

FEB 5, 1968

4-30-68

NOTES

MR. GORMAN'S COPY

2/5/68 w/ comments

No comment for DEP A

2.4/9
948
4/11

| MSFC ROUTING SLIP | | | | | |
|-------------------|------|---------------|----------|----------------------------|---|
| | CODE | NAME | INIT. | <input type="checkbox"/> | <input type="checkbox"/> |
| 1 | DIR | Dr. von Braun | ✓ | A C T I O N | I N F O R M A T I O N |
| 2 | | | | | |
| 3 | | B 3/28 | direct | | |
| 4 | | | 3/27 950 | | |

REMARKS

Copy to Mr. Weidner, R-4 DIR

K
file 2/5 NOTES



W. R. Lucas

| | | |
|--------------------|---------------------|-----------------|
| CODE R-P&VE-DIR | NAME W. R. Lucas | DATE 3-19-68 |
|--------------------|---------------------|-----------------|

March 19, 1968

In response to your questions, ^{attached} on my notes of February 5, 1968, concerning the inordinately large number of insulation doubler failures experienced during the initial cryogenic tanking of the S-II-4 stage, the failures were the result of stressing at temperatures below the operational limit of the silicone rubber and adhesive used in the doublers. (The configuration of the insulation closeout and doubler system is shown in the attached sketch; the doubler bridges the gap between adjacent segments of insulation.) Although the nature of the doubler failures is evident, the exact combination of events leading to the low temperatures, high stresses, and resultant failures is not known since the configuration and conditions of test experienced on S-II-4 represented a considerable departure from S-II-1 through -3. The following unique combination of conditions contributed to the doubler failures:

a. The lightweight (thin wall) construction of S-II-4 resulted in stresses on the insulation about 20 percent greater than had been experienced on S-II-1 through -3.

b. Effective on S-II-4, the gap between adjacent insulation segments was increased from 1/16 to 1/8 in. This change results in less support for the doubler and slightly lower temperatures.

c. The helium purge manifold configuration on S-II-4 (to preclude over-pressurization of the insulation after lift-off) was different than tested on earlier stages; this, also, could have lowered doubler temperatures a few degrees.

d. Manufacturing discrepancies, such as excessively thick bond lines, would impair the efficiency of the bond joint.

To preclude a reoccurrence of the doubler failures, it was recommended to NR that the doublers be changed on S-II-4 through -7 (S-II-8 and subsequent stages have spray foam insulation) to nylon fabric reinforced polyurethane resin doublers. This doubler had been utilized in the extremely cold areas, such as under the systems tunnel and feedline fairings, on all stages with excellent success. Furthermore, laboratory tests on the replacement doubler indicate a much lower service temperature than the silicone rubber doublers. To further verify the replacement doubler design, some of the rubber doublers will be replaced prior to the cryogenic proof test on S-II-4. Based on the experience with the nylon reinforced polyurethane resin doublers, we do not anticipate difficulties.

After analysis of the factors contributing to the silicone rubber doubler failures on S-II-4, the potential problems with the same type rubber doublers on S-II-2 and -3 are judged to be less severe; nevertheless, thorough contingency plans have been developed for use at KSC. A quick repair technique for the rubber doublers, utilizing the same nylon reinforcement but a silicone resin which cures rapidly at room temperature, was proved adequate on the S-II-4 acceptance firing. It is, thus, anticipated that rubber doubler failures, should they be encountered during CDDT, can be repaired without impacting the scheduled time between CDDT and launch; furthermore, based upon the S-II-4 experience, the rubber doubler failures, should they occur, would not constrain launch. ✓

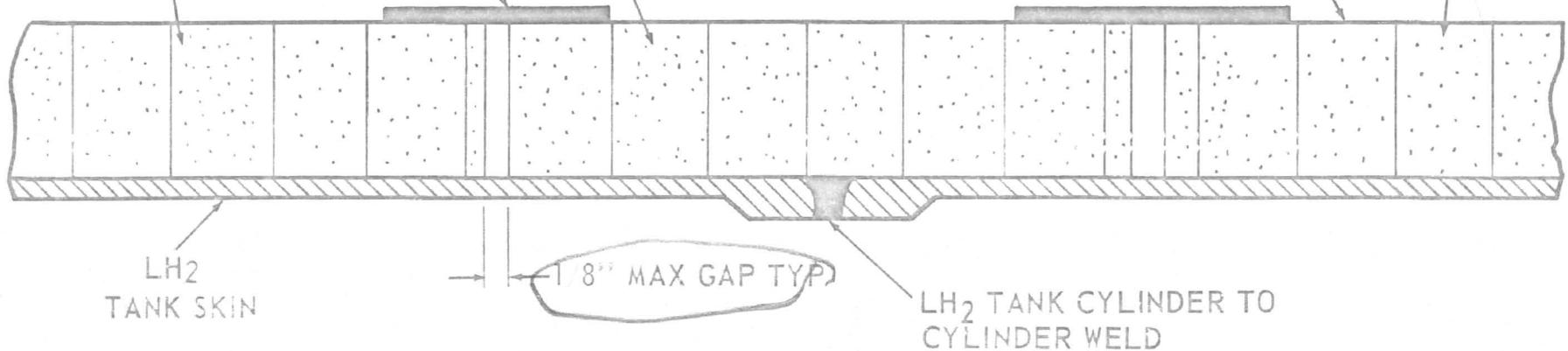
From Lucas

1.6" FOAM FILLED HONEYCOMB - INSTALLED ON QUARTER PANELS @ NR-LA DIVISION
PRIOR TO SHIPMENT TO SEAL BEACH FOR WELDING INTO TANK CYLINDER SECTIONS.

2" WIDE SILICONE RUBBER DOUBLER APPLIED WITH SILICONE ADHESIVE -
FACING SHEET CLOSE OUT BETWEEN 2 INSULATION SEGMENTS

14" WIDE 1.6" INSULATION CLOSE OUT SEGMENT INSTALL
AT SEAL BEACH AFTER LH₂ TANK PNEUMOSTAT AND TANK
WELD INSPECTION

1 PLY TEDLAR
2 PLY NYLON/PHENOLIC
LAMINATE FACING SHEET



TYPICAL S-II LH₂ TANK SIDEWALL INSULATION CONFIGURATION AT WELD

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2/12

1. REVIEW BY BOEING OF S-II STRUCTURAL TEST PROGRAM: At the direction of their Washington TIE Office, the Boeing/Huntsville structures group has evaluated the S-II Lightweight Design Structural Test Program. The results were presented informally by Boeing/Huntsville to our Structures Division and consisted of answers to the following specific questions: (1) Are contractual design/test criteria unnecessarily severe in light of current data? (2) Will test program qualify S-II lightweight structure? (3) Will test program supply information to assist fracture mechanics assessment? (4) Does present test schedule support Apollo program? (5) Can test program be accelerated? (6) Can test program be modified to supply more useful data? (7) Will test-to-failure provide valuable information? Although the answers to these questions (which were transmitted to Boeing/Washington TIE on 1-31-68) were favorable to MSFC, we are highly concerned about the loss of manpower to mainline Saturn activities while we participate in reviews and repeated explanations to those chosen to check us.

B.L.
I'm concerned, too. But I guess there's not much we can do in the present climate
B

2. S-II-504 INSULATION: In my notes of 1-25-68, the failure of the rubber doublers on the S-II-504 insulation was identified. Those defects were repaired and the stage was tanked again after which about 50 similar defects were found in the factory-applied doublers. During the initial tanking the ambient temperature was about 40°F; during the second tanking the ambient temperature was about 70°F; thus, the postulation that the severe weather conditions cause the failures was not substantiated. As was the case during the initial tanking, however, the rubber doubler failures occurred at the time of LH₂ tank pressurization, closely linking the failures to the reduced skin thickness (higher strain) on the S-II-504.

B.L.
Could I get a 2 or 3 page explanation on this rubber doubler problem and what we plan to do about the 504 defects
B

3. SPRAY FOAM INSULATION: As a result of meetings with North American Rockwell (NAR) personnel, agreement has been reached to utilize a spray foam repair procedure (previously, pour foam repairs had been made in the field) for a field repair demonstration which is scheduled for the second week of February. NAR is to accelerate efforts to find an acceptable pour foam and is to evaluate means to make spray foam repairs at MTF and KSC. The disbanding of the NAR insulation group has severely jeopardized the program.

B.L.
What's that??
With the X-15 tests also in jeopardy, I'm really concerned about our irrevocable commitment to foam insulation effective SII-8.
Please comment. Action w/ NAR indicated?
B

4. ORBITAL WORKSHOP: Light evaluation tests were completed 1-30-68, using the OWS mockup as the test model. A complete set of flight type lights including the initial entry lights was installed and evaluated with respect to the astronaut tasks to be performed. Off-center participation in the tests included representatives from McDonnell Douglas, MSC, and Loewy-Smith, Inc., Industrial Design Consultants.

5. S-II FRACTURE MECHANICS: We spent about a half day with Bill Hittinger and Jim Menard (BellComm) last week reviewing the fracture mechanics situation and recent related activities in preparation for a presentation to the OMSF Management Council if necessary.

6. AAP MECHANICAL PANEL MEETING: The 5th AAP Mechanical Panel Meeting is tentatively scheduled for 2-28-68 at MSC. The Panel has tentatively scheduled an ICD working group session at MSC on 2-27-68. The ICD working session will probably be limited to the prepared ICD's (structural/mechanical, thermal/ECS, and environmental ICD's for the AM/MDA and AM/S-IVB interfaces).

2/5 NOTES file 2295
direct 3/13/68
m. 3/26 988 3/19

MEMORANDUM

FROM

E. D. GEISSLER

Dr. von Braun, DIR

TO _____

March 12, 1968

B 3/18
Dear Wernher:

The attached note is in response to your comments on item 3, Notes 2/5/68 Geissler, "Plume Impingement: on AAP Vehicles" (copy attached). A rather detailed response was required, therefore, I am sending this to you separately, rather than in our "Weekly Notes."

E. D. Geissler
E. D. Geissler

cc:
R-DIR, Mr. Weidner
R-DIR, Mr. Cook
R-AERO-A, Mr. Dahm



Plume Impingement on AAP Vehicles:

We appreciate your interest in this control jet/space vehicle interference problem (Note Geissler 2/5/68). While we presently estimate jet plumes with an engineering method developed by Lockheed/Huntsville, which very ably supports us in this area, we are trying to progress in essentially three directions:

1. More rigorous analytical solutions of the transition of jet plumes from continuum flow to free molecule flow.
2. Development and/or acquisition of a suitable probe to investigate experimentally jet plumes in our own facilities.
3. Acquisition of a suitable balance system to measure jet interference forces on our space station configurations in wind tunnel fashion, and development of an in-house test capability.

On Point # 1 we are in contact with a capable group at GE, and are trying to fund a proposed program. On Point # 2 we attempt to obtain an electron beam probe for probing the low density parts of our plumes (supplemented by a laser beam probe for the high density parts, that is also needed for the radiative base heating problem). We aim initially at testing in our low density chamber, where CO₂ is our working medium; we want in the end a probing capability in our Impulse Base Flow Facility (IBFF), where we can simulate exhaust temperature and composition. Point # 3 concerns directly the interference forces and moments on the ATM, etc. Analytical approaches are tedious, since the jet plumes are inhomogeneous and the space station configurations are complex; accuracy is questionable. We plan to place models of our stations into our vacuum chamber (= Low Density Wind Tunnel), simulate control jets with scaled, separate nozzles, and measure interference forces and moments directly. We can probably take liberties with the similarity parameters except geometry, without undue degradation of engineering-type results. Systematic experiments should teach us how far we can go. We may be able to design and produce the balance system in-house. A logical future step will be to develop a similar capability for the IBFF.

Our pacing item is funding. About \$250K are required for the program sketched above. Since the ideas are relatively new, they make their debut only in the FY-69 budget, and except for about \$20K of tooling funds our only immediate hope is year-end leftovers. Funding of research work is made especially difficult by present program policies. Our low fabrication allotment makes it hard to obtain larger equipment. Manpower tends also to become critical. Our trend of increased experimental non-routine work in-house collides with the shrinking trend of our technician strength, caused directly or indirectly by RIF, and our plans will burden our few instrumentation engineers to the limit. One silver lining: A post-doctoral fellow from T. H. Aachen, Germany, is scheduled to join us this summer, and will most likely work in the area of Point 2 above.

We appreciate your pointer concerning Dr. Hermann. His institute may fit in at Point 1 above, though we are not aware of any specific capability or past work in this direction. We will explore; funding will be a problem. Our past work contact with the Research Institute has been much less than desirable, due to causes on both sides, as I presume. Our research funding uncertainties put a strong damper on our aggressiveness. The Research Institute is not aggressive at all.

FEB 29 1968

2/5/68

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NOTES 2/5/68 GEISSLER

1. AAP Launch Opportunities: Launch opportunity studies for AAP-1 and AAP-2 missions have been completed. Studies have shown that if AAP-2 workshop vehicle is inserted and passivated into 230 NM circular orbit with inclination of 28.95 degrees, two inplane and inphase launch opportunities can be provided for AAP-1 approximately one day later. To obtain these favorable launch opportunities, AAP-2 must fly a small yaw program to move descending node of orbit by approximately 1/10 degree east. Cost of this slight yaw maneuver is less than 50 pounds of payload. First inplane and inphase AAP-1 launch opportunity occurs 23 hours and 20 minutes after AAP-1 liftoff; second opportunity occurs 1 hour and 38 minutes later. As a result of synchronizing inplane and inphase launch opportunities, AAP-1's plane change requirements can be reduced across the launch window. Launch window studies are proceeding to develop two launch opportunities.

2
B
1/2
AAP-1
B

for each of five possible AAP-1 launch days. Work has begun to define launch opportunities for the AAP-3 and AAP-4 missions.

2. AS-501 Guidance Transient: During the S-IVB second burn in the AS-501 flight there were large transients in pitch and yaw commanded by the guidance system. They occurred about 114 seconds after S-IVB restart command and amounted to incremental changes of 29 and 13 degrees in pitch and yaw, respectively. These transients were the result of the guidance scheme as implemented on the AS-501 vehicle responding to the S-IVB stage thrust coming off the stop from the high EMR operation to the reference mixture ratio setting. Nominal predicted stage second burn operation was at the reference mixture ratio setting. Actual thrust was about the same as the predicted 3 sigma high EMR variation case. The characteristics observed on the flight had been noted in preflight studies with the predicted 3 sigma propulsion dispersions. They were not considered detrimental to the mission therefore changes to the flight program to smooth them out were not requested. We have the same implementation on AS-502 but due to a different profile out of orbit the transients due to these effects will be very small. We are, however, initiating efforts to desensitize the guidance scheme to propulsion perturbations on later flights. We hope to have changes in time for AS-503M.

Use their capabilities very little!
are indeed looking for better fitting study contracts for the Research Institute.

3. Plume Impingement on AAP Vehicles: Orbiting AAP vehicles will be immersed in gaseous plumes from control and thruster rockets and dumped waste. Plumes may produce forces, moments, thermal loads, contamination, and surrounding gas clouds. We will define the resultant environment, using propulsion and leakage characteristics from P&VE, and mission duty cycles. Analytical techniques in jet plume continuum cores are fairly precise; however, those in transition and free molecular regions produced by expansion into vacuum are not. Interaction and deflection of plumes around body components is extremely complex. Study approach is to first define "ideal" plumes theoretically. Parallel to this, analytical approximations, using source flows and experimental techniques, will provide the multitude of information required in different design areas, using "exact" calculations to define accuracy bands. Interference reactions on the workshop, due to use of APS rockets compensating for CMG dump cycles, can be estimated. Pressure fields will be induced on S-IVB tank structure, adjacent ullage rocket fairings, and to a small extent on the extended solar panels. Adequate design numbers for these fields can be provided in 30 days.



E.G. I think this is a most worthwhile undertaking. Since so little is known about all this, maybe we should let additional study contracts in this area. I could imagine that Dr. Hermann's U of Ala Research Institute has qualified people who could make valuable contributions. Please advise.

Notes

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NOTES 2/5/68 BALCH
2/5/68

S-II-504 Testing - Acceptance test firing on 1/30/68 was terminated after 17.4 seconds as a result of indicated excessive pressure in the LOX tank. At cut-off there was also an indication that the P.U. computer failed. It has been determined that the indication of excessive LOX tank pressure was caused by LOX entering the annular space of the LOX pressurization mast through a sense port near the top of the mast. During stage pressurization, the LOX in the annular space boiled and gave an indication of overpressurization in the LOX tank. The location of the LOX ullage measurement will be changed for static firing. Conditions that gave the high pressure indication will be duplicated in the next static firing and recorded on a flight measurement to verify the cause. The P.U. probe in the LH₂ tank was found to have an open circuit. The LH₂ tank was entered, and it was determined that the probe could not be repaired in the test stand (vertical position). North American - Rockwell is going to request a waiver against the propellant management system for static firing. Full-duration static firing is now scheduled for Thursday, February 8, 1968. ✓

S-II-505 Stage - Information has been received that stage was shipped from Seal Beach on 2/3/68. Expected date of arrival at MTF is 2/17/68. ✓

S-IC-D Stage - Stage was removed from B-2 test stand on 2/1/68 as planned. ✓

S-IC-506 - Schedule still calls for arrival at MTF on 3/1/68 and installation in stand on 3/5/68. ✓

Legal Affairs - The seventh formal claim as a result of the S-IC-505 test firing on 8/25/67 has been received. The property alleged to have been damaged is owned by C.M. Lumpkin of Carriere, Mississippi. After further investigation of the property, recommendations will be forwarded to MSFC. ✓

We have received a copy of the complaint in the suit by the widow of John Stell, who was killed in an accident at MTF. The Government has sixty days in which to file an answer to the complaint. ✓

Public Affairs - Thirty-two members of the New Orleans Consular Corps and over 100 other educational, governmental, business and civic officials from the state and local area were at MTF to witness the firing of the S-II-504 on 1/30/68. ✓

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ATM PRELIMINARY REQUIREMENTS REVIEW (PRR): The ATM PRR Board met on February 1, and established final disposition of the Review Item Discrepancies (RID's) referred to by the pre-Board screening last week. Significant results were: (1) A meeting will be arranged with Mr. Mathews to discuss the question of redundant digital computers and star trackers, requested by MSC; (2) The Control and Display Working Group was agreed to and assigned a target completion date of March 29, 1968. Dr. Smith was identified as the MSC lead man; and (3) A Pointing Control Working Group was also established with Dr. Smith (MSC) and Mr. Moore (MSFC) as the lead representatives. ✓

CONTROL MOMENT GYRO (CMG) DEVELOPMENT: A CMG technical status review with Bendix is scheduled for February 6 at MSFC. The first production gyro was brought here for display during the Thompson visit and has been returned to Bendix for final checks prior to shipment back to MSFC later this month. This is the qualification CMG and the first contract delivery unit. ✓

ORBITAL WORKSHOP HABITABILITY STUDY: The first phase of the OWS Habitability Study of Loewy/Snaith, Inc., was completed on January 31. This phase concentrated on an analysis of the AAP-2 Workshop. A final written report is due in the near future and arrangements have been made for an oral report at MSFC on February 28. This report will be held in two sessions: 10:00 a.m. to 3:00 p.m. with IO/R&DO personnel, and 3:00 to 4:00 p.m. with Dr. von Braun. The Loewy Study is being extended for two months (to March 31) with primary emphasis being shifted to future CWS missions. It is expected that NASA Headquarters will manage any effort required beyond this extension. ✓

MSC DEVELOPED EXPERIMENTS REVIEW MEETING: A meeting at MSC on January 30-31, disclosed that a substantial number of MSC developed experiments are behind schedule since many are not yet under contract and have a two year leadtime. Headquarters delay, inadequate funds, and Apollo manpower priorities were stated as reasons for delay. ✓

2/5/68

Bate

F-1 ENGINE During the second Overall Test Sequence (OATS) on vehicle SA-502, RJ-1 from gimbal actuators leaked on several thermal insulation panels on two engines. Inspection revealed that one insulation panel was internally contaminated by the RJ-1. This panel was replaced. Protective covers have now been installed on all outboard engines to protect the insulation until just prior to launch. ✓

J-2 ENGINE The retrofit of improved timers into the J-2 engine electrical control assemblies (ECA) for AS-502 is now expected to be completed without launch vehicle schedule impact. The "improved timers" incorporate improved electrical components and eliminate the transistor whisker growth failure mode previously reported. The AS-502 schedule is being met by diverting ECA production resources at Rocketdyne to support a two-shift, seven-day work week and utilizing the ECA's removed from AS-503 for timer retrofit. The S-IVB-502 ECA was replaced during the past week and the remaining units for the S-II stage should be at KSC by 2/11, thus supporting the 2/13 deadline established by KSC. Timers for AS-503 and subsequent vehicles are being expedited from Tempo Instruments of Long Island, N.Y. Representatives of Rocketdyne, Tempo, and MSFC-R&DO have been in contact with the component suppliers and delivery schedules are improving. The Saturn V Program Office has been requested to investigate the 5/2, "drop dead" schedule established by KSC for AS-503 and to provide as much relief as possible. The retrofit schedule for AS-503 is not firm at this time, but maximum effort is being expended in support of vehicle schedules.

Further analysis of the failed timer from AEDC reported last week, has revealed that no whiskers were present in the transistors and that the failure was a result of the unwetted solder joint. However, we have experienced an additional timer failure on the S-II Battleship which was traced to transistor whiskers. ✓

GENERAL To minimize the effect of recent schedule stretches on the cost of our rocket engines, I have requested that an extensive study be made of Rocketdyne's facility and equipment utilization. The need for this study became quite clear when we received the proposals for stretching of engine deliveries (\$9.9 M to stretch the F-1 14 months and \$16.9 M to stretch the J-2 20 months -- a 15 to 25% increase in the unit price of the engines). The study group, which is composed of Engine Office, Test Lab, Comp Lab, and Qual Lab personnel and is chaired by Mr. Vern Looney of my office, visited Rocketdyne the week of 1/15. In general, they found that there is rather poor utilization of the facilities and machine tools and that significant improvements are possible. On Friday (2/3), I met with Messrs. Bill Brennan (Vice President, LRD) and Wally Fore (Vice President, Manufacturing & Facilities) of Rocketdyne to review the findings of the group. Although no detailed agreements were reached, we agreed that a very penetrating "scrub down" would be conducted of all facilities, warehousing, machine shop capability and practices, manpower, etc. ✓ I will keep you posted as we progress. ✓

NOTES 2/5/68 CONSTAN

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Nothing of special significance.

NOTES - 2/5/68 - EVANS

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Nothing of significance to report.

NOTES 2/5/68 FELLOWS

2/5/68

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1. Closeout of Western Operations Office: With the closeout of the Western Operations Office (WOO) arrangements have been made with Industrial Operations to provide necessary on-site administrative services from the Resident Manager's Offices (RMO) for 75 R&DO personnel located on the west coast. Travel authorization approval has been assigned to the RMO effective January 31. Payroll checks are mailed direct to personnel effective with the December 17-30, 1967, pay period. Personnel files were returned to MSFC for maintenance. ✓

2. Neutral Buoyancy Change House: A trailer has been transferred from R-TEST to R-ME for refurbishment and modification for use as a shower room and change house for the Neutral Buoyancy Simulator. F&D is preparing the drawings for modification of the trailer. ✓

3. Quality Support to Mr. Rees: R&D Operations has been requested by Mr. Rees to provide 30 civil service inspection personnel to support the Apollo Special Task Team activities at Downey. Support is particularly needed in qualification test monitoring, receiving inspection, and in pre-inspection test to certain manufacturing operations. In response to Mr. Rees' request, Mr. Cook asked the laboratories and Industrial Operations to determine the availability of individuals whose background or experience could be made available to support the Task Team requirement. Of the 30 individuals desired, 13 have already been provided by the Quality Laboratory. Efforts to identify the remaining personnel are continuing. ✓

S.F.

For how long?

B

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use their capabilities very
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Note

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1. TRANSISTOR SPECIFICATION WORKING GROUP MEETING: The Defense Electronics Supply Center (DESC) Transistor Working Group meeting number 13 was held at MSFC January 15, 16 and 17, 1968. This was a meeting of all military services, NASA, many transistor manufacturers and users to generate MIL-SPEC and standards. Several specifications were completed and several initiated. Of particular interest to MSFC were three Transistor Safe Operating Area Test Methods originated by this Laboratory for incorporation into MIL-STD-750 (Standard Methods for Transistor Testing). These methods have been accepted and will be incorporated into the standard in the near future. ✓

2. LEAK DETECTION: Work has been initiated on preparing an MSFC specification for the use of different type leak detection methods. The specification will describe the various approved types of leak detection methods, their limitations, their limits of sensitivity, and their application. It is anticipated that the specification will become the guidelines for all MSFC contractors to follow. ✓

D.V.
 Hope we told
 them about our
 whisker
 growth problem
 with the
 ECA boxes
 on the
 J-2 engines!
 B

1. Optical Rendezvous and Docking System. This system has been under development by Astrionics for several years and there have been hardware contracts for the optical sensing subsystem with the ITT Corporation. During our visit to Martin Denver this summer, you witnessed a large scale simulation with the developed hardware. Subsequent considerations by MSFC were to further develop the system for future ATM vehicles, and complete a development plan to fly the system as an experiment. MSC personnel were totally on board with our activities but considered it to be applicable for later vehicles. Several sources from MSC and at the Headquarters level have now expressed renewed interest in what has been developed and it has been requested that arrangements be made for the ITT Corporation to discuss with MSC the hardware which has been developed. These arrangements have been made; a meeting will be held tomorrow (2/6/68). One potential application is for an unmanned rendezvous and docking of the LM/ATM to the cluster immediately following the launch phase. I wanted to bring this subject to your attention and ask for your guidance in so far as further development and/or application of the system by MSFC.

2. ATM PRR (Preliminary Review Requirements Board). The ATM PRR Board met last week and the significant results were:

a. Establishment of ad-hoc group for the ATM controls and display to define the requirements and design criteria. Bill Horton and Dr. Glen Smith (MSC) will co-chair this group.

b. Establishment of an ad hoc group for the ATM pointing control and related control requirements for the other elements of the cluster during the ATM mission. Brooks Moore and Mr. Rege Machell (MSC) will co-chair this group.

c. Requirements for redundancy (digital computer, star tracker, digital command) were to be determined by MSFC. For this activity, we will close the loop with Mr. Mathews, tentatively, by February 21, 1968.

Considerable discussion revolved about the concept of the PRR, the efforts involved, the efficiency of the operation, etc. No specific agreements or methods of resolution were reached in these discussions. ✓

L.H.

In view of MSC concern about the unmanned ATM docking to the cluster this scheme becomes more attractive every day. Suggest we not only define an "unmanned AAP docking experiment", but study all aspects (methods, hardware, flight procedure, time required for development and funds needed) to actually use this method for ATM docking. Please coordinate this study with Leland Bellis.

B 2/26

S-1C STAGE (MSFC)

One lox fill and drain test was conducted on the S-1C-T stage February 1, 1968. This was the final test and completes the program requested by R-P&VE. ✓

S-11 STRUCTURAL TEST PROGRAM

The electronic trailer from R-P&VE was placed in position at the tower on February 1, 1968. Boeing and BECO personnel are expected to start work on installation of the instrumentation system this week. ✓

MOBILITY TEST ARTICLES

No activity during this period. Capt. Lee Scherer will visit MSFC on February 16, 1968. We have been requested to prepare the MTA's for him to drive and also brief him on the test program. He will visit Test Laboratory from 12:30 p.m. to 1:30 p.m., Friday, February 16, 1968. ✓

APOLLO TELESCOPE MOUNT AND S-1VB WORKSHOP

The component test fixture for air pad testing was delivered and has been installed. Testing will begin as soon as R-ASTR delivers the redesigned hardware. The hardware is presently scheduled to arrive next week. ✓

K.H.
that's
that? B

S-1VB (MSFC)

Test S-1VB-052S was conducted at the S-1VB Test Stand on February 1, 1968, for a duration of 1 second idle mode, 74 seconds mainstage and 1 second "post-mainstage idle mode". The "post-mainstage idle mode" was planned for 5 seconds; however, the test was erroneously terminated by the fuel turbopump overspeed trip (automatic) 4 seconds short of the planned 5 seconds. All test objectives were met with the exception of the "post-mainstage idle mode". ✓

S-1B (MSFC)

Test SA-50 is scheduled for February 6, 1968. This test is to be a 15 seconds test with instability, inducing bombs to be installed in two engines, one inboard and one outboard, positions No. 1 and No. 7. Test SA-51 is scheduled for February 13, 1968. ✓

S-11-4 (MTF)

The acceptance firing of S-11-4 was attempted on Tuesday, January 30, only to be aborted at T+17 seconds due to what has been determined to be an erroneous measurement of lox tank ullage pressure which appeared to go off the upper scale reading. The cause of this erroneous measurement (not instrumentation) has not been determined at this time. After cutoff it was also found that the LH₂ PU probe had failed which would have resulted in a shorter than planned duration even if the lox tank pressure abnormality had not occurred. Both lox and LH₂ tanks have been entered to trouble-shoot these problems. ✓

1. ATM DISTURBANCES: This problem was begun approximately one year ago in a highly simplified form. It has been expanded to a very large hybrid problem, which presently includes the simulation of Control Moment Gyro (CMG), H-vector control, gravity gradient and aerodynamic disturbances, momentum dump scheme, and the three-dimensional spin vector display. ✓

R-COMP-RS is currently providing 36 hours a week in support of this problem on the 8900 Hybrid System. Future efforts will include the Experiment Pointing Control (EPC), bending, and Astronaut Motion. ✓

2. REDUCTION IN FORCE (RIF): The Industrial Systems Branch, which is responsible for management type computer applications supporting Industrial Operations and the staff offices has been severely affected by the current RIF actions. Of nine civil service personnel, four are affected (two directly by RIF notices, two others are leaving to join the Sentinel Command, presumably for better job security). These employees are project officer level (GS-7, 12 and 13's) trained in computer applications, and cannot be replaced. ✓

3. 3-G Acceptance: Start of the Third Generation computer (UNIVAC 1108, Phase 1) acceptance has been delayed from February 1, 1968, to February 9, 1968. The delay was initiated by MSFC inasmuch as power wiring could not be completed on time. Lack of materials was cited as the reason. Installation at Slidell is proceeding from February 1, 1968, as scheduled. ✓

2/5/68

B
2/12

SRT Obligations - Recent actions initiated by P&C to secure from Headquarters approval for obligation of funds individually for each of our proposed SRT contracts are not yet being reflected in the total of funds obligated. However, progress is made toward thawing the procurement freeze using this required ice cube by ice cube approach. The number of requests to Mr. Vecchietti's office from all Centers has now reached a level at which requests for concurrence from his office to the technical program managers in the Program Offices are having to be made verbally by telephone. As the flow of requests increases, it may be impossible for Vecchietti's group to maintain their current very good response time of two working days while still securing individual review (even verbally) of each proposed contract action by the pertinent program personnel. To assist in avoiding bottlenecking of the MSFC requests because of lack of program office concurrence, P&C and the Experiments Office are working together closely to assure that the program managers in Headquarters are alerted to actions coming up for approval and that they have no unanswered questions on actions with which they must concur. Mr. Miles spent last week in Headquarters assisting in this effort. Using this approach, we anticipate that the approval mill will run fairly smoothly for us even when the flow of requests begins to inundate the Vecchietti office. ✓

Payload Working Group - Dry Launched Workshop Study - Mr. Capowski of the Experiments Office attended the meeting of this group in Washington on January 31. His status in the group is somewhat ill-defined; he is at this point essentially an observer who will ultimately have to figure means of implementing the study results into individual, defined experiments. From his report, I am becoming increasingly concerned that the payload planning currently in progress, which is generally compatible with the guidelines given the group when it was established, may be more of a detriment than benefit to the total study effort. The discipline areas currently contributing the majority of experiments are earth surface survey technologies and astronomy. Requirements to support each are in most cases mutually exclusive. Neither places a highly essential responsibility-type role on the man-in-space. Configuring vehicles, establishing mission constraints, detailing resources requirements (and apportionments) for payloads which have a high probability of ultimately becoming "poor customers" could be highly detrimental to keeping the dry workshop sold. Perhaps, less involvement with payload specifics (weights, power, thermal environment, time lines, etc. of individual experiments) and a more generalized look at potential, total objectives and payload concepts might be worthwhile during these early study phases.

B.L.

Do you have any specific suggestions on how I could help? Should I call Doug Lord? Shall we get GEM as Chuck Matthews into the act? B

B
2/12

Neutral Buoyancy Tank: The mechanical erection of the new large tank and platforms is complete as is the installation of the water circulating and filtering equipment. At present the steel work is being painted and Technical Services are working on the installation of the tubing for the air supply systems. The elevator for access to the top platform will not be ready for installation until about August, but we will be able to make do with "lift-a-lofts" until then. The instrument trailer has been located and all utilities connected. The cabling for instrumentation, communications and video systems as well as all electrical panels are being fabricated in our shops. There are several hundred cables to be made ranging in length from one foot to 250 feet. The transfer of the instrumentation from the old to the new tank and the installation of other electrical equipment will begin within about two weeks. The Operational Readiness Inspection (ORI) Committee has virtually completed its work for the existing small tank. Their findings have been most helpful for certain aspects in the preparation for use of the new large tank. ✓

Payload Module Rack: When the mission for the Payload Module was cancelled, it was decided to continue the fabrication of this PM Rack using the existing hardware and building it to the basic ATM configuration. Although this Rack does not incorporate the lower ring which had been added recently, it will serve for limited structural tests and for a tool try-out and debugging purpose. This Rack is now being assembled on the assembly fixture in Building 4755. The optical checkout of the set-up proved the rings and vertical beams to be within tolerance. However, some modifications in tooling and pending changes for the side beams of the Rack have slowed down the operation. ✓

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2/12

1. REVIEW BY BOEING OF S-II STRUCTURAL TEST PROGRAM: At the direction of their Washington TIE Office, the Boeing/Huntsville structures group has evaluated the S-II Lightweight Design Structural Test Program. The results were presented informally by Boeing/Huntsville to our Structures Division and consisted of answers to the following specific questions: (1) Are contractual design/test criteria unnecessarily severe in light of current data? (2) Will test program qualify S-II lightweight structure? (3) Will test program supply information to assist fracture mechanics assessment? (4) Does present test schedule support Apollo program? (5) Can test program be accelerated? (6) Can test program be modified to supply more useful data? (7) Will test-to-failure provide valuable information? Although the answers to these questions (which were transmitted to Boeing/Washington TIE on 1-31-68) were favorable to MSFC, we are highly concerned about the loss of manpower to mainline Saturn activities while we participate in reviews and repeated explanations to those chosen to check us.

B.L.
I'm concerned, too. But I guess there's not much we can do in the present climate
B

2. S-II-504 INSULATION: In my notes of 1-25-68, the failure of the rubber doublers on the S-II-504 insulation was identified. Those defects were repaired and the stage was tanked again after which about 50 similar defects were found in the factory-applied doublers. During the initial tanking the ambient temperature was about 40°F; during the second tanking the ambient temperature was about 70°F; thus, the postulation that the severe weather conditions cause the failures was not substantiated. As was the case during the initial tanking, however, the rubber doubler failures occurred at the time of LH₂ tank pressurization, closely linking the failures to the reduced skin thickness (higher strain) on the S-II-504.

B.L.
Could I get a 2 or 3 page explanation on this rubber doubler problem and what we plan to do about the 504 defects
B

3. SPRAY FOAM INSULATION: As a result of meetings with North American Rockwell (NAR) personnel, agreement has been reached to utilize a spray foam repair procedure (previously, pour foam repairs had been made in the field) for a field repair demonstration which is scheduled for the second week of February. NAR is to accelerate efforts to find an acceptable pour foam and is to evaluate means to make spray foam repairs at MTF and KSC. The disbanding of the NAR insulation group has severely jeopardized the program.

B.L.
What's that??
Killic X-15 tests also in jeopardy, I'm really concerned about our irrevocable commitment to foam insulation effective SII-8,
Please comment. Action w/ NAR indicated?
B

4. ORBITAL WORKSHOP: Light evaluation tests were completed 1-30-68, using the OWS mockup as the test model. A complete set of flight type lights including the initial entry lights was installed and evaluated with respect to the astronaut tasks to be performed. Off-center participation in the tests included representatives from McDonnell Douglas, MSC, and Loewy-Snaith, Inc., Industrial Design Consultants.

5. S-II FRACTURE MECHANICS: We spent about a half day with Bill Hittinger and Jim Menard (BellComm) last week reviewing the fracture mechanics situation and recent related activities in preparation for a presentation to the OMSF Management Council if necessary.

6. AAP MECHANICAL PANEL MEETING: The 5th AAP Mechanical Panel Meeting is tentatively scheduled for 2-28-68 at MSC. The Panel has tentatively scheduled an ICD working group session at MSC on 2-27-68. The ICD working session will probably be limited to the prepared ICD's (structural/mechanical, thermal/ECS, and environmental ICD's for the AM/MDA and AM/S-IVB interfaces).

NOTES 2/5/68 MAUS

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OPENING OF NASA AUTHORIZATION HEARINGS - The House Committee on Science and Astronautics will hold hearings on February 7 and 8. Mr. Webb and Dr. Naugle will testify on the 7th. The Center Directors have been asked to attend on the 8th. Dr. Rees will represent Marshall on that day when Dr. Mueller, Mr. Finger and Mr. Lilly are among those scheduled to testify. ✓

Manned Space Flight Subcommittee hearings will begin on February 19. Executive Staff is obtaining status inputs from MSFC operational elements in preparation for your testimony on February 21. ✓

ADP MANAGEMENT STUDY - Mr. Fairman, from Mr. Van Staden's Office, KSC, was here last week to review and discuss the study we recently completed of our ADP operations, which was conducted for us by Booze, Allen and Hamilton. KSC is planning to initiate a similar study of their ADP operations with emphasis on the optimum arrangement of computer capability to satisfy both internal and external requirements (base support and local area contractors.) We furnished them documentation on our study and discussed our approach for implementing study recommendations. ✓

NCTES 2/5/68 RICHARD

2/5/68

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2/12

Development Experience Checklist: We have initiated an effort in R&DO to develop a checklist to assure that the lessons and procedures gleaned from our previous experiences (Saturn I, IB, V, and Cluster 1) are not lost for new programs. One immediate use of the list is the Dry Workshop; however, the intent here is much broader and should encompass all items even if not applicable to the Dry Workshop. It should consist of "don'ts" as well as "do's." Past "show-stoppers," or those items which would have been "show-stoppers" if they had not been caught in time, are the real key to the list so that similar situations/conditions can be avoided in the future. The list should be of broad scope including the fields of design, manufacture, operations, and unique management tools or techniques. ✓

NOTES 2-5-68 RUDOLPH

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1. AS-502 Launch Vehicle at KSC:

o The linear shaped charge adjacent to the S-IC fuel tank jammed during installation and had to be removed. The same type problem was encountered on AS-501. Planning is now underway to install this ordnance item at the pad. ✓

o Rollout is now scheduled for 6:00 a.m., Tues, 6 Feb 68, and the vehicle is expected to arrive on pad by 4:00 p.m. ✓

o Flight Control Computer (FCC) experienced noise on the output signal. The unit was sent to Astrionics on Sat., 3 Feb 68, where #2 pitch amplifier was found to be faulty. The FCC was sent to Electronics Communications, Inc. (ECI) for rework the same day. ECI is working 24 hours per day on the FCC for amplifier replacement and RFI filter modification. After full acceptance test, the FCC will be shipped on Wed., 7 Feb 68, to KSC. No impact on launch schedule is expected. ✓

2. AS-503 Launch Vehicle at KSC: All stages of the vehicle, including the Boiler-Plate 30 spacecraft, completed erection, Fri., 2 Feb 68. ✓

3. S-II-4 Stage at KSC:

o Captive firing is now scheduled for Thurs., 8 Feb 68. ✓

o Cryogenic proof test now scheduled for 21 March 68. ✓

o Total delay because of cryogenic proof testing is about 4 1/2 weeks. ✓

4. S-II-5 Stage at Seal Beach:

o Weld repairs and inspections have been completed. The stage will not be re-pneumostat tested because the weld repairs will receive adequate verification in the cryogenic proof test. ✓

o Stage was shipped from Seal Beach on Fri., 2 Feb 68, and is due to arrive at MTF on Thurs., 15 Feb 68. ✓

NOTES 2/5/68 SPEER

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1. AS-502 MISSION RULES: MSFC inputs to the AS-502 Launch Rules are essentially complete with no major open items. These rules will be reviewed by the Launch Director (Petroni) and Mission Director (Schneider) at KSC on 2/7. MSFC inputs to the Flight Rules are about two-thirds complete, the major open work being completion of documentation and sign-off. The Flight Rules will be reviewed by the Flight Director (Charlesworth) and Mission Director at MSC on 2/13. We have introduced a new handling procedure for MSFC review of the Flight Rules, with the goal of obtaining more effective validation. The new procedure calls for sign-off of the rules by cognizant Center elements on an item-by-item basis. We are working with the R&DO labs and Program Office to close all open items prior to the February 13 review. ✓
2. AS-502 CRITICAL DATA DEFINITION: We are currently identifying all critical network data needed to assess the accomplishment of each 502 mission objective and operational test, as applicable to the AS-503 manning decision. With appropriate inputs from Center elements and contractors, we will identify a data retrieval plan with emphasis on a near nominal AS-502 mission. ✓
3. OWS OPERATIONS REVIEW: As specifications for instrumentation systems design for the Orbital Workshop (OWS) we have defined a baseline set of flight control parameters for passivation, activation and habitation. Inputs from P&VE and MDC have been utilized. These data were presented in an Operations Review on 1/31 with MDC and MSC participation. This baseline is now in final review prior to formal issuance. ✓

NOTES 2-5-68 Stuhlinger

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1. ASTRONOMY SUBCOMMITTEE MEETING: The Astronomy Subcommittee, chaired by Dr. N. Roman, met for three days last week at JPL, Jean Olivier (ASO) gave a presentation on the OASF study, and I gave presentations on radiation hazards in earth orbits, and on post-Apollo payload studies. The highlight was a very good presentation by Willis Foster on the OWS Planning Study (Doug Lord's Joint Action Group).

Throughout the meeting, disappointment and criticism was expressed because in the workshop study effort so little attention is being paid to astronomy. Astronomers always see themselves at the trailing end; they have to follow the workshop planners over an extremely long, cumbersome, and even erratic path, and they must accept for their scientific experiments whatever is left over after the engineering is done.

Willis Foster made the statement that for the next five or six years, astronomers will be the only customers for the OWS (besides biomedical experiments which cannot be considered at present a sufficient justification for the OWS), and that astronomical projects and programs must be integrated in our workshop studies from the very beginning. It is quite evident that this trend is not recognized by astronomers at the present time. The chairman expressed the feeling of most of the astronomers in these words:

"The Doug Lord study does not take advice from the astronomers. From the astronomer's standpoint, it appears better to start planning now an astronomy program, and to select the carrier vehicles and spacecraft which are best suited for this program."

I believe that the interface between astronomers and spacecraft planners is of absolutely vital importance, and that a determined effort should be made to establish a workable, efficient interface as early as possible. If we do not succeed in establishing this cooperative interface, we will lose our principal customer, as identified by members of Headquarters, before the workshop has come to life. ✓

That's all
my line.

NOTES 2/5/68 TEIR

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APOLLO 5 (LM-1) MISSION RESULTS: The Apollo 5 (LM-1) ten-day report has not appreciably changed the Apollo Program Manager's earlier conclusions on the LM-1 mission success. This report states, "Pending full evaluation of the data and verification of satisfactory systems performance, this mission is expected to satisfy all LM objectives required for manned earth-orbital flight." ✓

As indicated last week, we have put a hold on the shipment of all SA-206 stages pending a final decision on man-rating the LM. ✓

1. Saturn V Workshop, 2/2/68, Hqrs. Meeting Recap:
Configuration:

The configurations adopted for further consideration are the proper ones, and will allow us to provide more detail by March 1 deadline. The two "B Configurations" evolved are: (1) Minimum change to the wet workshop version, and (2) a more advanced one which uses wet workshop elements (solar cells/airlock/ECS sub-elements, etc.) and also includes use of LOX tank, additional solar cells, 6-man capacity, etc. These two bracket what is "most likely" DLWS in the '72 period. The "C Configurations" are still optimistic if we are realistic as to funding, availability and schedules, even for a '73 launch. The meeting helped to de-emphasize the "way out" type system such as 33' diameter and artificial G so that we are now looking at the type of "next step" which could come after the "B" and be launched in the '74/'75 time period.

Logistics:

The Saturn IB + modified CSM is still the strong horse logistic support for the B Configuration in the '72 (or maybe '73) launch, assuming no sweeping agreements between NASA & DOD on MOL and T III. The big question for logistics of "B" is what modifications will be made to the CSM. It looks like a "Dormant CM" is a must, which could possibly impact back into Cluster I. Logistic support for the "C" is fairly open in terms of "best", and numerous vehicles (IB, IB + MM, T III, SIC/SIV B, etc.) and spacecraft (modified CSM, Big Gemini, and completely new developments) are being considered.

Experiments:

Scope and magnitude of experiments proposed for both B & C are still optimistic; however, experiments task team will provide useful information and it will be more realistic by the end of the study. Two significant items presented have a major influence on the complete study: (1) from the expert viewpoint, the station should be below 200 mi. altitude for maximum ER exploitation, and definitely below 300 mi. if ER is to be done at all, and (2) there was no strong desire to go to polar orbits and that 50° inclination would be adequate (probably less would be acceptable).

Mission Analysis:

The higher orbits place considerably greater requirements on logistic systems and "operations" resulting in significant new requirements for ground facilities and systems.

Resources:

Resources presented what they considered to be a realistic forecast of what would be available to "buy" a DLWS "Mission, and indicated clearly that a "B Configuration" is about all we could afford and even that will probably be later than we currently show it, particularly if we start funding a post DLWS activity in the '71 time period.

Schedules:

No Schedules presentation was made, but the Schedule story jibes with Resources.

In summary, I feel you and Dr. Mueller helped to focus the study effort on the proper end of the spectrum and results for the 3/1/68 final review will be more meaningful.

Feb. 12, 1968



NOTES
MR. GORMAN'S COPY

2/12/68 w/Comments

None marked for DEP-A.

SATURN IB PROGRAM OFFICE

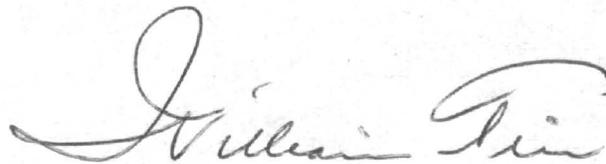
MEMORANDUM

DATE *B3/20*
March 20, 1968

TO: Dr. von Braun, DIR *3/21/68*

SUBJECT: Bomb Test, S-IB-11 Engines *958
2/28
7.4/9*

With reference to your question on my February 12, 1968, notes (copy attached) concerning the nature of the thrust peaks during the bombing of the two engines on S-IB-11 and the duration of the peaks, the attached reproduction of actual data show the type of pulses observed. These data are from strain gauges located on the thrust structure and the timing marks on the chart are 10 milliseconds apart. The low frequency component is approximately 145 cycles/second. The variations in times and amplitudes which you may have seen in different reports can be attributed to reading inaccuracies, or difference in definition of dampout time.



William Teir

Enc:

As stated

cc:

I-DIR, Gen. O'Connor



File 2/12/68 NOTES

Kinn

NOTES 2/12/68 TEIR

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SATURN IB PROGRAM: Dr. Mueller has asked Gen. Phillips to consider keeping the Saturn IB Program in a posture such that we will have the capability to launch a Saturn IB dual mission (SA-206/207 or SA-208/207) on four months notice at any time up through the launch of SA-504. After a brief review, we feel that we (MSFC) can support such a requirement without too much impact. However, it would cause considerable impact at KSC and MSC to stay in a position to support a dual Saturn IB launch with four months notice. Gen. Phillips' program office has given him an informal memorandum indicating the above impacts, however, we have received no definite directives. ✓

SECOND BOMB TEST ON S-IB-11 ENGINES: Two engines on S-IB-11 were bomb tested on February 6, 1968. The data are still being analyzed, but a first look at strain gauge data indicates an increase in thrust of approximately 50% for the inboard engine and approximately 45% for the outboard engine. The time from bomb detonation to thrust dampout for both engines was approximately 20 to 40 milliseconds. Data from the first bomb test have now been further refined and the thrust increase has been established at approximately 40%.

B.T.

Is that a transient thrust peak during the bombing? How long does it last, if dampening time is 20 to 40 ms?

B

FEB 27 1968

SIB-11 - Engine Bomb Test

STRAIN GAUGE READINGS

→ 10ms ←

TWO DIFFERENT
INBOARD ENGINE GAGES
ON BOMBED ENGINE PADS

Measurement # AS 204-9

Measurement # AS 205-9

FOUR DIFFERENT
OUTBOARD ENGINE GAGES
ON BOMBED ENGINE MOUNTING PADS.

Measurement # AS 206-9

Measurement # AS 207-9

Measurement # AS 208-9

Measurement # AS 209-9

NORMAL THRUST
READING
- 1500 μ IN/IN

-20
33
IN

NORMAL THRUST
READING
- 950 μ IN/IN

-14
47%

CONTINUOUS TIME RECORDING

G.T.C.H.

G



10 mill/sec
→

ZERO THRUST FOR
GAGE AS 204-9

NORMAL THRUST
READING
-1500 μIN/IN

-4000 μIN/IN
FULL RANGE
FOR GAGE AS 204-9

-2250 μIN/IN
50% INCREASE
IN THRUST

-800
-150

10 ms

2.7 ms

L THRUST
NG
μIN/IN

-900
-750

ZERO THRUST FOR
GAGE AS 206-9

-2000 μIN/IN
33% INCREASE
IN THRUST

≈ 145 cps

-3500 μIN/IN
FULL RANGE FOR
GAGE AS 206-9

-1400 μIN/IN
47% INCREASE

-1000
530
1200

-200
FULL
GAGE

16:40:7.730

16:40:7.880



0 m/s
↓

-750 μIN/IN
50% DECREASE
IN THRUST

-800
-1500

AS 201-9

INBOARD ENGINE
GAGES

AS 205-9

AS 206-9

OUTBOARD ENGINE GAGES

AS 207-9

ZERO THRUST FOR
GAGE AS 208-9

AS 208-9

-2000 μIN/IN
FULL RANGE FOR
GAGE AS 208-9

AS 209-9

CONTINUOUS TIME RECORDING

10140 0300

10140 0300



AS 201-9

AS 205-9

AS 206-9

AS 207-9

AS 208-9

AS 209-9

INBOARD ENGINE
GAGES

OUTBOARD ENGINE GAGES

ORDING



NOTES 2/12/68 BALCH

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2/12/68

S-II-504 Testing - A full duration static firing (349 seconds) was successfully accomplished on Saturday, 2/10/68. Ignition occurred at approximately 2:39 p.m., and test termination occurred as planned at the 2% LOX sensor. There was only one minor interruption to the almost perfect countdown. ✓ A preliminary examination of firing data indicates that all test objectives were met. ✓ There was some insulation damage as a result of the firing, but the exact nature and extent of this damage has not yet been determined. ✓

S-II-505 Stage - Estimated date of arrival at MTF is still 2/17/68. Installation of stage in A-1 test stand is tentatively scheduled for 3/8/68. ✓

S-IC-506 Stage - Schedule still calls for delivery to MTF on 3/1/68 and installation in test stand on 3/5/68. ✓

Public Affairs - Mr. Phillip P. Dickinson, a staff member of the House Subcommittee on NASA Oversight, is expected at MTF this week, with representatives from NASA Headquarters and MSFC, to discuss C of F projects which have varied 5% or more from the Congressional authorization. ✓

2/12/68

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CAPTAIN SCHERER'S VISIT: Captain Scherer's visit for February 16, has been postponed until later this month due to the forthcoming Congressional hearings. He plans to show the Surveyor and Lunar Orbiter pictures to senior MSFC staff members during his visit to MSFC, as requested by Dr. Rees. ✓ Captain Scherer will make essentially the same presentation he made at the last Management Council meeting. ✓

JET PROPULSION LABORATORY VISIT: Jim Burke and Herman Bank of JPL visited MSFC last week to assist in updating MSFC's information on lunar surface characteristics and to discuss the potential design and development of an unmanned roving vehicle. ✓

GODDARD SPACE FLIGHT CENTER VISIT: Five MSFC ATM personnel visited GSFC for the purpose of discussing some of the concepts, procedures and problems experienced with the Orbiting Astronomical Observatory (OAO) program. ✓

A considerable degree of similarity was found in the two projects. For example, their sequence in acceptance testing is essentially the same as ours. They are also concerned about contamination during thermal vacuum testing and take careful sampling prior to and during tests. The assembly and testing activities take about the same time as ours. We agreed to identify specific counterparts in some of the mutual problem areas and follow up with more detailed discussions. ✓

ORBITAL WORKSHOP: The Crew Station Review with MSC was initiated this morning with an overall briefing. The walk-through will occur all this week with a detailed discussion on Friday with MSFC designers and the Principal Investigators. ✓

AAP AD HOC COMMITTEES: Several ad hoc groups have been set up recently as a result of Preliminary Requirements Reviews, Preliminary Design Reviews and program baselining sessions:

1. ATM Control and Display - Set up to resolve problems primarily centered around astronaut operation methods with the control and display panel;
2. ATM Pointing and Control - Set up to resolve commonality of control directions, automatic sequencing for initiation of controls and crew time for CMG dumping in backup mode;
3. AAP Cluster Attitude Control - Set up to rebaseline the stabilization requirements and methods primarily in light of the new AAP-3A 56-day revisit mission,
4. ACE versus ESE for ATM - Set up to fully impact use of Auxiliary Checkout Equipment (ACE) for ATM at KSC for von Braun/Debus meeting. ✓

NOTES 2-12-68 BROWN

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H-1 ENGINE The second bomb test on S-IB-11 was satisfactory. Preliminary data indicates that the engines (one inboard and one outboard) damped in approximately 10 milliseconds. ✓

F-1 ENGINE The lead time of the F-1 engine dictates that we revise, resubmit and obtain Headquarters approval of our AAP procurement plan by April in order to support the current AAP schedule (ML-13A). This will be the fourth time in eighteen months that we have submitted a procurement plan for F-1 engines for AAP. Prior submissions, though made in response to then existing schedules and/or guidelines, have not been approved because of the uncertainty in the Apollo Applications Program. ✓

J-2 ENGINE After a successful 80-minute restart couple on 1/31 and an attempted couple on 2/6 (terminated because of a fire in the cell), testing at AEDC has been suspended so that the simulated S-II fuel inlet duct can be installed. Based on a compressed installation schedule, the next air-on period (primarily for leak and flow checks of the duct) is anticipated on 2/15. ✓

On 2/7, the last of six electrical control assemblies for retrofit of SA-502 with improved timers was delivered to KSC. Rocketdyne had originally committed themselves to a 2/13 date. ✓

S-II-504 was fired successfully for 350 seconds. Preliminary data indicates all engines operated normally. ✓

GENERAL In mid-December, Dr. Dorman visited MSFC and was briefed on the engine sustaining engineering/production support program. (You saw him in the staff luncheon.) He also had Guy Thibodaux of MSC, Irv Johnson of LeRC, Del Tischler of OART, and Charlie King of MSF Apollo Test with him. These people, plus myself, make up a group under Dr. Dorman who are reviewing the NASA propulsion effort. We visited Rocketdyne, AGC, Marquardt, TRW, Pratt & Whitney. Also, to get the "user's view," we visited Grumman and talked to Mr. Stoner of Boeing. NASA-wide policy recommendations are to be made by Dr. Dorman as a result of these reviews. Similar reviews are being planned for the stages and the SRT/ART areas. If you like, I will prepare a short briefing of what has happened in the propulsion area, and what I have heard concerning the subsequent reviews.

Reference my notes of 2/5/68 regarding the study of Rocketdyne's facility and equipment base. The ME Lab, a major contributor to the study, was inadvertently omitted from the list of those participating. ✓

B.B.
Yes,
please
by on
B

Noted.
2/26

B 2/20

NOTES / 2-12-68/CONSTAN

2/12 NS

Nothing of special significance.

NOTES - 2/12/68 - EVANS

2/12 Q/S

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NO SAFETY ITEMS OF SIGNIFICANCE TO REPORT

NOTES 2/12/68 FELLOWS

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Cost Reduction Program in R&DO: R&DO has taken steps to strengthen the Cost Reduction Program within R&D Operations to provide a more dynamic program that should achieve the R&D cost reduction goals for this fiscal year. Four specific steps taken to date are; (a) a more vigorous publicity campaign has been developed and initiated to focus attention on the Cost Reduction Program; (b) greater recognition for participants has been initiated to stimulate the desire for participation, certificates will be awarded, vehicle models will be presented and special launch observer trips will be awarded to participants; (c) procedures for validation and implementation of Cost Reduction proposals have been strengthened; and (d) a man has been assigned full-time to keep the program active. We believe these four actions will focus additional management attention on the Cost Reduction Program and gain management support in achieving our goals. ✓

2/12/68
B 2/20
NOTES 2/12/68 GEISSLER

1. S-II Spray Foam Insulation: Results of the recent spray foam insulation test conducted on the X-15 were discussed by P&VE and NAR on Jan. 30, 1968. NAR stated that the X-15 flown trajectory was not as hot as AS-504 max heating trajectory. However, excessive erosion on insulation trailing edge was experienced due to total flight environment. Whether the erosion took place during the controlled trajectory or during uncontrolled flight of X-15, is unknown. P&VE desires to test for aerodynamic heating and shear during a simulated max heating trajectory to verify spray foam insulation design. We agree that this must be accomplished on an X-15 flight, since wind tunnel facilities cannot simulate the total environment, even though recent MSFC wind tunnel tests verified that insulation will withstand max q pressure (without heating). Insulation physical properties are expected to degrade as temperature rises. Therefore, further X-15 testing would benefit verification of insulation design. X-15 program phase-out is Headquarters controlled; one more flight may be made if enough experiments are proposed. I.O. informed Headquarters of X-15 test importance for qualifying S-II insulation for flight. A reply from Headquarters is anticipated. ✓
2. Astronaut's Emergency Communication During LSSM or LFV Operations: The R&DO ad hoc committee formed to look for equipment to solve this problem (per your request in Notes 11/20/67 Geissler) has found that Thiokol manufactures a series of hand-held, rocket propelled illuminating signals. These signals are used in the field today. The most reliable system would be a flare with either a controlled spectrum or long duration burning time so that it could be tracked. The committee is still looking for a small military or commercial transmitter which could be modified and incorporated into the hand-held rocket signal, and thus provide the voice mode if necessary. ✓
3. Lunar Probe Data: Mr. O. H. Vaughan of our Aerospace Environment Division prepared an invited paper for the AAS Symposium on the Interpretation of Lunar Probe Data - II, at Huntington Beach, California, on January 25-26, 1968. The presentation was made via magnetic tape due to the travel funds shortage. This was a meeting to discuss lunar probe data and its effect on the lunar exploration program. Title of Mr. Vaughan's paper was "Lunar Terrain Roughness with Respect to Roving Vehicles." He discussed MSFC terrain models, various concepts developed from these models, and the implications of the Surveyor and Orbiter data with respect to the mobility capabilities of the MSFC lunar roving vehicle concepts. Conference participants came from U.S.A., England, Ireland, and Japan. ✓
4. LM/ATM Alternative Mission: An intense effort is being engaged in support of the LM/ATM unmanned rendezvous with the OWS Cluster. Various characteristics of several injection profiles are being investigated from a flight mechanics viewpoint. In-house and contractor (Martin/Denver) efforts are also being initiated to extend tether studies for potential application in the final phase of the unmanned LM/ATM rendezvous. ✓
5. AIAA Technical Committee on Aerospace Environment: Mr. W. Vaughan was recently appointed chairman of this committee, which is comprised of approximately 20 members from industry and government. Dr. J. Kuettner was the previous chairman. ✓

2/12/68

B 2/20

QUALITY & RELIABILITY SURVEY IN MSFC: Headquarter's survey team with the task to assess the quality and reliability assurance activities in MSFC was here from January 29 through February 9. It was chaired by KR (Dr. Condon's Office), had 3 more members from KR and one member each from the Apollo Program Office, Apollo Applications Program Office, KSC, LeRC, LaRC, and GSFC. Dr. Condon conducted the debriefing on February 9 in the presence of Dr. Dorman. The audience included Dr. Rees, Mr. Neubert, Mr. Hueter, Mr. Weidner, Colonel Teir, and Colonel Murphy. ✓

The team concluded that an effective reliability and quality assurance program is in operation in MSFC, but it pointed out (as expected) a number of deficiencies or areas which require further attention. A complete report will be issued shortly; the most essential points were discussed in the debriefing session and consist of the following findings:

- (1) UCR system not working fast enough.
- (2) Quality and reliability audits inside MSFC missing. ← *DF. What do you propose to set up? B*
- (3) Findings in quality and reliability audits in the contractors' places require faster close out. ← *B*
- (4) Apparently cumbersome chain of command and coordination due to the various Offices and Points of Contact in IO and R&DO working in the quality and reliability area. ← *Suggestion? B*
- (5) Lack of formality, more pronounced in the operation inside MSFC than with the contractors.
- (6) Weakness in reliability competence.

Good points which were made are not listed here due to lack of space; they do not require special attention any way.

Of the listed subjects, (1) and (3) have already been worked on in the recent months and positive results are expected in the foreseeable future. Subject (5) requires a special effort and can probably be alleviated to a certain degree when some of the talents presently working in support of KSC and MSC (Dr. Rees, Downey) return to MSFC. Subject (2) presents a problem; with the available resources we have oriented our effort toward surveying prime contractors and vendors and have not been doing enough there. It is as much beyond my control as subject (4) and (6).

But you can have some ideas on how to improve the setup!

1. AS-502 Flight Control Computer 2/12/68 A series of problems have been encountered recently on the flight unit (Serial Number 506) and its spare (Serial Number 507) for AS-502. These are summarized as follows:

Serial Number 507. This unit was returned from the Cape to ECI (Electronics Communication, Inc.) to rework poor solder joints. During dynamic check at MSFC subsequent to the solder rework, the RFI (Radio Frequency Interference) filter was shorted to ground. The problem was due to a shorted capacitor and another capacitor has been added to correct for the shorted condition. Future filters will have two capacitors in series built into the unit to protect against a failed capacitor. This unit is back at the Cape as the spare for AS-502. ✓

Serial Number 506. During control systems testing at KSC, a significant spike appeared on the output of the pitch amplifier. The cause of this anomaly was traced to a faulty transistor. The amplifier has been replaced and a team from IBM, ECI and R-QUAL will investigate the cause of the faulty Fairchild transistor. Since this unit was at ECI for replacement of the pitch amplifier, the addition of the capacitor to the RFI filter was also accomplished. This unit is back at the Cape and testing is presently in progress. ✓

2. ATM Control and Display Ad Hoc Working Group. The first meeting of the ATM Control and Display Ad Hoc Working Group was held at MSFC on February 7, 1968. MSC presented their requirements and design criteria in the areas of switches, digital address system and timing displays. Progress was made to the extent of achieving a more detailed understanding of the desires of MSC although there are some areas wherein a consolidated position within MSC has not been established as yet. A meeting is scheduled at MSC for February 16, 1968 to further review the requirements and discuss the impact these requirements have on ATM. ✓

3. Preliminary Requirements Review. The Preliminary Requirements Review of the Harvard College hydrogen-alpha telescope and the MSFC hydrogen-alpha telescope was chaired by MSFC at MSC on February 8, 1968 with NASA Headquarters in attendance. It was concluded that the Perkin-Elmer proposed designs for both telescopes are acceptable. Final design configuration will be dependent upon the ultimate selection of the filter band widths which will be a subject of discussion by the PI's at the Lockheed Rye Canyon Test Facility later this month. ✓

2/12 STS

F-1 ENGINE

Test FW-075 is tentatively scheduled for February 20, 1968, at the West Area F-1 Test Stand. Primary test objective will be to verify the adequacy of the site location selected for acoustical testing on a Saturn V instrument unit model with a live ST 124-M installed. ✓

S-II STRUCTURAL TEST PROGRAM

The S-II (V7-21) stage is now scheduled for delivery to Test Laboratory on May 13, 1968. Testing is scheduled to start July 8, 1968. This schedule is compatible with the facility construction, activation and checkout. ✓

S-IVB (MSFC)

Tests S-IVB-053SA and -053SB were conducted at the S-IVB Test Stand on February 8, 1968. Tests S-IVB-053SA and -053SB were scheduled for one second idle mode, 75 seconds mainstage, 10 seconds post-idle mode, cutoff, 15 minutes coast, 10 seconds idle mode and 5 seconds mainstage, respectively. The above tests were completed successfully and all test objectives were met. ✓

S-II-4 (MTF)

A successful full duration acceptance firing was conducted at MTF A-2 Stand at 2:30 p.m., February 10, 1968. ✓

S-IB (MSFC)

Test SA-50, a 15 seconds test with bombing of R&D engines in position No. 1 and No. 7, was successfully performed on February 6, 1968. No unexpected behavior occurred from the bombing. ✓

SIMULATED SATURN 501 FLIGHT AUXILIARY PROPULSION SYSTEM MODULE TEST

As a result of the S-IVB Auxiliary Propulsion System (APS) 501 flight chamber pressure anomaly, P&VE requested an APS test with simulation of the 501 pulse firing density and temperature history. The test was designed to ascertain whether or not the higher than expected 501 APS temperature contributed to the observed chamber pressure decay. The requested test series has been completed and the results show no significant APS Pc degradation as a result of the simulated temperature history. ✓

S-IVB LOX FILL AND DRAIN TESTS

P&VE has identified a potential problem area in the S-IVB fill and drain system should an inadvertent loss of electrical or pneumatic power occur during lox transfer at KSC. A test program was established to investigate the above problem by simulating the S-IVB lox transfer system. To date, 13 tests have been conducted which appear to verify the existence of the problem. The S-IVB fill and drain valve exhibits abnormal closing characteristics causing unacceptable pressure spikes during closing, which may exceed the design limits of the fill and drain system. The problem is being investigated by personnel from Test Lab, P&VE Lab, and Douglas.

1.0.
that
sounds like
a pretty
hazardous
situation.
Solution
in sight?

Such a failure could cost us a bird!!

B

NOTES 2-12-68 HOELZER

2/12/68

B 2/20

NASA-HEADQUARTERS WORKSHOP MEETING ON NUMERICAL ANALYSIS,
JANUARY 29-30, 1968:

The workshop meeting at NASA-Headquarters Auditorium dealt with a variety of topics on practical problems in the field of advanced numerical mathematics. During the two days, 35 short papers were presented and discussed among mathematicians from NASA Centers, universities, and industry. The meeting was of high quality as reflected by the attendance of well-known mathematicians as Dr. Hamming, Bell Telephone Laboratory.

Dr. Trauboth of Computation Laboratory presented a paper on the "Use of the Convolution Integral for Simulation of Continuous Dynamics" which explained a new promising method for the calculation of dynamic time responses on a digital computer directly from transfer functions block diagrams. ✓

NOTES 2/12/68 JOHNSON

2/12/68

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2/20

MSF Supporting Development Quarterly Review - Messrs. Miles, Hoppers, and Cummings attended the February Quarterly Review. Mr. Eldon Hall conducted the meeting which was primarily concerned with guidelines for the FY 69 Program, and also the financial status of the FY 68 Program. The MSFC funding projection for FY 69 is presently \$13.5M, vs \$16.7M this year; however, expenditures for the J-2S will be limited to \$3.0M in FY 69, vs \$12M this year.

Technical guidelines were briefly discussed. It was concluded that the Apollo Supporting Development Program (904) would support developments on items up to and through vehicle 514. Workshop B would be an appropriate project to be supported by the Apollo Applications Program (905). Workshop C and future logistics systems would be supported by the Advanced Manned Missions Program (908). ✓

A second effort will be made by MSF to obtain approval on the FY 68 908 Program. If funds are not available for these projects, technical approval will be granted to allow pursuit of in-house activities on these work units.

At the next Quarterly Review to be held in Houston in April, each Center will be expected to discuss problem areas found in selected subsystems which can be the basis for future Supporting Development Programs. Headquarters is to provide a definition for the subsystem's concept. ✓

2 1/2 JTA

1. C-1 ENGINE ACOUSTIC LINER: Reference Notes 1-15-68 Lucas. All tests using the C-1 engine acoustic liner have indicated freedom from combustion instability. ✓ Successful completion of the current inhouse program should demonstrate that a satisfactory solution to the C-1 instability problem has been found, and that a useable C-1 engine could be made available if needed. There is presently no requirement within NASA for the engine, and any recovery of funds would only be possible through application to a program. ✓
2. USAF HIGH PRESSURE BELL ENGINE: Reference Notes 1-15-68 Lucas. The work described is to test a flight type demonstrator engine by early CY-1972 for \$36M. Following this milestone would be a 5-year development program to engine qualification if a requirement materializes. The flight type demonstrator design is basically compatible with S-II and S-IVB application. The size and weight is smaller than the J-2 engines and the specific impulse is somewhat higher (less than 10%). Major changes to the stage design would be required in the propellant inlet duct locations and other interfaces. ✓
3. LM STRESS CORROSION SURVEY: Our team has finished the stress corrosion survey of the LM. Of 1027 drawings, representing 2400 machined aluminum components, 516 drawings were judged to indicate probable stress corrosion problems while an additional 177 drawings were judged to represent possible problems. Many components are machined from large forgings and extruded bars of 7075-T651 and 7079-T651; because of the extensive machining, most of the raw material is stress relieved, which is good. The reviewing committee recommended refitting and shimming to relieve assembly stress, aging to the -T73 temper where possible, and shot peening of some parts. It is not known when MSC and Grumman might implement the recommendations. IM 2 through 6 are nearly complete and IM 7, 8, and 9 are well into assembly.
4. ST-124 ACOUSTIC TEST: Plans have been formulated to expose the ST-124-M to a series of F-1 engine static firings for the purpose of adding confidence to the functional integrity of this component. Testing is scheduled to begin the second week in April. ✓
5. AAP ACTIVITIES: Mr. Webb has stressed the importance of keeping the public informed on AAP activities. As a result, arrangements have been made for a press conference and photographic coverage during the OWS Crew Station Review. (a) 2-9-68: Still photographs of the OWS mockup interior with all experiments installed. (b) Week of 2-12-68: Photographic (color) and sound track coverage of the astronauts using the part task mockups and the "six degree of freedom simulator," installation of experiments, the inter-center review team, and other Crew Station Review activities. (c) 2-15-68: Crew Station Review open to approximately 15 newsmen from various news syndicates for press releases and personal interviews with astronauts and key NASA technical personnel. (d) 2-20-68: Movie coverage (color) of mockup interior with P&VE test subjects. This will involve a talk-through and demonstration stage activation, habitation, and experiment installation and operation. Film will be used for the Space Science TV series. ✓
6. MR. ZERE B. LILE: A heart attack claimed the life of Mr. Zere B. Lile, a metallurgist in the Metallic Materials Branch, Tuesday morning. Mr. Lile had a principle role in our metallographic and failure analysis work, and his loss will be substantial to both his colleagues and the program. ✓

B.L.
 For the covering
 DCR of
 LEM 206
 I'd like to
 have a
 briefing on
 this. Please
 arrange w/
 Bouie B

Bouie
 Please prepare condolence letter
 to Mrs.
 B

NOTES MAUS 2/12/68

2/12 JA

B 2/20

National Launch Vehicle Stable Study: We have recently received some unofficial information on the way NASA/DOD plans to implement some closer planning in the review of the National Launch Vehicle Stable. It is expected that the Aeronautic and Astronautics Coordinating Board (AACB) will again be requested to conduct such a study.

Preliminary information indicates that the approach will be to (1) develop a "certified" DOD/NASA Mission Plan; (2) review this plan for a possible "gap" or duplication in launch vehicle capability; and, (3) where these gaps and duplications occur, make a detailed study.

We will attempt to gain more insight into this effort as plans develop.

H.M.

Maybe this will offer us a new opportunity to promote the SIB/SIBB/SM configuration. Please discuss with Frank Galliano B

NOTES 2/12/68 RICHARD

2/12 9/13

B
2/20

Cluster Review: The critical review by Dr. Mueller of the use of the LM/ATM in the first Cluster mission presently scheduled for early March may become an overall Cluster review in depth. We are preparing presentations, in cooperation with the laboratories, in accordance with the working outline (memo of Jan. 19, 1968). ✓

AS-502 Spacecraft Weight Shift: The propellant mass shift in the spacecraft reported Jan. 29, 1968, is associated only with AS-502 and is a crutch to a structural weakness of the SM propellant tanks characteristic of AS-502. At the moment I don't know where the permanent fix becomes effective. The stresses of the SM tanks are dependent on propellant static head, ullage pressure and acceleration as you recall. On AS-502, MSC wishes to reduce stress in the substandard area by reducing the head. I think the in-line fix is effective at AS-503. ✓

NOTES 2-12-68 RUDOLPH

2/12 9/15

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1. AS-502 Launch Vehicle at KSC:

o The AS-502 launch vehicle was moved from the VAB to the launch pad on Tuesday, 6 Feb. 68. Start of move was delayed about 6 hours due to troubles with the Launch Escape System (LES)..

o Winds peaked at 55 knots at the top of the vehicle during transit -- Q-ball cover was blown off and lost in the canal.

o Mobile Service Structure (MSS) was positioned on-pad adjacent to the vehicle on Friday, 9 Feb. 68.

o A redundant capacitor was installed in the RFI filter of the Flight Control Computer and the Computer was delivered on-dock KSC, Wednesday, 7 Feb. 68. Flight Control Computer was checked out at KSC and installed on the vehicle on Thursday, 8 Feb. 68. Power-up and functional tests were conducted on Friday, 9 Feb. 68. ✓

2. S-II-4 Stage at MTF:

o Captive firing of S-II-4 stage was successfully completed Saturday afternoon, 10 Feb. 68. ✓

o Manual cutoff was given after 347.3 seconds, when LOX level reached 2 % (planned firing time was 345 seconds). ✓

o No insulation damages occurred. ✓

o Stage will now be prepared for cryogenic proof testing which is now scheduled for Monday, 18 March 68. ✓

- 2/12 9/13
1. AS-502 LAUNCH MISSION RULES REVIEW: The Launch Director's review of the AS-502 Launch Mission Rules was held on Wednesday at KSC. No major problems were uncovered, and Schneider and Petrone both commented on the improvement over similar past reviews. MSFC received 22 action items, all of which should be closed by February 14. KSC will publish the final Launch Mission Rules Document on February 20. ✓
 2. FLIGHT CONTROL OFFICE, HOUSTON: Mr. Scott Hamner (S-IVB Stage Office) has been selected as Office Manager. Our serious manpower shortage at Houston was reviewed on-site with Dick Cook and Chris Andressen. Open positions will be announced MSFC-wide. ✓
 3. AS-204L FLIGHT DATA: Approximately 98% of all KSC/GSFC data is now at MSFC. Blockhouse and facility and environmental data has not been received from KSC because of a computer data problem. Separation data from the Coastal Sentry Quebec (Telemetry Ship) has not been received from GSFC due to an airline strike. Data is stranded in Perth, Australia. The rest of the data delivery was good and for the most part met MSFC's data requirements. Following launch, our Requirements Control Office has issued periodic bulletins about the data situation to all elements involved. ✓
 4. FLIGHT CONTROL COURSE: We had arranged with MSC a one-week condensed training course on all elements of flight control, given by Philco personnel. About 35 personnel attended (1/3 R&DO, 2/3 IO). The course was well presented and well received. ✓
F.S. So do I B
 5. AAP MISSION OPERATIONS CONTRACTOR SUPPORT: In the review of MSFC's AAP contractor requirements for General O'Connor and Mr. Weidner, concern was expressed about the dependency of the oncoming mission upon the ground and the significant cost impact of this support. I share this concern and have dedicated a major portion of my AAP contractor support to assist my office in addressing this problem. We are working closely with MSC to optimize the operational flexibility of the onboard systems and minimize the ground support requirements while still ensuring a high degree of confidence in mission success. ✓
 6. RESCHEDULE OF KRAFT VISIT: The AAP Flight Operations Meeting which was cancelled in December is now rescheduled for February 29 and March 1 with the same agenda as previously established covering AAP systems and management interfaces. Luncheon is scheduled for March 1. ✓

1. VISIT TO DR. JOHN CLARK: As you suggested on 1/31, I visited Jack Clark at GSFC on 2/8 for a discussion of his viewpoints on manned versus unmanned space science experiments, and on the space science program of the OWS, which he had presented briefly to the Floyd Thompson Committee. The two-hour exchange of thoughts was very frank and candid; this Center has certainly a sincere friend in Jack Clark. His basic thought, which permeated our entire discussion, was this: "MSFC must begin now to extend its activities beyond pure vehicle-building; unless Center Management shows some genuine interest in space scientists and their experiments, the scientists will look for support elsewhere. This goes particularly for space astronomers, the only true customers for the workshop." I am preparing a trip report with more details of our discussion.

2. RADIO ASTRONOMY FACILITY: Dr. Tom Clark began operation of his radio astronomy station on the Wheeler Reservation by receiving radio signals from the sun on 2/9. The first study will concern Faraday rotation of 144 MHz solar burst signals. ESSA in Boulder will send us information on solar activity via telephone "hot line" so that some Type III bursts can be recorded. We will also utilize white light and H-alpha photos taken at our SSL Solar Observatory to support assessment of solar activity. *E.S. Request a briefing on this*

3. SOLAR OBSERVATORY: Our solar observatory has proceeded to a status of limited operational capability. The first picture of the solar disc (with sunspots) is attached. Pictures in H-alpha light can be made in about four weeks when larger mirrors, currently being ground in Astrionics' optical shop, are ready. Prime purpose of the facility during the next few months will be the testing and checkout of filters, cameras, TV displays, and other components of the ATM system. ✓

Hermann Weidner
Let's discuss this again, and more thoroughly
B

2

^{2/12/68}
SATURN IB PROGRAM: Dr. Mueller has asked Gen. Phillips to consider keeping the Saturn IB Program in a posture such that we will have the capability to launch a Saturn IB dual mission (SA-206/207 or SA-208/207) on four months notice at any time up through the launch of SA-504. After a brief review, we feel that we (MSFC) can support such a requirement without too much impact. However, it would cause considerable impact at KSC and MSC to stay in a position to support a dual Saturn IB launch with four months notice. Gen. Phillips' program office has given him an informal memorandum indicating the above impacts, however, we have received no definite directives. ✓

SECOND BOMB TEST ON S-IB-11 ENGINES: Two engines⁸ on S-IB-11 were bomb tested on February 6, 1968. The data are still being analyzed, but a first look at strain gauge data indicates an increase in thrust of approximately 50% for the inboard engine and approximately 45% for the outboard engine. The time from bomb detonation to thrust dampout for both engines was approximately 20 to 40 milliseconds. Data from the first bomb test have now been further refined and the thrust increase has been established at approximately 40%.

B.T.

Is that a transient thrust peak during the bombing? How long does it last, if dampening time is 20 to 40 ms?

B

1. Unmanned Planetary (Inhouse) Studies: We have aligned our work and priorities for the next couple of months, taking into consideration the results of our discussions with OSSA last week. We will still concentrate on Saturn IB/SM in February and plan to up-date Saturn IB/Centaur information during March. Comparisons with Titan III will be made during February and March. Most of our work on post-1973 missions will occur after April 1. We presently plan to have another working session with North American-Rockwell at MSFC on February 21. ✓
2. SLV-3X/Centaur ("Fat Atlas"): Luke Spears talked with Dr. S. Himmel in Bruce Lundin's office at LRC. He is sending us a package of information on SLV-3X/Centaur. ✓
3. Saturn V Workshop Status: A meeting among Doug Lord and the Saturn V Workshop study Task Team Chairmen was held at MSC on February 7. Highlights of agreements are: (1) The workshop configurations, selected at the presentation on February 2 to the Planning Group, would be considered for Program Alternatives I, II, and III (as shown in enclosure 1.*). The early configuration B, essentially a ground-fitted version of the wet workshop, and the advanced B configuration will be considered for Program Alternatives I and II. The C configurations will be considered for Program Alternative III. Alternative I represents the program that could possibly replace the revisit flights 337, and Alternatives II and III consist of Saturn V workshops launched after the currently planned revisit flights. The only difference in II and III is approximately one year's delay in launching the Saturn V workshop. As stated by Dr. Mueller at the February 2 meeting, no program alternatives will be shown with both the B and C configurations. It appears that the B configurations, especially the advanced B, are now being accepted as the most promising. ✓ Additional screening will now result from schedule and resources estimates. (2) The astronomy payloads/experiments for the alternatives shown in enclosure 1 were defined by Bob Piland (as presented in enclosure 2*). (3) Direct ascent will no longer be considered for launch and orbital insertion of the workshop. ✓ The CSM or a rocket on the workshop will be employed with the final determination dependent upon selection of the manned vs unmanned launch configuration. ✓ (4) Logistics systems for each workshop configuration/program alternative will subsequently be selected on the basis of schedule and resource data presented next week (February 16) for the alternatives defined by Bill Stoney. This data will be presented to the Planning Group. (5) Report preparation for the volumes on configurations B and C will be prepared by the Task Teams and Headquarters (Lord (as shown in enclosure 3*). Working data/papers will be assembled by the Task Teams to provide appendix-type data. (6) Primary presentation emphasis at the February 16 meeting at MSC to the Planning Group will be on schedules and resources. Each other Task Team will have one-half hour to present material. Primary emphasis in the Configuration Task Team area will be on safety, on-board checkout, and maintenance and repair concepts. ✓

* Enclosed with Dr. von Braun's copy.

Feb 19, 1968



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NOTES
MR. GORMAN'S COPY

2/19/68 w/comments

None marked for DEP-A

NOTES 2/19/68 BALCH

B 2/25

2/20/68

S-II-504 Testing - Stage was removed from the A-2 test stand on 2/16/68 and installed in the low bay area of the S-II Service Building. The LH₂ tank capacitance probe was replaced on 2/18/68. LH₂ tank inspection and X-Ray of welds commenced on Sunday, 2/18/68. Reinstallation in the test stand is tentatively scheduled for 2/24/68, with the cryogenic proof pressure test on 3/18/68. Shipment to KSC is tentatively scheduled for 4/26/68. ✓

S-II-505 Testing - Stage arrived at MTF at 0900, 2/17/68, and will be installed in the Vertical Checkout Building for a 12-day modification period on 2/19/68. The following events are tentatively scheduled as follows: Installation in test stand on 3/3/68, cryogenic proof pressure test on 4/12/68, and static firing on 4/23/68. ✓

S-IC-506 Arrival - Schedule still calls for delivery of S-IC-506 to MTF on 3/1/68 and installation in test stand on 3/5/68. ✓

Legal Affairs - The 46th complaint for damage as a result of static firings at MTF has been received. Claims, forms and instructions were forwarded to Mr. W.L. Moseley, Picayune, Mississippi. Mr. Moseley was not specific as to which static firing caused damage to the walls of his business establishment. ✓

Contracts - Final distribution was made on 2/12/68 of Contract NASw-410, Modification MSFC-1, Amendment 130, which incorporated changes deemed necessary by NASA Headquarters to Amendment No. 122. ✓

General Electric has been granted a 14-day extension for submittal of their proposal to provide General Support Services at MTF during the period 7/1/68 through 9/30/69. Required submission date is now 2/29/68. ✓

Hancock County Airport - The FAA has approved the county's declaration of intent to proceed with the construction of Hancock County Airport. The county has let a contract with Yates and Patterson for airport construction. ✓

Public Affairs - MTF hosted 131 foreign nationals of the Department of the Army Schools Group VI-68 on 2/12/68. Nine U.S. Army personnel escorted the group. ✓

Five newly appointed scientist-astronauts visited MTF on 2/15/68 on an orientation tour. Astronauts Allen, Musgrave, O'Leary, Chapman, and Llewellyn were given briefings by General Electric, Boeing, and North American Rockwell. ✓

Mr. Phillip Dickinson, Staff Member, House of Representatives, NASA Oversight Subcommittee, arrived at MTF on 2/14/68 to discuss C of F Projects. Upon conclusion of the meeting, Mr. Dickinson and group were taken on a site tour. ✓

2/25 JLB

B 2/25

ATM DIGITAL COMPUTER AND STAR TRACKER: The RFQ for ATM digital computers was released by Purchasing on February 2. The proposals should be received for evaluation March 19, with contract execution scheduled May 15. The D&F for ATM star trackers was approved by Headquarters on February 14. The RFQ will be released this week. ✓

ATM HEADQUARTERS REVIEW: The periodic ATM status review is still planned for February 21 at Headquarters. Overall status as to schedule and funds will be covered; however, primary emphasis will be on liquid thermal control status and the question of redundancy. The redundancy discussion is a result of Review Item Discrepancies from the ATM Preliminary Requirements Review concerning star tracker and digital computer failures. ✓

McDONNELL DOUGLAS CORPORATION CONTRACT STATUS: MDC signed the Letter Order Amendment February 14, with a target date for stage available for delivery to KSC for July 31, 1969, ending detailed negotiations. In discussing the 533 Monthly Financial Report for the Orbital Workshop with MDC and MSFC Contracts personnel, MDC agreed to a separation between Apollo costs and AAP costs. ✓

ORBITAL WORKSHOP CREW STATION REVIEW. The Crew Station Review was held February 12-16, and was finished according to schedule and operational plans. Four days were devoted to review of engineering mockup and side mockups. Approximately 100 Review Item Discrepancies (RID's) have been submitted. The fifth day was devoted to review of the experiment equipment with the Principal Investigators. The crew (including Cooper) were enthusiastic about approach and conduct of the review, even compared to Apollo, and progress was such that elimination of all major discrepancies has now been accomplished. ✓

LUNAR SURFACE SIMULATOR: A visual lunar surface simulator developed by R-COMP is now operational and exhibits the following features: (1) an Air Force SMK-23 visual simulator which provides a 30° to 50° field-of-view of a three-dimensional terrain model; (2) the crew station consists of a general purpose two-man cockpit; and (3) the terrain model is scaled at 150:1, with a maximum dimension of 12' x 27', with surface details made from Ranger VIII photographs. The simulator, used for determining man-machine interactions for vehicle design, will be shown to Captain Scherer and party during their visit to MSFC in March. ✓

SYSTEM SAFETY PANEL: The System Safety Panel met February 13 at MSC. Significant actions were: (1) Apollo is qualifying an 8 pound hand fire extinguisher capable of ejecting 2 cu. ft. of foam at 6 psi ambient. Use on AAP is uncertain because in 1 "g" its contents must be restirred every 5 weeks with paint can shaker. MSC Safety Office will submit their requirements to the panel for fire extinguisher use. These will be reviewed with the Centers; and (2) the panel is reviewing inputs to establish criteria for the cluster warning system. When established, these will be provided to the I&C Panel for implementation. ✓

2/20/68

F-1 ENGINE Reference the cracking problem in F-1 bellows joints, reported in my Notes of 1/29. Small cracks were found in a helium inlet pressurization duct bellows on four recent production engines during post-acceptance checkout. All failed ducts were supplied by one vendor, and no ducts from this source are on engines for stages AS-502 thru AS-507. Efforts to duplicate the failure mode in blowdown tests of ducts at Rocket Engine Test Site, EAFB have been unsuccessful to date. Engine system testing using a production support engine will be started this week to simulate failure conditions more closely. ✓

J-2 ENGINE Installation of the simulated S-II fuel inlet duct has been completed at AEDC. Three of four tests planned primarily for leak and flow checks of the duct and for determining characteristics of the duct were successfully conducted on 2/15. The fourth test was canceled due to a LOX leak from the LOX sump.

The test data from S-II-504 indicates three engine performance anomalies. One engine ran at approximately 6100 lbs. lower thrust than the previous run for the entire firing duration. Thrust shifts during the run were noted on two other engines. One engine decreased approximately 1600 lbs. while the other increased about 1200 lbs. A pressure change of 35 psi was noted on the gas generator bootstrap line which could account for the low thrust during the entire firing. No satisfactory explanation has been found for the performance shift. Hardware and data investigation are continuing on all three thrust changes. All engine performances are within specification. ✓

GENERAL Emphasis is being placed on resolving, finalizing, and incorporating engine checkout and test requirements in the "Test Specifications and Criteria Documents" which implement MSFC requirements at KSC. A memorandum of agreement is being implemented by the program offices which makes it mandatory for Rocketdyne to work with the stage contractor during the generation of these documents.

Typical current problems requiring resolution for the F-1 engine include transducer calibration, acceptance criteria redline items, and camera coverage for turbopump LOX seal leakage monitoring. KSC has recommended replacement of an engine transducer on AS-502 based on their interpretation of the requirements criteria. The transducer is acceptable to MSFC and Rocketdyne. This problem is presently being worked with KSC and Boeing. Problems have also been encountered in getting Rocketdyne "in the loop" at KSC regarding the review and concurrence of KSC test procedures related to engines. Recent discussions with KSC-LVO personnel indicate that this problem will be resolved within the near future. In the interim period, Rocketdyne is obtaining procedures on an informal basis. ✓

NOTES 2/19/68 CONSTAN

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VISIT OF MEMBER OF HOUSE OVERSIGHT COMMITTEE

On Thursday, February 15, 1968, the NASA/MAF facilities management made a presentation to Mr. Dickinson, member of the House of Representatives Oversight Committee, on the history of FY-64 Michoud Coff projects. Mr. Dickinson was accompanied on this visit to Michoud by Messrs. Kubak and Mitchell of NASA Headquarters, and Messrs. Hueter, Dykes, Daly, and Huth of MSFC/Huntsville. At the conclusion of the presentation; the group was given a tour of the facility. Mr. Dickinson appeared satisfied with the information he received at Michoud. ✓

VISIT OF SCIENTIST - ASTRONAUTS TO MICHLOUD

Five newly appointed scientist - astronauts, Dr. Joseph P. Allen, Dr. Philip K. Chapman, Dr. John A. Llewellyn, Dr. F. Story Misgrave, and Dr. Brian T. O'Leary, made their first visit to Michoud Assembly Facility on February 15, 1968. Chrysler and Boeing conducted presentations and tours to acquaint these astronauts with the Saturn IB and Saturn V rocket first stages. Upon completion of the tour and lunch, the group departed Michoud for the Mississippi Test Facility. ✓

NOTES - 2/19/68 - EVANS

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Safety Program Planning at NAR

A visit was made to North American Rockwell on February 13 to review the contractor's Safety Program. Headquarters (Mr. Lederer), MSFC (Mr. Neubert), MSC (Mr. Bond), and KSC (Mr. Atkins) and other NASA representatives were present. Tours were conducted during the visit through the capsule and S-II stage areas. ✓

MSFC Safety Board Meeting No. 15

A meeting was held on February 2, 1968, at MSFC for the specific purpose of hearing the presentation by the Apollo Program Office at Headquarters and their TIE contractor representatives on the logic diagram methodology for performing system analysis of the Saturn V Apollo system.

Another meeting is planned to be held at MSFC by the MSFC Safety Board on February 27, to hear a presentation by Martin/Denver on:

1. The execution of the safety function in the Martin Company.
2. The system safety analysis methodology being utilized in AAP. ✓

AS-502 System Safety Review

This review meeting was held at MSFC on February 13, 1968, for the purpose of reviewing each contractor's progress in implementing Program Directive 44A, including, system safety review status and configuration certification. Some of the contractor information was not clear as to the details of how they performed their safety review. Mr. Brooks (R-QUAL) was requested to investigate with some of the contractors, before the review with you. (AS-502 MSFC Pre-Flight Review). ✓

System Safety Network Technical Interchange Meeting

The meeting was held at Michoud on February 16, 1968. Representatives were present from MSFC, and the following contractors: McDonnell-Douglas, Huntington Beach, Bendix/Teterboro, Boeing/Michoud, GE/Huntsville, IBM/Huntsville, NAR/Seal Beach, Rocketdyne/Canoga Park. This group meets periodically to exchange accident information. It is sponsored by IO System Safety. ✓

NOTES 2/19/68 FELLOWS

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1. Swing arm facilities: R&DO and IO met with KSC representatives February 15, to discuss maintaining the R-TEST swing arm facilities in an active status through September 1, 1968, to permit KSC/Boeing to accomplish modification, refurbishment, retesting and inspection of swing arms for installation on Mobile Launcher (ML) number 3. R&DO will keep buildings 4649 and 4656 and their equipment, adjacent to the "swing arm farm," available to accommodate the KSC/Boeing personnel during this period of modification and retest and will furnish office space for KSC/Boeing personnel in the R-TEST engineering building number 4566. ✓

2. GAO Review of Sperry/Astrionics Support Contract: A GAO representative intends to review the Sperry support contract with Astrionics for the period July 1966-August 1967. His entrance conference was with the FMO Internal Audit Branch this morning. The GAO representative wants to complete his review by this Friday (February 23); the review is to cover nature of tasks performed, description of work, and estimated versus actual costs and completion dates. The representative declined to identify the requesting source which generated his review. ✓

2/20/68 NOTES 2/19/68 GEISSLER

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1. Optimum Linear Flight Control System Determination: Under contract to Aero-Astroynamics Laboratory, Honeywell's Dr. Grant Skelton developed a technique for determining a launch vehicle's optimum linear flight control system. Vehicle's dynamic behaviour and a statistical description of winds aloft are used to compute the linear flight control system which minimizes vehicle's probability of failure due to excessive bending moments, terminal drifts, cut-off angle-of-attack, etc. Although this optimum control system is linear and, in that sense, similar to conventional attitude or drift-minimum systems, it is extremely complex and needs simplification before it can be applied. Study results of our contract were presented at the 1967 International Federation on Automatic Control by Dr. Skelton. The Russians had apparently studied the paper quite carefully, and showed great interest in it. Dr. Skelton applied the technique developed under our contract to the Air Force's LAMS (Load Alleviation and Mode Suppression) project, which was trying to extend the B-52's operational lifetime by reducing structural fatigue at several critical stations. The B-52 flight control system calculated by Dr. Skelton was successfully simplified to an operational system by using engineering judgment and "trial and error" methods. We are currently funding a continuation to the earlier Honeywell work, and hope to receive FY-69 OART funds to further support the development of a rational, semi-analytic method of devising an operational flight control system which approximates the performance of the optimal system. These studies should result in a better and more rapid design than the "trial and error" methods used in the Air Force project. ✓

2. Inflight Acoustic Data Analysis: Recently we completed a survey of past inflight acoustic records including 203 results, and we are happy to report that our predictions are generally in good agreement with flight results (approx. +2db in the 160 db range). While this in itself may not be a "Noteworthy" statement, I would like to take this opportunity to set the record straight because earlier "quick-look" reports to you (e.g. Notes 7-18-66 Lucas) may have left you with the impression that the prediction accuracy of inflight acoustics leaves a lot to be desired. A superficial look at the data showed a larger than factor of two difference in pressure between the prediction and the transducer recording. Actually, the measured and predicted intensities should not have been compared directly without transformation to account for transducer location. Reliability in acoustic intensity predictions is important in the configuring of protuberances (e.g. the fairing on SIA to accomodate the docking probe on the MDA) and future payload shapes. ✓

3. AAP Cluster Attitude Control Ad Hoc Working Group: The first meeting of this group at MSC on February 9, 1968, established several action items regarding the workshop Attitude Control System (WACS) which could result in additional requirements for this system that have previously been baselined for the CSM RCS system. Such functions include OWS experiment pointing, re-acquiring of POP attitude after experiment pointing, solar orientation hold during ATM CMG spin-up, and possibly ATM CMG back-up momentum dumping. If these additional functions are placed on the WACS along with additional requirements to overcome various leakages and dumps, then the available excess capability of the 8-tank WACS configuration could disappear. ✓

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1. ENGINE PROGRAM: All ECA packages for AS-502 have been retrofitted with the "interim" timers, returned to KSC, installed, and checked out on the vehicle. ✓
 - o H-1 engines 7118 and 7119 were recently shipped to Michoud. These are the last two production engines to be assembled and tested at Neosho. The phase-out of all H-1 work at Neosho is scheduled to be completed by May 1968. ✓
2. S-II TEST PROGRAM REDUCTION: In October of last year NAR submitted a proposal for reductions in the S-II Stage Test Program. While we could not concur in their proposal, mutual agreement on the major portion of a counter proposal from this Laboratory was reached. Post-manufacturing checkout of S-II-6, which was completed February 13, 1968, demonstrated the savings resulting from these test reduction efforts. Total test time was reduced from two shifts, six days per week for 45 days to one shift, five days per week for 30 days. (Two shifts were worked during checkout, but only one performed checkout, the second shift being a cleanup type operation.) Simulated Flight Test was performed within a five-hour period, and followed a preparation period of one day. Preliminary evaluation of test data revealed no NO-GO's. S-II-6 will also be the first stage to undergo modification and retest at Seal Beach, instead of after shipment as in the past. ✓
3. TECHNOLOGY UTILIZATION: At the request of Mr. Wiggins, three physicians from Cook County Hospital, Chicago, were given a tour of this Laboratory recently. They especially wanted to know what we have done in automating checkout, with the idea of substituting a patient in shock from a heart attack for a stage. They appeared somewhat overwhelmed in that we seem to have already solved many of the problems that they were concerned about. They were also interested in bone integrity assessment with ultrasonics, liquid crystals, solid-state radiographic imaging, analog signal analysis as used for sonic signal pickup from valves, and software for computers. We will try to arrange to analyze a tape from a heart patient for them, will arrange a contact in the computer systems industry, will provide additional information on complex wave analysis, and will attempt to locate an ultrasonic unit for them to operate on a loan basis. ✓

2/20/68

1. Quality Control Support. We have encountered problems in our development effort on the ATM solar array in that solder joints have failed during temperature cycling tests. The problem is being solved but prior to and subsequent to these development tests, inspection for failures is necessary which has been provided by the Quality & Reliability Assurance Laboratory. Recently, we have encountered a priority problem and several inspectors were not available since they had commitments to support MSC for their North American problems. I will try to resolve this specific area with Mr. Grau but wanted to bring to your attention the general subject of spreading ourselves too thin in many areas of activity. ✓

2. Orbital Workshop Control System. The impulse requirements for docking to the OWS had been specified by MSC about eight months ago. Subsequent to this, a baseline control system was established by NASA Headquarters based on a MSFC presentation. Based on the meeting of the Cluster Control Ad Hoc Working Group, MSC has indicated a significant increase in the impulse requirements which will have an impact on the previously established baseline and puts the system in an early preliminary design phase. The problem which arises with impacts such as these is that the schedules become questionable. Present schedules provide for only 17 months for a cradle-to-grave cycle (initiation of procurement actions, through the flight of the hardware). There have also been other discussions on whether the OWS schedule can be made earlier. ✓

3. ATM Ad Hoc Committee Meeting. The Control and Display and Control System Ad Hoc Committees met at MSC last Friday. Significant items which were brought out by MSC were:

a. Control Systems. For CMG momentum dumping with the CSM reaction control jets, MSC stated the best approach was to use an attitude hold mode. We proposed this a year ago and the MSC position was that their system (inertial components and RCS engines) should not be operated in this fashion.

b. Controls and Displays. MSC has indicated a strong desire to fashion the ATM Controls and Displays for power management similar to the Airlock System, i.e., individual ON/OFF control of each of the battery modules and load regulators for the 18 ATM power modules. There is no basic objection to this except we have a very limited amount of display area in the LM. The proposed power panel display could be located away from the main area of activity. We will also have to assess the entire scheme of power management both from the ground and onboard by the astronauts and what impacts there may be on other ATM systems, such as telemetry and measuring. ✓

NOTES 2/19/68 HEIMBURG

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S-1B

Test SA-51, a 15 seconds test with bombing of R&D engines in position No. 1 and No. 7, was successfully performed on February 14, 1968. Functional performance of all systems was satisfactory. Engine thrust levels were satisfactory and the instability induced in each of the bombed engines was dampened in approximately 30 milliseconds. No unusual loads or hardware damage were experienced. Test SA-52 is scheduled for February 21, 1968. It will be similar in all respects to SA-51. Test SA-53, the last of the combustion instability tests is scheduled for February 29, 1968. ✓

S-1C STAGE (MTF)

Facility preparation is being made to receive the S-1C-6 stage on March 1. Stage will be installed in the test stand March 5, 1968. ✓

S-1I STRUCTURAL TEST PROGRAM

The S-1I (V7-21) stage official schedule to be presented to NASA Headquarters is: Delivery to Test Laboratory May 8, 1968; testing to start June 19, 1968; and testing to be completed September 14, 1968. The facility construction progress is compatible with this new schedule. ✓

S-1VB STAGE (MSFC)

Test S-1VB-954S was conducted at the S-1VB Test Stand utilizing engine J-2SE, S/N 108, on February 16, 1968, for a duration of "1-second idle mode", "200-seconds mainstage", and "10-seconds idle mode", respectively. The 200 seconds mainstage duration is the longest test to date made on a prototype J-2S engine. The engine performed and operated satisfactorily and all test objectives were successful. ✓

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THIRD GENERATION COMPUTER INSTALLATION STATUS:

Contractually the acceptance tests were to start February 1, 1968. At Slidell hardware only was turned over to the Government on that date and the COTR acting under terms of the contract delayed the beginning of acceptance. At Huntsville a delay was initiated by the Government until February 9 due to lack of certain circuit breakers required by the contractor. Hardware and software were turned over to the Government for certification on February 12. The COTR acting under terms of the contract delayed the beginning of acceptance. The same occurred at Slidell. ✓

The contract calls for certain items critical to acceptance to be ready prior to the beginning of an acceptance period. These items were either missing or incorrectly implemented.

The contractor estimates that on or about March 1 the system will be turned over to begin acceptance.

The contracting officer has informed the contractor that he is in a damage situation under terms of the contract. ✓

NOTES 2/19/68 JOHNSON

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Nothing of significance to report.

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B-25

1. Visit to MAF:

Last week we made a field trip to MAF with a group of senior members of ME Laboratory for general orientation and review of manufacturing activities at Boeing and Chrysler. Three areas at Boeing have been of major interest to us: (a) The status of welding techniques and the quality records in welding, (b) the activities in manufacturing technology development, and (c) the newly created capabilities in their machine shop, mainly in the area of tape-controlled machine tools.

As to welding, The Boeing Company has made a number of improvements in their techniques which contributed to achieving higher quality levels. However, they are still plagued occasionally with high numbers of defects. In our discussions it was pointed out that the human element still plays a major role in the performance of welding requiring constant attention of shop supervision and training on the job. In spite of all mechanization and written procedures, welding is still an art and requires good teamwork and high motivation of the group.

The manufacturing technology development efforts are very limited at Boeing in Michoud and this is mainly company-funded. They are engaged in welding development of high strength steel for possible use for pressure fed boosters, in tube connection improvements, manufacturing technique development for flat bulkheads, and others.

In the area of machine shop modernization, Boeing is in the process of installing six numerical controlled milling machines which will become operational in June of this year. With the addition of much other equipment such as a heat treatment furnace, stretch forming press, etc., they will be capable of manufacturing a great number of components for the S-IC structure in house.

A tour of the Chrysler shop revealed the problems of maintaining the skills and capabilities in a low production program.

2. Loss of Key Personnel: Our senior resident engineer for the S-II stage at Seal Beach, Mr. Joe Halisky, has resigned and accepted a position in industry (at NAR) which offers a greater challenge and substantially higher salary. ✓

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B 2/25

1. ORBITAL WORKSHOP: The S-IVB Orbital Workshop Crew Station Review (CSR) was completed last week as scheduled. Organizations represented at the review include NASA Headquarters, MSC, MSFC, Martin Company, and McDonnell-Douglas Corporation. Astronauts taking part were: Gordon Cooper, Jack Lousma, Owen Garriott, Bruce McCandless, Paul Weitz, Joe Engle, Ed Gibson, and Joe Erwin. After a Monday afternoon inspection of the mockup by the review team, workmen disassembled the crew quarters Monday night and the astronauts began the task of putting it back together on Tuesday following the step-by-step procedure and sequence that they will use in space. The "walk-through" was continuously monitored by our technical personnel using closed-loop TV and voice communications with the astronauts. Following each work session, a debriefing session was held to present comments on the proposed design and document the recommendations. Approximately 140 RIDS were prepared. This brings the total for the December Engineering Review and the Crew Station Review to 226. The primary design deficiencies were in the controls and display panel and the penetration sealing plugs. ✓

2. HUMAN FACTORS ENGINEERING: Preliminary analysis of a KSC General Electric (GE) summary report for AS-501 indicates that lost time due to human errors cost the government approximately \$7M. Of these errors, a significant number could recur under similar relationships of men, equipment, and program operation. These errors, classified as repeatables, cost approximately \$3M. Information in the report was gathered by GE personnel observing launch preparation activities. Many of the items reported would yield to an effective human error control program. In dealing with the problems mentioned above, a preliminary Human Engineering Program Implementation Plan has been developed. We have been informed that a similar evaluation has been made by NASA Headquarters personnel and has been presented to General Phillips. ✓

3. NUCLEAR VEHICLE TECHNOLOGY: At their request, we gave a special briefing to Space Nuclear Propulsion Office (SNPO) personnel on Feb 15-16, 1968 at MSFC. The subject was the suitability of current technology efforts, particularly in the area of nuclear radiation effects on fluid phenomena. Discussed extensively was the proposed extension to the contract under which General Dynamics will do tests to determine nuclear heating deposition rates and stratification in LH₂. The proposed MSFC program has been endorsed by SNPO management and funding for implementing the program apparently has been approved. ✓

4. ENGINES: At the request of Space Nuclear Project Office (SNPO)/ Las Alamos Scientific Laboratory (LASL), Mr. Jewell and Dr. Steiner of our Structures Division went to Nuclear Rocket Test Cell C in Jackass Flats, Nevada, to assess possible damage to facilities by acoustic excitation during the coming Phoebus-2A tests. During facilities inspection, ten critical areas were identified where damage might be expected. We will recommend modifications to preclude the possibility of damage to these areas. ✓

2/19/68

PSAC REPORT: We have reviewed the December 1967 Draft PSAC Report on U. S. Strategy for Space Research and Exploration, FY-69 Program Decisions, and summarized the most significant recommendations as follows:

Planetary Exploration for 1969 - 1972: Use proven capability, e. g., Mariner class spacecraft/Atlas-Centaur. Maximize scientific first discoveries; minimize development cost and shorten lead times. ✓

Planetary Exploration for 1973 - 1975: Explore the surface of the near planets. Undertake studies and long lead-time development work leading to the use of the Titan III and other greater capacity combinations, e. g., Titan III F - Centaur is an attractive example. As an alternative to Saturn V Voyager, study the use of the Titan III F - Centaur. A 1973 "Titan Voyager Orbiter" is not attractive; main objective should be a competent lander at the earliest opportunity. ✓

Manned Flight for Earth Orbital: Studies leading to the establishment of a sound biomedical research basis for manned orbital flight programs. The AAP "first set" of missions (S-IVB workshop - ATM) is a reasonable approach, but urge serious study be made of the MOL systems as an alternative follow-on system for the second set of Workshop - ATM missions. Cancel Saturn IB after 216.

Manned Flight for Lunar Exploration: Immediate consideration of an unmanned logistic system capable of deploying on the moon a roving vehicle using a launch vehicle of the Titan III class. Use Saturn V for manned landing.

NASA Organization: NASA expand SRT investments so that NASA, essential contractors, and the scientific community can be kept competitive, of high quality, and facilitate sound scientific planning. Place importance on the support of ground based programs offering the possibility of gathering data on planets which can increase the value of the flight program.

Reduction of NASA Organization to lower resource levels by retaining only the essential in-house capabilities required for upcoming programs, retaining involvement of the scientific community, continuity in the training and experience of young investigators on whom the future programs will depend, retaining competitive spirit between organizational units of the NASA team, and identifying (and implies reducing or eliminating) those elements of Center programs which do not contribute to the "cutting edge" of space missions or technology so that funds will be available for the above objectives. ✓

NOTES 2/19/68 RICHARD

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No submission this week.

NOTES 2-19-68 RUDOLPH

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1. AS-502 Launch Vehicle at KSC:

o Cutoff and malfunction test was successfully completed, Fri., 16 Feb. 68, on schedule. ✓

o Modification kit installation has continued to improve and is no longer expected to be a major problem area. ✓✓

o The MSFC Pre-Flight Review for AS-502 is scheduled for 9:00 a.m., Tues., 20 Feb. 68, at LIEF. ✓

2. First Manned Saturn V Mission:

o For several months, MSC has been studying the problems associated with having the manned CSM remain with the S-IVB through restart. The lack of firm decision has delayed the start of the software program for the first Saturn V manned mission.

o On Mon., 12 Feb. 68, Dr. Gilruth decided that the manned CSM would separate from the S-IVB, and extract the LM, prior to S-IVB restart.

o When the manned CSM/LM have maneuvered safe distance away, we will restart the S-IVB for a 70-second burn. This first restart will occur about 4 1/2 hours after orbital insertion.

o A second restart (100-second burn) will be made after an 80-minute coast period. ✓

3. S-II-4 Stage at MTF:

o Stage was removed from the test stand on Fri., 16 Feb. 68, and placed in the S-II checkout building. ✓

o LH₂ tank inspection is now in progress and is expected to be completed by Fri., 23 Feb. 68. ✓

4. S-II-5 Stage at MTF:

Stage arrived at MTF (on dock), Sat., 17 Feb. 68. ✓

NOTES 2/19/68 SPEER

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1. AS-502 FLIGHT MISSION RULES REVIEW: The 502 Flight Mission Rules were reviewed with the Flight Director (Charlesworth) and Mission Director (Schneider) on February 13. Major open launch vehicle area is the question of restart inhibit conditions. Due to recent changes in spacecraft primary objectives and the importance of a successful S-IVB restart the contingency conditions for inhibiting the restart by ground command have been reviewed with the Saturn V Program Office. We are questioning certain inhibit cases in which a restart could be demonstrated at the price of loss or destruction of the spacecraft. Dr. Rudolph and I have discussed the issues with Bill Schneider, who will obtain a decision from General Phillips. MSC (both Kraft and Low) are supporting our position as it potentially enhances the decision to man AS-503. A complicating factor is the recent decision to separate the S/C from AS-503 prior to the restart. This will give us two more opportunities to manrate S-IVB second burn. We are still gaining significant time and mission flexibility if we demonstrate a successful 2nd burn on 502. ✓
2. APOLLO 6 OPERATIONS REVIEW: I participated in Kraft's 502 Mission Operations Review at MSC and gave a short presentation on L/V items. Dr. Gilruth questioned the rationale of some of the S/C objectives such as heat shield cold soak and re-entry heating conditions. It was quite apparent that MSC does not really need this flight to proceed with manned missions. ✓
3. APOLLO 5 LM-1 DESCENT STAGE REENTRY: The LM-1 Descent stage reentry occurred on February 12, 1968, at 1220 EST in the Pacific Ocean 300 to 400 miles southwest of Guam. ✓
4. DESIGN CERTIFICATION REVIEW: The next DCR is to cover LM-3 and CSM 101 and is scheduled for March 6 & 7 at MSC. MSC has been requested to submit a DCR report one week prior to the DCR. We have arranged a two hour meeting on 3/1 to brief you on this report and any other information you will need to participate in this DCR. ✓
5. CHRIS KRAFT MEETING: The Titan III meeting is scheduled for 2/29, the first day of the Kraft meeting. We have agreed to proceed as planned with AAP systems briefings and hardware tour scheduled for 2/29 and the more principal discussions and the luncheon for 3/1. ✓
6. AS-205 AND AS-503 FLIGHT MISSION RULES: A very profitable discussion of AS-205 and AS-503 flight control plans and mission rule related requirements was held on February 14 with R&DO, Program Offices, MDC, and IBM participation. The meeting served to clarify needs, ground rules, and schedules for these missions. The understanding and efforts initiated by this and similar planned meetings should greatly improve the timeliness and effectiveness of our flight mission rules for 205, 503, and subsequent missions. ✓

NOTES 2-19-68 Stuhlinger

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1. OWS EXPERIMENT PLANNING: Jim Downey spent this week at MSC on Bob Piland's OWS Experiments Sub-Panel. Programs for astronomical and other experiments for both the OWS-B and -C versions were established. Unfortunately, Dr. Mueller's recent guideline that there will be either a B or a C version eliminated the earlier planning of the payloads group showing an evolutionary experiment program based on a B and a C version.

OSSA's recent decision to start a new collection and selection of astronomical experiments and to plan for an astronomy payload in the 1973-75 period, independent of the OWS, is in obvious discord with the present OWS planning effort. It is hoped that this discrepancy can be resolved soon. ✓

2. HELIOMAGNETOGRAPH: We were very gratified to obtain approval from R&DO for the joint NRL-MSFC heliomagnetograph project, including \$100K in 1968, and \$200K in 1969. The significance of this project will be fourfold: (1) Support of ATM before, during, and after flight; (2) original contribution to solar physics by MSFC; (3) development of scientific capabilities at MSFC related to scientific payload projects; and (4) improvement of MSFC's scientific image. We will give more detailed information on the project in our presentation to you on March 4. ✓

3. ESSA VISITORS: Dr. Harold Lienbach, Mr. Robert Olson, and Mr. Robert Decker will visit SSL on February 19 and 20. They will receive briefings on the experiments planned for ATM "A". ESSA is preparing a plan to meet ground observatory data requirements which have been identified by the PI's. ✓

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SA-205: Based on the CSM 101 delivery projection from the Management Council Meeting, we sent a TWX to General Phillips and asked that we have the shipment of SA-205 stages delayed to be compatible with spacecraft shipment. I saw General Phillips Thursday, February 15. He and George Low had just reviewed the CSM 101 status and it now appears to be about 25 days late. (Shipping date 10 April 1968.) Based on this estimate, General Phillips has delayed shipment of 205 stages until 30 March 1968. ✓

SA-205: The original design philosophy used by MSFC in the Saturn Programs resulted in numerous single failure points throughout the vehicle. At the meeting on launch hazards for SA-204, General Phillips asked that we look into the single failure points that might cause catastrophic vehicle loss near the launch pad. Astrionics Laboratory has made a detailed review of the Saturn IB launch vehicle electrical system and identified single failure points in the S-IB, S-IVB and I. U. stages, and submitted recommended changes for their elimination. The changes to the S-IVB and I. U. are considered minor from a schedule/design viewpoint while the twelve S-IB stage changes are significant. We have initiated a high priority action to obtain detail assessments from our contractors from a confidence, reliability, and schedule impact viewpoint. Although in almost every instance, removal of a single failure point is highly desirable, I feel we must consider all facets before making a decision on these changes. ✓

S-IB STAGE STORAGE ENCLOSURES: Demonstration of the prototype storage enclosure (located in Building 4708) was given to Chrysler personnel last week. A review of the operation of the enclosure during the past two weeks indicated a 40% or below humidity level can be maintained. We expect the first enclosure to be completed by March 12, 1968, and the fifth unit to be completed by May 7, 1968. ✓

2/20/68

1. Saturn V Workshop: The fourth (and next to the last) review of the Saturn V Workshop study review was held at MSC on Friday, February 16. In general, the meeting was very good. For the first time, Schedule and Resources were presented (with data), and although the cost data needs some rework, the real message of where our problems are came into focus.

It was shown that the only way to get such a program initiated (Phase D in Dec. '68) as per the guidelines was to go sole source and probably to use letter contracts for short periods of time. Even then, the early/simple "Configuration B" (B-1) Workshop would not be available until December '71 (which was optimistic and so stated), and only then if AAP flights 4 through 7 were not flown. The more advanced "Configuration B" (B-2) would not be available until June '72, and even then, it would have to be based on the complete core program flying on schedule. The "C Configurations" could not be ready until mid to late 1973 and even then, would be based on a relatively tight schedule - starting Phase D in July '69.

The cost picture did not come out clear in the meeting; however, based on our work in this area, it is clear that the early - year cost will be the controlling factor, and on any of the configurations, "B" or "C", it will have a big effect. The cost for the Workshop (minus experiments, launch vehicles, facilities, and logistics) ranged from around \$240 million to \$350 million for "B" and about \$1.1 billion for "C".

In the cost area, our biggest problem is the fact that Cluster I, and in particular flights 4 - 7, are requiring a heavy funding during '69/'70, just where we need the \$ to get the next workshop going, and there will continue to be a lot of pressure to delay the ATM to the Dry Workshop.

The final review will now be held on March 8 in Washington, D. C., and it is planned to present the results to the Thompson Committee on March 12. We are still planning on completing the final report by March 15. ✓

There was no discussion Friday about MSC's meeting the preceding day with the Thompson Committee. I didn't have time to talk to Mr. Stoney but plan to follow-up and get his impression. I'll let you know what I find out. ✓

FEB 26, 1968



NOTES
MR. GORMAN'S COPY
2/25/68 w/Comments

None marked for DEP-A

2/26/68 w/Comments

NOTES 2/26/68 BALGH

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S-II-504 Testing - Dye-penetrant tests and rework of minor discrepancies have been completed. X-Raying is still in process and is expected to be completed today. Dates for reinstallation in A-2 test stand and for cryogenic proof-pressure test have been changed from 2/24/68 and 3/18/68 to 3/1/68 and 3/24/68, respectively. Shipment to KSC is still scheduled for 4/26/68. ✓

S-II-505 Testing - Reevaluation of modification period in the Vertical Checkout Building has resulted in a change of the on-stand date from 3/3/68 to 3/7/68. Cryogenic proof pressure test and static firing are still scheduled for 4/12/68 and 4/23/68, respectively. ✓

S-IC-506 - Arrival at MTF has now been rescheduled from 3/1/68 to 2/29/68, and target date for installation in the B-2 test stand has been changed from 3/5/68 to 3/1/68. ✓

Public Affairs - A New York Times reporter, Mr. John Wilford, has arranged to visit MTF on 3/1/68 in connection with a story on the national space program he is developing. ✓

The Canadian Consul at New Orleans is coordinating a technical tour of MTF on 3/5/68 for 44 Royal Canadian Naval Officers. Exclusive of this visit, 585 foreign nationals have visited MTF thus far in 1968, which is more than the entire number of foreign nationals that visited MTF last year. ✓

2/26/68

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ATM HEADQUARTERS REVIEW: The periodic ATM status review was held at Headquarters on February 21. Mr. Mathews attended the morning session, which was devoted to discussions of the liquid thermal control system status and ATM redundancy, with particular emphasis on the digital computer and star tracker. Mr. Mathews made the following significant comments:

(1) Group all thermal procurements into a thermal system procurement package, rather than submit the D&F's to Headquarters for approval on an item-by-item basis.

(2) Be sure Martin is fully on board in the thermal effort in order to provide a "check and balance".

(3) He agreed with the MSFC recommendation that an acceptable backup procedure could be developed in the event of star tracker or digital computer failures, and that these items should not be redundant. As to other redundancy within the ATM system, he agreed in general with the present approach, but recommended that the command system be redundant. ✓

MULTIPLE DOCKING ADAPTER WEIGHT REDUCTION: Initial results of MDA weight reduction have resulted in the following significant changes: (1) Removal of floor, 200 pounds savings; (2) Reduction of skin thickness in docking port seat, 200 pounds savings; and (3) Delete 4 wall grid design in favor of 8 wall beam design. Weight savings will probably be in the area of 300 to 500 pounds. ✓

GROUP FOR LUNAR EXPLORATION PLANNING: The Group for Lunar Exploration Planning (GLEP) meets in Headquarters on February 26. This group consists primarily of scientists headed by Dr. Hess, MSC, who is charged with forming a scientific plan. The group has recommended unmanned lunar surface traverses as an early step in exploration beyond Apollo, as well as the addition of a lunar flying unit to the Lunar Module's capability. ✓

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H-1 ENGINE A static firing of S-IB-11 on 2/21 was terminated prematurely due to a failure in the rotating machinery of Engine No. 8 (H-4095). Indications are that there is no major damage to the stage or the other seven engines. On 2/23, a working group was established to develop a plan for data analysis, hardware disassembly, inspection, assessment of damage, and determining the cause of failure. The working group is composed of MSFC, Rocketdyne, and CCSD personnel. The turbopump was disassembled over the weekend and the parts are being examined to determine the sequence of events and primary cause of the failure. A preliminary report from the working group is expected by 2/27. At this point in time, there is no foreseen impact on launch schedule for the Saturn IB Program. ✓

J-2 ENGINE Five tests were conducted at AEDC on 2/22 in the reduced fuel pump inlet pressure testing program with the simulated S-II stage inlet duct. Pressure drop in the new duct was at the low end of the range predicted for the system. ✓ The last test was terminated prematurely due to a gas generator overtemperature condition which would be the expected failure mode for these test conditions (cold thrust chamber, low fuel inlet pressure, and high start tank energy). The next test period is scheduled for 3/1. Seven additional tests are scheduled with the simulated S-II stage inlet duct. ✓

F-1 ENGINE Reference my Notes of 1/15 and 1/22, concerning water shipment of F-1 engines. Engine S/N F-6073 arrived at Michoud aboard the USNS Point Barrow on 2/16. Initial inspection indicates this engine experienced no detrimental effects from the water transportation mode. ✓

The F-1 improved turbopump incentive demonstration test series was successfully completed on 2/21, at EAFB using production support engine 037. This test series substantiates the 6 full 6 partial vane LOX and fuel impeller and associated hardware, the internal shaft axial thrust balance system, and an improved intermediate LOX seal. These improvements provide a backup LOX impeller with reduced NPSH requirements which would eliminate operational redlines if incorporated in the engines on the Saturn V vehicle. ✓

2/26/68

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2/28MICHOUD VISITORS

On February 20, 1968, Dr. Oswald Lange, Chief Scientist of the Sentinel Project of the Army Missile Command, accompanied by Mr. J. B. Bocock, Military Systems Director of Western Electric, visited Michoud for the purpose of orientation and familiarization of MAF organization, facilities, and equipment. Their interest seemed to be probable utilization of existing Government facilities and contractors in performing some work in connection with the Sentinel System. After briefing Dr. Lange and Mr. Bocock and conducting them on a tour of the facility, Dr. Constan introduced them to Mr. Doug Lowrey, President, CCSD, and Mr. Bob Dunigan, Deputy Michoud Manager of The Boeing Company. ✓

LOCAL BOEING LABOR GRIEVANCE

Approximately eleven Boeing employees from the Tube Shop walked out on February 22, 1968, but returned to work the next day. Basically their grievance concerns wage analysis and Boeing management has interviewed each of these employees and have the matter under advisement at the present time with no recommendations as yet formulated. ✓

NEW YORK TIMES INTERVIEW OF MANAGER MAF

Mr. John Wilford, New York Times, will interview Dr. Constan on February 29, 1968, regarding the economic impact of the space program. Mr. Wilford, who is visiting aerospace contractors throughout the country, has also scheduled interviews at Michoud with R. H. Nelson, General Manager of The Boeing Company Aerospace Group, Launch Systems Branch, and H. D. Lowrey, President of Chrysler Corporation Space Division. Both NASA Headquarters and MSFC Public Affairs Offices are aware of Wilford's planned article. ✓

STATUS OF HURRICANE PROTECTION AT MICHOUD

The Corps of Engineers have advised that they are in the process of preparing a design memorandum on the new levees and access road to the Saturn dock; are finalizing plans for the levee along the Michoud Canal; and that construction should start probably in April on the section of the levee running east to west along the Gulf Intracoastal Waterway. ✓

MARDI GRAS OBSERVANCE

The contractor personnel at Michoud have a holiday on Mardi Gras, Tuesday, February 27, 1968. Inasmuch as there will be no contractor personnel on board on this date, a liberal leave policy for NASA civil service personnel will be in effect. ✓

NOTES - 2/26/68 - EVANS

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No Safety Items of significance to report

2/26 J/A

Servoactuators on AS-502: A MOOG servoactuator being prepared for shipment to KSC as a flight spare for AS-502 developed excessive leaks during test. Disassembly disclosed a crack in the housing.

R-P&VE-M has determined by examination that the crack was initiated by stress corrosion, a combination of tensile stress, corrosive atmosphere and time. Four 50M (MSFC type) MOOG servoactuators on AS-502 will be changed out and replaced with 60B (Boeing type) servoactuators which were manufactured using techniques more favorable to reduction of stress corrosion susceptibility. ✓

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NOTES 2/26/68 GEISSLER

1. Number of Landing Sites for Mission Planning Effort: At the Twenty-Third Flight Mechanics Panel Meeting, held February 14 & 15, 1968, MSC indicated that they had a tentative proposal for expanding number of landing sites for lunar operational mission planning effort from three to four. We presently have three launch opportunities for each monthly launch period of about 8 days duration; if above proposal is accepted, we would have four launch opportunities with a slightly longer launch period. Extra landing site would be on the eastern boundary ($\sim 34^{\circ}E$) of landing site corridor, which means that our window would open earlier than at present time. Closing of launch period remains unchanged. We shall determine impact on mission planning of this additional launch opportunity. Subsequent to FMP meeting it was learned that next meeting of the Apollo Landing Site Selection Committee is scheduled for Feb. 27, 1968. Since Dr. Stuhlinger is the MSFC member of this committee, we shall inform him of the above activities. ✓
2. Acoustic Data Windfall: In our 4 percent scale model acoustic tests of Saturn V at AEDC we used multiplexed data recording to preserve fidelity in time correlation of transducer outputs. The magnitude of the job and overall scheme was a "first" in wind tunnel testing technology. We used our own recorders and data conditioners which were developed integral with the model and its instrumentation. Word had gotten around to Lockheed, Sunnyvale, who approached us recently on this technology in conjunction with work they are doing for the Air Force. Out of these discussions developed a very beneficial - for Marshall - arrangement whereby we will obtain urgently needed data on a biconic nose shape which would be directly applicable to AAP configurations. The only burden on us will be the loaning of the recording equipment which, by coincidence, was planned to be at AEDC at about that time anyway for a different purpose. ✓
3. Cross-Beam Program with ESSA: Dr. Bradford R. Bean, chief of the Radio Meteorology Program Area of the Wave Propagation Laboratory, ESSA; Dr. Vernon Derr, Chief, Millimeter Wave Program Area and Mr. Raymond McGavin who is in charge of meteorological sensor development, visited Aero-Astro dynamics Laboratory for a briefing of crossed-beam technology. The three scientists agreed, that the first field test results are encouraging and provide the basis for further feasibility studies. They propose a joint MSFC-ESSA program for development of an infrared crossed-beam system to avoid the unwanted optical background fluctuations from distant clouds or haze. ESSA would like to match funds with MSFC to systematically explore infrared crossed-beam systems under weather conditions, which clearly prove or disprove the feasibility of crossed-beam systems to measure winds and turbulence. MSFC would provide the infrared detection units, all analog recording systems, partial funding of an on-line digital data logging system, and all statistical data evaluation. ESSA would provide design specifications for the infrared detectors, more advanced theoretical models and new computer programs for the evaluation of infrared light source variations in the troposphere, humidity, temperature and wind sensors on a meteorological tower. They would also operate all facilities, collect most of the test data and prepare digital tapes with these data for reduction on MSFC computers. The ESSA people were authorized by Dr. Gordon Little to commit ESSA on such a joint program, and have discussed such a commitment with Dr. Johnson, R-EO-DIR. ✓
4. Saturn V Performance Data: In response to an urgent request from Col. Burke - Headquarters, we transmitted two-stage Saturn V performance data for polar orbits. We understand it will be used by Mr. Cortright, and Drs. Mueller and Newell for planning purposes. Copy was sent to you separately. ✓

E.F.
Looks like
an attractive
proposal
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2/26 JS

1. TEST REDUCTION PROGRAMS: Our counter proposal to a Boeing test reduction proposal of November 1967 is presently being negotiated. The stage contractor did not immediately accept the proposal, an optimized schedule for the test and checkout program; however, we expect that implementation will be effected. The proposed program would reduce total dwell time of an S-IC stage in test and checkout from 32 weeks to 18 weeks, eliminate one test cell and crew at Michoud, and still deliver a complete and flightworthy stage to KSC. ✓
 - ° Instrument Unit testing has been reduced from 105 system/sub-system tests on IU-201 to the present 72 tests on IU-209. ✓
 - ° Test reduction recommendations for S-IB test and checkout operations at the manufacturing site (MAF) and at the static-test site (MSFC), when implemented by the contractor, will result in approximately a 25% reduction. ✓
 - ° A number of factors, most notably the developmental nature of the programs, efforts to reduce or optimize testing, and the contractor's learning curve have reduced S-IVB test and checkout time substantially. Checkout of S-IVB-502 at Huntington Beach required approximately 6500 man-hours, checkout of S-IVB-506 required approximately 3500 man-hours. Pre-static checkout flow time on S-IVB-501 was approximately 42 days, on S-IVB-505 it was approximately 20 days. Pre-static checkout flow time on S-IVB-204 was approximately 40 days, on S-IVB-209 it was approximately 28 days. Post-static checkout flow time on S-IVB-204 was approximately 32 days, on S-IVB-209 it was approximately 11 days. ✓
2. ELECTRICAL/ELECTRONIC HARDWARE CRACKING PROBLEMS: Lewis Research Center has discovered cracking problems on electrical/electronic hardware similar to those experienced at MSFC. A meeting was held recently with three of their representatives in order to provide them with the benefit of our experience in this area. We discussed the inspection to be performed to determine the quantity of cracks, failure modes present, a feasibility laboratory investigation to determine the seriousness or degree of cracking, variables involved, field repairs, design modification for preventative measures, and new design for future builds. Test results in the form of engineering requirements, technical memorandums, etc., were given the Lewis Center personnel so that they would not have to duplicate previous testing. ✓

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1. ATM Review. Meeting with Mr. Mathews at Headquarters on February 21 resulted in the following: B
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a. ATM redundancy concepts and hardware implementation as presented by MSFC were accepted with the exception of the command system. The MSFC approach was to use a simplex command system and utilize man as the backup mode. During storage, if subsystem failure occurs after the command link has failed, the revisit mission would probably be not possible. This would be a double failure and the NASA Headquarters guidelines have been to protect against single points of failure. However, since the impact of implementing a redundant command system is minimal with respect to weight, power consumption and cost, it was agreed that the command system should be made redundant. Based on the reliability prediction, a simplex command system has a .77 probability of success for 240 days continuous operation whereas the redundant system has a .97 success probability.

In the other areas (digital computer, star tracker, telemetry transmitter) of redundancy questioned by MSC during the Preliminary Requirements Review, Mr. Mathews concurred with the MSFC simplex approach, and he also acknowledged that more details from NASA Headquarters must be provided with respect to the ML-13 schedule. Dependent upon the nature of these details, the hardware implementation of the modules (ATM, LM, CSM, OWS) could be affected.

b. A status review was presented on the MSFC selection for thermal vacuum chambers for ATM. The main issue has been the use of the MSC chamber (which has problems with respect to its level of cleanliness and involvement with the Apollo program) versus use of other chambers (Boeing, GE/Valley Forge, Tullahoma). Mr. Mathews was not present during this discussion but John Disher accepted as a Headquarters action item to pull all the facts together and determine within the next month what chamber will be utilized. ✓

2. Flight Control Computer. In your FRR for AS-502, we made you aware of the cross coupling which was observed in the AS-502 flight control computer, S/N-506. The computer is considered flight worthy, at this time, since the amount of engine deflection disturbance due to the cross coupling (less than 0.01°) is safe from a vehicle dynamics viewpoint. Investigations of the potential reasons for the observed cross coupling are being conducted in the Astrionics Laboratory on the flight control computer spare from AS-501. Thus far, the cross coupling investigation has not revealed anything significant in relation to S/N-506. ✓

3. Servoactuator for SI-C AS-502. A cracked housing was discovered on a 50M Moog actuator while the unit was being tested by Astrionics Laboratory. The actuator housing was analyzed by R-P&VE and it was determined that the cause of failure was stress corrosion. Meetings between R&DO groups resulted in a recommendation to Dr. Rudolph on February 21 that the four old Moog actuators on AS-502 be exchanged with the newer Moog 60B actuators. Our confidence in using the 60B units is based on their age and the processes which are used in their manufacture that tend to minimize the susceptibility to stress corrosion. The four actuators on AS-502 were exchanged between February 22-25 and indications from R-ASTR-B are that no slip in the AS-502 schedule is expected as a result of the exchange process. Intensified effort will be applied by R-ASTR-NF to reinvestigate the use of steel in all actuators of the Saturn Vehicle. Although the use of steel will penalize the Saturn payload carrying capability by approximately 360 pounds, the reinvestigation is considered necessary. ✓

NOTES 2/26/68 HEIMBURG

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S-1B (MSFC)

Test SA-52, the fourth of the planned five "bomb" tests, was conducted on February 21, 1968. The countdown and test proceeded normally until a fire detect cutoff automatically occurred very shortly after "commit" or at approximately 3 plus seconds after ignition. Fire was reported by the Pillbox observers whereupon emergency measures were initiated. These consisted of dumping propellants and turning on the engine deluge fire system. The fire was the result of a turbopump gearbox rupture on engine position No. 8. The cause for this incident is under investigation. ✓

F-1 ENGINE

Tests FW-075 and FW-076 were conducted on February 20, 1968, at the F-1 Test Stand. Test FW-075 was terminated erroneously by a redline observer prior to mainstage. Test FW-076 was successfully conducted with a main-stage duration of 25 seconds. These tests were in preparation for Saturn instrument unit/ST-124 acoustic testing. ✓

SERVICE ARM AND ACCESS ARM MODIFICATIONS

Adm. Middleton, Mr. Buchanan, and others from KSC were here on Thursday, February 15, to discuss additional space requirements for the Boeing Flow 3 Service Arm Modification Program and the critical schedule for the Arm 9 (Access Arm) modifications. Space requirements were satisfied; however, there appears to be a major scheduling problem involving the Arm 9 re-design, modification, testing and refurbishment. KSC will return on February 26, to define test requirements so that test scheduling can be established by Test Laboratory and fitted into the overall schedule. We will keep you informed of Arm 9 schedule as it develops. ✓

NOTES 2-26-68 HOELZER

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NEGATIVE REPORT.

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Experiment S-027, Galactic X-ray Mapping - Information is being assembled on the requirements necessary to integration of the experiment into a vehicle other than the Saturn. Conversations have taken place with Lt-Col. Wallace Fry, Directorate of Space Experiments, on the possibility of flying the experiment on an Air Force vehicle. When assembled, the information will be provided, informally, to him. The request, by the Principal Investigator, (Kraushaar, U. of Wisconsin) that we provide him and his contractor assistance in collecting and making available the required integration information, arises from delays in the Saturn flight schedule. NASA originally entered into a contract with him in 1963-64 for the experiment to be flown in a Scout in about 24-30 months. The latest schedule is a Saturn in 1970-71. With much more slippage, his graduate students working on the experiment will be nearing retirement before they get publishable results. ✓

Manufacturing in Space - As you are aware from prior notes and other communications, Mr. Wuenscher, ME, has begun to develop some rather extensive, extremely interesting information on manufacturing processes which are "g" sensitive and which if conducted in space under balanced body forces conditions could result in some interesting, unique and highly useful new product forms. There is mounting evidence that the time is ripe to initiate a programmed effort, ✓ from research on the basic physical properties of materials through manufacturing techniques, to test some of the hypotheses and to begin to plan experiments leading to processing capabilities in a space "workshop." We have started putting together such a program. ✓ I would like to brief you on it, at your convenience, in about a month. ✓

NOTES 2-26-68 KUERS
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1. Visit of Mr. K. Boucher and Mr. W. Stitt from MDC: Mr. Kenneth Boucher who is now Assistant Senior Director of Operations for MSSD at McDonnell-Douglas and Mr. William Stitt who has recently been assigned as Director of Experimental and Development Operations for MSSD have visited us and Astrionics Laboratory for one and one-half days. This recently created development organization in MSSD/MDC comprises approximately 300 personnel and its function is to plan and direct the development of experimental hardware as a separate function from production of space stages or missiles. The purpose is to create a small but flexible laboratory-like organization with a high level of skills and quick responsiveness to program needs. ✓

2. Information and Awareness Program at ME Laboratory: Since the morale with a great number of our employees has become extremely low during the recent weeks, mainly caused by the reduction in force, we have started special efforts to provide better information and understanding of our projects to our first line supervisors, i.e., our section and unit chiefs and foremen in the shops. We are stressing in this information program the technical concepts, the importance of each piece of hardware, and how it fits into the total picture of our present and future space programs. The first line supervisors play an important role in creating the needed team spirit and any effort in familiarizing them with the concepts of our projects will pay high dividends in the future. ✓

3. Q-Ball Pressure Sensors: In reply to your suggestion on NOTES 1-27-68 KUERS, we now have to report considerable improvements in Rosemount's performance and we are hopeful that sensors of adequate quality will now be produced. A letter to the President of Rosemount does not seem necessary at this time. Last week we helped to conduct a survey of the facilities of two alternative manufacturers who are producing sensors to back up the Rosemount ones in case of further difficulties. ✓

4. IU Updating: The updating of the S-IU-500ST breadboard unit was completed this morning. ✓

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1. S-IB-211 STATIC TEST: The fourth test of the five tests stability program was conducted on 2-21-68. The duration of the test was 3 sec. and cutoff was given by the fire detection system or observer cutoff. Preliminary review of the records indicate that the Lox pump seal failed shortly after ignition on engine number 8 and this, in turn, resulted in severe damage to the gear box. The damage was minor except to engine number 8. This seal failure occurred prior to the bombing of engines 1 and 7, thus was not associated with the stability test. Both engines 1 and 7 recovered from the bomb within approximately 15 milliseconds. A committee headed by Dan Driscoll, with P&VE, Chrysler, and Rocketdyne representatives has been established to investigate the cause of the failure. ✓
2. BP-30: An MSC structural test on the service module propellant tanks showed that peak stresses of approximately 300% nominal exist during boost. This condition will buckle the aft skirts of the oxidizer tanks. To maintain a 1.25 safety factor on the service module propellant tanks for the conditions specified by MSC, 3000 pounds of ballast must be removed from each of the oxidizer tanks. The fuel tanks are satisfactory without modification. An analysis has been initiated to determine what structural changes are necessary to fly with the original ballast. ✓
3. APOLLO TELESCOPE MOUNT (ATM) PRESENTATION: A presentation on the ATM thermal control system was given to Headquarters on 2-21-68. The liquid system which is used to control the canister environment and rack mounted components during the pre-operational phase were emphasized. The recommended design approach, the selected fluid (methanol/water) and the several component modifications (although all modifications were not reviewed in detail) were accepted. ✓
4. MDA DEFINITION: Until the establishment of Control Weights last month, we had been trying to accommodate as many of the options desired by various organizations as possible. The result was a probable weight in excess of 9000 lbs. To meet the imposed control weight of 8000 lbs. we have accepted the following priorities:
(1) Get under the 8000 lbs. control weight, (2) Carry as many experiments as possible and satisfy the control weight; (3) Accommodate an experiment contingency mode. This will emphasize again the role of the MDA as a storage and transportation compartment and minimize its use as an experiment station. ✓
5. S-II-3 THRUST STRUCTURE TEST (404): The first ultimate test condition was successfully completed for the S-II-3 thrust structure configuration 2-21-68. 130% of limit loading was applied for the five engine full thrust condition with the four outboard engines gimballed 6°. A quick-look evaluation of data indicates no anomalies. The next and final test of this specimen is scheduled for 2-28-68. ✓
6. FLIGHT EXPERIMENT #42: Our flight experiment #42, "Surface Absorbed Materials" has been approved for AAP #2. OART has requested a briefing on the experiment on 3-6-68, in Washington, D. C. ✓

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EXTRA-CONTRACTUAL INFLUENCES: Dr. Raymond Hunt, Department of Psychology, University of New York at Buffalo, is the Technical Director of a study of Extra-Contractual Influences under a NASA Headquarters grant. Bill Hagen of Executive Staff has been appointed Technical Supervisor of the grant by Mr. Vecchiotti. Dr. Hunt visited Marshall in January and he and Bill Hagen will interview Dick Nelson of Boeing and Doug Lowery of Chrysler this week. The purpose of the interviews is to determine what factors are involved from the contractors viewpoint in dealing with the Government. In addition, contractor views on incentive contracting will be solicited.

One preliminary finding is that the contractors primary motivation is to maintain a predetermined dollar profit. Profit above this level becomes increasingly less important while other influences such as maximizing staff, corporate image, competitive position, etc., become increasingly important.

While this conclusion may not be profound, it has not been recognized in the existing incentive contracting philosophy propounded by NASA and DOD. Results of this research could, in the future, alter NASA and MSFC's incentive contracting approach. ✓

NOTES 2/26/68 RICHARD

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Workshop Attitude Control System: Dr. Mueller reviewed the Attitude Control System of the Workshop Friday, Feb. 23, particularly the comparison of a CMG plus APS system with the baselined propellant system. His main questions centered on the lifetime and reliability of the Attitude Control System; however, he agreed to wait until our presentation on March 15 (report of LM/ATM Study Group) for a complete presentation on this topic. We will be prepared to give you the status of the reliability study on Wednesday (2/28) when we are scheduled to review the LM/ATM effort with you. ✓

Improvements in Saturn GSE: We have been looking at short range and long range improvements that might be possible in the Saturn GSE System which could lead to improved launch availability. It is a natural second step we had planned in this development that would have been accomplished earlier if schedules would have allowed. We have had a continuing activity in this area for some time, but recent launch experience and better definition of future launch requirements have caused an added push from Headquarters, KSC, etc. In addition, Gen. Phillips has asked informally if we can inform him on what possibilities exist in this system. We would probably be ready with a report available for Headquarters by May 1 with internal briefings shortly before that date. We are working with I-V-E and Headquarters to eliminate lost motion in this effort. ✓

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2/281. AS-502 Launch Vehicle at KSC:

o The MSFC Pre-Flight Review for AS-502 was held on Tues., 20 Feb. 68. The major problem identified at the review concerned the stress corrosion cracks found in the F-1 engine servo-actuators (manufactured by Moog). On Wed., 21 Feb. 68, I spoke with George Hage (Gen. Phillips' Deputy), and we agreed to exchange the actuators on S-IC-2 for newer actuators which were manufactured under less stress corrosion conditions. The actuators were shipped to KSC on Thurs., 22 Feb. 68, and actuator exchange was completed, Sat., 24 Feb. 68. Functional tests of the actuators could not be performed this weekend as planned because of a failure in the facility power at KSC.

o A 3 to 4 day slip in the pre-launch checkout schedule for AS-502 has occurred because of delays in modification and checkout of the spacecraft. As a result, the Flight Readiness Test has been rescheduled to begin either late Sunday night (3 March 68) or early Monday morning (4 March 68). ✓

2. S-II-4 Stage at MTF:

o The pre-proof test dye penetrant inspection of the LH tank has been completed. Four minor cracks have been found, and they are being grooved out. Cause of the cracks is being investigated. X-Ray of the stage is expected to be completed today (Mon., 26 Feb. 68) and stage is scheduled to go back on stand, Fri., 1 March 68. ✓

NOTES SPEER 2/26/68

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1. SECOND BURN INHIBIT ON AS-502: According to Mr. Schneider the decision concerning conditions for inhibiting of the S-IVB second burn on AS-502 has been made by General Phillips. The inhibit conditions will be the same as on AS-501. We have accepted this decision. ✓
2. AS-502 SUPPORT REQUIREMENTS REVIEW: The Apollo 6 Support Requirements meeting was held at KSC on 2/20/68. MSFC's special data requirements in support of the AS-503/BP-30 decision were presented to the implementation agencies and accepted. Subsequently, we have officially submitted these requirements and the technical details are being worked. We are expediting all launch, insertion, pre-ignition sequencing and second burn phase telemetry and tracking data. All data will be delivered to MSFC within 24 hours. The implementation agencies reported they will be fully prepared to support the Apollo 6 mission. ✓
3. AS-204 DATA CRITIQUE: The Apollo 5 Data Critique was held at KSC on 2/20/68. In general, support for Apollo 5 was the best yet in our Apollo missions. There are, however, still numerous areas where improvements must be made. These are reviewed and those that can be corrected will be. Some discrepancies were not accepted by the support agencies and will require modification of our requirements. ✓
4. MSFC MISSION OPERATIONS PLAN: As requested by General Stevenson the MSFC Mission Operations Plan has been updated for Apollo and modified to include AAP. A draft of the plan was completed on 2/19 and is presently being reviewed within MSFC. ✓

NOTES 2/26/68 TEIR

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ENGINE FAILURE ON S-IB-11: On February 21, 1968, during the fourth scheduled combustion stability test on S-IB-11 stage, the stage was shut down by the static test Fire Detection System at T+0.36 sec. (launch commit +0.36 sec.) after three seconds of burn time due to a failure in the gear case of Engine 8. Small fire in area 8 was extinguished in a short time by the water flush system in the engine area. With the exception of Engine 8, damage to the stage was minor. Findings to date all indicate that the LOX seal in the LOX pump failed, allowing LOX to leak into the lube side of the gear case and that the failure was completely independent of the combustion stability (bomb) test being run on Engine 1 and Engine 7. Gen. O'Connor has written a memo to Mr. Weidner requesting a complete evaluation of the failure. Dan Driscoll is heading up a failure team and expects to have the first report on findings by noon Tuesday, February 27. ✓

SATURN/APOLLO SCHEDULES: Gen. Phillips is holding a working review with program managers from MSC, KSC and MSFC today at KSC to identify any problems which threaten the current Master Apollo Schedule. I am attending with Gen. O'Connor and Dr. Rudolph. ✓

SA-205/SA-206 PRIORITY: Because of the very low probability of having an SA-206/LM-2 unmanned flight and the fact that we would have a minimum of three and one-half months notice, if required to launch SA-206, we last week established a new priority for work on SA-206 and SA-205 documents. From now on, if in any area there is a requirement to establish a priority between SA-206 and SA-205 work, we will give SA-205 first priority. No hardware requirements are concerned. The only areas concerned are documentation such as test and checkout specs, criteria, and requirements, launch redlines, software, etc.

If the March 6 final decision date assures us that we will have no SA-206/LM-2 mission, we will continue only such work on SA-206 that can be used for the first Saturn IB dual launch mission, which we must continue to be able to support. ✓

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1. VISITORS FROM OSSA: Mr. Jesse Mitchell, Dr. Henry Smith, and other members of OSSA wish to visit MSFC on 3/18 to discuss the results of our ATM Follow-on studies, and also MSFC's prospective role in the space astronomy program. Preparations for this visit will be made jointly between R&DO and IO. I believe that we still have a good chance to assume an active and rewarding role in the evolving space astronomy program, if we so desire.

↖ Be sure do!
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NOTES 2/26/68 WILLIAMS

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2/26/68

1. Configuration Task Team: The Configuration Task Team of the Saturn V Workshop study will brief Dr. Gilruth, Mr. Trimble, and others on March 1 at MSC. As you may remember, Dr. Gilruth arrived late at the February 2 meeting in Washington, D. C. (the only meeting he has attended to date) and has not had any presentations on this subject. He requested the presentation which will be given by Hal Becker, Jim Madewell, and Ralph Hodge (MSC). No significant changes have been made since the February 2 meeting at which time the Configuration Team recommended two B and two C Configurations (one more C was added at the time - the artificial "G", rotating station) which were accepted. The effort since then has been on refinement of detail and on tying down open items. The Logistics, Resupply Team (Mr. Stoney) will also present their results at the same meeting. ✓

2. Saturn V Workshop Task Force Status: All of the Task Team chairmen will meet at MSFC on Monday, Tuesday, Wednesday (2/26 - 2/28) to work out the discrepancies in the Task Force final report and prepare it for the Planning Committee's review in Washington on March 8 and final report to be published by March 15. You will have a condensed "Final Review" with the Thompson Committee on March 12 in Washington. If you would like to have an internal review prior to that time, it can be arranged. ✓

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3. Orbital Astronomy Support Facility: A final presentation of the results obtained from the "Orbital Astronomy Support Facility" (OASF) study contract was made on February 21, 1968 to a sizeable audience from NASA and industry. This briefing will be repeated twice on March 11 in Washington, D. C.; once to Jesse Mitchell and his OSSA staff; a second time to OMSF representatives. ✓

4. Contributions to University Affairs Program: A number of MSFC people have assisted ASO in supporting the Headquarters University Affairs Office in the Georgia Tech doctoral program. Representatives of AERO, ASTR, and P&VE, as well as ASO, have participated at Georgia Tech in lectures and discussions, selecting and furnishing appropriate documentary reference material, and advisory consultations. We have kept all Marshall elements involved in University Affairs activities advised. Mr. Kent has furnished a summary of our involvement for the special Headquarters committee appointed by Mr. Webb to study these areas. Mr. Becker will make a presentation to the MSFC Graduate Study Steering Committee at the next meeting and will suggest that this kind of activity is an area in which that committee might well serve. Mr. Becker is also serving, by invitation, as a member of a Georgia Tech panel of faculty and industry and government assembled to select and guide their NASA sponsored doctoral candidates in their next year's Systems Engineering Project and in developing and completing their doctoral theses. ✓