

March 4, 1968



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NOTES  
MR. GORMAN'S COPY  
3/4/68 w/ comments

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NOTES 3/4/68 BALCH

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S-II-504 Testing - Stage was removed from the Vertical Service Building and reinstalled in the A-2 test stand on 3/1/68. Cryogenic proof-pressure test and shipment to KSC are still scheduled for 3/24/68 and 4/26/68 respectively. ✓

S-II-505 Testing - Repair of LH<sub>2</sub> tank propellant utilization probes and additional requirement to X-ray the forward bulkhead of the LH<sub>2</sub> tank have caused the on-stand date to be changed from 3/7/68 to 3/11/68 and the dates for the cryogenic proof-pressure test and firing to be changed from 4/12/68 and 4/23/68 to 4/16/68 and 4/26/68, respectively. Shipment to KSC is scheduled for 6/26/68. ✓

S-IC-506 - Stage arrived at MTF on 3/1/68. Failure to meet planned arrival date of 2/29/68 was due to high winds at Michoud. Installation in the B-2 test stand is tentatively scheduled for today. ✓

Public Affairs - Mr. John Wilford, space writer for the New York Times, visited MTF on 2/29/68 in connection with a story he is developing on the national space program. ✓

Mr. Neil Stanford and Mr. Norman Matheny of the Christian Science Monitor plan to visit MTF on 3/8/68 for general orientation and to take some pictures for their paper. ✓

NASA HEADQUARTERS CONFIGURATION REVIEW: A Configuration Review was held in Headquarters on February 27-28. The following significant baselines were established:

a. MSFC will be assigned the responsibility for jettisoning the SLA/Nose Cone. The MSFC technique for jettison is to pull the SLA and nose cone off as an integral piece with a jettison technique. Mr. Mathews stated that the technique to be employed would be determined by the development Center. He did, however, request that MSFC take one last look at the integral piece approach. ✓

b. MSFC will proceed with design and development of a bi-propellant system for the Orbital Workshop Attitude Control System. It is currently planned to perform the design and development of the control system and propulsion module in-house, and to assign physical integration of the control system and propulsion system to IBM and McDonnell Douglas Corporation respectively. ✓

c. MSFC will proceed to use modified ATM solar array type module for use in the OWS solar array. This modification consists of wiring one and one-half modules in series to obtain a voltage level compatible with the Airlock power conditioning system. ✓

APOLLO TELESCOPE MOUNT CONTROLS AND DISPLAYS: The ATM Controls and Displays Ad Hoc Working Group met again March 1, 1968 at this Center. Progress is being made by the group and a mockup review of the resulting baseline configuration is planned by April 15. ✓

PRINCIPAL INVESTIGATORS MEETING: A Principal Investigators meeting was held on February 27-28, at the Lockheed Rye Canyon Research Facility. The most important agenda item was a report by Dr. Reeves of Harvard on the preliminary results of the Lockheed filter evaluation program. Highlight of the presentation was a series of dramatic video tapes made at the Lockheed observatory which showed the detailed structure of solar flares never seen before. Dr. Reeves reported that the present Fabry-Perot (thin film) filter development appears definitely superior to the traditional Lyot birefringent filter. Concurrence was obtained on filter band width and field of view for the H-Alpha #1 Telescope/Camera and an action item placed on Harvard to recommend a band width for the ATM pointing telescope within four months. ✓

H-1 ENGINE Reference rotating machinery failure of Engine No. 8, during the static firing of S-IB-11 on 2/21. Two working groups have been formed to effectively cover the problem:

Group A is to answer the following questions concerning the hardware:

(a) What engine hardware change is required? (b) How and where should it be accomplished? and (c) What is the impact of the S-IB-205 shipment and launch schedules.

Group B is to answer the following questions concerning the vehicle and flight crew implications: (a) What are the crew safety aspects of an engine failure such as this? (b) Should the LOX seal cavity drain line temperature, gearcase pressure and other parameters be interlocked to prevent launch with a leaking LOX seal? and (c) If some or all of these parameters should be interlocked, what is the impact on the AS-205 launch?

Actions taken and/or information gathered to date are:

The remaining LOX seals on the other seven engines have been removed and inspected. Severe chipping was prevalent on the inside and outside diameter of the carbon nose on all inboard engines and on one outboard engine. Minor chipping (4 or 5 chips) was found on two outboard seals and one seal was in perfect condition. Review of data on seals pulled from other vehicles at Michoud after static firing indicates that the extent of seal damage on engines in S-IB-211 was abnormal. Inspection of used R&D seals at Rocketdyne including those that were bombed in single engine tests, show that the seals were in good condition with very few chipped carbon noses. Failure analysis is continuing with the major effort being concentrated on carbon and Kel-F material analysis and traceability. ✓

J-2 ENGINE One test in support of the S-II low fuel pump inlet pressure program was conducted at AEDC on 3/1. Subsequent testing was canceled when the engine ready signal could not be obtained through the facility electrical system. This cancellation necessitates an additional air-on period to obtain the data required to commit the J-2 engine to the reduced fuel inlet pressure in the S-II stage for vehicles 504 and subs. The next air-on is scheduled for 3/8. ✓

STATUS OF S-1C STAGES

- S-1C-3 at KSC
- S-1C-4 Retesting with Post Static Checkout scheduled for completion March 22, 1968
- S-1C-5 In Stage Storage, Bldg. 420. Engineering changes are being incorporated prior to start of Post Static Checkout. Post Static Checkout scheduled for completion June 11, 1968.
- S-1C-6 Shipped to MTF about barge Pearl River for static firing on 3-1-68.
- S-1C-7 In Stage Storage in Factory Building 103.
- S-1C-8 In Horizontal Assembly Position.
- S-1C-9 Removed from VAB on February 22; component installation in progress in Horizontal Assembly Position.
- S-1C-10 Thrust structure, intertank, fuel tank and forward skirt complete, painted and stored in factory. LOX tank installed in Hydrostatic Test Position and being prepared for calibration, proof testing and cleaning. Testing will begin March 4 and Stacking in VAB will begin after changeout of forward handling ring on S-1C-F.
- S-1C-11 Thrust structure complete and in pick-up position. Intertank complete, painted and stored in factory. Fuel tank complete and stored in tank repair position. Forward skirt 95% complete. LOX tank being prepared for closeout weld.
- S-1C-12 Thrust structure 55% complete; intertank 60% complete. All components (bulkheads and skins) for build-up of fuel and LOX tanks are fabricated.
- S-1C-13 Center engine support 70% complete; lower fuel bulkhead being prepared to accept the closeout gore.
- S-1C-F Scheduled for installation in VAB Tower for changeout of forward handling ring (aluminum to steel configuration) on or about March 11.
- S-1C-14 & S-1C-15 On schedule - All major components being fabricated.

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MSFC Safety Board Meeting No. 16

A meeting was held on February 27, 1968 at MSFC for the specific purpose of hearing the presentation by Martin/Marietta on:

1. The implementation of the safety function into the Martin Company.
2. The methodology employed by Martin Company for performing system safety analysis.

Some salient points include:

1. There is a central safety office with a broad charter which is functionally lined to system and crew safety elements that are located in the different program offices.
2. Top technical/operational personnel are assigned to safety.
3. System safety attention is focused on technical/engineering and operations effort.
4. The methodology employed for system safety analysis is a qualitative critical hazards - "Top Down" - analysis. This analysis approach is in contrast to the quantitative Fault Tree - "Top Down" - analysis approach being proposed for Apollo. ✓

NOTES 3/4/68 FELLOWS

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1. Approval of Procurement Requests: In compliance with the January 2 memorandum from DEP-A on this subject, laboratory officials have been designated who are authorized to approve procurement requests costing \$25,000 or more. Specific laboratory personnel have now been designated by each lab director for approval of procurements under \$25,000. Approval signatures certify that requirements have been reviewed, excess lists surveyed, available stock checked, and the material requested is necessary to meet commitments. ✓
  
2. Operational Readiness Inspection of the small Neutral Buoyancy Simulator: The Operational Readiness Inspection (ORI) Committee has completed the inspections of the small Neutral Buoyancy Simulator. Of 37 Review Item Discrepancies (RID's) 16 mandatory RID's have been resolved and 15 non-mandatory RID's have been resolved. Six open, non-mandatory, RID's, that are not considered detrimental to safe operation, will be resolved in the near future. The ORI committee considers the small Neutral Buoyancy simulator operationally ready for manned testing with the participation of MSC as well as MSFC personnel. A final report will be issued upon resolution of the remaining six open RID's. ✓
  
3. Quality Support to Mr. Rees: (Refer to your query on my attached 2/5/68 NOTES.) At present, twenty-five individuals have been selected and placed on tours of duty with Mr. Rees. Of this number, 1 is assigned until mid-March; 16 until the first of July; and the remaining 8 will complete their tours of duty by the end of July. ✓

1. AS-204 Post-Flight Control Evaluation: A potential S-IVB stage control problem has been revealed by further investigations into the cause and effects of the 17 cps roll rate gyro signal which was apparent primarily during the first sixty seconds of S-IVB burn. This signal reached a maximum peak to peak amplitude of 3.5 degrees per second. The effect of this signal on the roll channel APS control system was to increase the magnitude of the dead band sufficiently to allow the vehicle to exceed the established one degree attitude error zone for a period of approximately thirty seconds. The roll attitude error indicated by the stabilized platform did not exceed 2.5 degrees, however, only intermittent APS engine firings resulted when continuous firing should have occurred. This phenomenon has been investigated and tested on a bread board APS model by Astrionics Laboratory. Results reveal that the dead band width is a function of signal amplitude and frequency. The system reveals a characteristic that the maximum dead band amplitude attainable is approximately 12.5 degrees. The roll attitude error limit in the digital computer has been changed from the present 3.5 degrees to 15 degrees for the AS-502 flight. ✓ This new setting exceeds the maximum dead band obtained from tests and therefore will keep the vehicle from losing control in roll due to oscillatory rate signals. It appears that an electrical filter would be the most promising solution to this problem for other future flight vehicles. The problem was discussed at a special FEWG meeting held on Feb. 28. Additional information is published in AS-204 Evaluation Bulletin, #3 supplement. ✓

2. Postflight Evaluation Activities: Postflight evaluation activities for the Saturn vehicles, particularly Saturn V, have become more time consuming than originally envisioned. Also, any requirements for expedited evaluations which might influence a change in mission on a subsequent flight will cause an increased work load. (e.g., AS-503 boilerplate vs manned mission decision is required within 10 days after the flight of AS-502.) In order to meet these requirements and maintain our responsibilities, it will be necessary to intensify our in-house efforts as well as those of the contractors. Steps have been initiated to increase contractor support along these lines for the AS-502 flight evaluation. The proposed plan for handling increased activity in the flight evaluation area will be discussed in the March 22 R&D Council Meeting. ✓

3. Wind Turbulence Efforts: Our Aerospace Environment Division held a meeting Feb. 28, 1968, to discuss the aeronautical clear air turbulence work for which we received funds from OART. Attending were representatives from Wright-Patterson Air Force Base, NASA-Langley, NASA-ERC, and Dr. McCreary of Meteorology Research, Inc., our contractor. An inter-agency/center cooperative approach to the contract study was developed, and we are looking forward to an in-depth research effort, making use of our FPS-16 Jimsphere data, to study the clear air turbulence problem. Much of the theoretical and analytical work will be directly applicable to our space vehicle oriented interests in turbulence. ✓

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1. QUALITY AND RELIABILITY SURVEY IN MSFC: Reference NOTES 2-12-68 GRAU (copy attached): The official report on the subject (or at least a draft of it) is due to arrive in the very near future. Since it will contain more detailed information than could be furnished in the debriefing session, I'll wait for this to establish definite action items or make suggestions. ✓
2. S-II WELD ACTIVITY: This Laboratory has generated a matrix for each S-II stage which shows what inspection such as X-ray, dye penetrant and visuals were performed on all LH<sub>2</sub> and Lox tank structural welds. Inspection activities from completion of manufacturing through launch, including special inspections performed at Seal Beach, MTF and KSC, are covered. The matrix provides high visibility as to the type of inspection performed, time since last inspection, conditions the weld has been subjected to since last inspection, and should assist materially in determining additional inspection requirements if new problems are encountered on any given weld.
3. S-II VENDOR VISITATION PROGRAM: Representatives of this Laboratory and the Saturn V Quality Office participated in a recent S-II vendor visitation program. Representatives of NAR/SD made presentations at the facilities of Aeroquip Corporation, Aircraft Division, Jackson, Michigan; United Aircraft Products, Dayton, Ohio; and Pesco Products, Division of Borg Warner, Dayton, Ohio. In each instance the vendors were highly receptive to all comments and appeared anxious to receive information regarding performance of components they had supplied.

ATTACHMENT: Notes 2-12-68 GRAU (Dr. von Braun's and Mr. Weidner's copies only)

1. ATM Control and Displays. The Ad hoc group on Controls and Displays (C&D) met last Friday. The main subject of discussion was on the requirements for ground control (RF digital command link) during the manned and unmanned phases of flight. The impact on the C&D panel is that when ground control is involved, an unambiguous status of the system must be displayed to the astronaut. The requirement for an unambiguous status impacts the design of the hardware (more panel area, power, etc.). These ground control requirements were generated by Flight Operations Directorate personnel and were considered preliminary since Chris Kraft had not signed off nor had the MSC Project Office. In general, we are making good progress with MSC now in identifying the important design criteria which is allowing the Control and Display design to proceed. At our next meeting on March 19, MSFC will present a total list of C&D functions and implementing approaches as applicable to each ATM subsystem (experiments, electrical subsystem, pointing control subsystem, etc.). ✓
2. CSM/LM Solder Problems. Based on a request of Dr. Rees, a brief survey of the electronics hardware used in the LM and CSM was made by members of the Cracked Solder Committee. Nine companies were visited from January 9 through February 16, 1968. The purpose was to ascertain whether or not the cracked solder joint problem experienced at MSFC existed. After visually inspecting the hardware and reviewing the packaging methods, the cracked solder problem is equally great, if not greater, than at MSFC.
3. Servoactuator for SIC, AS-502. (Reference Notes 2/26/68 Haeussermann) In the SIC Moog actuator investigation of the 50M actuator housing failure, 25 actuator housings of the old type in storage at Moog were examined for evidence of cracks and/or other defects. Two definitely cracked units, and two suspected units were discovered. These were the housings left from converting 25 each 50M actuators to the 60B configuration. The new 60B housings are processed differently from the old 50M units and are not interchangeable. The 50M units were stored at Moog for future disposition. An extensive test program by ASTR, P&VE, Moog and Boeing will be initiated to determine the cause and effect of these cracks and any relationship to presently existing 60B configuration units. At this time, it is known that the definite failures and the suspected failures were from the same forging lot and heat treat lot of 19 each. ✓
4. Cross Coupling Effects, AS-502. Continued testing of Flight Control Computer No. 506 on AS-502 revealed a wiring error in the computer. This error causes a cross coupling between channels in the control computer. Simulations have shown that this condition would not have deteriorated the flight performance of the control system. The total simulation has been the method used to ascertain if the total circuitry and hardware is satisfactory. Tests will be instituted by the manufacturer to check all the wiring of the computer before any modules are plugged in. The AS-502 computer has been corrected and is back on the launch vehicle. ✓
5. Software Changes, AS-502. A change was made to the AS-502 flight program on Friday/Saturday. The change was in the switch selector table and consisted of changing the point level sensor arming time from  $T_6+683.2$  to  $T_6+663.0$ . The change was reinitiated and approved by IO after having previously (Friday) been disapproved by the Saturn V Level II CCB. The reconsideration was prompted by a slip in the start of the FRT at KSC. The change has been made and a new magnetic tape was sent to the Cape Saturday afternoon. The change provides a backup in case of a failure in the LVDC. ✓

S-II KSC FILL TESTS

A series of S-II lox fast fill verification tests was conducted at the West Area F-1 Test Stand to investigate possible slugging in the vertical lox facility line as the saturated lox from the cross-country transfer line flashes. Data from these tests are being evaluated.

APOLLO TELESCOPE MOUNT AND S-IVB WORKSHOP

Tests are being conducted on the various concepts of providing a Zero G condition for Solar Panel Deployment tests. Three different concepts have been investigated at this writing, the fourth and final will be tested as hardware becomes available.

S-II-4 (MTF)

S-II-4 was re-installed in the MTF A-2 Test Stand on Friday, March 1, 1968, for pre-cryo proof checkout and testing.

S-IC STAGE (MTF)

The S-IC-6 stage is expected to be installed in the test stand today.

S-II STRUCTURAL TEST PROGRAM

Boeing personnel are expected to start work on the access tower today, installing instrumentation cables and J-boxes. Facility construction is progressing on schedule.

S-IVB TEST STAND (MSFC)

Test S-IVB-055S, a planned pre-mainstage "idle mode" of 10 seconds and 75 seconds mainstage, was conducted on March 1, 1968. All objectives were met successfully.

RESPONSE TO QUESTION BY DR. VON BRAUN ON NOTES OF 2/5/68

Three concepts of simulating Zero G for the Apollo Telescope Mount Solar Panel Deployment Tests are being investigated by R-TEST for R-ASTR.

Each of these concepts utilizes air pads, for translational motion. These pads are rubber diaphragms attached to steel plates. Air is brought through the plates and allowed to escape through holes in the rubber diaphragms which allows the unit, and any item supported by the pads to float on this escaping gas. The three concepts differ in the approach taken to supply gas to the plates such as ground air source and umbilical connection, and two types of motor/blowers mounted on the plates.

At the present time one blower/motor unit is providing the more reliable system, but the ground source and umbilical system is more desirable from the operation end.

A memorandum, with pictures describing the test series, will be distributed in a few weeks.

NOTES 3-4-68 HOELZER

1. AMTRAN: Computation Laboratory has received an experimental graphics terminal, the DEC-339. This terminal will be used in preliminary graphics experiments, particularly in printed circuit board design for Astrionics Laboratory. ✓
2. RSIC DATA PROCESSING SUPPORT: At the direction of top management, additional resources within existing personnel have been allocated for the development and implementation of ALPHA-2 (Automated Literature Processing Handling Analysis) in support of the Redstone Scientific Information Center. ALPHA-2, an on-line data processing system tailored to Computation Laboratory's third generation equipment, will replace ALPHA-1, which is currently being processed by Computation Laboratory in a batch-processing mode on second generation equipment. ✓

Meeting with Research Institute - On February 28, Mr. Miles, members of his staff, and I met with Dr. Thompson of the Research Institute to discuss our FY 69 program plans and the competences of the University of Alabama, Huntsville-Research Institute combine. We outlined for him in fairly general terms the technical scopes which we normally cover in each of the discipline areas. Where he thought he would have a particular competence to offer we gave him more detailed information on the types of work we had under way in the area, who in the laboratories was responsible, and what next year's needs look like. We encouraged him to encourage his staff "to sell" us by visiting with our responsible personnel and determining the details of our needs. It appears possible for them to direct and plan their individual tasks to meet our requirements; but still allow room for academically meaningful advanced research. The conversation was very much like those we have had on numerous occasions with company technical reps. If the university will now follow through with some individual contacts, they should be able to develop a program of research that is highly beneficial to us and to them. But they will have to sell individual tasks and individual researchers.

B.D.  
I guess  
I should  
reiterate  
this to  
Dr. Harrison  
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Payload Working Group - Dry Launched Workshop - In response to your question on my note of 2/5/68 (copy attached). I can propose no specific short term action. We are preparing a brief description of a plan which might provide some long range solutions; it will be available in about two weeks. I would positively recommend not calling in either Dr. Mueller or Mr. Matthews at this time.

1. Neutral Buoyancy Simulator: As scheduled, the initial filling operation for the large Neutral Buoyancy Simulator started on February 29, 1968. Approximately one foot of water was run into the tank and then drained to check the basic pumping system and to flush the pipe network. Filling operations will begin this week and will be accomplished in ten-foot increments. A survey will be made after each ten-foot increment to verify that the foundation settles evenly. In order to gain use of the large simulator by mid-March, we plan to activate one quadrant only initially. Activation of the entire tank will be accomplished by April 15. Installation of instrumentation cabling and air supply piping is on schedule. Relocation of instrumentation from the small simulator to the large simulator will begin on March 4. It is expected that the ORI Committee will reconvene in mid-March to begin review of the large simulator. ✓

2. Delivery of Damper Arm System - ML-3: The third Damper Arm System ML-3 was completed in our shops and shipped to KSC last week, two days ahead of schedule. However, the shipment of this system was made with the shortage of a Hook Box Assembly and a Distributor and a Panel Assembly which were retained here for incorporation of a modification of the hooking mechanism. This modification which was first labeled as a product improvement was agreed upon a week ago between P&VE, IO, and KSC. The modified hardware is scheduled for delivery on dock KSC by March 21. This modification time includes testing and checkout. No new procurement is involved in this modification. We have thus completed a very challenging task in the development of this system and will for some time only be involved in supporting some product improvement and spare parts provisioning tasks in this program until The Boeing Company at KSC resumes full responsibility for the system. ✓

3. S-II Facility/Dynamic Test Stage: Corrosion removal and re-iriditing of the bulkheads, baffles, and sidewalls of the LH<sub>2</sub> tank were completed last week. ✓

NOTES 3-4-68 LUCAS

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1. COMMAND MODULE (CM) BONDING PROBLEM: In a recent test at North American Rockwell (NR)/Downey, a failure occurred in the structure joining the LES to the CM. The failure occurred in a honeycomb composite structure and started at the bonded joint between an internal "I-beam" stiffener and the aluminum face sheet. At this time, we don't know whether the HT-424 bond failed before or after the face sheet. Dr. Rees has requested our support in evaluating the failure since CM's 1 through 12 allegedly have the same configuration and about 130 MR actions were written against the fabrication of the parts. Dr. Stuckey (Materials Division) will be going to NR today.

2. S-II-3 THRUST STRUCTURE TEST (404): The MSFC 404 Test Program was successfully completed 2-28-68. Completion of this program fulfills the test objectives that were not attained on the thrust structure during S-II-S testing at Seal Beach, California in 1965. A total of 12 limit conditions and two most severe ultimate conditions were simulated during 404 testing. All thrust loads, actuator loads, and associated engine shear loads were tested to 130% of limit loading.

3. AAP SYSTEMS SAFETY PANEL: In response to NASA Headquarters emphasis on Failure Effects Analysis (FEA) as the primary basis for reliability and safety hazards analyses, an intercenter FEA Working Group was established to insure compatible analysis, interface identification and responsibilities, and an integrated analysis for the AAP cluster missions. The working group membership is as follows: OMSF - Mr. R. Storm; MSFC - Mr. J. Gillooly; MSC - Mr. C. Vetter and Mr. W. Sullivan; KSC - Mr. J. Joyner.

4. SMALL MANNED ROVING VEHICLE (SMRV) STUDY: At the 2-26-68 meeting of the Group for Lunar Exploration Planning (GLEP), the unmanned, remote-controlled (R/C) version of the lunar roving vehicle was emphasized because of (1) the lower likelihood of contamination with the R/C version, and (2) the large number of surface samples from a very large area which can be obtained by the R/C version. It appears now that the science package will be about 200 pounds, based on preliminary JPL information. Captain Scherer's visit is now scheduled for March 12-13, 1968. A presentation is being prepared which will describe the status of our work on SMRV. A study has also been initiated on the application of an unmanned, remote-controlled roving vehicle to be used for both lunar and unmanned planetary programs.

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|| Like to have a briefing on SMRV before Scherer gets here

5. EXTRATERRESTRIAL RESOURCES, SUBGROUP ON BIOTECHNOLOGY AND HUMAN FACTORS AD HOC WORKING GROUP: Mr. Vaccaro, member of the Ad Hoc Working Group, attended the 6th annual meeting at Brooks AFB, San Antonio, Texas, on Feb 19-21, 1968. In the human factors engineering area, the use of "neutral buoyancy" (as well as the KC-135 airplane) was emphasized as a method for simulating 1/6 g.

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Production Rates of Saturn V and Saturn IB: This is in response to your request that we obtain OMSF's views on the fact that the "NASA Flight Schedule Supporting FY-69 Budget Program" did not show a follow-on 2 X 2 production for Saturn IB and Saturn V. The schedule reflected only the "approved program" and the missions requested in the FY-69 budget and as such, did not show a continuing 2 X 2 rate. The position taken by Mr. Webb and Dr. Mueller in testimony before congressional committees is as follows:

On February 27th, in his appearance before the Senate Committee on Aeronautical and Space Sciences, Mr. Webb stated: "In Apollo Applications, we are reducing production rates in order to hold expenditures to a minimum in F6-68 and FY-69. The delivery rate of Saturn IB's after the first 12 and of Saturn V's after the first 15 will be reduced to two per year. We are also carefully analyzing with the DOD future requirements for large launch vehicles and will consider further adjustments."

On February 28, Dr. Mueller in his appearance before the same Committee stated: "The current Apollo Applications mission plan assumes availability of Apollo Saturn IB vehicles 207 thru 212 and follow-on production of two vehicles per year beginning with 213. Apollo Saturn V vehicles 513 thru 515 have been designated for Apollo Applications with follow-on production also at the two per year rate."

It is of further interest to note, however, that Mr. Webb in his appearance before the Senate Committee on Aeronautical and Space Sciences reflected on the Titan III and its possible effect on the Saturn Programs by saying: "The Titan III vehicle that DOD will use to launch the MOL is a very successful, very capable, very effective booster that can go on a moment's notice. It is instant reacting, practically. On the other hand, a Saturn IB will carry a larger payload. So we now have to discuss with them whether in a shortage of money, we will drop back to where we will have for NASA use the Titan III, which is not as large as the Saturn IB or whether we both shall have an intermediate rocket between the Saturn IB and the Titan III. If we do that, we will probably phase out the Saturn IB."

He further stated: "...at this moment, we are engaged in two lines of activity." The Thompson Committee is studying requirements for a Saturn V Workshop and at the same time we are engaged in preliminary discussions with DOD of needs for a booster for logistic purposes. (Ref: My notes 2/12/68). He concluded by saying: "... Saturn IB inclusion in this budget at two per year -- is an indication that we feel we need at least that class of payload in the NASA program, but would drop it out if we could agree on another booster."

URGENT



Jim Stogin

We should base our internal discussion on "should

MSFC

bid on

Titan III

manage-

ment

assignment

if Saturn IB

is phased out"

on this Webb statement

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NOTES 3/4/68 RICHARD

LM/ATM Task Force Meetings: The agenda for the LM/ATM Task Force meetings is now as follows:

March 9 - 9:00 a.m. at Ball Brothers, Boulder, Colorado  
ATM Experiments

March 15 - 9:00 a.m. at NASA Headquarters  
Cluster Problem Status, Impact of ML-13 Schedule

March 16 - 9:00 a.m. at NASA Headquarters  
LM/ATM/Cluster Subsystems

March 17 - 9:00 a.m. at Grumman, Bethpage, N. Y.  
LM Systems and AAP Mods

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1. AS-502 Launch Vehicle at KSC:

o For the second time, the flight control computer experienced cross-channel coupling. This latest problem occurred during relay redundancy testing on Thurs., 29 Feb. 68; therefore:

- the computer was removed from the vehicle on Fri. night, 1 March 68 and returned to Electronic Components, Inc., (ECI), St. Petersburg, Fla., for repair;

- inspection indicated a wiring error in the internal wiring harness;

- the wiring was corrected and the computer was reinstalled in the vehicle on Mon. morning, 4 March 68.

o The diligent efforts and wholehearted cooperation of personnel in Astrionics Laboratory, the IU Stage Office and KSC were responsible for resolving this problem without impacting vehicle checkout activities. ✓

o Because of spacecraft problems, the Flight Readiness Test (FRT) was rescheduled for Tues. - Wed., 5-6 March 68 ("T-0" at 11:00 a.m., EST, Wed., 6 March 68).

o Launch is now scheduled for Mon., 25 March 68. ✓

2. AS-503 Launch Vehicle at KSC:

o Pull Test on the vehicle (in order to calibrate the strain gages which measure compressive and tensile bending stresses) is scheduled to be accomplished on Mon., 11 March 68.

o All testing activities are supporting a rollout of the AS-503 vehicle with Boilerplate 30 spacecraft 10 days after the AS-502 launch.

3. S-IC-6 Stage at MTF: Stage arrived on dock (from Michoud) on Fri., 1 March 68. Stage is scheduled to be placed on stand today, Mon., 4 Mar. 68. ✓

4. S-II-4 Stage at MTF:

o All X-rays, dye penetrant inspections and flaw repairs have been completed and stage was reinstalled in test stand on Fri., 1 Mar. 68. ✓

o Cryogenic proof testing is scheduled for Sun., 24 Mar. 68. ✓

5. S-II-D Stage at MSFC: Stage was placed in vertical storage in the MSFC Dynamic Test Stand on Wed., 28 Feb. 68, in order to release the ground transporter. ✓

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NOTES 3/4/68 SPEER

1. KRAFT VISIT: The meeting went according to schedule. MSFC participation was very satisfactory in spite of other conflicting meetings. Main theme was how to strengthen mutual ties between operations and design. During the systems discussion we developed many general considerations which will be useful for the ongoing design effort and forthcoming reviews. Examples: provide true redundancy for all crew critical systems; evaluate zero-g effect on ECS gas flow; assess onboard spares requirements for long life; assist P.I.'s in developing their real time data requirements; develop rationale for trade off between manual, automatic, and ground commanded functions. All systems briefings were very well received by Kraft. In discussing management interfaces we agreed to augment MSFC's support to Kraft's Flight Operations Plan Meetings (FOP) and in turn have active participation by MSC Operations in our design coordination panels. We shall attempt to define in the near future a satisfactory division line between FOP and panel scope of effort. In addition, we are to establish a new AAP resident group at MSC to effect the necessary day-to-day working interface with Flight Operations and to prepare for our participation in the missions. I believe Kraft will develop into a strong ally for our cluster concept and effort if we continue to strengthen our technical interface with MSC Flight Operations. ✓

2. AS-502: The L/V Software Interface Test was conducted from Houston MCC on 2/27. Except for minor pad problems causing some delay, the test went very well. All commands were transmitted and received by the L/V as planned. At no time was it necessary to retransmit a command. ✓

B 3/10

1. FLIGHT EXPERIMENT ON AMBIENT GAS COMPOSITION: In connection with SSL's contamination study program, Dr. J. Cortez attended the OART Experiments Review Board Meeting on 2/28 where his proposed MSFC Flight Experiment #81, "Environmental Gas Composition," was considered. The board, chaired by Dr. Kurzweg, unanimously approved the experiment and recommended that we prepare the appropriate 1122's for immediate definition funding. An OART number, probably T029, will be assigned to this experiment next week. ✓

2. PROJECT ASTRA: Dr. H. Smith and Dr. N. Roman asked me last week whether MSFC would be interested in accepting project management for astronomical projects, such as ASTRA. I replied that we would be greatly interested, but emphasized that any commitment must wait until (a) we have learned more about the project, and (b) we have had time to establish a Center position. I was promised background material on Project ASTRA, and I suggest that SSL jointly with ASO prepare a presentation on ASTRA as soon as we have digested the existing information on the project.

E.S.  
Let's not be too wishy-washy. The answer is "yes" B

→ please invite me B

3. OWS PAYLOADS STUDY EFFORT: The final version of the astronomy section for the Payloads report for the Doug Lord study was completed jointly by J. Downey and J. Olivier this week and furnished to Mr. Piland. We feel that there are too many astronomy and other experiments on the C Workshop. However, since there was no active OSSA participation, we did not think that it was our place to choose, as an example, LAOT in lieu of EMR-II or ATM-B, etc. Therefore, we included all of the astronomy payloads in which OSSA had expressed an interest, and this forced the configuration groups to consider all configurations. When OSSA provides the required guidance, the C Workshop payload can be reduced to practical terms. ✓

4. LUNAR DRILL SUPPORT: John Bensko will begin a series of field trips around mid-March to select several drilling test sites for the lunar drill. The drill sites will be in regions with very low ground water table and will be selected on the basis of Geology, accessibility and convenience of quarters for the test crew. Two regions have tentatively been selected in cooperation with the US Corps of Engineers (USCE): one in southwest New Mexico and the other in the Gila River basin in Arizona. Preliminary studies have been made by Mr. Bensko of MSFC and geologists at USCE during the past several months and attempts will now be made to obtain select locations. Leases will be obtained by the USCE for a two to three year period to allow for any setback in the lunar drill funding. Since we don't have any travel money left, and we never get enough, Mr. Bensko has made arrangements to get invitational orders from the USCE. ✓

5. EMPLOYEE RESIGNATION: Dr. Larry Wood, Physicist at SSL during the past six years, GS-14, who has been active in a number of projects including electric propulsion, AMTRAN computer, plasma physics, and planetary exploration, will leave SSL on 3/8 to join the Electronics Research Laboratory at Corning Glass Works. The reason for his resignation is "better opportunity for professional advancement."

Sorry to see him leave P

B  
3/10

S-IB-11 LOX SEAL FAILURE: Following Dan Driscoll's report of the findings of the S-IB-11 failure evaluation group, Bill Brown and I organized two working groups to determine actions to be taken on the H-1 engine and S-IB stage for SA-205. One, headed by Jerry Thompson, P&VE laboratory, is to study and recommend action to be taken on the LOX seal. The other is studying crew safety and launch operations aspects and determining whether additional interlocks are required. It is headed by Fred Vreuls, R-SE. We have established March 11, 1968, as a final report date. Our objective is to have any changes in the S-IB-5 stage completed and ready to ship by March 25 to meet the present need date. ✓

USE OF FLIGHT BATTERIES FOR CDDT: Recently KSC unilaterally required flight batteries in the missile during CDDT in lieu of the previously used rechargeable batteries. We agreed to furnish them for SA-204 rather than trying to establish a hasty position just prior to flight. Saturn V is also furnishing flight batteries for the AS-502 CDDT. Astrionics' position is that flight batteries are not required for any prelaunch tests and that an external source could be used. We agree and are currently developing a Center position on the matter. ✓

HYPERGOL COVER AND WATER DELUGE SYSTEM: KSC is not adequately supporting the requirement for the hypergol cover and the water deluge system to protect against spacecraft hypergol leakage. Admiral Middleton has sent a letter to General Phillips describing their plans for AS-205, 206, 502 and 503, requesting approval of their minimum system. For 205 they would not use the cover and would use only external hoses for water deluge. The system for Saturn V is also inadequate. If we are unable to resolve this at Program level, we may again have to get you into this discussion. ✓

SATURN I WORKSHOP: As you are aware, until recently we were scarring the S-IVB-211 and S-IVB-212 stages as workshop stages. We had earlier put a 2 mil aluminum foil liner in the S-IVB-211 LH<sub>2</sub> tank. Recent tests have shown that a 3 mil foil liner is required. This means the S-IVB-211 stage can no longer be used for the workshop and we have designated the S-IVB-210 stage as the workshop backup stage for SA-212 or as a second workshop. We have received McDonnell Douglas ECP's for scarring both S-IVB-210 and S-IVB-212 and for the workshop kit installation in S-IVB-212. We are expediting these ECP's. A review at MDC has determined our workshop schedule is already tight because of a 2-month incompatibility between R&DO furnished GFE and MDC schedule requirements. R&DO is working on eliminating this incompatibility; however, I believe the GFE delivery schedule must be watched closely to assure that we do not cause MDC to miss their schedules. ✓

B<sub>3/10</sub>

I. Nuclear:

A. Your proposed testimony to the Senate Committee on Aeronautical and Space Sciences in support of the Nuclear Rocket Program was reviewed with Milt Klein (by Ron Harris) and with Mr. James Gehrig, Committee Staff Director (by J. Foster). Their proposed changes were minor and have been incorporated in the latest version which was forwarded to Executive Staff 2/29. Appropriate arrangements have been made for R. Harris to attend M. Klein's testimony on 3/13 and your testimony on 3/14 and for Ron and Milt to brief you on the results of Milt's testimony at breakfast on 3/14. ✓

B. The Phase III extension (75K) of the "Modular Nuclear Vehicles Study" and the "Calculation of Inflight Modular Nuclear Vehicle Radiation Environment" (50K) were negotiated 2/21 with LMSC. ✓

C. The Nuclear Systems Engineering Task Force met 2/27-28 at SNPO. R. Harris and Don Saxton attended from MSFC. This was the final meeting of the Task Force prior to reviewing the work accomplished with Dave Gabriel. Preliminary functional diagrams have been made for 4 mission applications of the NERVA engine. SNPO is still wrestling with the idea of having a Systems Engineering Contractor pick up this work and continue it on a full-time basis. ✓

D. A meeting was held at NRDS 2/26-27 to review the nuclear facility program status and to initiate STS/2 program planning including criteria preparation, site selection study and stand concepts. MSFC was represented by Bill Loomis (R-AS-VP), Varge Cornett (R-TEST) and Joe Graham (F&D). This will be a significant activity for the next 3 months or so since it is planned to have a Preliminary Engineering RFQ by June and to select an AE contractor and initiate the preliminary engineering study by August. A working group was formed at the meeting and specific assignments for MSFC were made. ✓

II. OSSA-ASTRA Studies: We (MSFC) have been asked if we are interested in participating/supporting/or doing the ASTRA study for OSSA. Dr. Henry Smith (Deputy to Jesse Mitchell) has confronted Jean Olivier (ASO) and Dr. Stuhlinger with this situation. I have only briefly discussed it with Ernst and plan to follow up; however, I felt you should be aware of the matter. My personal opinion is that we should definitely be interested and offer to do the ASTRA study for Jesse. I have my people preparing a Statement of Work at this time (and will coordinate with Ernst and others) and plan to discuss this with Jesse this week. (This also will be done in conjunction with Ernst.) ✓

I.W.  
Yes by  
all means  
B

III. Saturn V Workshop Briefing to MSC: Due to the President's visit, Dr. Gilruth could not attend; however, the presentation did take place to George Trimble, J. West, Max Faget, Bill Stoney, and others. In general, the presentation went very well. G. Trimble, in particular, was quite happy with the depth of material that had been worked up as well as the way it was presented. He asked the question of Hal Becker: "Is it really realistic to jump from the wet workshop to a sophisticated "C" version?" Hal gave a very conservative answer but left the message quite clearly that we felt it was too big a step (all things considered, i.e., schedule, dollars, experiment program, relying on man's capability, and sub-systems life-times). ✓

March 10, 1968



H

NOTES  
MR. GORMAN'S COPY  
3/11/68 w/ comments

Heimburg notes (with son Braun)  
comment

to U Box 3-25-6

NOTES - 3/11/68 - BALCH

Korman  
B  
3/18

S-II-504 Testing - Stage leak checks have been completed, and engine leak checks will start today. Cryogenic proof-pressure test is still scheduled for 3/24/68. ✓

S-II-505 Testing - LH<sub>2</sub> tank propellant utilization probe has been replaced. Dye-penetrant tests and X-ray of forward bulkhead have been completed. Installation in the A-1 test stand is scheduled for today. Cryogenic proof-pressure test and static firing are still scheduled for 4/16/68 and 4/26/68, respectively. ✓

S-IC-506 - Stage was installed in the B-2 test stand on 3/4/68. Power application to stage is scheduled for 3/25/68. ✓

GE Service Contract - Information has been received by telephone from MSFC Procurement and Contracting that the Notice of Intent to Award a Support Services Contract to General Electric, applicable to extension of contractual coverage from 7/1/68 to 9/30/68, has been approved in NASA Headquarters. ✓

Public Affairs - Mr. Neil Stanford and Mr. Norman Matheny of the Christian Science Monitor visited MTF on 3/8/68 as planned. ✓

Other visitors during the past week included 45 Royal Canadian Naval Engineering Officers on 3/5/68, Billie Joe Richey of the Huntsville Times on 3/6/68, 117 members of the AIAA and 21 members of Project SETE (Secretariat of Electronics Testing Equipment Coordinating Group) on 3/7/68, and B.K. Thomas of Aviation Week on 3/8/68. ✓

*ok. You're  
at*

*Bonnie  
I'd like to  
great the  
group*

NAVAL RESEARCH VISIT TO MSFC: Dr. Tousey of the Naval Research Laboratory has requested that we arrange for an ATM briefing and tour of mockups and facilities at MSFC for a group of forty Navy Scientific and Management personnel. The group will be headed by Rear Admiral Thomas Owen, Director, Office of Naval Research. The visit is tentatively planned for March 27, 1968. ✓

DR. THOMPSON ATM MEETING: Mr. Keathley attended a discussion with Dr. Floyd Thompson, Langley Research Center, at NASA Headquarters on March 7. The subject was the status of specific areas within the ATM program such as astronaut participation, time lines, and the latest phasing of the flight with solar cycle. All questions were satisfactorily answered and a separate note on the details of the meeting is being prepared. ✓

LM-A PROGRAM REQUIREMENTS REVIEW (PRR): The LM-A PRR is scheduled for the week of April 29 at Grumman. We are organizing the ATM effort in order to have consolidated and effective inputs for the review. ✓

ATM THERMAL VACUUM TEST FACILITIES: The ATM thermal vacuum evaluation team visited the General Electric Valley Forge Facility on March 6. The group met at MSFC on March 7 to review progress to date and departed for AEDC to review their facility on March 8. Members of the team include personnel from this office, R&DO, Headquarters, MSC, GSFC, and JPL. The team was formed by Chuck Mathews in order to effect a selection of the facility for testing the ATM. ✓

CLUSTER ATTITUDE CONTROL AD HOC WORKING GROUP: ✓ Of significance to date is MSC's recommendation to perform all rendezvous and docking with the cluster in the X-POP attitude and MSC Flight Operations Directorate's desire to fly the AM/MDA/OWS in the X-POP mode until the AAP-1 CSM docking. All these recommendations are changing from a gravity gradient attitude. These changes do not significantly impact the current Workshop Attitude Control System (WACS) except if this mode changing must be automatic. ✓

LM/ATM REVIEW MEETINGS: The LM/ATM review meeting with Dr. Mueller is still scheduled for March 15-16 (covering cluster operations and selected systems for 17 months lifetime) in Washington and March 17 (covering LM design) at Grumman. MSFC will be represented by Ludie Richard, Dr. McDonough, Mr. Ise, Mr. Horton, several other R&DO personnel and myself. ✓

LM/ATM REVIEW TEAM VISIT TO BALL BROTHERS: On March 9, the LM/ATM Review Team (Dr. Mueller, Mr. Trimble, Mr. Richard) and others from NASA Headquarters, MSC and MSFC visited BBRC to review ATM experiments status with the Principal Investigators and look at some of the hardware. Attached (Dr. von Braun's copy only) is a more detailed report of the visit. ✓

NOTES 3-11-68 BROWN

B 3/12

F-1 ENGINE Effective last week, Rocketdyne reduced effort on the F-1 turbopump and gas generator stands at Santa Susana Field Lab from two shifts to a single shift. This is one of the areas we recommend for reduction in our comments to their stretchout proposal. This will reduce direct manpower in that area by 10 to 15 heads. In addition, Rocketdyne is consolidating the test activity at the Edwards Rocket Engine Test Site to use only the new engine stands, 1C, 1D, and 1E. (These stands have a common control center.) The injector stand 2A (which operates from a different control center) will be operated on an "as needed" basis only. This will reduce the head count at Edwards by 63 (from 250 to 187). The reduction is to be effective April 1. ✓

During testing of the water deluge system at MTF a ladder broke loose and hit an engine thrust chamber and a heat exchanger line on S-IC-6. The thrust chamber does not appear to be damaged; however, one thermal insulation stud was broken loose. Damage to the heat exchanger line is now under investigation. ✓

J-2 ENGINE A spare J-2 engine electrical control assembly incorporating the improved timers has been delivered to KSC in support of AS-502 checkout and launch operations. The spare ECA has three new "improved" timers and one "improved" timer used in R&D testing at Rocketdyne. The used timer controls a non-critical function (purge control after shutdown) on the S-II stage; however, the function is critical on the S-IVB stage. Should an ECA replacement be required on the S-IVB stage, the spare would be installed on S-II-2 and the one removed from the S-II stage installed on S-IVB-2. The first ECA incorporating all new timers will be delivered to KSC on March 24 and the six required for AS-503 should arrive prior to the April 2 impact date. ✓

Two 30-second tests using the S-II simulated duct were conducted at AEDC on March 8, in support of the S-II reduced fuel pump inlet pressure investigation. Subsequent tests were canceled due to a leaking gas generator fuel poppet and the remainder of the air-on period was utilized to run blowdown tests in support of launch restraint reductions. The next tests are scheduled for March 14. ✓

B  
3/18VISIT TO MICHLOUD

On Friday, March 8, 1968, the NASA Personnel Management Review Committee composed of Dr. John W. Townsend, Deputy Director, Goddard, Dr. Herbert R. Brown, Consultant, and Messrs. Harry H. Gorman, Bernard Moritz, Arthur D. Holzman, and Grove Webster, visited Michoud for an orientation briefing and tour. ✓

STATUS OF S-IB STAGES

- S-IB-5 - Post-storage modification checkout near completion.
- S-IB-6 - In two week Readiness Status awaiting direction to ship to KSC or to return to storage configuration.
- S-IB-7 - Post-storage modification essentially complete with shakedown preparatory to reverification checkout in process.
- S-IB-8 ) In storage status with maintenance of dessicant being performed.  
 S-IB-9 ) S-IB-12 is awaiting shipment to static test upon completion of  
 S-IB-10 ) static firing of S-IB-11.  
 S-IB-12 )
- S-IB-11 - At MSFC static test site undergoing preparations for long-duration firing.
- S-IB-13  
 thru     Manufacture of detail parts in various stages of completion.  
 S-IB-16 ✓

NOTES - 3/11/68 - EVANS

B 3/18

Safety - Nothing of significance to report

Transfer of Project Support Office: The Project Support Office of the Operations Management Office was detailed en bloc to the Systems Engineering Office pending charter changes and permanent reassignment of all personnel in the office. The transfer will consolidate technical staff coordination functions for the Saturn/Apollo and Apollo Applications Program within the Systems Engineering Office to facilitate handling of technical problems with the most economical expenditure of staff manpower. Fourteen engineers are involved in the transfer. I consider them experienced and very capable and know they will continue their excellent performance under Ludie Richard's guidance. ✓

1. AAP Launch Opportunities: This note clarifies and updates item 1 of Notes 2/5/68 Geissler, and answers your question. The AAP-2 workshop vehicle is inserted near apogee of a 215 NM by 230 NM ellipse such that after the S-IVB LOX and fuel tanks are bled down through the J-2 engine (passivated) the orbit is circular at 230 NM. The AAP-2 vehicle flies a small yaw program in the S-IVB stage to move descending node of orbit approximately 3.6 degrees east. Cost of the yaw maneuver is 19 pounds of payload. Resulting inclination (28.94 degrees) and descending node (99.89 degrees) of the AAP-2 orbit plane provides a zero plane change requirement for AAP-1 CSM vehicle at two in-phase launch opportunities on the next day. The first AAP-1 launch opportunity occurs 23 hours and 20 minutes after AAP-2 lift-off. Second opportunity occurs 1 hour and 38 minutes later. Two nonplanar launch opportunities occur on day 2 and one nonplanar launch opportunity per day occurs on days 3, 4, and 5. Day 6 has two nonplanar launch opportunities. The two launch opportunities on day 7 are very nearly planar. Maximum plane change requirement for AAP-1 vehicle is 0.56 degrees (day 4) and represents a payload decrement of 98 pounds from planar flight. A launch window of up to 2.4 minutes can be provided for each AAP-1 launch opportunity within the single planned phasing orbit revolution. A larger launch window can be built using more revolutions of the phasing orbit. The payload loss for a launch window of ten minutes is 115 pounds compared to an on-time launch. A similar analysis is being conducted in support of the AAP-3A mission. ✓

E.F.  
That looks very good. Margins seem to be very comfortable  
B

2. Probability of Launch Delay Due to AS-503 Spacecraft Near-Pad Abort Wind Constraint: Re: the Friday, March 1, 1968, Preview of MSC's DCR Briefing. Using the information presented at the meeting concerning a wind component from the east at any altitude up to 2 km as constituting a launch constraint, a brief analysis was made. An east wind component constraint at 2 km for September shows: (1) There is a 67% chance of a launch delay on any randomly selected day; (2) The mean number of days required to obtain a 95% chance of success for at least one launch opportunity is 16 days; (3) There is a 5% chance of no launch opportunity for 9 consecutive days; and (4) The launch/no launch probabilities relative to an east wind component at any height 0-2 km, and for an afternoon launch, will be worse than indicated for the 2 km only wind constraint used in this analysis. We feel that management should be made aware that there is a high probability of launch delays when such wind constraints are imposed. Bellcomm (OMSF) is looking into this problem and will probably contact us for our specialized Cape wind data records for use in conducting their studies.

E.F.  
Please provide letter to Rudolph, copy to Speer.  
B

3. Apollo Flight Evaluation Panel (FEP): During the 15th meeting of the FEP at MSC on March 5, 1968, MSFC proposed that the MSFC engineers, who briefed the astronauts on Saturn systems and operations prior to the mission, participate in the flight crew's systems debriefing. MSC accepted this proposal. This participation would be in addition to that of the MSFC program and flight evaluation management, who provide feedback into MSFC flight evaluation activities. MSFC design and systems engineers are now able to request prior to a mission, specific Saturn operational observations and checks during flight, with crew responses tape recorded during the technical debriefing (usually held the first day back on land). Normally, the transcript of this debriefing will be available for review by MSFC personnel prior to the systems debriefing at MSC, so that preparations can be made to effectively participate in the flight crew's systems debriefing. Subsequent to the systems debriefing, transcripts of the onboard voice tapes, and copies of notes made during the mission, will also be available for review. ✓

A

B  
3/18

1. QUALITY MANAGEMENT TRAINING: This Laboratory will conduct seminars on Quality Management at KSC beginning March 12, 1968, and at MSC beginning April 9, 1968. This will mark the fifth seminar at KSC and the first at MSC. Arrangements are complete except for receipt of a written request from MSC. ✓
2. S-IB PROGRAM: The Certification Program for S-IB stage flight critical components is complete for all flights through SA-212. ✓

B  
3/18

LM/ATM Review Committee. A report was given to the Committee (Dr. Mueller, Messrs. G. Trimble and L. Richard) by the Principal Investigators at Ball Brothers on March 9. There were no schedule or development problems brought out by the PI's. The most significant output of the meeting was Dr. Mueller's concluding remarks:

- a. How significant is it to the PI's to fly their experiment in 1971?
- b. How important are the ATM revisit missions?

Very  
rather high, too

Dr. Giacconi (American Science and Engineering) gave the most affirmative and clear-cut answers to these questions. Scientifically (sun spot cycle activity) and maintaining the interest and impetus to the program are the reasons why he felt the program should continue as now planned.

Dr. Tousey (NRL) and Mr. Milligan (GSFC) were not as positive in their statements but their answers were more in line with Dr. Giacconi's rather than being in opposition.

Dr. Newkirk (High Altitude Observatory PI) had left the meeting and Mr. Ross, representing HAO, generally gave affirmative answers to both questions.

Mr. Harby (Harvard College representative) had already left the meeting. However, Dr. Goldberg/Dr. Reeves answers to these questions would have been necessary to be meaningful.

Dr. Mueller also stated that if the ATM PI's really wanted this mission to fly in 1971 and also have revisit capability, they should make some efforts to firmly convey this message to the scientific community as well as to NASA Headquarters. ✓

4-18-68

ADDENDUM TO NOTES 3/11/68 HEIMBURG

(Copies for Dr. von Braun, Mr. Weidner, Mr. Gorman only)

REDUCTION IN FORCE

On Tuesday, March 5, 1968, 17 Test Laboratory Electronic Technicians received job offers from Goddard at the same grade and pay. This was totally unexpected, since these people had been interviewed by Goddard just a week ago and told that they did not have the right experience. These people had received separation notices.

They were given five working days, until today March 11, to accept or decline positions which are not identified or described. They are quite upset and bitter. As a specific example, one of our technicians called the Goddard official who signed the letter to inquire about the offer. He was told, 'We don't know what the job is. We will have to see how many people accept before we can set up the job; you wouldn't want to live in Maryland anyhow'.

Our own Personnel Office knew nothing about the offers of employment since they were mailed special delivery by Goddard to the individuals. I feel that we should insist on complete coordination between ourselves, NASA Headquarters and other NASA Centers on matters such as this which so vitally effect our employees and ourselves as a Center and which has such a detrimental effect on morale.

It does seem to me that there must be a better way to treat people who have contributed so much to our programs.

WPK  
Notes  
3/11/68

NOTES 3/11/68 HEIMBURG

B  
3/18

S-1C STAGE (MTF)

The S-1C-6 stage was installed in the test stand March 4, 1968. ✓

S-11 STRUCTURAL TEST PROGRAM

Boeing personnel started working at the tower on March 8, 1968. ✓

S-1VB TEST STAND (MSFC)

Tests S-1VB-056SA and -056SB were conducted at the S-1VB Test Stand on March 7, 1968. All objectives were completed. ✓

S-11 STAGE (MTF)

S-11-4 was placed in the A-2 Test Stand on March 1, 1968, on schedule. Stage mechanical and electrical hookup and checkout are in progress to support the cryogenic proof pressure test on March 24, 1968. S-11-5 was moved from the vertical to the horizontal position in the VCB on March 6. Lox/LH<sub>2</sub> tanking test and the proof pressure test is currently scheduled for April 16, 1968. ✓

NOTES 3-11-68 HOELZER

B  
3/18

NEGATIVE REPORT.

NOTES 3/11/68 JOHNSON

B  
3/18

OART Advisory Committee for Electronics - I attended the initial meeting of this committee in Washington on March 5-6. Professor John Linville is chairman. After discharging a few brief organizational matters, the committee heard reports from the subprogram managers from the OART Electronics Program Office on current program content, status and plans. The subcommittees' each reported primarily on organizational matters, and on the specific areas in which they propose to concentrate their efforts during the next few months. The principal problems presented to the committee were in the areas of computer systems (hardware and software) for ground based operations, on-board data management systems (including systems for the SST) and "basic" research in electronic components, materials and techniques.

Minutes of the meeting are to be available next week. I will distribute copies (with a more extensive trip report, if it is required) to interested MSFC personnel when available. ✓

1. MDA Thermal Test Unit: This is a development test article which we build in our shops for P&VE Laboratory. It is composed of two skin segments of the MDA welded together with two bulkhead enclosures. Because of its shape it is often referred to as the "football". The skin sections represent the actual gage thickness and rib pattern of the MDA, including a docking port hole. Inside is a heat source and outside a new type insulation is applied which consists of a number of layers of aluminized mylar with alternate plastic foam layers. These layers of insulation are stitched together thru an overlaying plastic grid pattern. The structure of this Thermal Test Unit has been completed and is presently undergoing pressure tests at R-QUAL. The next step is to attach the insulation pads which have been fabricated in our plastic shops. Delivery to P&VE is scheduled for April 1. ✓

2. ATM Canister Coldplates and Radiators: As a vital part of the ME Lab's involvement in the ATM development activities, we are presently manufacturing conceptual test articles of the ATM canister coldplates and radiators. The basic construction of both is very similar, consisting of two rolled plates to be either bonded or welded together. One plate will have milled channels for fluid flow, and the other will be of constant thickness as a cover plate. The test radiator, 30" x 69", has been bonded and is in cleaning to be completed and delivered to P&VE today for their test program. The coldplate, 32" x 64", has been milled, contoured and is presently in preparation for resistance seam welding. We plan to complete and deliver it by March 15, 1968. Once the preliminary testing is completed, we expect a bonded vs welded decision to be rendered. Following a final design decision, the ME Laboratory is committed to manufacture the total program requirements. ME Laboratory is assisting P&VE in their design approach and presently devoting much effort in developing manufacturing processes. ✓

3. Large Neutral Buoyancy Simulator: Filling operations to the 40' level on the large simulator have been completed. Some minor leaks were encountered on the diving bell but were corrected without complication. All major components have been received and procurement of small components is in good shape. We will begin checkout of the recirculation pumping system and filtration system today. ✓

1. SPRAY FOAM INSULATION TESTS: (Reference Lucas, Notes 2-5-68) Our Materials Division specialists took up essentially full-time residence at Sacto and pushed the field repair technique of spray foam to completion. Two types of field repair for the spray foam were developed, a spray foam repair and a bonded repair. After two very severe cryogenic tests, one entailing a 24-hour hold with LH<sub>2</sub> onboard and one with 14 consecutive pressure cycles with LH<sub>2</sub> onboard, no failures were reported for any of the bonded repairs. Between the two tests, repair activity (12 repair areas) was accomplished within the 24-hour period preceding the second test in an attempt to simulate conditions that might be encountered at KSC between CDDT and launch; the repair, furthermore, was intentionally scheduled at night to insure the worst possible climatic conditions at Sacramento. It is our belief that spray foam repairs will have to be restricted to the assembly buildings at MTF and KSC where environmental conditions can be controlled whereas the bonded repairs will accommodate nearly any repair requirements on the test stand or the launch pad. We are particularly pleased with the performance of the accelerated curing (less than 24 hours at room temperature) 7343 adhesive system developed by our Materials Division. Additional laboratory tests will have to be run at North American Rockwell (NR) to define the environmental extremes under which repairs can be made, and we are discussing this with the contractor. The X-15 tests are still planned and we do not expect difficulty. ✓

2. FLIGHT EXPERIMENT # 42 (TO23): NASA Headquarters (OART) personnel were very impressed with our 3-6-68 presentation of Flight Experiment #42 on "Surface Adsorbed Materials," and asked if we would investigate the extension of the experiment to measure contamination between the initial and revisit OWS missions. We will implement this request. ✓

3. SATURN IB-11 BOMB TESTING: Data received from the 4 tests have been sufficient from a propulsion and structures viewpoint to eliminate the need for further tests. The probability of an engine in flight exceeding the 100 ms maximum allowable damping time is less than one per million ( $.3 \times 10^6$ ). ✓ Apparently no problems exist for the S-IB thrust beams with the original bolts. Acceleration response data indicated the bomb induced transient in the aft skirt primary structure; however, the energy is of short duration and does not stimulate significant component response. No S-IB stage has to be beefed-up due to H-1 engine combustion instability. ✓

4. S-II-4 CRYOGENIC PROOF TEST MEETING: The subject meeting was held 3-7-68 in P&VE Laboratory with all involved elements of MSFC represented. NR/SD gave a presentation which included the hardware changes, redlines, safety considerations, schedule and detailed test plan. As a result of the review, we have confidence that the cryogenic proof test of the S-II stage can be done safely and that all aspects have been considered in depth to successfully cryogenic proof test the S-II stages. ✓

B  
3/18

BOB STUDIES

We have learned that BOB is presently contemplating a number of internal Saturn V Production Studies that are concerned with the "compacting" of the contractor base and closing out some facilities. Also, the alternative of placing all stage production under one contractor and at one facility is being considered. So far, the BOB Studies are only preliminary in nature; Mr. Webb's staff has been informed but not yet requested to comment. ✓

APOLLO COST STUDY

We have been requested to conduct the yearly updating of the Apollo Cost Study model which has been continuously utilized by Headquarters for planning and budgetary purposes.

We propose a revision to the present concept of unitizing all costs. We would identify certain costs as an annual requirement to maintain our industrial capability; certain other costs would be identified to the production of the actual hardware. The sum of these industrial base and hardware costs would be the total program cost.

✓ The present method is inadequate for low production rates and this is especially true when there are sizeable gaps in the production schedule. The proposed method isolates the hardware costs so that if a vehicle is cancelled only the hardware portion would be "saved" (this appears to be the approach used by our competitors, resulting in a low unit cost). A comparison of the current and the proposed methods is illustrated on the attached page. ✓

John Stucker will serve again this year as our center coordinator for this update. He is pursuing this proposed method with the Headquarters personnel. ✓

NOTES 3/11/68 RICHARD

B  
3/18

LM/ATM Review : The first day of the four-day LM/ATM Review was held March 9, 1968, at Ball Brothers (Boulder, Colorado). The Principal Investigators definitely showed that they are confident of making the schedule on ATM. Dr. Mueller asked the Principal Investigators two questions: (1) How important is it that we hold to a 1971 launch? (2) Is there any advantage to using revisit capability to extend experiment time? Reasons cited by the Principal Investigators for holding to the schedule were: (1) decreasing solar activity with time, (2) loss of momentum in program, (3) cost of delays, and (4) need for timely data for design of the next generation of experiments. All Principal Investigators expressed the desirability of extended reuse of the experiments. We will be prepared to discuss the results of this review with you anytime next week. ✓

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3/181. AS-502 Launch Vehicle at KSC:

o The Flight Readiness Test (FRT) was completed on Fri., 8 Mar 68. The launch vehicle "flight phase" of the FRT went very well; however, there were several problems during the "pre-launch" phase. The most notable problem was in the RCA 110A computer when the 6 1/2 volt power supply (built by Lambda) experienced a capacitor failure in the over-under volt sensing circuit. (The power supply was operating normally at time of failure.) The spare power supply was installed; however, the failure caused a 1 1/2-hour hold in the FRT. Further investigations are being made to determine cause of failure. ✓

o The Flight Readiness Review (FRR) is being conducted today (Mon., 11 Mar 68) at KSC. ✓

o This week the spacecraft and the S-IVB APS units will be loaded with hypergols. The protective curtain for the IU Stage and S-IVB forward area will be installed during the hypergol loading operations. ✓

o The launch is still officially scheduled for 25 Mar. 68; however, a reschedule is expected shortly because of the lengthy delays in completing the FRT. Our estimate is that the launch will be scheduled about 29 Mar. 68. ✓

2. S-II-4 Stage Cryogenic Proof Test:

o A management review of cryogenic proof test planning for S-II-4 was conducted on Thurs., 8 Mar. 68. Test requirements have been jointly determined and coordinated with NAR, P&VE, Test Lab. and MTF to insure that all possible safety precautions will be included in the test. No significant problems were identified, and a final test readiness review at MTF will close out all actions prior to the scheduled cryogenic proof test on 24 Mar. 68. ✓

3. AS-503 Design Certification Review (DCR):

o My DCR (Phase I) for the AS-503 manned mission will be held at the LIEF Conference Room on Wed. and Thurs., 13 - 14 Mar. 68. ✓

o The MSFC DCR (Phase II) is scheduled for 4 April 68. ✓

NOTES SPEER 3/11/68

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3/18

1. AS-502 FLIGHT READINESS TEST: The Flight Readiness Test (L/V portion) was completed at 5:40 AM CST on 3/8/68. There were three holds during the test with a total duration of 5 hours 31 minutes. The HOSC was manned during the test by 30 support engineers (22 MSFC and 8 contractor). L/V related items which contributed to the hold time were: (1) Digital Data Acquisition System Interface Problem and (2) RCA-110 power supply failure. ✓
2. FLIGHT OPERATIONS PLANNING MEETING: A joint IO/R&DO flight operations planning meeting was held at MSFC March 8. Items of discussion were the immediate flight operations schedules, guidelines and criteria for flight mission rules, flight control measurement status review, and AS-205 Flight Mission Rule and flight control display status. The meeting was well supported by R&DO and IO elements, and like the previous meeting on February 14, was very beneficial in identifying and helping to resolve the problems and needs for MSFC support of Apollo flight operations. ✓

1. ATM FOLLOW-ON STUDY: The study of the EMR II payload concept, as directed by J. Mitchell, has been completed. The payload includes a spark chamber proposed by Klarmann and Waddington, the nuclear gamma ray spectrometer proposed by Gibbons, and the Giacconi X-ray telescope with an attached Bragg spectrometer proposed by Clark. These experiments are mounted to the aft end of a ground-fitted S-IVB Orbital Workshop. All experiments are provided with separate orientable platforms with pointing capabilities so as not to require Workshop reorientation. The maximum payload weight would be approximately 8,700 pounds, including instruments, supporting structure, pointing mechanisms, and shielding. ✓
2. PRESENTATION TO ASTRONOMY MISSION PLANNING BOARD: Upon the request of Mr. Shepherd and Mr. Weaver, I have furnished information and suggestions in preparation of your forthcoming presentation to Dr. Goldberg's Astronomy Mission Planning Board. Inputs were obtained from various R&DO laboratories. I would like to recommend that we have a short verbal discussion before the presentation. ✓
3. ATM CONTAMINATION WORK: Dr. Dozier will give a presentation on ATM contamination as part of the three-day LM/ATM Review to Dr. Mueller on 3/15. A dry run was held with Systems Engineering Office. Dr. Tom Tweedie, Bellcomm, will help us in the preparation for the presentation.  
  
One of our experimental vacuum chambers and its related equipment were modified for outgass testing of ATM materials. This work will assist and complement work presently underway at P&VE and ASTR in the very extensive outgass test program in which this Center is now engaged. The system is now ready for use; testing began on 3/7. The results will be included by ASTR in the ATM materials control documents. ✓
4. LASER DOPPLER GRAVIMETER: The laser doppler gravimeter which we developed under OSSA sponsorship with the help of QUAL's support contractor (SPACO) has reached now the status of a laboratory model with consistently satisfactory relative accuracy. We will soon begin testing against a gravity grid which was surveyed recently with considerable assistance from Test Laboratory. ✓
5. THERMAL CONTROL COATINGS: A damage mechanism meeting for thermal control coatings, chaired by SSL (Gary Arnett), was held last week at Lockheed with OART, Ames, Lewis, JPL, and MSFC participating. Much of the work under discussion has been performed by SSL inhouse and under contract. The OART Congressional Report for the hearings on the 1969 budget was partly based on this work. ✓

E.S. Purpose? B

NOTES 3/11/68 TEIR

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3/18

No submission this week.

NOTES 3/11/68 WILLIAMS

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3/18

I. Negative report.

March 18 + 25. 1968

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NOTES  
MR. GORMAN'S COPY  
3/18/68 - 3/25/68

w/ comments

No comment marked DEPA

NOTES 3/18/68 BALCH

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3/31

S-II-504 Testing - Engine leak checks are in process and are expected to be completed by 3/20/68. The stage contractor has accelerated the cryogenic proof-pressure test schedule and is now planning for completion on 3/22/68 instead of 3/24/68, as previously scheduled. ✓

S-II-505 Testing - Stage was installed in the A-1 Test Stand on 3/13/68, two days later than scheduled because of high winds. Power-up is scheduled to be completed on 3/19/68. The stage contractor is initiating recovery action to meet schedule dates of 4/16/68 and 4/26/68 for cryogenic proof-pressure test and static firing, respectively. ✓

S-IC-506 Testing - Hardware and software shortages may impact the stage electrical power-up schedule date of 3/25/68 by approximately two days. The stage contractor is assessing these problems for impact on the entire MTF test program schedule for the S-IC-506 stage. ✓

LOX and LN<sub>2</sub> Procurement - Air Force representatives visited MTF on 3/11/68 and 3/12/68 in connection with their assumption of responsibility on 3/1/68 for procurement of all LOX and LN<sub>2</sub> at MTF. ✓

Public Affairs - Mr. Robin R. Clarke, reporter for the Science Journal, London, England, visited MTF on 3/15/68. ✓

NOTES 3/18/68 BELEW

B 3/31 *Lozman*

LM/ATM REVIEW WITH DR. MUELLER: The LM/ATM Review Committee (Dr. Mueller, Mr. Trimble, and Mr. Richard) met on March 15, 16, and 17 to hear detailed presentations by MSC, MSFC, and GAEC on design, operations and cost considerations of the current AAP 3/4 mission baseline. Major concerns with the baseline mission are the dual rendezvous requirement (attendant problems of operational complexity, weight, crew training and LM docking) and LM modification costs. Alternates discussed to alleviate the dual rendezvous problems were unmanned rendezvous (several options like automatic, remote and combinations of these are available) and uncoupled mode (CSM/LM/ATM). In connection with the unmanned rendezvous mode, Dr. Mueller requested the MSFC study in detail the possibility of accomplishing rendezvous and establishing initial station keeping conditions with the S-IVB/IU. In the review at GAEC, Dr. Mueller questioned in detail the proposed LM modifications and interfaces with the ATM in an attempt to reduce the scope of modifications and the attendant cost. Dr. Mueller has asked Chuck Mathews to continue to look at this in more detail, pulling together a team from MSC/MSFC/Headquarters, etc. Also, Dr. Mueller asked Ludie Richard to summarize the material presented to the Review Team and present it to the Center Director's Retreat this weekend. It appears to me a strong recommendation is forthcoming for an unmanned LM/ATM rendezvous and docking to the Orbital Workshop. ✓

SATURN I WORKSHOP DELTA PRELIMINARY DESIGN REVIEW: The Saturn I Workshop Delta Preliminary Design Review (PDR) Board will meet at MSFC on Tuesday and Wednesday, March 19-20. This is a meeting of the formal Review Board following the documentation and crew station reviews. Preliminary design should be essentially finalized at the completion of this review. ✓

B 3/31

H-1 ENGINE Since no firm evidence has been found as to the cause of the engine failure during the static firing of S-IB-211, it is concluded that there was gross leakage of LOX past the LOX seal as a result of broken carbon or a failure of the Kel-F lip seal during engine start. Based on this conclusion, the coordinated R&DO/IO position is that the following precautionary actions should be taken relative to SA-205:

(a) Replace the LOX seals in the S-IB-205 engines with new seals which have been completely re-inspected, including disassembly and inspection of the Kel-F lip seal. (The seal installation will be accomplished after shipment of 205 to KSC, as the task is simplified by working on the stage in the vertical position. No impact on the ship or launch date is anticipated.) ✓

(b) Install a temperature measurement in the LOX pump cavity drain lines and interlock this measurement for launch. ✓

To gain experience with the bellows-type seal in the stage cluster application, both bellows and lip-type seals (four of each) will be tested on the next test of S-IB-211. For the final stage test (full duration) all engines will be equipped with bellows type seals. Spare seals are available or on order to support test and retrofit programs for both configurations as may be dictated by additional data. ✓

F-1 ENGINE As reported in the AS-502 FRR, the gas generator ball valve fuel quick disconnect boss was found damaged on engine 4019. An ECP was approved at the FRR to replace the disconnect bushing with an improved bushing which has more thread engagement. Following the FRR, the bushings on the other four engines were inspected. Based on this inspection the decision was made to install the improved bushings on all five engines. All replacement adapters have been installed. ✓

Early last week during thrust chamber throat plug leak check on AS-503 at KSC, excessive LOX valve seal leakage was indicated on engine 4022. An attempt to isolate the leakage will be made following OATS (overall test sequence) tests. ✓

J-2 ENGINE Seven successful J-2 engine tests were conducted at AEDC on March 14. ✓ The first two tests concluded the planned testing on the first engine sample to demonstrate the capability of the J-2 engine to start on the S-II stage with a fuel pump inlet pressure as low as 27.0 psia. ✓ The remaining five tests were blowdown tests in support of the launch constraint reduction program. The next tests on the J-2 at AEDC are scheduled for March 20. ✓

The delivery of improved timers for the electrical control assemblies is progressing on schedule and the first shipment consisting of timers for three assemblies was "hand carried" to Rocketdyne March 15. The first AS-503 ECA will be delivered to KSC by March 24 and provide additional spare support to AS-502. All AS-503 units will be delivered to KSC by April 2 with no vehicle schedule impact. ✓

B<sub>3/31</sub>

CCSD OTHER WORK

During the past two months Chrysler Corporation Space Division has received contracts for 16 tasks of work other than prime contract activity. ✓

Included in these contracts were a significant number of tasks awarded by IBM Huntsville for quality testing of components for the Instrument Unit; two tasks awarded by General Electric and Mississippi Test Facility for testing and urgent fabrication of pressure fittings; one task awarded by Princeton University for the study of telescope maintenance and updating in orbit for a period of five months; and one task was awarded by Martin-Marietta for a five-day Vibration Test for the Walleye Control System. ✓

Since the first of the year Chrysler has submitted proposals on approximately 50 "other work" tasks. ✓

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3/21

NASA Hazard Identification Committee

Mr. Helgeson is establishing a NASA-wide Hazard Identification Committee. The chairman will be from OART/Headquarters and all Field Centers will have a member on the committee. The purpose of the committee will be to review existing activities pertaining to hazards, assess the overall situation and create a NASA Index of Hazards. Dr. W. Mrazek agreed to be the MSFC member. Mr. Bolger was very satisfied with our selection. ✓

Identification of Explosives

As a result of the Ordnance Equipment (Explosive) color coding at Kennedy being different for each contractor, NASA Headquarters (MSF) has established a Safety Standards Committee at agency level to provide safety standards for use by both NASA Centers and Contractors. Mr. Huth is the MSFC contact point for this committee. Mr. Phil Bolger, Deputy of Mr. Lederer, will call when action is required. ✓

Safety Directors Meeting

Mr. Lederer has tentatively scheduled a meeting of the Center and Headquarters Safety Directors at MSFC on April 3. ✓

Resident Management Office Inspection: An inspection tour was made of the Resident Management Offices (RMO's) at Seal Beach, Huntington Beach and Canoga Park, California, to examine the relationship of support contractor personnel in the RMO's to civil service personnel. A similar inspection tour of the laboratories at MSFC has already been completed. Minor adjustments will be made to physical locations of support contractor personnel to insure complete compliance with the letter and spirit of current regulations governing the use of support contractors. ✓

NOTES 3/18/68 GEISSLER

B<sub>2</sub>/31

1. Mars Surface Models: On Tuesday, March 5, 1968, Dr. J. de Wys and Mr. A. Beck of JPL, visited our Aerospace Environment Division to discuss Mars surface models. Dr. de Wys is responsible for preparing a monograph about the Martian surface for NASA Headquarters' Space Vehicle Design Criteria program. Dr. de Wys discussed the areas of Mars on which his studies indicate permafrost may occur. Dr. de Wys requested that we provide comments on a draft of his monograph, and that we keep him informed about our studies of planetary surface thermal environments. We shall satisfy his requests. ✓
2. Cross Beam Work With Other Government Agencies: The Federal Aviation Agency (FAA) is the second government agency which has expressed an interest in joining MSFC in the development of crossed-beam technology. ✓ (ESSA's interest was described in Notes 2/26/68 Geissler). Dr. W. C. Sperry and Dr. John Powers, from FAA's Noise Abatement Office, invited Dr. F. Krause to give a technical briefing in Washington on February 28, 1968, on "Measuring Turbulent Fields as Related to Sonic Boom Propagation." After this briefing, Mr. Ken Power, chief of FAA's sonic boom staff, stated that FAA would place a sole source contract with Colorado State University (which works with us in atmospheric crossed-beam technology) to explore whether a crossed-beam turbulence detection system could be developed in the next year for sonic boom propagation studies. If the CSU studies indicate feasibility, FAA would consider joining MSFC in future development of ground-based and airplane-based instruments. ✓
3. Use of Aero-Astrodynamic Laboratory Reports in University of Michigan Curriculum: Professor Edward Epstein, Head of U of M's Aeronomy Department, has informed us that he is using the following MSFC reports in his planetary meteorology course: (1) "Environment of Mars: An Interpretation of Atmospheric and Surface Characteristics"; (2) "Mars Environment Definition Final Report: Voyager Spacecraft"; and (3) "Laboratory Simulation of the Mars Atmosphere: A Feasibility Study." These reports were prepared by our Aerospace Environment Division. Professor Epstein also plans to use our latest planetary atmosphere report "A Collection of Papers Related to Planetary Meteorology," now in publication. ✓
4. Inertial Guidance: On Tuesday, March 19, Mr. Clyde Baker, of our Astrodynamics and Guidance Theory Division, will be at Rensselaer Polytechnic Institute, Troy, N.Y., to speak on the history of inertial guidance to the graduate engineering students. This is being given at the request of Dr. Dean Frederich who was an employee in our laboratory under the Summer Faculty Fellowship Program in 1967. Dr. Frederich plans to return here in the summer of 1968. While there, Mr. Baker will informally interview several possible candidates for MSFC employment. No commitments will be made, however. ✓

ok

1. TESTER FOR RAPID AUTOMATIC CHECKOUT OF ESE REVISIONS (TRACER):  
The expanding use of hard-wire programmable patch distributors created the need for a device which could rapidly check the wiring in patchboards. Personnel of this Laboratory developed TRACER, which is controlled by the RCA-110A computer, to rapidly determine the configuration of an unknown patchboard, generate a wiring list, compare new configurations to an old one, generate a magnetic tape of the configuration, and produce a high-speed printout of the entire patchboard or just the errors and/or changes from previous configurations. The present method of testing requires three to four hours for an average 60 connector patchboard. TRACER does the job in ten minutes and a new computer program now being completed will reduce this time to five minutes per board. We have just successfully completed the establishment of the configuration of 58 patchboards for the Saturn V Breadboard, providing Boeing with a printout for each patchboard. TRACER can greatly enhance checkout and prelaunch operations at other locations through: (1) increasing confidence in patchboard configuration, (2) substantial reduction in time to check the patchboard, and (3) practically eliminating the possibility of human error. We are presently refining the prototype documentation, and upon completion will highly recommend the device as a vital checkout tool for use at locations such as IBM, KSC, and Boeing-Michoud. ✓
2. SIMULATION PRESENTATION TO MSC: A presentation on the Laboratory's simulation activities was given to Mr. E. Hamblett, MSC, recently. The presentation was requested after a discussion between Dr. Rees and personnel of this Laboratory concerning MSC's efforts to simulate portions of the spacecraft for a sneak-circuit analysis prior to the first manned Apollo launch. The presentation was to point out the approach and problem areas based upon our experience in Launch Vehicle Component Level Simulation (LVCLS), Automatic Malfunction Analysis (AMA), and Launch Vehicle ESE Simulation. Representatives from Computation Laboratory and Astrionics Laboratory participated in the presentation and discussion. Handouts and supporting documentation were provided to Mr. Hamblett. Any further action concerning this matter will be at Mr. Hamblett's request. ✓

1. Inertial Navigation System Redundancy. For future applications, we have been investigating means of eliminating single point failures within the inertial navigation system. Presently, our ST-124 Platform represents a source of a single point failure within the launch vehicle inertial navigation system. Providing redundancy with the gimbaled ST-124 system would be complex to implement along with the penalties of increased weight, volume and power. A more promising approach is to use a redundant strapdown inertial sensor system, which would require five or six inertial components such as gyros and accelerometers whereas in case of the use of three redundant gimbaled platforms, nine inertial components would be required. An engineering prototype of a strapdown system is being assembled in-house and a flight model is being proposed to fly as an AAP experiment. The formal request to fly the experiment is being prepared for submission to NASA Headquarters for MSFEB approval.

2. ST-124 Platform for AS-502. A high frequency oscillation was indicated to exist in one of the gyro servoloops. The indication was based on a measurement within the servoloop but from other measurements the servoloop was performing satisfactorily. Based on the information, my decision was that it was not mandatory to remove the platform from the launch vehicle and this approach was supported by IO (Col. Murphy/Mr. Duerr). Dr. Gruene felt that it should be removed and, since the removal/replacement would not impact schedules, it was finally resolved with Dr. Rudolph/Col. Petrone that the platform would be removed. The normal operating groundrules are to remove only mandatory items once the FRT has been accomplished. ✓

Kallo H. (via Weidner)

Suggest you discuss the desirability of this backup with Ludie Richard. If Systems Engineering buys this and if it can make the requirement (even as a post-Apollo objective) stick with our Section V Program Office, I think this is good idea. I'd like to avoid, however, that this option is used as an excuse to keep our strapdown guidance project alive. B4-1 Please keep me posted.

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3/31S-1C STAGE (MTF)

S-1C-6 stage schedule: Power-up March 25, propellant load test April 16, static fire April 30, and remove the stage from the test stand May 15, 1968. ✓

S-11 STAGE (MTF)

S-11-4 - The electrical and mechanical checks are on schedule to support the cryogenic proof pressure test on March 22, 1968. The test conductor's readiness review meeting for the test is being conducted on March 18 and 19, 1968, at MTF. ✓

S-11-5 - Placed in the A-1 Test Stand on March 12, 1968. The delay of one day in the stage installation was due to high wind conditions. Electrical and mechanical hook-up and checkouts are in progress. As of Thursday, March 14, 1968, only six of ten LO<sub>2</sub>/LH<sub>2</sub> prevalves had been delivered to MTF. The prevalves were originally scheduled to be installed in the VCB. ✓

S-1VB TEST STAND (MSFC)

Test S-1VB-057S, a scheduled 10 seconds idle mode, 75 seconds mainstage and 10 seconds idle mode test, was conducted on March 14, 1968. The test was cut at X+19 seconds (9 seconds mainstage), due to a fire in the hot gas tap-off area. After detanking and purging, inspection revealed a hot gas leak at tap-off orifice flange. Disassembly of this joint showed that the orifice plate installed prior to this test was cocked. There is no meaningful way to leak check this joint without destroying the integrity of another equally critical joint. A design change in this area is necessary since it is possible to assemble this joint and not detect that the orifice plate is not properly seated. The damage was restricted to instrumentation cable, and minor burning to electrical cable. A sequence test on March 15, 1968, indicated no damage to control cabling. No other damage occurred to the engine or stage. ✓

F-1 ENGINE (MSFC)

Test FW-077 was successfully conducted on March 12, 1968, at the West Area F-1 Test Stand for a mainstage duration of 25.75 seconds. Primary test objectives was to acoustically evaluate a Saturn V IU model with a live ST124-M installed. Data from this test are being evaluated. ✓

S-1B STAGE (MSFC)

The stage S-1B-11 LOX pumps will have four each of the new (Zero run time) bellows seals and new vented lip seals equally distributed between inboard and outboard engines for the next firing of 35 seconds duration with no bombing. ✓

1. 690: The EAI 690, a medium sized hybrid computer, has been installed in Building 4200, primarily for support of the Aero-Astro dynamics Laboratory. This computer will be used to solve small hybrid problems and for the initial investigation of large problems which will later be run on the large hybrid system in the Computation Laboratory. Checkout of the 690 is virtually complete, and programs are being prepared to run on this computer, and problems are being programmed presently to be run on this computer. ✓

NOTES 3/18/68 JOHNSON

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3/21

Nothing of significance to report this week.

NOTES 3-18-68 KUERS

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No significant items to report.

1. MOOG HYDRAULIC ACTUATORS (S-IC): Six cracked actuator housings have been identified. Two of these housings are on hand in this laboratory; one has been evaluated and the second is being evaluated. The remaining four cracked housings are at Moog; two of these will be forwarded to the Boeing Company and the remaining two will be forwarded to this laboratory for evaluation. A plan for redesign of the actuator housings (to avoid stress corrosion) is being prepared by Boeing and will be discussed in a meeting on 3-19-68. ✓
2. S-II-2 LOX FAST FILL: A fast fill procedure with minimum loading pressure transients during the initiation period has been established between MSFC and KSC. The large pressure surges experienced in the Lox sump area on S-II-1 CDDT will be eliminated by dumping the hot Lox contained in the transfer system through the ground facility vent prior to flowing into the S-II stage. This procedure will require dumping approximately 12,000 to 15,000 gal. of Lox overboard through the facility vent before the transfer system is filled with good quality Lox.
3. F-1 ENGINE GAS GENERATOR DAMAGE IS FOUND ON S-IC-2:  $\text{GN}_2$  leakage was noted at the gas generator of S-IC-2 engine number 3 (S/N F-2019). The transition piece between the 3/8 in. quick disconnect (CRES) and the 1/2 in. gas generator drain port (AL Alloy) had been overtorqued. The engaged gas generator drain port threads had been completely stripped out. A sufficient number of threads remained which could be picked up with a longer adapter. There will be no degradation of reliability and the launch schedule will not be affected. The adapters of the other four engines were also overtorqued, and the long adapters will be installed on these engines also.
4. SPRAY FOAM INSULATION (X-15 AIRCRAFT TEST): On 3-20-68, the X-15 Aircraft will test a panel of spray foam located on the upper speed brake. We have instrumentation as well as camera coverage. The trajectory to be flown will closely simulate S-II flight conditions. Another test is scheduled on 4-1-68. ✓
5. NUCLEAR: As previously reported, our Vibration and Acoustics Branch is engaged in engineering support to determine vibro-acoustic effects on facilities at the Nuclear Rocket Development Station (NRDS). The following preliminary results of this study have been transmitted to NRDS. (1) Overall sound pressure level contours for a Phoebus 2-A engine firing; (2) A typical sound pressure spectrum; (3) A list of locations where pressure and response measurements should be taken; (4) Recommendations concerning the calibration range of the instrumentation. ✓
6. FIRST LAUNCH CONSTRAINT TESTS ARE CONDUCTED AT AEDC: The first J-2 engine launch constraint tests at AEDC were conducted on 3-8-68. Three blowdown tests at elevated thrust chamber temperature were conducted to investigate fuel pump stall at a simulated altitude environment. Preliminary data indicates that the thrust chamber chill requirements for launch can be reduced. ✓

NOTES MAUS 3/18/68

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OART REQUEST FOR MANPOWER DATA: We received a TWX from OART dated March 11 requesting that Marshall include with POP 68-1 a listing of the direct positions that are applied to OART programs at the unique project level for FY-68 and FY-69. This data has been developed jointly between us and R&DO and shows a total of 256 direct civil service people for EOY FY-68 and 304 people for EOY FY-69 working on OART programs. This is the first time that OART has requested this type of data and this is the only program office we are sending this type data in POP 68-1. ✓

SENATE SPACE COMMITTEE HEARINGS: Chairman Anderson has announced a one-day resumption of NASA Authorization Hearings on Tuesday, March 19. At 10:00 a. m., March 19, the Committee on Aeronautical and Space Sciences will hear testimony from NASA witnesses Mac Adams, Milton Klein, and Gerald Truszynski. This is a continuation of the Authorization Hearings that were interrupted by the Civil Rights debate on March 5. Mr. Klein's testimony on Tuesday will be on Space Power. No announcement has been made regarding rescheduling of the Nuclear Rocket Hearings which involve you. ✓

NOTES 3/18/68 RICHARD

B 3/31

No submission this week.

B 3/31

AS-502 Launch Vehicle at KSC:o ST-124 Stabilized Platform

- During the Flight Readiness Test (FRT), noises (high pitch oscillations) were noticed on the pitch gyro of the ST-124 stabilized platform. A team of R-ASTR, IBM/Huntsville, Bendix/Huntsville, and Saturn V personnel went to KSC on Saturday, 16 March 68, to investigate the problem. Though various tests were made, the noise on the pitch gyro could not be reproduced.
- Even though the noise was not occurring on a primary control circuit, it was felt advisable to replace the complete ST-124 with the spare that was already at KSC. Installation of the spare ST-124 was completed Monday morning, 18 March 68, and the original ST-124 is being returned to Huntsville for further analyses. ✓
- There was no impact to the launch schedule caused by this action, as the launch schedule had already slipped from 28 March 68 (Thursday) to 1 April 68 (Monday), for replacement of a helium valve in the spacecraft Service Propulsion System (SPS). ✓

o Bendix Labor Strike:

- The Bendix support services personnel went on strike this morning (Monday, 18 March 68) at KSC. These are the personnel who operate the cranes in the VAB; the large machine shops; tube cleaning shops; and vehicle fueling facilities at KSC. Bendix management and administrative personnel are performing some of the operations in order to avoid major shutdown. Strikers are only picketing one gate at KSC; therefore other contractors are using the other gates and are continuing their work on AS-502 and AS-503. ✓
- Launch vehicle schedule impact cannot be determined at this time. ✓

1. MSC PROPOSAL FOR DATA RELAY SATELLITE SYSTEM: Dr. Gilruth has forwarded to Dr. Mueller (copy to MSFC) a Preliminary Project Proposal Document on a Data Relay Satellite System (DRSS). MSC is proposing the establishment by 1972 of a system of communication satellites (preferably three) in synchronus earth orbit for support of the Manned Space Flight Program. The system would provide continuous communications directly to earth orbiting spacecraft and make all mission data available to the Mission Control Center. These capabilities are commensurate with the expected increase in data management for future programs (complexity of missions, large quantities of scientific and experiments data). The proposal predicts long term cost gain due to the possible reduction in earth orbit (not lunar or planetary) support of the Manned Space Flight Network (MSFN). However, a firm commitment to support earth orbital missions exclusively with DRSS and without MSFN ground stations is carefully avoided. Development of such a system would have to proceed parallel with spacecraft design definition. The estimated costs of the system is between 160 and 209 million with a yearly operating cost of 11 to 18 million (MSFN yearly operating cost is about 73 million). ✓
2. MSFC OSRO REPRESENTATIVE: General Stevenson and Dr. Mueller have agreed to eliminate the full-time residence requirement for the MSFC (as well as MSC and KSC) OMSF Operational Support Requirements Office (OSRO) representative. Under the new arrangement, we have appointed a primary and an alternate representative in our Operations Requirements Office as Center interface with OSRO. They will be available on an on-call basis to support OSRO efforts. General Stevenson was quite complimentary of William Hynes who has been the OSRO representative for MSFC for the last three years. Tentative plans call for Mr. Hynes to be assigned as Chief of Plans and Systems Development in the OMSF Mission Operations Office. ✓
3. AS-502 FLIGHT CONTROL PROCEDURES REVIEW: A review of AS-502 Launch Vehicle Flight Control Procedures was held on March 14, with participation by R&DO, I-V, I-MO, and the Launch Vehicle Flight Controllers for AS-502. Based on this review, a significant improvement has been achieved in these procedures since AS-501, and the procedures are adequate for AS-502 launch. A few remaining open items are being worked. ✓

NOTES 3-18-68 Stuhlinger

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3/31

1. PROJECT ASTRA: Jim Downey attended a meeting, chaired by Dr. Roman, on the status of Project ASTRA in Washington on 3/15. Dr. Danielson, Princeton, read the preliminary report of the ASTRA Committee. Many technical details were presented (one meter diffraction-limited mirror; pointing accuracy better than 0.1 arc sec; Cassegrain system, f:4). Members of GSFC questioned the role of man; in fact, most of the discussion concerned the reasons why man should maintain the ASTRA payload, and why the system should be designed for maintainability. The final report will be written by the end of April. ✓

2. SOLAR RADIATION FLUX EXPERIMENT: As part of our assignment to define the electromagnetic radiation environment, an experiment to measure the solar flux is being prepared by SSL (Roger Linton). Spectral range: .25 microns to 7 microns. Absolute accuracy: 1%; fluctuations can be measured to within 0.01%. This high sensitivity will permit correlation between the solar radiation flux and solar flare activities. Phase A has been sponsored locally. A contract with TRW for 45 K has just been completed and resulted in a breadboard. We intend to fly this breadboard onboard a Convair 990 out of Ames Research Center in May. Inhouse support is obtained from ASTR, ME and QUAL Labs to prepare the flight hardware. ✓

3. PERSONNEL LOSSES: Dr. Tom Clark, radio astronomer, who had been with SSL on military detail, will terminate his military assignment this month. We had hoped to be able to retain him as a Civil Service employee at SSL; R-DIR as well as Personnel helped us to make him an attractive offer. He decided, though, to accept a job offer from GSFC, because that Center "gives a better opportunity for professional development of a scientist." The fledgling radio astronomy station which Dr. Clark built up on the Wheeler Dam Reservation will be taken over by Mr. Jim McGuire (M. S. in astronomy) of SSL. ✓

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S-IB-11 LOX SEAL FAILURE: Reference is made to my notes dated March 4, 1968, (copy attached) concerning the establishment of two working groups to determine actions to be taken on the H-1 engine and S-IB Stage for SA-205. We are currently replacing all of the LOX seals on S-IB-11. Half of the replacement seals will be of the lip seal type and half of them will be bellows type for a short-duration static test to obtain comparison of the two types of LOX seals. Eight bellows type seals will be used for the long-duration static firing. The short-duration static test is expected to take place on April 11 or 12. A final decision on LOX seals for S-IB-5 will be made after the above testing is completed. It appears that either seal is flightworthy. Concerning the vehicle interlock consideration we have decided to add triple redundant temperature measurements to the LOX cavity drain lines on S-IB-5. These temperature measurements will be voted two out of three on the ground and interlocked. This change will be installed after arrival of S-IB-5 at KSC. No schedule impact is expected. ✓

SA-206/LM-2: We received information from Headquarters that the SA-206/LM-2 launch requirement has been terminated. The SA-206 launch vehicle has been reassigned to the first dual launch with delivery late July 1968 and SA-207 delivery mid-August 1968. The official teletype is being held pending the signature of Mr. Webb to the approval document. The approval paper for Mr. Webb's signature is being staffed through his immediate staff. ✓

APOLLO PROGRAM DIRECTIVE 34: We have received Apollo Program Directive 34 which raises the approval of Level II hardware changes to the Level I Board after FRT/CDDT, and it raises the approval of Level III changes to Level II after MSFC turnover of the stages to KSC. We are coordinating with Saturn V and will prepare a Program Directive for implementation. ✓

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3/21

1. Chrysler "National Space Booster Study": As you know, Doug Lowery and other Chrysler people proposed to Mr. Webb in late January a contracted study to define a "National Space Booster" to meet NASA-DOD needs in the 1975-85 period. Mr. Webb reportedly indicated interest, and a written proposal was later submitted to him (8-Mo. CCSD study, cost of slightly less than \$1 Million).

We were informed late last week that Doug Lord's shop has been instructed to initiate procurement for the CCSD study. The contract is to be issued from Headquarters and is to be managed by Col. J. Burke of D. Lord's office, with MSFC support. A letter contract, based on the CCSD proposal, is being issued by Headquarters to expedite action on the study; negotiation of the actual study contract is to occur within the next couple of weeks. We have been asked to participate in the contract negotiation as well as subsequent direction of the contract.

Although the CCSD proposal says the study will examine future missions and determine launch vehicle requirements, it concentrates a great deal on the "100K to orbit launch vehicle".

Although the reasons for current emphasis on this study are not all clear to us, we do feel that MSFC should be a participant in any such major planning activity. We will report further developments to you later in the week.

2. Saturn V Workshop: The "final" presentation on the Saturn V Workshop was given to C. Mathews on March 7 and 8 and presented to the Thompson Committee on March 12. Discussions during these presentations and subsequent events have indicated that aspects regarding the initial guidelines and criteria which constrained the investigation may have been somewhat inappropriate. As an example, C. Mathews apparently feels that the study, has provided him with design concepts but no valid program alternatives. Also, both C. Mathews and apparently the Thompson Committee are properly raising very basic questions concerning such items as a contingency program alternative if difficulties arise with zero "g" operation, consideration of utilization of MOL derived hardware, and the entire subject of experiment program priorities. Chuck Mathews is currently deliberating on these items and may request additional work of a more basic nature.

A presentation is also planned for the Scientific Advisory Group at KSC on March 27 and 28. We have been considering an approach to take in lieu of these events and have been discussing the situation with Mr. Weidner. We hope to be able to pull together some thoughts which may put the entire situation in the proper perspective including some alternative approaches and discuss them with you prior to the next Thompson Committee meeting.

*Holman*

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3/27

NOTES - 3/25/68 - BALCH

3/25/68

S-II-504 Testing - Cryogenic proof-pressure test was successfully completed late Friday afternoon, 3/22/68. LH<sub>2</sub> tank was pressurized to 36,185 PSIG. Quick-look data appears satisfactory. Post-static checkout and modifications are continuing. Removal from test stand is scheduled for 4/6/68. ✓

S-II-505 Testing - Power-up was completed on 3/19/68 as scheduled. Cryogenic proof-pressure test and static firing are still scheduled for 4/16/68 and 4/26/68, respectively. ✓

S-IC-506 Testing - Power-up is set for this afternoon as previously scheduled. Propellant loading and static firing are currently scheduled for 4/16/68 and 4/30/68, respectively. ✓

Damage Claims from Stage Firing - A local attorney, Mr. Nicholas M. Haas, has requested copies of pertinent documents concerned with the claims of his clients, Otho, James A., and Larry W. Rester for damages allegedly caused by the static firing of the S-IC-505 stage on 8/25/67. In addition, Mr. Haas requested claim forms in order to file another formal claim for damages from the S-IC-505 firing, this one for a Mr. Chester W. Lee. The claim forms and copies of appropriate documents pertaining to the Rester claims were furnished to Mr. Haas. ✓

Public Affairs - Mr. Albert Ducrocq, writer and broadcaster for Europe No. 1, with Department of State Escort-Interpreter, Mr. Jean Claude Porson, visited MTF on 3/20/68 as a participant in the International Visitors Program of the Department of State. ✓

3/25/68

B3/27

NAVAL RESEARCH LABORATORY (NRL) VISIT: At the request of Dr. Tousey (NRL), we have arranged for about 40 people from NRL and NASA Headquarters to visit MSFC on March 27. Dr. Tousey's primary reason for coming is to discuss the ATM and he has requested 30 minutes on the agenda for a presentation by himself. Jim Shephard and Jay Foster have arranged a full day's agenda of laboratory tours and presentations on the total Saturn/Apollo Applications Program. ✓

NATIONAL ACADEMY OF SCIENCES PERSONNEL VISIT: At the request of Chuck Mathews, we are responding to a letter from Dr. Leonard Sayles to General Bogart requesting arrangements be made for him and an associate (Dr. Guest of Dartmouth College) to visit MSFC and meet with some of the people responsible for ATM. Dr. Sayles is directing a NASA funded study with the National Academy of Sciences concerning administrative problems associated with management of complex technologies. We and Executive Staff (Mr. McInnis) plan to brief them on March 26, and then have them join the visiting NRL group on March 27. ✓

Dr. Sayles has visited MSFC before and received an overall Center briefing (February 1, 1967). ✓

SATURN I WORKSHOP DESIGN REVIEW BOARD MEETING: The Saturn I Workshop Design Review Board convened at MSFC March 19-20, 1968, to review the Review Item Discrepancies (RID's) which were generated at the Documentation Review held in December 1967 and the Crew Station Review held in February 1968. Personnel from NASA Headquarters, MSC, MSFC, and McDonnell Douglas Corporation participated. Two hundred and nineteen (219) RID's were reviewed and approximately 200 were resolved. The remaining items are in work and of these, only the following are significant: (1) Thermal Vacuum Test on S-IVB Workshop; (2) Complete Cluster Flight Systems Mating Test; (3) Interface Definition of all OWS Operated Experiments; (4) Fire Extinguishing/Suppressant System for the OWS; and (5) Deletion of Experiment M053 because of Crew Safety. ✓

LOEWY/SNAITH PRESENTATION TO MSC: At the request of the MSC Flight Crew Operations Directorate, Loewy/Snaith will present their AAP-2 habitability study results at MSC on April 16. ✓

MONTHLY WEIGHT REPORT: The monthly weight report submitted informally to Headquarters reflects the following status: (1) AAP-1 - Margin of +2,399 pounds. This will decrease by 600 pounds if we finally assign AS206 to this flight. (2) AAP-2 - Margin of +688 pounds. This dips into Mathews dictated 1300 pounds margin by 612 pounds. Included in current weights is the Workshop Attitude Control System to conduct AAP-3A. Not included is potential SLA increase and some 1000 pounds of Airlock mods. (3) AAP-3 - Margin of -192 pounds. and (4) AAP-4 - Margin of +1872 pounds. ✓

3/25/68

LM RCS ENGINE PROBLEM Reference your discussion of the LM DCR in the last Center Staff and Board Meeting and particularly your comments concerning the Marquardt attitude control engine explosion: I assumed that you were referring to explosions that had occurred in the engine Qual Test program many months ago, but subsequently found that a Marquardt engine had blown up a few days prior to the DCR under circumstances (duty cycle and engine temperature) which were considered in the safe operating region. These conditions had good probability of being repeated in a lunar mission. Since the DCR two additional engines have blown up, but under more aggravated conditions.

I discussed this situation with MSF Apollo Test (Dave Winterhalter and Charley King) and with the Houston subsystems manager (Chester Vaughan). Adjustments in duty cycle and engine temperature redlines can be made to decrease the likelihood of an explosion, but each LM contains 16 of these engines and each engine experiences many starts (exposures to a possible explosion) during a given mission. Research contracts have been let by MSC to investigate the basic mechanism of this type energy release. But results cannot be available in time to influence the solution to this problem.

A possible long range solution is the use of the C-1 engine. Charley King does not think the situation is serious enough for us to "dust off" the C-1. Chester Vaughan said that they (MSC) have not seriously considered it. However, we are looking into the C-1 hardware inventory and have discussed informally with Reaction Motors their activation time. ✓

F-1 ENGINE A mandatory requirement for visual observation of the F-1 engine LOX overboard drain line to verify no liquid leakage prior to launch was given to KSC in the Specification and Criteria document (on 3/6/68) and as a Launch Mission Rule Redline (on 3/19/68). The Mission Director's Office (Chet Lee) at KSC stated verbally last Friday (3/22/68) that the requirement would not be met due to potential schedule impact to harden the camera location to preclude flying debris at launch. Discussions are continuing in an effort to resolve this problem.

The LOX valve seal leakage on AS-503, Engine 4022 (reported in my Notes of 3/18/68) has not been isolated and corrected because of delayed completion of the OATS (overall test sequence) tests.

All approved modifications on the S-IC-4 F-1 engines will be completed by April 16, 1968, and there will be no traveled work at KSC. ✓

3/25/68

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Visitors

Members and wives of the Canada-United States Interparliamentary Group visiting New Orleans in recognition of the City's 250th anniversary, will tour MAF Saturday, May 23. ✓

Co-chairman of the U. S. delegation are Sen. George D. Aiken (R. -Vt. ) and Rep. Cornelius E. Gallagher (D. -N. J. ) Other Senate members are: Allen J. Ellender (D. -La. ), Russell B. Long (D.-La. ), William B. Spong, Jr., (D. -Va.), John Sherman Cooper (R. -Ky. ), Len B. Jordan (R. -Idaho), Hiram L. Fong (R. -Hawaii) and Robert P. Griffin (R. -Mich. ).

In addition to Rep. Gallagher, the group will include the following members of the House of Representatives: William T. Murphy (D. -Ill. ), Harold T. Johnson (D. -Calif. ), John M. Slack (D. -W. Va. ), James W. Kee (D. -W. Va. ), Mark Andrews (R. -N. D. ), Robert T. Stafford (R. -Vt. ), Vernon W. Thomson (R. -Wisc. ), John J. Duncan (R. -Tenn. ) and William S. Broomfield, (R.-Mich. ).

The Canadian delegation will be headed by the Hon. Alan A. Macnaughton. ✓

Economic Impact

Mr. Roger W. Hough of the Stanford Research Institute, Menlo Park, California, visited Michoud Assembly Facility on March 21 and 22, in support of the Institute's current study for NASA Headquarters of significant impacts of the space program. He was particularly interested in the build-up of New Orleans East area and the effects that MAF has had on its development. ✓

Mr. Hough was furnished copies of various economic impact studies as well as updated information secured from the New Orleans Chamber of Commerce and the State of Louisiana, Division of Employment Security. ✓

"HAPPY BIRTHDAY" - from the Michoud Assembly Facility Employees. ✓

3/25/68

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3/21NASA Safety Program Memo

A memorandum from Dr. Finger to NASA Program and Staff Offices and Field Installations, dated March 8, 1968, announces "The NASA Safety Program" as recommended by the NASA Director of Safety, Mr. Helgeson. The following areas were highlighted:

- a. Relationships among line and functional management.
- b. Surveillance of contractors.
- c. Specific delegations and requirements.

A brief on the NASA Safety Manual was enclosed. They plan to issue the manual early next month. The subtitles only are listed below for your information:

- |           |   |
|-----------|---|
| PART I    | General   |
| PART II   | Safety management                               |
| PART III  | System safety                                   |
| PART IV   | Industrial safety                               |
| PART V    | Public safety                                   |
| PART VI   | Safety services                                 |
| PART VII  | Manned Space Flight safety                      |
| PART VIII | Safety training and certification               |
| PART IX   | Accident investigations and reporting           |
| PART X    | Hazards identification safety research and data |
| PART XI   | Aviation safety                                 |

Safety Conference

A three day Government/Industry System Safety Symposium is presently planned for early May at Goddard Space Flight Center. Helgeson, Lederer, McGuire and Cohen and others from NASA Headquarters, as well as Center representatives, will participate. ✓

NOTES 3/25/68 FELLOWS

3/25/68

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3/31

Physical relocations, Advanced Systems Office and Systems Engineering Office: Planning has been completed for the move of Advanced Systems Office personnel to the seventh and eighth floors of building 4200 and the concurrent relocation of Systems Engineering Office personnel to the sixth floor of building 4202. The moves will be made on the weekend of April 6, 1968. ✓

3/25/68

NOTES 3/25/68 GEISSLER

B 3/31

1. Computational Support Problems: Inadequate computational support is delaying us in meeting our commitments. IBM 7094 turn around time is extremely slow; AAP mission analysis work is hampered by small amount of UNIVAC 1108 time available for scientific studies. Completion of 3rd generation (1108) computer facilities is supposed to relieve the latter situation. However, some immediate relief is needed, e.g. (1) allowing additional 1108 time for scientific evaluations, and (2) insuring that other facilities adequately handle 7094 overflow. We are affected by reduced programming support, and next fiscal year's proposed reduction is alarming. Even though budget cuts are unavoidable, requirements for computers and programmers should not be considered proportional to amount of hardware to be developed. Computer usage for simulating missions, mission planning, timeline analyses, etc., may increase during periods of program austerity that force use of reduced hardware systems. We continually reevaluate our assignments to Computation Laboratory's programmers to insure that only necessary tasks are being pursued. Also, since we currently request more jobs to be run than Computation Laboratory can accomplish for us, it has been necessary for us to assign a priority to each task. To maintain our competence and capability of quick response, it is extremely important that we be provided adequate programmer support. We plan to review this whole problem area in considerable detail during the forthcoming manpower review for Mr. Weidner, or in a special meeting, if the manpower review is delayed.

2. Dr. Mueller Briefing on Unmanned Rendezvous 3/20/68: Upon request by Dr. Mueller, Aero-Astrodynamics Laboratory performed a quick study of promising ways to deliver the LM/ATM within 500 feet of the orbital workshop, using the S-IVB stage and the IU, for propulsion and guidance. Six Aero-Astrodynamics personnel participated in the presentation of the results, coordinated by R-SE, to Dr. Mueller, Mr. C. Matthews and others. The most promising flight profile consists of direct injection into an elliptical phasing orbit, a minor correction after 1/2 orbit using the S-IVB auxiliary propulsion system or workshop auxiliary control (WAC) system, and the orbit is then circularized after 1 1/4 to 1 3/4 orbits by using a second S-IVB burn. All these maneuvers are controlled by the S-IVB IU. These maneuvers are followed typically by 4 vernier burns, less than 4 m/s each, using a modified auxiliary propulsion system. The presentation, even if necessarily lacking in depth and leaving many details open, was essentially well received. A follow-on error analysis and more detailed cost impact study by MSC was requested by Dr. Mueller. Also, the effort is to be supported by MSC. Somewhat confusing to the uninitiated was the supposedly small savings claimed by MSC, to be achieved by using the S-IVB/IU for this phase of the mission. MSC stated that only a few million could be saved in LM modifications if the S-IVB/IU were used to perform the rendezvous. This supposedly small savings was quoted to be even less than the \$6 millions required for software modification to the LM/CSM guidance computers. There appears a very good possibility that the 2 burn S-IVB portion of the profile will be adopted, while for the vernier maneuvers, either the S-IVB or the separated LM systems will be considered. This should give us a good start toward unmanned resupply mode. ✓

H. Weidner  
Please let me know what came out of the review  
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3/25/68

1. SPACECRAFT PROGRAM: Houston has received 25 spaces for use at the Downey CSM facility to hire badly needed inspectors. The provision is that they first offer positions to some of our "technician" category people. We are setting up a 60-day training course to make inspectors out of those "technicians" that accept employment with MSC at Downey. ✓

Quality Laboratory presently has 29 people supporting the CSM full time in the field. Of these, 11 are inspectors that will be withdrawn the end of May. By then Houston should have the 25 new spaces filled with qualified inspectors. ✓

2. NEUTRON RADIOGRAPHY: We have recently culminated an agreement with P&VE Laboratory for a cooperative effort in the field of neutron radiography. P&VE has agreed to modify their Van de Graaff generator and facility to provide a medium energy level neutron source. It is our intent to develop a direct viewing, closed circuit TV system which will provide an instantaneous radiograph of the item being examined. X-Y transtation axis will be included to allow movement of the item while it is being viewed. Further, neutron radiography provides a means of evaluating low density organic materials which are pervious to X-ray. Present methods require an eight-to-ten hour autoradiography film transfer technique which is very costly (approximately \$250 per shot). The neutron radiography system, which is being developed under FY-68 OMSF SRT funds, will not replace X-ray, but will provide a complimentary NDT method. It is planned to have the facility operational by July 1969, at which time we will initiate development and evaluation of NDT methods and application of neutron radiography as a quality tool. ✓

3/26/68

B 3/31

1. ST-124 Platform for AS-502. (Reference Notes 3/18/68 Haeussermann, Item 2) The platform which was removed from AS-502 at KSC has been returned to R-ASTR-G for tests. Special slip ring tests, torque tests, gimbal friction tests, continuity tests and a complete system overall verification test have been completed. The system is in satisfactory working condition and meets all specifications. No trace of the problem that was reported at KSC can be found, nor can it be duplicated with this system. It is now planned that this system will be returned to KSC on Monday 25 March for spare backup to AS-502, AS-205 and AS-503. ✓

2. ATM Controls and Displays. As a result of the ATM Preliminary Requirements Review two months ago, MSC felt that the Control and Display Panel could be simplified and reduced in size. We have been working with MSC in the established Ad Hoc group to first define the requirements and from that establish a panel layout. The size of panel prior to the PRR was approximately 1700 square inches. Based on the newly defined MSC requirements, the panel area is 2200 square inches. We will have to resolve with the MSC personnel what requirements can be eliminated or accept another design approach on some of the functions; i.e., utilization of the Digital Address System (DAS) via the keyboard. MSC personnel strongly objected to the DAS at the PRR. During the recent LM/ATM review, Dr. Mueller stated that attempts should be made to make the panel smaller than 1700 square inches. At that time, the 2200 square inch panel size had not been identified. We will continue to work with MSC personnel to reduce the panel size to a minimum. ✓

NOTES 3/25/68 HEIMBURG

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3/26/68  
F-1 ENGINE

Test FW-078 was successfully conducted on March 19, 1968, at the West Area F-1 Test Stand for a mainstage duration of 25 seconds. Primary test objective was to acoustically evaluate a Saturn V IU model with a live ST 124-M installed. Data from this test are being evaluated by R-P&VE and R-ASTR. ✓

S-11-4 (MTF)

S-11-4 proof pressure test was successfully conducted on March 22, 1968, to a LH<sub>2</sub> tank pressure of 36.18 p.s.i.g. The No. 1 LH<sub>2</sub> vent valve was relieving at 35.7 so the override closed feature was used to prevent this valve from relieving. The vent was manually opened at 36.18 p.s.i.g. by the C7-801 panel operator. ✓

S-IVB (SACTO)

S-IVB-505N was installed on SACTO Beta I Test Stand on March 14, 1968. Modification work including non-propulsive vent will continue until post-static checkout begins on April 18, 1968. S-IVB-506N is in pre-static on Beta III Test Stand. ✓

EXPLOSIONS ON REACTION CONTROL SYSTEM (R.C.S.) ENGINES

From the test experience we have on the S-IVB Auxiliary Propulsion System, we do not encounter the same phenomena on the MMH/N<sub>2</sub>O<sub>4</sub> propellants as MSC encounters with Aerozine-50/N<sub>2</sub>O<sub>4</sub>. Apparently, the R.C.S. propellant freezes on expansion through the injector, plates out on the chamber and under the right condition, explodes. We have talked with Henry Pohl, the MSC Project Engineer who worked in our Components Lab for about six years, and MSC is on top of the problem. They have a test facility and are already testing to try to duplicate the conditions. ✓

3/26 KB

1. APOLLO MANAGEMENT INFORMATION RETRIEVAL SYSTEM (AMIRS) PRESENTATION: Mr. Don Seaton, Apollo Program Control Office (MAP-1), NASA Headquarters, gave a presentation March 21, 1968, to MSFC personnel on the above system. AMIRS is a generalized information retrieval system funded by Headquarters and developed by GE-Daytona for use by Headquarters, MSFC, KSC and MSC. The system is currently undergoing translation to run on MSFC's third generation UNIVAC 1108 computer and is scheduled to be available for use some time in April 1968. Actual applications for AMIRS have not been determined but it does appear to have some potential use at MSFC. ✓
2. PRINCE/APIC: At a meeting between Computation Laboratory and Brown Engineering Company top management, BECO verbally proposed to handle all computational support for the Parts Reliability Information Center (PRINCE/APIC) as a part of the support now being accomplished under the current contract with Quality Laboratory for PRINCE/APIC. An unsolicited proposal is to follow. ✓
3. PRINTED WIRING BOARD LANGUAGE: The Printed Wiring Board (PWB) language, developed by Computation Laboratory, was successfully demonstrated during the Gerber 1500 Drafting Machine's acceptance test prior to shipment to Astrionics Laboratory. The PWB language permits a design engineer to describe the wiring path of a printed circuit board in a language more natural to the engineer; the language is processed on the IBM 7094 computer. The output from the computer is compatible with and is used to control the drafting machine's actions. The PWB language offers a significant advancement in the area of printed circuit manufacture. ✓
4. THIRD GENERATION INSTALLATION STATUS: It is estimated that the contractor will begin Phase I acceptance between April 1 and April 15. At the request of the contractor, system checkout is being continued. Plans for the Phase IIA installation are underway. Difficulty is being experienced in floor space allocation because of our inability to move the IBM 7094's to the GSA installation. ✓
5. VISIT OF CAPTAIN SHERER, NASA HEADQUARTERS: Captain Sherer, the chief of the recently formed Operations Office at NASA Headquarters visited the Simulation Branch on Tuesday, March 22, 1968. Captain Sherer drove the Lunar Surface Roving Vehicle Simulator and observed the Lunar Terrain Model and details of the Terrain Sensors and the optical pickup on the SMK-23. He, also, observed results of an engineering design study being accomplished on an EAI 8812 analog computer. ✓

3/20/68

B 3/31

Thermal Control Coating Experiment - It now appears that this experiment will be flown on AS-206. It had already been integrated into the IU prior to the Apollo directive which eliminated flight experiments. Since to render it inoperative now would require further rework of the IU, it appears that the decision has been made to let it stand. It is strictly a non-interference type experiment, requiring no astronaut participation. It is designed to expose automatically thermal control surfaces to selected portions of the launch and injection environment in order to determine, by comparing the effectivity of identical coatings exposed different times along the trajectory, the effects of operations during each portion of the launch program on the thermal coatings. The only imposition on the Apollo program is the stripping and distribution to P&VE of the data which is planned as a part of the normal IU data. ✓

Precision Optical Tracking Experiment - This experiment, which involves as the only vehicle change the installation of corner reflectors on the external skin of the IU, has been delayed in execution pending the completion of the Apollo program. The decision to delay was based on the no flight experiments directive. The experiment is designed to test the capability of tracking a vehicle from lift-off to orbit, with fractional meter precision, using a laser-telescope radar. One of the questions needing an early answer was the effects of "debris" blown up into the line-of-sight during the very early phases of launch. To get an answer, the proposal was made to mount a corner reflector to a handrail on the arming tower at about the IU level and measure during the 502 flight. The test would have been completely non-interference with Apollo operations; engineering requirements would have been simple -- the spotting, drilling and cleaning of a couple of bolt holes and bolting the reflector in place. Activation of the beam would have occurred only when the work area was unoccupied. The request to conduct the test has been disapproved on the basis that the required mod to the LUT is not a mandatory change. We agree, but philosophically we wonder if maybe we haven't just finished straining over another gnat which would probably have been swallowed unnoticed if we could have made it a more nearly camel sized requirement.

Kind of bus  
KSC  
Looks like  
this would  
have been  
a very  
worthwhile  
test. How  
What review  
mechanism  
Was this  
turned  
down?  
I think  
we ought  
to be a  
little  
more  
flexible  
for things  
like  
this  
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Work by the Research Institute - (reference my note of 3/4/68) (copy attached) I think it would be good for you to occasionally reiterate to Dr. Hermann several of the points which we have attempted to make recently: (1) It is necessary that they sell us as individuals on the competence of their individual researchers and their capabilities to do our individual research tasks. (2) The thing most likely to give them a real competitive advantage is to develop and to utilize in approaching our fairly prosaic research tasks the imagination and original thinking capability most usually found in a strong academic staff. (3) Generally, the very good original researcher is a poor salesman; but successful research institutes probably occur only when their management arrives at a proper mixture of good researchers (academicians) who may be poor salesmen and good salesmen, who may not be world beaters as researchers. (4) Briefly - start worrying less about selling ARI and start worrying more about building up a salable combine of U. of Ala-Huntsville and ARI. ✓

B.L.

I hope our meeting with Reeves and Hermann accomplished what you suggest here. B

NOTES 3-25-68 KUERS

3/26/68

B 3/31

S-II Mini-Stage Structure: We are presently in a very tight schedule squeeze in the manufacturing operations of this structure. The Boeing Company has completed the installation of approximately 7,000 strain gages as of Monday, last week. This installation took several weeks more than originally planned for, due to an underestimation of the job. However, Boeing has made an all-out effort to minimize schedule impact, working 7 days a week, 24 hours per day, and pulling in specialized people for this operation from Wichita and Seattle. They have really done an outstanding job. The next phase which we have started now is the foaming of the bulkhead. Again, we work around the clock, seven days a week, using a considerable amount of overtime. Since the tooling and the set-up is new and this is the very first time we have applied the foaming technique to full-size hardware, we have hit some minor unforeseen snags. However, the foaming of the bulkhead has been satisfactorily completed over the weekend. The foam will now be machined at the side to allow assembly of the forward skirt section to the Y-ring. This is the next major operation and is scheduled to start April 1. The 2000 special Huck-bolts needed for this operation have not been received, although they have been on order for more than seven months. The manufacturer, who is a sole source for these bolts, apparently has higher priority work from the aircraft industry and has changed delivery promises several times. Mr. G. Buckner is personally working with us to overcome this problem. We are already planning work-around methods, substitution of bolts, and changing sequence of operation in order to meet our end date.

✓

3/26/68

1. PRELIMINARY DESIGN REVIEW BOARD MEETING: The Senior Review Board met at MSFC 3-19-68 and 3-20-68 to dispose of the 220 RIDS generated during the Design Review in December and the Crew Station Review in February of this year. Dispositions of these RIDS were: 179 approved, 29 disapproved, 2 approved for further study, and 8 withdrawn. The preliminary examination of the resulting actions indicates that MSFC has 85 open actions, MSC has 27, and there are 46 joint inter-center actions; one action was assigned to Headquarters. The total review was completed in a day and a half thanks to the cooperation between the working levels of the two centers in pre-board meetings aimed at the resolution of design discrepancies. This is the last large design review for the workshop until the Critical Design Review, tentatively scheduled for early fall. Interim design reviews will, of course, continue particularly on those items which were not available for the current review. ✓
2. S-II-4 CRYOGENIC PROOF TEST: The S-II-4 liquid hydrogen tank passed the cryogenic proof test on Friday (1.05 times max flight stress). A test program by Tiffany of the Boeing Company at our request supports that 1.05 is an appropriate proof test level. The successful test on Friday supports the long standing MSFC contention that the vehicle is ready to fly. ✓
3. RECENT R-4D ENGINE FAILURES: During the Apollo 5 Mission flight, one R-4D engine (RCS) on the LM I stage failed. This failure occurred after some very severe off-limit operating conditions. In a recent series of tests at Marquardt, 3 R-4D engines failed. These failures all occurred with the engine firing in a vertical up position, using Aerozine-50 as the fuel, and operating at minimum impulse bits 13MS (milliseconds) per pulse. The very low impulse bit aggravates the problem since incomplete combustion occurs with the short firing duration. The unburned propellant deposits on the chamber wall and, with sufficient accumulation, will overpressure the chamber on a subsequent firing. Our OWS Propulsion System (WACS) uses a scaled-down R-4D engine. We use MMH (not Aerozine -50) as the fuel since experience has shown MMH to provide more stable combustion characteristics and to be less susceptible to pressure spikes. Using the 22 lb. thrust (instead of 100 lbs.), we operate the engine in a near steady-state mode (60 MS instead of 13 MS), thus allowing time for complete combustion and sufficient chamber heating to vaporize any unburned propellant at shut-down. We will continue to follow the MSC experience, but at this point are not overly concerned due to the above comments. We plan a rigorous ground test program, with sufficient limits testing, and should be able to pinpoint any problem of this nature early. ✓
4. INDUSTRY REQUEST: A representative of the American Sterilizer Company, Erie, Pennsylvania, has requested James Kingsbury to assist him in finding alternate materials for use in commercial sterilizers. The gentleman was referred to us by NASA Headquarters. He will visit us the week of 4-1-68. ✓
5. HAZARDOUS GAS DETECTION SYSTEM (HGDS) TRAINING: Our Materials Div. gave a one-week training course for operators of the HGDS at KSC last week. We believe that any future training requirements can be handled by the KSC civil service personnel.

\*mono-methyl-hydrazine ✓

3/26/68

MUELLER POP 68-1 REVIEW - Dr. Mueller reviewed POP 68-1 at MSF on March 19. Significant items were:

a. Apollo Cost Estimates - FY-68: Dr. Mueller expressed concern that center estimates of the cost during the balance of FY-68 are higher than estimated by MSF, since both the centers and MSF use essentially the same data as their basis for the estimates. (MSFC projected total cost for FY-68 - \$971 M; MSF estimate - \$940 M.)

MSFC's estimates of cost in POP 68-1 are intentionally conservative and based upon target costs for the major primes. The cost rate projected in the "other" area (R&DO procurements, minor contracts, propellants, etc.) in Marshall's POP will probably not completely materialize while the major primes can be expected to continue to be below target cost. MSF's estimate is probably realistic. ✓

b. Over Guideline Submission in FY-69: Dr. Mueller was concerned that the centers came in over the MSF guidelines in FY-69. Marshall was \$13.6 M over in Saturn IB and \$1.9 M over in AAP Experiment Definition. Both MSC and KSC submitted a much larger "over guideline" request than Marshall. ✓

c. Saturn V Follow-on Procurement: Due to concern that Congress may cut AAP drastically in FY-69, Kubat asked MSFC to develop a delivery plan for Saturn V based on no FY-69 funding for 516 and subs. The resulting plan slipped delivery of 516 one year from the current schedule. This would cause either a production gap after 515 or a further stretchout in the deliveries of the Apollo vehicles. Kubat will try to get FY-69 money to avoid the gap (even with a reduced AAP Program). Dr. Mueller indicated he prefers a production gap (even with Kubat's warning that this might eliminate any follow-on program) to an additional slip in Apollo deliveries. ✓

d. MSF Mark-up of POP 68-1: The attached chart shows the MSF program office positions on the MSFC POP 68-1 submission for Apollo and AAP. ✓

e. Apollo Runout Costs: The Manned Lunar Landing cost previously given to Congress (\$23.9 B) includes \$18.7 B for Apollo R&D. Apollo R&D cost estimated by the centers totaled \$19.8 B. The Apollo Program Office evaluation results in a new estimate of \$19.2 B; however, Gen. Phillips advocates adhering to the established figure (\$18.7 B) by charging to Apollo the launch and operational costs only through SA-205 and SA-511 and "common" support costs through 1970 (rather than 1971). ✓

NOTES 3/25/68 RICHARD

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B 3/31

Ad Hoc Committee on Apollo Crew Safety: The Ad Hoc Committee met at Headquarters last Wednesday and Thursday. This Committee is configuring an investigation which will hopefully dovetail with the manned flight DCR looking primarily at crew activity and operations through the mission time lines. Past design and operating judgements will be reviewed in cases where new data, systems changes, experience, etc., may have invalidated prior work. It is intended that the Committee work through the line rather than through the panel operation - largely the same people at this Center.

Although the intent of the Committee Chairman, John Hodge, MSC/FC, is to avoid back tracking through previously decided issues, this Center's representation expects to rejustify positions taken previously.

Membership consists of the following:

John Hodge	MSC/FC
R. D. Harrington	KSC/LO-PLN
F. Vreuls	MSFC/R-SE
J. W. Bilodeau	MSC/CF2
D. B. Pendley	MSC/FC

To assure minimum DCR overlap, we intend to work closely with Col. Teir and Dr. Rudolph. ✓

1. S-II Stage Cryogenic Proof Test: 3/26/68

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o The simulated S-II-4 cryogenic proof test on the B structure of the S-II structural test program (S-II-4 type upper tank section, forward dome and forward skirt) was successfully completed at Santa Susana on Sat., 16 Mar. 68. ✓

o Based on the above success, the S-II-4 stage cryogenic proof testing was conducted at MTF on Fri., 22 Mar. 68. ✓

- The LOX tank was filled with  $LN_2$  and pressurized to flight pressure of 22 - 24 psi. ✓

-  $LH_2$  tank was filled (with  $LH_2$ ) and pressure was increased until it reached maximum proof pressure of 36.2 psi at which time the tank vented as planned. All objectives of tests were accomplished successfully and there were no insulation damages. ✓

- Stage will be removed from test stand on Sat., 6 Apr. 68. The tank will be re-inspected and stage is scheduled for delivery to KSC (on dock), Tues., 30 Apr. 68. ✓

2. AS-502 Launch Vehicle at KSC:

o During a routine check of the  $LH_2$  umbilical disconnect, and also internal to the disconnect, water was found on disconnect confirm switch actuation shaft. It was, therefore, necessary to replace the ground half of the  $LH_2$  umbilical disconnect. ✓

o CDDT began Sunday night, 24 Mar. 68, at 6:00 pm (EST). The CDDT is officially scheduled to be complete on Sat., 30 Mar. 68; however, Rocco Petrone (KSC) is targeting all activities to be completed with CDDT at 7:00 am (EST) on Fri., 29 Mar. 68. ✓

o Launch of AS-502 is scheduled for 7:00 am (EST), Wed., 3 Apr. 68, whether CDDT is complete Friday or Saturday, 29 or 30 Mar. 68. ✓

3. AS-503 Launch Vehicle:

o Overall Test # 2 was not completed on Fri., 22 Mar. 68, as planned due to several problems. Inasmuch as KSC is pressing most of their launch crews into the AS-502 launch activities, additional testing of this nature on AS-503 is being postponed until after AS-502 launch. The only major test on AS-503 which will be conducted is the Pull Test which is scheduled today, Mon., 25 Mar. 68. ✓

4. Bendix Labor Strike at KSC: The strike of the Bendix support personnel was terminated on Thurs., 21 Mar. 68. ✓

NOTES 3/25/68 Speer

B 3/31

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1. AAP Mission Operations: MSC, in keeping with agreements reached during the Kraft visit, is increasing their support of the AAP Panel Structure. ✓ Flight Operations Directorate (FOD) has taken action in personnel assignments to panels they have heretofore not participated in and reassigned personnel to the other panels. In all cases the FOD personnel will participate with the authority of their organization. MSFC has in turn started their augmented support of the Flight Operations Planning Meetings. Personnel from I-MO, I-S/AA, and R-AERO attended the first meeting, under the new chairman W. Koons. We plan to increase the participation in future meetings as required. ✓

2. Baseline Reference Mission Document: MSC, upon direction by Mr. Mathews, is generating an AAP Baseline Reference Mission Document. They intend to utilize the MSC chaired Flight Operations Planning Meetings (FOP) as the media for coordinating the document and for obtaining Marshall's inputs. It has been recommended that the FOP generate the document and the Mission Requirements Panel technically validate it. The document will cover the entire ML-13A schedule and will provide as a minimum mission profiles, systems performance requirements, crew timelines, and contingency operations. The document is to be compiled and published under a very tight schedule, preliminary copy to printing by May 1 and a finalized copy by August 1. ✓

NOTES 3-25-68 Stuhlinger

B 3/31

3/2/98

1. CONTAMINATION EXPERIMENT T 027: This experiment, which consists of a photometer and a surface sample array (developed and built at Martin-Denver), has received a FY-68 funding of 200 K from OMSF; this money is presently in P&C. Additional funding requirements of 200 K in FY-69 and 50 K in FY-70 have been agreed upon by OMSF (Dr. Werner), OART (Mr. Novik and Mr. Quass), and SSL. These amounts do not yet include data analysis. This has been coordinated with EO. ✓

2. ATM FOLLOW-ON EXPERIMENTS: You asked recently what funding is visualized by OSA for ATM Follow-on experiments in FY-68. The following funds are authorized presently in OSA: (AAP Funds for stellar astronomy)

a. For direct contracting by HQ:

UV Experiment (Tiff)	75 K
Gamma Ray Experiment (Frye)	75 K
Gamma Ray Experiment (Klarmann)	121 K
Gamma Ray Experiment (Waddington)	73 K
Gamma Ray Experiment (Clark)	27 K

b. For contracting through GSFC:

Gamma Ray Experiment (Fichtel)	100 K
1-meter Telescope (Stellar)	235 K

c. For contracting through MSFC:

Support of Experiments	90 K
Gamma Ray Experiment (Oak Ridge)	119 K
Radiation Effects on Films	75 K

d. Contingency 60 K

Σ ~ > 1 M

As usual, these figures are still subject to changes. ✓

Q-BALL TRANSDUCERS: <sup>3/26/68</sup> Rosemount Engineering Company has finally succeeded in improving the welds in their differential pressure transducers used in the q-ball to the extent that ME, Quality and Astrionics laboratories are pleased with the result. A sample of the last six welds was inspected by ME laboratory a few days ago and declared to be of excellent quality. What is really encouraging is that it now appears that Rosemount has developed their technique to the extent that they are now producing welds with repeated quality. They delivered the first four of sixteen transducers for requalification tests ahead of schedule last Thursday. They should deliver four per week beginning April 5. The fifth set of four is scheduled to go to Chrysler for installation in the flight q-ball for AS-205. If this schedule is maintained, it will permit delivery of the q-ball six weeks prior to launch. It is desirable to follow this arrangement for two reasons; first, it will permit some early retesting prior to installation of the new production transducers in the q-ball, and second, it will permit calibration just prior to shipment. Recalibration is required each six weeks. ✓

FILTORS, INC. RELAY: We use the Filtor relay in the S-IB stage and in the IU. This is the relay which recently had the problem of a plug used during a soldering operation falling through the port causing subsequent shorting or blocking of operation. We have tested a large number of relays without experiencing the plug problem. In addition, all of our flight critical circuits using the relays have built-in redundancy and we do not expect a problem. ✓

INSTALLATION OF SA-206 MOD KITS IN VLF 37B: You may hear that we are installing SA-206 mod kits in VLF 37B even though the SA-206 LM-2 mission has been canceled. We have recommended, and KSC has agreed, that the SA-206 update mod kits be installed in VLF 37B to bring the configuration of the facility as alike VLF 34 as possible and to reduce turnaround time for the next launch from VLF 37B. ✓

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1. AS-515 Scheduling:

One of the points brought out in the Saturn V Workshop study was the schedule advantage that can be accrued by allocating the AS-515 vehicle as a prototype for the Saturn V Workshop. However, this requires modifications to the existing MDC contract because the materials and components are presently under procurement and sub-elements manufacturing will begin in early June 1968. If the intended use of the S-IV B stage of 515 is to be a DWS, some effort to modify the contract to delay the start of any fabrication on the stage should be started soon. (S-IV B 515 is the last MDC stage presently under contract.) ✓