyne corporate policy.

2. TRANSISTOR TESTING: This Laboratory has received the Transistor Analyzer Safe Operating Area (SOAR) equipment from Bendix. Second breakdown is a serious problem in power transistors as it is an irreversible catastrophic failure mechanism. With the SOAR equipment, which essentially makes a functional test of the dynamic power handling capabilities of power transistors, the previously unknown second breakdown parameter can be brought under control. A demonstration of the equipment is scheduled for April 13, 1967, at 9:30 a.m. in building 4752. Interest in attending this meeting has been expressed by NASA Headquarters, Navy, Air Force, National Bureau of Standards, Goddard Space Flight Center, Manned Spacecraft Center, and Ames Research Center.

3. S-IVB PROGRAM: S-IVB-208 completed post-static checkout March 21, 1967, and is being removed from the checkout tower. There are large amounts of rework and modification scheduled to be performed during storage, which will invalidate approximately 75% of post-static checkout.

   - DAC has submitted their final analysis of "follow-on" stage checkout. This checkout will be at Huntington Beach and will take into account the possible deletion of static firing.

   - A new safety policy at DAC requires checkout at Huntington Beach to be run at reduced pressures. Should static firing be discontinued, the new DAC policy would contribute to shipment of stages to KSC which had never been pressurized to full operating pressures.

D.F.

We should put our foot down and declare this as unacceptable. If you run into any difficulty, just let me know and I'll raise cane. B

NOTES HAEUSSERMANN 3/27/67

B 4/4

3/27 [illegible]

1. ATM Ascent Stage Raising (Reference Notes Haeussermann 3/13/67). A detailed review on the addition of an IU slice in lieu of raising the LM ascent stage was held with the P&VE and AERO Laboratories. Present indications are that there are no technical drawbacks if an IU slice were added except for the payload penalty of approximately 600 pounds. Thus far the structural, aerodynamic and GSE impacts have been found to be acceptable. The IU slice addition allows the experiment canister to be moved to the rear within the rack which provides a better condition for EVA film retrieval and an improved structural design. P&VE will proceed with the redesign of the rack based on the premise of adding an IU slice and the total subject shall be further explored. A schedule slippage of 2 1/2 months due to the rack redesign will be involved should this be the final solution. Penalties on ascent stage raising are the excessive cost $500K/1M and the attainment of adequate design clearances.

2. ATM Ascent Stage Raising. Based on the quarterly review and subsequent discussions with MSC personnel, the status of raising the ascent stage eight inches is as follows:

a. MSC states that it is technically feasible and the violation of the clearance envelope can be relieved by rework of the SLA panels or perhaps modification of the interfering components.

b. Rework of the work stands for on-pad servicing presents a cost impact of approximately $500K to $1.0M and MSC intends to advise OMSF this week for OMSF funding authorization.

c. MSFC (P&VE/ME Labs) will also explore whether or not the work stands should be redesigned and fabricated "in house".

An alternate approach which has been explored is to add a section between the IU and SLA and comparable in size to the IU. This approach would be considered only if the raising of the ascent stage was not acceptable to MSC or Headquarters.

NOTES 3-27-67 HEIMBURG

3/29/67

4/4

F-1

F-1 engine S/N 6049 (truck delivered flight spare) has been retained in the West Area F-1 Test Stand due to a shift in performance on Test FW-060. There were no major hardware changes and the engine was not re-orificed after the previous test at the Edwards Rocket Test Site. Data from these tests are being analyzed by Rocketdyne and P&VE.

S-IB-10

Stage S-IB-10 is expected to arrive at MSFC for installation in the static test tower east on April 10, 1967.

Moderate Depth Lunar Drill

Scopes of work were finalized and transmitted forward for the following contractors - Northrop, Westinghouse, and Joy Manufacturing Company. These were sent by the formal route as well as the direct route to Jack Hanley (MTL) so that there should be no delays in their releasing the FY 67 money.

S-IC

The plan to remove the S-IC-T stage from the test stand at MTF today has been nullified due to problems encountered the night of March 26, 1967, in the derrick following the load test. After the derrick load test and while lowering the boom to the saddle the main block started falling, apparently due to a burned out amplifier in the control circuit. The main breaker was thrown to stop the movement of the block. Inspection revealed over heated motors. Time to repair is not presently known. Another load test will be made after repairs.

S-II-2

S-II-2 firing scheduled for Saturday, March 26, 1967, was cancelled for at least a week due to a decision to change LOX vent line inside the LOX tank.

S-IVB

DAC was directed to conduct a single burn S-IB type acceptance firing on S-IVB-503 (new) in lieu of a two burn S-V type firing. In order to checkout the O_2H_2 burner as a part of the test, DAC will retank propellants to the 70% level after the acceptance firing and conduct the burner tests. DAC will have to rework the firing tape as a result of changing to the single burn test. This rework will cause a one week slip in the schedule. The new firing date is April 26, 1967.

NOTES 3-27-67 HOELZER

3/27 TS

B 4/4

NEGATIVE REPORT.

NOTES 3-27-67 JOHNSON

B 9/4

3/27 DTS

Nothing of significance to report.

NOTES 3-27-67 KUERS

3/27 9Ts

B 4/23

S-II Manufacturing Task Force: Our main attention and efforts in this Task Force are still directed at the most critical area: the horizontal welding of the structure at Seal Beach. Last week one more of the most difficult welds of this kind, the LH_2 dome to cylinder #6 weld, for the S-II-7, was accomplished. The results are encouraging and show improvement in the quality of the weld. However, we as well as S&ID are not entirely satisfied with the results. The progress of improvement is relatively slow because it is the result of a combination of two factors which are difficult to separate: the technique per se being used and the execution of the technique, i.e. the art and skills and understanding of all people involved in the operation. For this reason we discuss and agree for each major weld the technique in detail and have our personnel on the floor in the shop at the time of performance. Mr. van Leuven, S&ID Manufacturing, who now personally participates in these activities, has stated to me after the last weld that the effect of our participation in the shop is being felt beneficially. For this specific LH_2 dome weld we feel now that the present technique is marginal and will not consistently produce zero defect welds--even with application of the utmost skill and care. We are, therefore, working on a back-up technique, using the pulsed-arc welding and opposed nugget (welding from two sides) process. P&VE Materials Division is with us in this program evaluating the properties of weld samples after natural aging and at cryogenic temperatures. Up to now this new technique looks very promising and we hope to make a 33 ft. diameter weld on our turntable in approximately two weeks from now.

URGENT

→ I.O. — DIR

In view of the increasing storage time for Sat. V. launch vehicles (as a result of the spacecraft delays) it would really be smarter to stop welding more SII stages in an inadequate manner and use the time now available to introduce the more promising pulse-arc welding method. I know that OEM is still backing the idea of delaying delivery schedules, but maybe the Lewis report on the SII structure will cause him to reconsider, at least the SII deliveries. Please give me your views B 4/23

NOTES 3-27-67 LUCAS

3/27 RS

B 4/23

B.L. Can't we use existing and time-tested AF Discoverer capsules? B

1. UNMANNED ORBITAL DATA RETURN CAPABILITY: Preliminary studies show a need for unmanned data reentry devices during the Cluster operation in addition to the CM return capability. Preliminary design for such a Data Return Capsule is underway based on the assumption requirements for the capsule will be forthcoming soon. We are now trying to establish firm definition of requirements.

2. S-IVB ORBITAL WORKSHOP VENTILATION: We have contacted AiResearch Division of Garrett Corporation and Hamilton Standard Division of United Aircraft relative to environmental control. Both companies are actively involved in design/manufacture of life support systems for manned spacecraft including the MOL system (Hamilton Standard). To gain information on environmental control in submarines and other ships, a meeting with the Bureau of Ships has been scheduled for March 28, 1967, at Washington. Efforts are in progress to contact Case Institute, a consultant to the American Society of Heating, Ventilation and Air Conditioning Society.

3. NUCLEAR GROUND TEST MODULE (NGTM): MSFC and SNPO discussed nuclear vehicle technology on March 21, 1967. The purpose of the discussion was to make recommendations for a combined FY 68-69 vehicle technology program that would support the initiation of preliminary design of modular nuclear flight vehicle in FY 70. Presently, a flight vehicle is not sanctioned officially; however, it appears that SNPO is assuming approval will come in a year or two if the Congress approves the budget for the advanced nuclear engine. It was re-emphasized that development of meaningful technology for utilization in a future flight stage program is a major objective of the NGTM program.

4. S-II SIMULATED ULLAGE MOTOR TEST: The S-II simulated ullage motor test was successfully completed in our Structural Test Facility. The S-II high force test interstage specimen was used in this program. Two loading conditions were simulated: (1) eight motors firing, loaded in increments to 130% of maximum motor thrust during flight, (2) seven motors firing, loaded in increments to 130% of maximum motor thrust during flight. This test structurally qualified the S-II interstage for AS-501 flight.

5. NASA WORKING GROUP ON PRESSURE VESSEL STRESS CORROSION: This group had its first meeting at NASA Headquarters with representatives from Headquarters, KSC, MSC, MSFC, and LeRC as official members and representatives from USAF and Aerospace Corporation as observers. It appears that the group will not be a funded working group but a coordination group to assure that all involved are aware of the experiences and research of others in stress corrosion.

Art Rudolph FYI B

6. SATURN V COMPONENT HANDLING EQUIPMENT: A complete review of our ability to safely replace components of the Saturn V vehicle in the stacked configuration shows a shortage of approximately ¼ of the required component handling equipment. Ninety-two pieces of component handling equipment are under procurement for maintenance of the Saturn V vehicle. Thirty-five additional pieces of component handling equipment have not been procured primarily, it appears, because KSC is reluctant to state a requirement for this equipment. P&VE's position is that the procurement and use of this equipment is an MSFC requirement to safeguard the Saturn V vehicle and servicing personnel.

7. APOLLO TELESCOPE MOUNT (ATM): An alternate approach to accommodate the required lengths of ATM experiments involves the insertion of an IU structure between regular IU and SLA. The choice amounts to weighing the dollar penalty of work platform modification by MSC ($1M) against payload loss (~500 lbs) plus RACK redesign (2 to 4 weeks).

NOTES 3/27/67 MAUS

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Negative Report

B 9/23

NOTES 3/27/67 RICHARD

3/27 9T8

Systems Engineering Specification Development: We were hosts last week to the Air Force Task Team engaged in preparation of a Systems Engineering Specification for proposed industry-wide aerospace application. The specification is designed to define the "what" and not the "how" for systems engineering. We are observers in this activity and feel that we at Marshall should know the Air Force aerospace program proposed techniques and methods since we have many common contractors. We think this will help our future relationship in the system engineering areas.

NOTES 3/27/67 RUDOLPH

3/27/67 B 4/25

1. S-II Stage LOX Tank Vent Lines:

o The failure of the LOX tank vent line on the S-II stage of the Saturn V Dynamic Vehicle (on 26 February 67) prompted a review of X-rays of all similiar lines. As a result:

- S-II-1 Stage at KSC: Lox tank vent line will be replaced on Tuesday, 4 April 67; however, roll-out of AS-501 will not be impacted.

- S-II-2 Stage at MTF: LOX tank vent line was replaced; and captive firing was re-scheduled from Saturday, 25 March 67 to Friday, 31 March 67.

2. AS-501 Launch Vehicle at KSC: Power was removed from the vehicle on Wednesday, 22 March 67, to accomodate ESE mods and other work. Power-on will occur again on Friday, 7 April 67.

3. AS-502 Launch Vehicle at KSC:

o Vehicle is now being erected (with S-II spacer) on LUT 2 in High Bay #3.

- S-IC-2 stage was erected on Friday, 17 March 67.
- S-II spacer was erected on Wednesday, 22 March 67.
- S-IVB-502 stage will be erected on Tuesday, 28 March 67.
- S-IU-502 stage will be erected on Wednesday, 29 March 67.

4. S-IVB-503 (new) stage at SACTO:

o S-IVB-503 (new) stage acceptance firing will be changed from the planned two burn firing to a single burn firing to reduce the hazards.

o Change in checkout and captive firing computer programs will delay firing from 19 April 67 to 26 April 67; but, delay is not expected to impact the required "on-dock" date of 8 August 67.

o Further discussions between MSFC and DAC will be held before deciding on the acceptance firing plan for subsequent Saturn V S-IVB stages.

5. Modification of Apollo Spacecraft - Boilerplate - 30:

o Plans are being developed to modify Boilerplate - 30 (in the MSFC shops) for use as an alternate un-manned payload on an early Saturn V launch.

NOTES 3/27/67 SPEER

3/27 9AM

B 9/27

1. AAP FLIGHT OPERATIONS: MSC has not yet agreed to establish an AAP Flight Operations Panel and they refuse doing business through the Apollo Flight Operations Panel. This is only part of a more serious problem, MSC's strong effort to eliminate any and all MSFC participation in planning and execution of AAP flight operations. Mathews (OMSF) originally accepted MSC's position on the basis of the Lake Logan Agreement which assigns prime responsibility (but not necessarily sole ownership) of flight operations to MSC. Consequently, any reference to HOSC operations support was removed from the guidelines for the new AAP integration contract. I have talked to John Edwards (AAP Flight Operations, OMSF) and Gen. Stevenson and we have agreed that this whole area will be carefully re-evaluated before any further steps are taken. Important coming milestones are an MSC presentation on the proposed MCC-H augmentation for AAP to Stevenson (4/13), and an Operations Retreat Meeting on 4/28 to which I am invited. At stake for MSFC are our direct participation in MSC's flight operations planning, coordination of ground command functions, execution of flight operations functions within the Control Center, utilization of our engineering design force for operations support through LIEF/HOSC, identification and defense of MSFC ground support requirements, participation of experiment engineers and scientists, and the near-real time and non-real time analysis of experiment data for the purpose of operations support. I believe there are two points in our favor: (1) MSC's position means a major deviation from Apollo; (2) the degree of our involvement in AAP will make it technically very difficult to exclude MSFC from operations support. I am planning to give a status review to Dr. Rees on 4/4.

F.S. Please let me know whether the long discussion Rees and I had with John Stevenson and your subsequent Operations Hideaway in New Orleans produced any results. I'm standby ready to help again if necessary

B

2. PASSIVATION EXPERIMENT FOR AS-204/LM-1: We have investigated operations aspects of this experiment. Jointly with MSC Flight Control, a requirement for ground monitoring and inhibit of the experiment has been defined and details have been worked out with ASTR of an acceptable inhibit implementation utilizing the LV Digital Command System. If the experiment is approved for AS-204/LM-1, the nominal sequence will be programmed with events of the experiment. If the LM mission status dictates, a switch selector command will de-energize selected scheduled activities, and, thereby, inhibit the passivation experiment.

NOTES 3-27-67 Stuhlinger
3/27 JTS

B 4/23

1. EMR: We received 25K of FY-67 funding from OSSA for EMR to be applied to the ORNL line gamma-ray experiment. This funding, although modest in amount, was very badly needed. The 25K is of particular significance since it represents the first funding we have received from OSSA in support of the EMR effort. The EMR Project Proposal has been on the agenda of the Space Science Steering Committee for some time. It is expected that it will be discussed in one of the next meetings.

2. VOYAGER: Following discussions with Oran Nicks, Don Hearth and Bob Fellows on March 7, the functions and organizational position of the Voyager Project Scientist at MSFC were formulated, and full agreement was reached with R-DIR and Dave Newby. The Project Scientist will hold a double position as staff member of the Voyager Spacecraft Systems Program Office in IO and as Voyager Project Scientist in Space Sciences Laboratory. Copies of charts showing organizational location and functions are attached for your information.

NOTES 3/27/67 TEIR

3/27/67

B 4/23

B.T.

Storage!!!

B

S-IB ACTUATOR POTENTIOMETERS: CCSD noted that two actuator potentiometers on S-IB-11 were exceeding the upper limit of the specification for total resistance (5,000 ohms plus or minus 500 ohms). A quick look assessment indicates that the resistive plastic element in potentiometers built since November 1966 is increasing its resistance at the rate of 3 or 4 ohms per day. At this rate, potentiometers built since November would exceed the upper limit in 250 days. The resistive plastic is a proprietary item built by Markite. Some of the potentiometers on SA-206, and all of those on SA-207 and subsequent, are believed to be growth prone. Those on SA-204, SA-205, and some on SA-206, have been rebuilt by CCSD to a hardwire design. CCSD will visit Markite this week in an effort to pinpoint and correct the difficulty. A flash report has been issued to other concerned offices.

S-IVB PASSIVATION EXPERIMENT: There is an S/AA S-IVB Workshop requirement for incorporation of a passivation experiment on a Saturn IB vehicle. This experiment involves dumping of propellants and also the helium bottles. A meeting was held Friday with representatives of R&DO, AAP, and Saturn V, however attending personnel did not present a strong enough position to justify conducting this experiment on SA-204. If this experiment is required only by AAP, it must go to Gen. Phillips' Level I Board for approval before modifying the hardware and software. I do not believe that we have sufficient information in this office at this time to justify forwarding the request for this experiment to Headquarters for approval. To get approval of AAP experiments on Apollo mainstream flights, they will have to be well justified and well supported by the AAP Office. At the Friday meeting, we asked R&DO representatives (coordinated by Ludie Richard's Office) to give us the required technical justification for running the experiment for the AAP Program and for Saturn V, if such a requirement is required for future Saturn V missions. If we are going to get this experiment into SA-204, we must have a Headquarters approval prior to 12 April 1967 to prevent a delay in the present launch schedule. To do this, we must receive a good justification this week.

Got it?

B

CORROSION INSPECTION AND CONTROL GROUP: We have established an SA-204 and SA-501 Corrosion Inspection and Control Group to provide a corrosion inspection criteria for inspection and maintenance of these two vehicles at KSC. R&DO (P&VE Lab coordinating) and the contractors are preparing the criteria. After coordination with KSC and approval by the Program Offices, it will be provided to KSC, MSFC, and the contractor inspection personnel for implementation.

NOTES 3/27/67 WILLIAMS
3/27 9TS

B 4/23

1. April Management Council Meeting:

I received a call from Ed Gray on March 23 requesting support in preparing a presentation for the April Management Council meeting on the topic "Resource Requirements for FY-69". Dr. Mueller asked Ed (as a final departing swan song) to "tell us what we should spend our MSF program resources on in FY-69". As of March 23, Ed was not specific - in fact, he asked me for suggestions as to how/what should be pulled together. I plan to discuss it over the phone with him this week and meet with him on April 5 in Headquarters to finalize our plans. If you have any guidelines or constraints regarding this activity, please let me know. I will keep you, Mr. Weidner and Mr. Maus advised of our actions.

F.W.
Too late. Was on travel. What transpired? B

2. Agreements with Headquarters:

As a result of discussions with Headquarters personnel this week, we have obtained agreement to conduct a contracted study (FY-67 funds) in the area of system integration and program planning for Earth Orbital systems. We had previously obtained agreement to contract a study of this nature for the Planetary program. Agreement with Headquarters that we should contract these types of efforts has essentially accomplished, at least from the Advanced Manned Missions Office, the recognition that this is a significant and valid advanced study area and one that Marshall should for the present be responsible for. This would seem to accomplish those types of assignments that we discussed several months ago.

3. POGO (Lunar Flying System):

Preparation for the 1/6 g Pogo test flights at Langley Research Center is proceeding very well and is expected to begin as scheduled, April 24, 1967. Liquid air will be used in the backpacks instead of liquid oxygen. Fabrication of the adapting subsystems required to support the Pogo vehicle in the Langley facility is about 95% complete and on schedule. These subsystems will be checked out at Bell prior to shipment to LaRC.

4. S-IVB Station Modules:

A configuration selection meeting will be held at DAC April 3-4 to narrow the configurations studied by the contractor during the advanced workshop study. It is intended to narrow to 5 ground-fitted configurations (EOSS) and 3 spent-stage configurations (AWS-LO).