

Oct. 2, 1967

NOTES
MR. GORMAN'S COPY
OCT 2 1967

w/ comments

*No comment marked
for DEP-A*

NOTES 10/2/67 BALCH

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S-II-3 Testing - A full-duration static firing of the S-II-3 stage was successfully accomplished on Wednesday afternoon, 9/27/67. Data acquired is being reduced and evaluated and formal data presentation will be made on 10/4/67. ✓

S-IC-6 Stage - Date of delivery to MTF has not yet been established. ✓

Acoustic Data from S-II-3 Static Firing - During the S-II-3 full-duration static firing on 9/27/67 the Acoustic Lab made a total of 22 far-field measurements. All units, including six community monitoring systems, produced good data, and the noise levels recorded were well below red line. ✓

MTF Transportation - Information has been received that study group will convene at MTF on 10/16/67 to begin study to determine feasibility of assigning transportation responsibilities at MTF to General Services Administration. ✓

GE. Service Contract - MSFC concurrence in amendment covering second through fourth quarters of Fiscal Year 1968 has been obtained, and final approval by NASA Headquarters is expected this week. As a result of NASA Headquarters teletype, dated 9/8/67, General Electric was advised on 9/28/67 of NASA's intention to extend their service contract at MTF through 9/30/69. ✓

Visit of NASA Advisory Group - On 9/27/67, the following members of the NASA Advisory Group were at MTF: Mr. Gerald Lynch, President of Menasco Manufacturing Company and NASA Consultant; Dr. Floyd Thompson, Director of Langley Research Center; and General Charles Roderick, Special Assistant to NASA Administrator. ✓

Public Affairs - On 9/26/67, twenty-five Foreign National student officers, accompanied by a representative from Keesler Air Force Base, where they are undergoing training, were given a briefing on MTF and escorted on a site tour. ✓

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AAP MECHANICAL PANEL: The third AAP Mechanical Panel Meeting was held September 27, at MSC. Preliminary analysis shows Lunar Module (LM) not adequate to withstand Command Service Module (CSM) docking loads if CSM docks last. MSC has indicated they want MSFC to determine probe/drogue solution for LM/Multiple Docking Adapter (MDA) docking including post Apollo probe requalification if required. We feel that the probe/drogue should continue to be MSC qualified items GFE'd to MSFC for MDA installation. Docking the CSM first will be pursued in the Mission Requirements Panel as an alternative although operational problems are introduced. ✓

ATM THERMAL VACUUM CHAMBER CLEANLINESS TESTS: MSFC plans for conducting a cleanliness test of the MSC vacuum chamber prior to final selection for ATM testing have now run into higher priority Apollo tests in both chamber and manpower availability. We will pursue this with the MSC AAP Program Office. If AAP is to be decoupled from Apollo then it may be necessary to pay the higher costs for a non-Apollo facility. ✓

MSC/GRUMMAN AIRCRAFT ENGINEERING CORPORATION (GAEC) MONTHLY MANAGEMENT MEETING: We participated in the MSC/GAEC Monthly Management Meeting held at Houston, September 28. The meeting was primarily devoted to the final GAEC report on 18 alternate studies of possible modifications to the LM for the ATM mission. During the recent ATM Project Review, Mr. Thompson, MSC, pointed out that the LM was being designed for a 14-day open end mission; however, at this meeting MSC directed GAEC to baseline the LM for a 56-day mission, orbital storage of one year, and a 56-day revisit. ✓

LANGLEY RESEARCH CENTER (LaRC)/MSFC ATM POINTING CONTROL SYSTEM (PCS) MEETING: A working session with LaRC was held at this Center September 26 to explore in detail results of PCS analytical simulations by both Centers. The exchange was beneficial, cooperative and MSFC outlined specific study areas for LaRC to report on at the next meeting. ✓

ORBITAL WORKSHOP DESIGN REVIEW PLANNING: McDonnell Douglas has submitted a detailed schedule for updating the Orbital Workshop engineering mockup. The mockup is scheduled to be returned to MSFC from McDonnell Douglas, Huntington Beach, on December 29. The delta Preliminary Design Review Documentation Review and Crew Station Review are being rescheduled to conform to the return of the engineering mockup. ✓

LOCAL SCIENTIFIC SURVEY MODULE (LSSM): Boeing and Bendix gave their final presentations last week on the studies they have been conducting on an LSSM to be used on a dual launch AAP mission, now scheduled for 1973 with single extended lunar missions in '71 and '72. The two candidates for the initial lunar extensions are flying units or a smaller LSSM. We will be examining this area in conjunction with Frank Williams for definition of a smaller LSSM. ✓

Attachment for Dr. von Braun's copy only.

NOTES 10-2-67 BROWN

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H-1 ENGINE A technical review of the H-1 stability problem was conducted at MSFC on 9/27 and 9/28. Additional tests are required to resolve this anomaly; however, it is the concensus that the problem is facility oriented, and that the engines on S-IB-4 will repeat the stable performance demonstrated on S-IB-1 through S-IB-3. ✓

F-1 ENGINE The thermal insulation on 501 has been exposed to driving rain at KSC, and the batting in the insulation panels has become soaked. If possible, it is planned to remove selected panels from AS-501 for weighing to determine the amount of residual water present. In addition, in an effort to determine whether or not this poses a serious problem, Rocketdyne is conducting both structural and heat flux tests on water soaked panels. Preliminary results indicate that the added weight resulting from the water causes no structural problem. However, under simulated flight heat flux, some bulging and minor damage of the insulation skin were noted. Testing is continuing and final results should be available within a week.

The three-way solenoid and associated lines which were added to the F-1 engine to provide a redundant shutdown system have successfully passed component qualification testing. (The requirement for redundant shutdown was imposed in October 1966 after it was determined that the stage prevalves could not be used to provide this capability.) This completes all required component qualification testing for F-1 engine components. ✓

J-2 ENGINE All mandatory actions resulting from J-2 engine problems identified to date by the Safety Board review for AS-501 have been resolved by agreements between MSFC and KSC. Procedural revisions are presently in work at KSC to complete the paperwork in time for CDDT.

A full duration acceptance test firing was successfully accomplished on the S-II-503 stage engines on 9/27. All programmed test objectives appear to have been achieved. Post test inspection revealed no apparent engine discrepancies. The engines performed at maximum PU for a duration of 276 seconds.

Installation of the second 225K engine for environmental verification testing at AEDC has been accomplished. Reactivation of the test cell is scheduled for 10/3. ✓

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Honeywell Magnetic Tapes

300 Honeywell 3/4" magnetic tapes -- excess to the Computer Operations Office needs as a result of conversion of computer applications to UNIVAC equipment -- were shipped to the Ames Research Center. By MAF providing these tapes, Ames was able to avoid a magnetic tape procurement action amounting to approximately \$16,500. ✓

VIP VISITORS TO MICHLOUD

The following special groups visited the Michoud Assembly Facility this week:

Wednesday, September 27 - NASA Headquarters Advisory Group, consisting of Mr. Gerald Lynch, president of Menasco Manufacturing Co. and consultant to Mr. Webb; Dr. Floyd Thompson, director of Langley Research Center; Maj. Gen. Charles R. Roderick, special assistant to Mr. Webb; Mr. Herbert Brewer, NASA/DOD procurement liaison officer; Mr. Daniel Linn, Office of Manned Space Flight, Procurement, and Mr. Wilbur Davis. ✓

Friday, September 29 - Two Labor Party Members of Great Britain's House of Commons, Mr. Robert E. Sheldon and Mr. Joel Barnett. ✓

Friday, September 29 - Twenty-four allied officers from the U. S. Army Armor School, Fort Knox, Ky. ✓

As of this week, 1,036 foreign nationals have visited Michoud since January 1. ✓

NOTES 10/2/67 FELLOWS

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1. Neutral Buoyancy Tank: The schedule for completion of tank welding of the Neutral Buoyancy Tank has slipped about one month from January to February 1968, because only about one-fourth of the originally scheduled civil service welders have been available for this work. Some welders expected to be used on the tank were required for welding on the S-II Structural Test setup. Arrangements are being worked out with Test Lab, ME Lab, and the Technical Systems Office to see what can be done to prevent a further schedule slip on the tank. ✓

2. R&DO Work on Voyager and Nuclear Ground Test Module:

As a result of recent discussions with respect to funding levels for Voyager and the Nuclear Ground Test Module (NGTM), steps are being taken to assure that, as R&DO people clean up any remaining essential work, they discontinue charging their time to either of those two programs. R&DO people who have been working on and charging their time to Voyager or NGTM will in most instances be identified with selected AAP projects requiring additional emphasis. ✓

3. MSFC/KSC Mutual Assistance Program: A meeting has been scheduled for you at 3 p. m., October 10, with the 18 - 20 men who will have completed their TDY assignments and returned to Huntsville (10 or 12 R&DO people will still be at the Cape). Informal discussion between you and the R&DO representatives is planned, rather than formal presentations by the R&DO people. ✓

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1. Cluster for Stellar Astronomy: In a recent Note (9/11/67) Dr. Stuhlinger stated that for stellar astronomy satellite separation of the LM/rack from the cluster would be almost mandatory, in order to obtain enough stellar observation time in spite of need for some orientation to satisfy energy requirements. It is our understanding that the second generation ATM will not have its own solar arrays but will rely for power on the orbital workshop arrays. (This, of course, is subject to change). If this is the case, there is somewhat greater latitude in placing experiments on ATM-B than on ATM-A since the interference of solar arrays is a major limiting factor for placement. It seems at least possible that a design can be found which will permit simultaneous solar and stellar observation. If it becomes impossible to accomplish this simultaneous operation of solar and stellar astronomy experiments and the stellar experiments are to be limited to the night portion of the orbit, there should be no difficulty in utilizing the entire night period. Gimbaling the ATM while holding the workshop inertially fixed is far less severe than reorienting the entire cluster and can be accomplished in an insignificant amount of time with low propellant consumption. Hence, the free-fly mode of operation cannot be justified on this basis at this time. This does not mean, of course, that this mode could not be attractive for other reasons, such as minimization of contamination or disturbances by man (assuming the LM to be unmanned).

2. AS-204 Ground Winds: Pull tests at KSC on AS-504 indicate that the vehicle is considerably stiffer in the base region than earlier calculated. R-P&VE is re-computing the dynamic characteristics which will be used in revised ground winds loading analyses. Preliminary estimates are that the first cantilever mode frequency may be 50% to 70% higher which will increase the allowable critical peak ground winds as much as 20% to 30% over the earlier recommended restriction (\approx 21 knots). It now appears that a 95 percentile ground wind (28 knots) capability will be achieved compared to the design requirement of 99.9 percentile (46 knots). ✓✓

Notes
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you prepare
a joint
meeting
with
Stuhlinger
& myself
where we
can brain-
storm this
entire issue
of the best
stellar
astronomy
configuration
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A. Rudolph

1. S-II-4 CHECKOUT: The decision to assign S-II-4 to the SA-503 launch vehicle has resulted in deleting two weeks from the scheduled stage checkout operation in order to meet the earlier delivery date to KSC. Extensive manufacturing activity deferred into checkout locations is making any improvement in the original schedule difficult.

| Is this firm?
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| Is this wise?
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2. VISIT OF DR. DORMAN: Dr. Dorman, who was accompanied by Dr. John Condon, was given a briefing on PRINCE/APIC and a presentation of a proposal for a "Uniform Parts & Materials Information Center" which were received very well. He plans to familiarize himself with efforts along this line in other Centers and wants to discuss the subject with MSF, OSSA, and other interested organizations. Since the Navy (Navy Ship Engineering Center, Great Lake, Illinois) inquired about active participation in PRINCE/APIC with contribution to funds, Dr. Dorman was furnished the contact point in the Navy who had asked us about a contact point in NASA Headquarters for negotiations. ✓
3. ROLE OF GENERAL ELECTRIC IN THE QUALITY AREA: Mr. George White (MAR), accompanied by Mr. Tom Keegan, met Thursday noon with Dr. Rees, General O'Connor, and others with no conclusive results. Thereafter, during their visit to the Quality and Reliability Assurance Laboratory, I appraised these visitors of the areas in which additional effort should be invested in order to increase the chances for success of the launch vehicles. They were also shown the data which are already available on a regular basis and their utilization for follow-up actions. It was emphasized that General Electric has always had access to these data. If additional bits of information are needed in order to provide across-the-board visibility for General Phillips and others, we'll be glad to look into the possibility of furnishing them, but agreement has to be reached as to the required bits of information. Despite of our efforts over several years, MAR has not told us what is needed by MAR for GE, which George White admitted as being the fact. The information which is available now was developed by us in cooperation with the prime contractors and is limited to what we believe is meaningful information (which is contrary to the GE claim for all information, whatever that is). ✓ Upon request by Dr. Dorman, Dr. Condon participated in the noon meeting as well as in the informal briefing thereafter. ✓

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 1. ATM Control System. Langley personnel visited with us as a result of the discussions which came to light during their CMG presentation at the last ATM quarterly review. Three areas which accounted for the different results were:

- a. Langley was using outdated data for their mathematical model of the CMG.
- b. Langley math model of the CMG was more complex whereas the MSFC model was a simplified version.
- c. The Langley analyses were based on more severe man motion disturbances than those used at MSFC.

With the establishment of a common set of ground rules, both Centers will continue with the analyses and our differences should be dissolved. ✓

Dr. Anderson of Langley also stated that he did not take a strong position on the utilization of the Langley Control Law since he recognizes that it contains certain shortcomings. ✓

2. ATM Star Tracker. (Reference Notes 9/25/67 Haeussermann) NASA Headquarters advised by teletype to IO/SAA to proceed with the star tracker in accordance with our meeting of July 19 at Headquarters with Mr. Mathews. Mr. Buckner expects to resolve, within the next few days, the MSFC position relative to this procurement action, i.e., the need to go out for a rebid or proceed with our current selection. ✓

3. AS-501 Control Computer. After the solder rework, the checkout of the spare control computer for AS-501 started on September 20 on a 24 hour per day basis. The computer was delivered to IBM for shipment to KSC on September 26. ✓

4. AS-501 ST-124 Platform. The Z accelerometer (cross range) on the ST-124 platform S/N 9 for 501 shows a shift in bias and scale factor errors. This shift exceeds specification and, to date, we have not been able to determine what caused the shift. Experience with this type accelerometer has shown that an unstable accelerometer servo loop would cause the mechanical pick-off stops to be damaged thus shifting the bias and scale factor settings. Monitor checks on this servo show it to be stable now. It is being recommended to IO that the platform system be removed from the IU and taken to the lab for verification tests and, if necessary, a change of the accelerometer. A representative of this lab is at KSC for CDDT who will witness these test. A Bendix technician will be sent to KSC with a new accelerometer and will make the change. A systems test to check the new accelerometer will have to be performed. It is estimated that 48 hours will be necessary to perform these activities.

↳ Arthur Rudolph

↳ Could it affect launch date?

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F-1 ENGINE

Test FW-070 was conducted on the West Area F-1 Test Stand with F-1 Engine S/N F-5038-1 on September 28, 1967, for a mainstage duration of 44 seconds. Cutoff was initiated by the S-1C low level cutoff sensors. Primary purpose of this test was to evaluate engine performance during lox depletion utilizing GN₂ pressurization. ✓ KH

MOBILE TEST ARTICLES (MTA)

← That designation doesn't ring a bell. What is it? JB

The test course layout was forwarded to Advanced Systems Office to acquire funds for construction. The two vehicles are operational except for the instrumentation systems. The instrumentation systems are being modified and new measuring hardware is being installed.

SOLAR PANELS ATM

The facility panels have been completed and checked out. We are holding for hardware. ✓

MODERATE DEPTH LUNAR DRILL

Design review was held with Northrop on slave valve hammer design. Several changes were made to the design and the drawings will be released to the shop next week. Provisions for instrumentation have been made at building 4649 and testing on the Northrop designed nitrogen compressor will begin next week. ✓

S-11-3 ACCEPTANCE FIRING

Ed O'C.
I agree.
This kind of thing must be avoided
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One of the first rules of safe static firing operations (do not distract the operators) was ignored when NASA required the SD Site Manager (Allen) and Test Operations Manager (Schwartz) to give a two hour presentation on safety during propellant loading to a committee on "procurement" from Mr. Webb's office. Key test management must have first hand knowledge of the operation prior to firing and must be present during countdown if they are to function reliably. Other than the above, the operation was by far the best SD has performed to date. ✓

H-1 ENGINE

Tests No. P1-516 and P1-517 were conducted at the Power Plant Test Stand during the week of September 25, 1967, using engine H-4067 in the continuation of the H-1 engine instability problem. Test No. P1-517 was a "bomb test" and the bomb induced instability dampened within the specification limits. Test No. P1-518 is planned for today, October 2, 1967. This test will end the planned instability program on the Single Engine Test Stand at Marshall. ✓

S-IVB

Stage 505 (N) was installed on Beta I Test Stand at the Sacramento Test Center and has been undergoing prestatic checkout in preparation for full duration static firing on October 11, 1967. ✓

NOTES 10-2-67 HOELZER

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Negative Report.

NOTES 10/2/67 JOHNSON

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Supporting Development Program Status - In the meeting with George Trimble on 9/25, he directed a \$12.5M apportionment to MSFC for the J-2 Improved Engine and associated work. In dividing the residual \$19.5M Supporting Development funds, MSFC was allotted \$3.0M, giving a total program of \$15.5M. This is about \$3.0M less than we had planned for. We are re-working the planned program and expect to be able to recover about \$2.5M of the potential loss. ✓

NERVA Program - Mr. Dave Miller, SNPO, visited MSFC on 9/28 to discuss the Nuclear Program. It was agreed that FY67 funds committed for NGTM hardware would be de-committed where possible and used for other planned nuclear technology work. Use of '68 funding is not yet firm; however, new authority in this area will probably be about \$1.4 - 2.0M for FY68 and will be used specifically for new technology and components work. ✓

Experiment Review Board Meeting - A meeting of the MSFC ERB was held on 9/28. Four Experiments were reviewed. It was recommended that two of these be submitted to Headquarters for funding support leading to development. It was recommended that the other two be pursued as in-house efforts until more nearly defined. Procedures for bringing experiments proposed by outside investigators to the attention of the Board were discussed and adopted. You will be provided a copy of the minutes when they are completed. ✓

NOTES 10-2-67 KUERS

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Astronaut Visit: Astronauts Bean, McCandless and Lousma visited our Laboratory on Wednesday for the purpose of reviewing with the principal investigators two of our flight-approved AAP experiments, electron beam welding and exothermic brazing. Both welding and brazing operations were performed on prototype equipment while they were here. The astronauts commented favorably on our experiment philosophy, development, and potential applications. The astronauts consider themselves as co-experimentors and, as such, want to contribute to the design and development of the experiments. They will participate in evaluation of the manual operations of the experiments under simulated zero "g" conditions in our neutral buoyancy test tank. Also they have asked us to set up a training program for them on our standard welding and brazing equipment so that they will be entirely familiar with the principles and operation of such equipment and so that they can make the gun perform in space as our welders would a machine in our laboratory. ✓ In addition they will be kept informed of our laboratory experiments, modes of testing, and resultant data; they will thus establish a baseline for comparative engineering judgment in space.

The electron beam welding experiment is designed to study the behavior of a pool of molten metal under zero "g" conditions. The experiment will be enclosed in a can provided with windows: one for a camera to record the events on film, the other for the astronaut-operator to observe the weld and make suitable adjustments to the beam power and/or focus. It is for this reason that the astronauts want to familiarize themselves with standard welding procedures. ✓

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S-II Margin

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1. S-II SPRAY FOAM INSULATION: A series of wind tunnel tests on samples of the S-II spray foam insulation is scheduled to begin 11-6-67 to demonstrate the resistance of the basic foam insulation to aerodynamic shear loads and to determine the probable results of launching the S-II stage with spray foam insulation defects. A new 8-foot tank will be delivered to McDonnell Douglas Company 10-1-67 to be spray-foamed and tested with cryogenics in the tank. The earliest date that testing can begin at SACTO is 11-13-67. ✓
2. APOLLO TELESCOPE MOUNT: MSFC is required to make a presentation on ATM thermal control 10-25-67, at NASA Headquarters to Dr. Mueller and Mr. Mathews. This is a repeat of the presentation at the recent ATM Quarterly Review. In addition, we were asked to comment on a set of questions emphasizing a liquid cooling system. ✓
3. DAMPER COMPONENT QUALIFICATION TEST PROGRAM: Our present commitment for 100% completion of component qualification testing by 12-31-67 cannot be met. We are experiencing difficulties with the procurement of acceptable components (5) from vendors. Some deliveries are not expected prior to the end of the year. The complete qualification testing may take up to 3 months after component arrival. After 501 launch, some spares may become available for qualification testing. We will negotiate realistic schedules with IO. ✓
4. ORBITAL WORKSHOP PACKAGE TRANSFER SIMULATION: The first zero-g tests of the manual package transfer concept were conducted on 9-20-67 thru 9-22-67, at Wright Patterson Air Force Base, Dayton, Ohio, aboard the Air Force KC-135. Mockups of the aft airlock module compartment and LH₂ tank manhole rim, fireman's pole, and crew quarters entrance hatch were used to evaluate manual transfer of 60 lb_m, 80 lb_m, and 150 lb_m mockups of representative packages. The proposed Douglas package mount/dismount concept and several MSFC mount and dismount concepts were also evaluated. A total of 50 parabolas were flown; the three test subjects were P&VE personnel. ✓ KC-135 flights are scheduled for October 9, 10, and 11, 1967, at MSC for final evaluation and concurrence of the "fireman's pole," design concept, and operational utility. Astronauts will serve as test subjects during these evaluations. ✓
5. SUNSPOT I VACUUM FACILITY: The Sunspot I Vacuum Chamber, which is 12 feet in diameter and 12 feet long, has been acceptance tested and met all specifications. With both the diffusion and Ion/Titanium Sublimation pumping system, pressures as low as 8×10^{-10} mm of Hg have been achieved with the chamber cold, dry and empty. On speed runs, pressures of 2×10^{-7} have been achieved in one hour. ✓
6. LSSM CONTRACT STUDIES: The two LSSM study contractors gave their final presentations at MSFC this week - The Boeing Company on 9-27-67 and Bendix Corporation on 9-29-67. Because of recent funding reductions, both contracts are being allowed to expire at the end of September. No additional funding for this fiscal year is anticipated. ✓
7. S-IC DEBRIS VALVES: On Friday (9-22-67), we received an urgent call from the Saturn V Program Office to provide a fix to keep the debris valves open after lox replenishing, to assure umbilical carrier retract. This requirement was due to a KSC facility problem. P&VE and Test Lab personnel worked Friday night and handcarried the modification hardware to KSC Saturday morning. ✓ However, Boeing (KSC) would not even consider our design since they are responsible for the installation of swingarm and the certification of proper functioning and proceeded to develop an alternate design, which was manufactured Saturday night. It appears that the responsibilities of the various organizations are not yet defined. ✓

1" Margin Deleted

A Patton Rudolph

Looks like some SNAFU. What happened?

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10/2 XLS

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PERT COMPUTER PROGRAM - At the annual management systems coordination meeting held at Ames Research Center last week, the decision was made by NASA Headquarters to have a single NASA computer program (software) for processing PERT data i.e., a computer program that requires a minimum effort to convert between different types of equipment (Univac 1108, IBM 360, CDC6600, etc.).

The decision comes at this time because most of the Centers are converting to third generation equipment which requires conversion of both hardware and software.

The PERT/TIME II program developed by Lewis Research Center and used by OSSA was selected over the PERT/TIME "C" program used by MSF elements including Marshall.

MSF Headquarters has agreed that the phase over will not be accomplished for on-going programs and only for new programs after it has been determined that the PERT/TIME II program will satisfy all of MSF's requirements. We will be working with MSF Headquarters in making this determination to assure no impact on Marshall program activities.

RESOURCES MANAGEMENT STUDY - Mr. Gorman asked us to conduct a study of the Center Resources Management. This study has been completed and a presentation given to Mr. Gorman on September 27, 1967.

As a result of this effort we have concluded that the Program Execution Plan (MSFC internal document supporting the POP cycle) should be eliminated and that the Center should replace the PEP with a modified task supporting justification book.

It is felt that this approach will result in a work package system which will benefit MSFC as well as satisfy the requirements of MSF.

NOTES 10/2/67 RICHARD

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No submission this week.

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AS-501 Launch Vehicle at KSC:

- o On Friday, 29 Sept 67, the Countdown Demonstration Test (CDDT) was extended for 24 hours due to spacecraft, ordnance installation and other problems.
- o On Sat, 30 Sept 67, the CDDT was extended an additional 24 hours because of low resistance in the cable between the LOX PU sensor and the electronics assembly on the S-IVB Stage. The cable was replaced on Sun, 1 Oct 67.
- o The strain gages on the soft release devices were installed and calibrated during these hold periods.
- o "T-0" for the CDDT is now scheduled for 8:00 am, EDT, Tues, 3 Oct 67.
- o Gen. Phillips' Flight Readiness Review is now scheduled for Mon-Tues, 9-10 Oct 67; and the Flight Readiness Test is scheduled for Wed, 11 Oct 67. ✓

S-II-3 Stage at MTF: The second captive firing (full duration of 360 seconds) was successfully completed on Wed, 27 Sept 67. ✓

S-II Pulsed Arc MIG Welding: Reference your comment on the Kuers notes dated 9/25/67 (copy attached). I believe the decision to proceed with TIG welding (rather than MIG pulsed arc welding) on S-II-8 was correct. A team consisting of NAA and MSFC Engineering, Manufacturing, and Quality very carefully reviewed the MIG test data and unanimously concluded that too much scatter was evident in the weld properties and that further work was necessary before committing to MIG welding. As Mr. Kuers points out in his notes, the No. 6 cylinder to bulkhead weld is the most difficult weld in the S-II structure, and trouble could be encountered in the actual hardware, even if the weld sample data looks good.

Kuers
Kuers
FYI
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I would not have hesitated to slip the schedule on S-II-8 to allow the MIG process to be incorporated if the weld samples tested up to that time had been more acceptable to Engineering. I assure you that all necessary action will be taken to incorporate the new process just as soon as the pre-production weld samples are acceptable.

Attachment: Notes 9/25/67 Kuers (DIR, I-DIR and R-DIR cys only)

NOTES 10/2/67 SPEER

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1. AS-501 CDDT STATUS: As of this morning the accumulated hold times during the L/V Countdown Demonstration Test (started at T-67 hours on 9/28) is 42 hr 52 min. Major L/V related hold items were S-IVB PU coax cable; Helium servicing problem. T-0 is now scheduled for Tuesday morning 10/3, 0800 EDT. ✓
2. AS-501 RANGE SAFETY: We have been advised that range safety has accepted the AS-501 nominal flight profile and that resulting wind constraints for two directional components (35° and 109°) yield an October launch probability of 95% or better. One remaining problem is the engine #3 out case which - in combination with very low performance and other adverse conditions - could lead to debris impacting the VAB. Dr. Debus has requested additional trajectory studies from R-AERO and it is intended to establish the permissible performance variation in combination with engine #3 out. We need to concern ourselves not only with the VAB safety but also with the risk of destroying a L/V with only four engines going but otherwise healthy. ✓
3. OPERATIONS COST REDUCTION: In response to cost reduction efforts in the Office of Tracking and Data Acquisition, OMSF/MO has defined certain reductions in network operating costs. MSFC's operations planning recognizes these considerations, and, as such, no significant impact on mission support is anticipated: (a) After Apollo 5 mission, phase out of two prime Gemini ships; (b) After Apollo 5 mission, deletion of flight control console operation at Carnarvon and Guaymas; upon demonstration of reliable communications to and from the Apollo ships via communication satellite, deletion of flight control console operation on two ships, Redstone and Mercury; (c) Defer dualization of 30 ft Unified S-Band stations at Bermuda, Canary Islands, Antigua, Guaymas and Corpus Christi for AAP. ✓

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1. ASTRONOMY SUBCOMMITTEE MEETING: During the last meeting of the OSSA Astronomy Subcommittee (of which I am a member), the following subjects, among others, were discussed:

a. OAO Program - Four, and possibly five, more flights are planned in the period 1969 - 1972. Objectives are mostly spectrophotometric measurements in the UV.

b. ASTRA Project - This project deals with a man-maintained OAO-type satellite which could be launched around 1974 - 75; the man should not live inside the satellite capsule. The satellite would carry a diffraction-limited, 1 meter, f: 10 to f: 20 Cassegrainian system for visible and UV spectrophotometric observations. The study group includes Houck, Henize, Tifft, Whipple, and Roman.

c. ATM-Follow-On Study - This study, presently underway at MSFC, includes ATM-type systems for solar and stellar UV, X-ray, and gamma ray observation. The Subcommittee requested a report by MSFC in January, 1968.

d. OASF Project - The status of MSFC's study of an orbiting astronomical support facility was presented by members of ASO and their study contractor (Douglas). Subcommittee members were concerned, and even critical about the fact that MSFC has not yet expended more effort toward the questions of how to accommodate, operate, service, and maintain advanced astronomical systems on or near manned orbiting stations. It became evident that we must pay considerable attention to these problems in the future, and that we should work closely with astronomical planning groups (OSSA Subcommittees; ASTRA Working Group; Spitzer Committee; Astronomy Mission Planning Board under Goldberg; and even with individual astronomers) to arrive at a sound and workable astronomy program.

We will present a more coherent picture of the astronomy planning situation in the Astronomy Program presentation to you on October 13.

2. SEMINAR SPEAKER: Dr. L. I. Schiff of Stanford University will talk on gravitation and relativity at MSFC on November 30 at 10:00, with emphasis on the relativity precessional experiment (gyroscope in low-perihelion solar orbit) proposed by his group. Dr. Schiff is an outstanding theoretical physicist of international reputation. I believe that you would enjoy hearing his presentation, and meeting him personally before or after the seminar.

10/2/67

B 1017

AS-205 CREW BRIEFING AT IBM, HUNTSVILLE: If the AS-501 CDDT T-0 holds as scheduled for 7:00 AM, we will give the crew briefing at IBM tomorrow. If the CDDT slips into the day, we must postpone the crew briefing due to presenters having to attend the CDDT. Twelve crewmen plus 3 MSC personnel will attend and plan to observe the swingarm testing at the Test Lab. ✓

UPDATED SATURN I MINUTEMAN STRAP-ON PRESENTATION: CCSD made their final presentation to MSFC on 9/27/67. We are working with Ludie Richard's office for technical evaluation and approval and to arrange for the final presentation to Headquarters. We will schedule the full presentation for you prior to going to Headquarters. ✓

ACTION BEING TAKEN BY MSC TO CORRECT LM LEAKS: Dr. H.G. Jones (Boeing, TIE/MSFC) was here 9/29/67 to give MSFC personnel a rundown on actions in process at MSC and Gruman Aircraft (GAC) to correct LM leaks. He indicated primary propellant plumbing will be welded at GAC prior to AS-204. Leak detection methods will be standardized in GAC, White Sands, & KSC test procedures. Higher pressure (approx. 200 psi) pure helium will be used to leak check at KSC. The sealing "O" rings will be changed from teflon to butyl rubber to help avoid cold flow problem experienced with teflon. In general, MSC is involved in a much more comprehensive design analysis and repair program than we knew of prior to Dr. Jones' visit. We will continue our efforts to protect our hardware from inadvertent spillages and leaks as previously outlined in my notes of 9/18/67 (copy attached). ✓

IU BATTERIES: When IBM, Huntsville, assumed procurement responsibility (204/501) for I. U. batteries, they proposed the use of lustran material for the cell cases instead of previously used bakelite because of the greater strength of the lustran. This change was approved and qualification tests were run on batteries with the lustran cell cases. Cracks in the cell cases were experienced during temperature testing of an unactivated battery at temperatures below 32°F. Based on these test results, IBM and R-ASTR have agreed these batteries are qualified for all effectivities provided temperature is controlled for 50°F minimum during handling and transportation.

Based on additional test data, IBM now agrees that batteries with bakelite cells will probably meet all environmental requirements without the requirement to control temperature during handling and transportation. IBM would accept MSFC "Certificate of Qualification" for bakelite batteries on the basis of government directed design; otherwise, IBM will not certify the bakelite batteries qualified until they test 3 batteries to their test spec.

Based on above, we are directing IBM to perform the tests on bakelite batteries. This should put us in a posture of having both batteries qualified and having a battery which does not require the 50°F minimum controlled temperature during handling and transportation. ✓

B 10/7

1. Modular Nuclear Vehicle Study:

On September 28, Lockheed (LMSC) presented final results here on the Radiation Environment for Modular Nuclear Vehicles contract. The study indicates that the gamma radiation imposed upon a manned spacecraft propelled by a nuclear stage of the class that has evolved over the last several years (approximately 170,000 pounds of propellant and using a Nerva II engine) is much more severe than previously anticipated. The study employed more detailed and sophisticated calculation techniques than previously used. It appears that the spacecraft and reactor shield designs currently being utilized are far from adequate. The study presentation was attended by SNPO personnel and many contractors around the nation who are currently working in this area. We are assessing the impact of these new data and shall be working with SNPO on the effects on engine, reactor and stage design and with OMSF on spacecraft design. We shall inform you when we have a more complete assessment and can brief you then if you so desire. *(I guess for time being that info is enough (bad enough!))*

The recent budget actions by Congress and the present environment, including the more realistic timing of manned planetary missions, indicate that we have sufficient time to do additional homework which is now required. As a related item, we understand that, on September 28, Mr. Webb told the Senate Appropriations Committee that, in light of the current budget, he planned to pursue a flight program with the NERVA I engine if the Senate appropriation for nuclear rockets is comparable to the \$46.5 million house bill. Mr. Webb did not elaborate on potential flight applications of NERVA I or the fate of NERVA II in such an approach. ✓

2. Local Scientific Survey Module (LSSM):

Last week we had the final reviews of the LSSM contracted design study/program definition work by Bendix/Lockheed and Boeing/General Motors. It is not expected that the studies will be continued. ✓ We plan to maintain a smaller inhouse effort and possibly (if money is available) some contracted supporting technology on sub-systems. The follow-on effort will be reviewed by Mr. Weidner prior to its initiation. ✓

Oct 9, 1967

A

NOTES
MR. GORMAN'S COPY
OCT 9 1967

w/ comments

Dr Haussermann's notes

to Urgent Box 10-16-67.

*Haussermann's
notes pulled from
one nushig's copy*

10/9 958

B 10/13

S-II-3 Testing - Data evaluation of the S-II-503 acceptance test static firing has been completed and the certificate of acceptance has been signed. Have been advised that NASA Headquarters will extend the S-II-503 delivery to KSC by approximately 30 days. Local SD has been requested by Local NASA to present a new processing plan to reflect the schedule change. ✓

S-IC-506 - Delivery date to MTF has not yet been established. ✓

Alleged Damages from Stage Firings - A total of 10 claims resulting from the S-IC-5 test firing on 8-25-67 have been investigated by I-MT-SF. Formal claims Form 95 totaling \$21,596 have been submitted for 6 of these claims. ✓

GE - Mr. Virgil Anderson and Mr. Lew Tierney, Facility Management, Office of Administration, NASA Headquarters, and Mr. Garth Summers, Maintenance Branch, OMSF, were present October 4 and 5 to discuss and verify GE MROF Cost Accumulation System. ✓

Public Affairs - Mr. J. Antell, National President of the Union Chamber of Commerce, was conducted on a tour of MTF on October 2, 1967. ✓

NOTES 10/9/67 BELEW

10/9/67

B
10/13

REDUCED SCALE LOCAL SCIENTIFIC SURVEY MODULE (LSSM) STUDY: Advanced Systems Office and P&VE plan to define a possible configuration for a reduced scale LSSM which could be flown on an extended Apollo mission in the 1971/1972 time frame. ✓

AAP CLUSTER MISSION REVIEW: A meeting is scheduled at MSF on Oct. 12-13 with Chuck Mathews to review the current Cluster Mission Baseline (operations and hardware). Particular emphasis is being placed on an attempt to perform the missions in terms of payload weight and launch vehicle performance. Several meetings have been held with MSC to arrive at approaches to resolve the current major deficits between payload and performance. Areas under investigation include: (a) Updating launch vehicle performance commitments; (b) 2½ stages to orbit (burn Service Propulsion System (SPS) into orbit); (c) Spacecraft Lunar Module Adapter/Nose Cone (SLA/NC) jettison; (d) Replacing the current SLA with a shorter, light weight SLA; (e) Tradeoff fuel cell power versus solar array power for the Command Service Module (CSM) (reduce fuel cell reactants); (f) Lowering the insertion orbit of the Orbital Workshop (OWS) from the current 260 NM baseline; (g) Weight reduction of the Apollo Telescope Mount (ATM) solar array power system; (h) Elimination of LM/ATM free flight; (i) Tradeoff study for redistributing AAP-3 expendable to AAP-2 or AAP-4. In addition, we will propose an OWS orientation during the first part of the cluster mission which provides a new solar orientation as opposed to the current gravity gradient orientation. A presentation on the effect of such an orientation in the OWS thermal balance and power output (solar arrays) will be made. A bi-propellant system hardware implementation scheme will be recommended. ✓

L.B.

GEM is
viciously
opposed
to this
idea. B

MSC plans to discuss the decoupling of the OWS and the ATM mission.

ATM EXPERIMENT INTERFACE DESIGN REVIEW: The first interface design review for the Harvard College Observatory "C" Experiment was conducted at MSFC on Oct. 5 and 6. Several action items resulted and will be further discussed at subsequent interface design reviews to be held during the present definition phase. ✓

ATM STAR TRACKER: We received approval from Headquarters to proceed with procuring an ATM star tracker. ✓

AAP ELECTRICAL PANEL MEETING: Shortage of travel funds caused postponement of the 4th Electrical Panel Meeting scheduled for Oct. 4-5 at MSC. ✓

EXPERIMENT IMPLEMENTATION PLAN (EIP) - HABITABILITY/CREW QUARTERS: The EIP (Habitability/Crew Quarters) has been approved by MSFC and MSC and forwarded to Headquarters. The plan designates the MSFC as the engineering development center for the overall experiment with the MSC responsible for the Food and Waste Management Systems. ✓ Funding authority for the MSC portion will go direct from NASA Headquarters to MSC. ✓

ORBITAL WORKSHOP NEUTRAL BUOYANCY HARDWARE: Initial deliveries of neutral buoyancy test hardware for the Orbital Workshop crew quarters were received last week. ✓

GENERAL: The POP 67-2 has been prepared within the Headquarters dollar guidelines of \$110M for FY 68 and \$239.4M for FY 69. This guidance appears to be adequate based on launching the first cluster early in CY 1970. ✓

10/9/67

B 10/13

H-1 ENGINE It was reported by KSC that several H-1 engines on AS-204 were found to have small patches of corrosion on the external surface of the thrust chamber bell. Inspection by Rocketdyne and Chrysler materials experts on 10/3 and 10/4 showed that only superficial oxidation had occurred. An EFIR has been issued and approved for cleaning, passivating, and re-painting the affected areas, and no further action is deemed necessary. All engines on AS-204 remain in flightworthy condition. ✓

F-1 ENGINE Reference my Notes of 10/2. Further heat flux tests of wetted insulation indicate that a water content of .15 lbs/sq.ft. of panel area will result in bulging and tearing of rivets in the inner skin. The vents currently in the 501 panels are sized for 100% humidity (0.08 lbs/sq.ft.). Tests with water content of 0.1 lbs/sq.ft. result in only slight bulging. A meeting was held on 10/3 to obtain a Center position. It was decided that Rocketdyne will accomplish an in-place field modification to provide additional vent areas in the AS-501 F-1 lower skirt thermal insulation. These vents will be sized based on the assumption that the panels are wet or may be wet during the last few hours of the terminal count. In addition, selected panels will be removed and inspected to determine if additional venting is required on the upper skirt and cocoon panels. No action is required prior to CDDT on panel modifications, etc. Action has also been initiated to provide protection from driving rains during prelaunch operations. ✓

On the two occasions when CDDT was terminated, fuel was observed in the fuel manifold drain tube of the No. 1 valve on the center engine after removal of hydraulic control pressure. Either a back-pressure in the hydraulic return line (caused by a surge from the GSE hydraulic unit) is causing a momentary opening of the main fuel valve or the valve is leaking. In the event valve leakage is confirmed, replacement of the valve will be necessary. It is anticipated that a resolution will be reached after completion of the CDDT. ✓

J-2 ENGINE The method of relieving pressure in the J-2 engine start tank will be improved on vehicles 502 and subsequent with the addition of an emergency dump valve which provides a redundancy to the start tank vent and relief valve. The emergency dump valve wiring by-passes the engine electrical control assembly and connects directly to the engine/stage interface. This redundancy is significant in ground operations since the only alternative in an emergency is to dump the start tank through the engine. Dumping through the engine creates an interstage hazard and also may cause damage to the turbopumps. ✓

NOTES 10/9/67 CONSTAN

B 10/12

10/9/67

Nothing of special significance.

B 10/13

NOTES 10/9/67 FELLOWS

10/9/67

1. Neutral Buoyancy Equipment: An initial staffing plan for operation of the Neutral Buoyancy Facility by 34 civil service employees has been submitted by ME Laboratory. The target date for operational staffing of this equipment, involving personnel from several laboratories, has been established as January 1, 1968. ✓

2. Performance Evaluation Board: The current six-months' evaluation cycle for the support contractors got underway in mid-September with the second evaluation of our newer contractors, Computer Sciences Corporation and Federal Electric Corporation. For the other ten support contractors, this will be their fifth semi-annual performance evaluation. Continuing efforts to improve evaluation techniques have resulted in steadily increasing joint review of the total evaluation report by the Technical and Business Evaluation Coordinators, so that the PEB is, in effect, receiving one consolidated report instead of the two (technical and business) independent reports of the past. ✓

3. MSFC/KSC Mutual Assistance Program: Individual evaluation reports by the MSFC returnees in this KSC support program (some of these reports you have already read) are being accumulated for your October 17 meeting with these men. ✓ The KSC supervisor reports, however, are not available at Marshall, and informal information is that they will not be furnished to us until after the 501 launch. ✓

B 10/15

10/9/67

1. AAP Cluster I Weight and Performance: A meeting between MSFC/MSC personnel on the first cluster weight and performance was held at Michoud on September 29, 1967. The cooperative attitude was excellent. ✓ Major payload improvements for the AAP-2 (OWS) and AAP-4 (LM/ATM) were SLA/NC jettison during ascent and lowering the insertion altitude at least 20 n.mi. In addition, more accurate estimates of the L/V weight and propulsion characteristics result in an increase in L/V performance. The decrease in insertion altitude results from the scheduled launch now occurring later (less solar activity and corresponding atmospheric density) and by having an orbital storage mode between Mission A (AAP 1/2) and Mission B (AAP 3/4) such that OWS array is perpendicular to the OWS centerline. These conditions produce a -2σ lifetime which is still one year. ✓ Present plans now call for a revisit mission after Mission B, to occur well within a year from OWS insertion. Notes 9/25/67 Geissler (copy attached) referring to a -2σ lifetime of 200 days corresponded to a January 1969 OWS launch and orbital storage between Mission A and Mission B with the OWS array along the side of the vehicle. Major performance or weight improvements for AAP-1 (CSM) and AAP-3 (CSM) include either removing the SPS (Service Propulsion System) or flying the CSM as a third stage to orbit. In addition, the L/V performance improvements and decrease in orbital altitude also benefit the manned vehicles. Use of a short lightweight SLA is being investigated for a potential payload increase to orbit. Some of the cryogenics for fuel cell operation can be reduced by having a larger array on AAP-2. Other possibilities exist to obtain relief in the weight/performance area including elimination of LM/ATM free flight and off-loading of consumables from AAP-3 to AAP-2 or AAP-4. A presentation to Mr. Mathews is planned for October 12 or 13, 1967. ✓
2. New AAP-3 Configuration: The NAA proposal for a new relatively short lightweight SLA (see item 1. above) required a quick analysis of the aerodynamic consequences. Within 48 hours we had test results from a force model (drag and lift data), and most importantly we have spark photographs of the flow field at a few critical Mach numbers. ✓ These pictures give an indication of the extent of the separated flow regions and the location of flow reattachment. Aided by this information it will be possible to make reasonably reliable prognostic statements about the fluctuating pressure intensities. The benefit of having an inhouse wind tunnel has again been demonstrated. ✓
3. Water in Thermal Insulation on AS-501 F-1 Engines: At the 10/3/67 meeting called by the Engine Office on this subject, it was revealed that an excessive amount of moisture was present in the external insulation which protects the F-1 engine bells. Tests by Rocketdyne indicated that 0.1 lb of water/ft² of insulation is permissible without harmful results. It was suggested that vent holes be placed in the lower portion of the insulation. Mr. Dahm suggested that the holes be not larger than $\approx 1/8$ " in diameter to prevent aerodynamic load problems. At the completion of the Rocketdyne tests, a decision will be made as to whether the vent holes are required. ✓

5

NOTES 10-9-67 GRAU

B10/15

10/9/67

1. AS-501 CABLING & WIRING: All cabling and wiring discrepancies reported against the stages of AS-501 launch vehicle have been satisfactorily closed out. We have recommended acceptance of the electrical cabling and wiring on AS-501 as flightworthy. ✓
2. S-II BATTERIES: One of four Electric Storage Battery Company batteries in qualification testing failed high temperature vibration testing due to shorted plates. One met all high temperature test requirements. Heaters in the two batteries undergoing low temperature testing would not raise internal battery temperature to an operational point, and vibration testing was, therefore, not conducted. The four Eagle Picher batteries met all test parameters except that the temperature controller (GFE from MSFC) failed to operate on one battery, and on another, may have cycled at the wrong temperature level. Investigation of the temperature controller is underway. ✓

B 10/15

10/9/67

1. ATM Star Tracker. With reference to last week's notes as to whether the star tracker procurement would have to be rebid, Mr. Buckner's Office has resolved with Mr. Gorman that this procurement action will have to be rebid. We are updating the technical specifications for this action and the recommended bid list will contain a limited number of contractors. ✓

2. Systems Engineering Positions in Astrionics. When Ludie Richard left Astrionics in 1965 (taking his GS-16 position with him), we were unable, because of the unavailability of GS-16 spaces, to promote Jerry Mack. We have been trying, still unsuccessfully, since that time to secure a GS-16 for him. Because he remains a GS-15, I am encountering serious difficulty in establishing and maintaining the grade structure in my Systems Engineering Office. I have two GS-14's, holding critical positions, whom I am unable to promote to GS-15 because the Personnel Office objects to a grade stacking situation. Our inability to act on these two promotions could very well result in the loss of these two key people - which would be extremely detrimental to our systems engineering activity in Astrionics. Mr. Cook has supported us in our efforts; however, Personnel advises that the key stumbling block is the grade stacking situation. Any assistance you and Mr. Gorman can give us will be greatly appreciated.

B10/15

10/9/67

S-IVB (MSFC)

Tests No. S-IVB-H-06 and H-07 (oxygen/hydrogen helium heater tests) were conducted at the S-IVB Test Stand on October 4 and 6, 1967, respectively. The heater system operated satisfactorily and all test objectives were met successfully. ✓

KSC LOX TRANSFER PUMP

The test of the new Byron Jackson lox pump seal requested by KSC will be completed today. ✓

S-II STRUCTURAL TEST PROGRAM

The facility construction is progressing on schedule. The S-II "A" structure scheduled for delivery to R-TEST has been delayed until the middle of March 1968. ✓

Shep
Please arrange
a briefing on
status of this
program B

F-1 ENGINE

Preparations were made for Test FW-071 scheduled for 1 p.m. October 12, at the West Area F-1 Test Stand. Purpose of the test will be to evaluate engine performance during lox depletion utilizing GOX pressurization. The thrust vector control system will also be evaluated with modified hydraulic research actuator springs. ✓

SATURN V HOLDDOWN ARM (HDA) PROTECTIVE COVER

Reference Notes from Test to Dr. von Braun dated 9/25/67.

KSC Engineering (Buchanan) has re-evaluated the utilization of the HDA Protective Cover for AS-501. They are planning to incorporate a locking device to preclude premature closure of the cover against the vehicle. ✓ We understand this locking device to be the explosive nut used on the Saturn IB redundant HDA release system. Proper incorporation of the explosive locking device will make the protective covers acceptable for use in support of AS-501 launch. ✓

S-II INSULATION VENT SPOUT PULLOFF TEST

The S-II insulation vent spout "beer can top" pulloff test has been completed on the proposed 501 configuration. The static lanyards, connected between the vent covers and the main umbilical carrier on the S-II forward arm, satisfactorily performed the function of pulling off the vent spout covers at umbilical disconnect and withdrawal without hitting or damaging the vehicle simulator during ascent. We are preparing to test a back-up vent spout pulloff system and are waiting hardware delivery from NAA. ✓

10/9/67

B 10/15

1. THIRD GENERATION COMPUTER STATUS:

Software conversion efforts have been rescheduled to emphasize the earliest possible release of rental computers. This will result in maximum dollar savings and applies to most of the UNIVAC 1108 conversion effort to commercial type work. ✓

UNIVAC has delivered most of the second interim system to Computation Laboratory and it will be operational by the end of October 1967. This will increase the availability of daily 1108 machine hours from 13 to 22, but will still leave very little for general production work. Conversion work for jobs currently on rented computers will be given priority. ✓

2. TELEPROCESSING SYSTEM DOWNTIME:

The teleprocessing system (IBM 7010/7740) was down for two days during the week due to hardware trouble. IBM engineers were brought in from Virginia and California. The system was used for limited and controlled production Friday afternoon. Additional tests were made Saturday and eight circuit boards were replaced. The system was placed in full production status Monday, October 9, with no apparent problems. ✓

NOTES 10/9/67 JOHNSON

10/9/67

B 10/15

Nothing of significance to report.

10/9/67

B10715

1. SAE Meeting: Last week the annual Aeronautic and Space Engineering and Manufacturing Meeting was held at Los Angeles. A great part of the five-day meetings was devoted to manufacturing technology, such as Titanium Joining, Adhesive Bonding, Electrical Discharge Machining, Electro Chemical Machining, Profile Milling Machine Shortage, etc. I participated in the session on Utilization of New Manufacturing Developments and Production Techniques which was chaired by Mr. William Moore, Director, Technical Staff, MSF Field Center Development, NASA. Participants in the Panel discussion were Mr. M. Steen, Operations Development Division from Lockheed, Capt. W. Fortune, and myself. The essential theme of Mr. Moore's speech was a broad view of how both Congress and the Administration desire the industry-government cooperation. The interest of the West Coast industry in this panel discussion was indicated by the good and high level attendance at the meeting. ✓

2. Neutral Buoyancy Testing: Last week we started neutral buoyancy simulation tests with the ATM trainer. The first task is a simulation of the translation of the astronaut from the LM end to the sun end work station of the ATM through solar panels. The purpose of the simulation is to determine the best locations for translation handrail and to define problem areas with respect to structural interference and safety hazards. ✓

3. Manufacturing Engineering Assistance to Principal Investigators for Astronomical Flight Experiments: Over the last year or so members of our Planning and Tool Engineering Division have been in close contact with Dr. Tift of the University of Arizona, the PI on the ultra-violet camera. Initially conceptual mock-ups were built from verbal information only. Later through discussions on materials, design and manufacturing criteria, a manufacturing plan was generated in advance of the detail design. Inputs to the design at the University of Arizona and at P&VE allowed us to shorten lead times by using readily available materials and structural shapes. In effect our "producibility" activities served to bridge the gap between the scientific objectives of the apparatus and the actual detail designers. Our activities have also served materially to reduce lead times and to highlight design problems. The initial prototype UV camera was assembled in our shops and interferences, mismatches, etc., were corrected as they occurred. Drawings were modified in consonance with the modifications made. Similar activities are underway with Dr. Jack Gibbons, Oak Ridge National Laboratory (Gamma Ray experiment) and with Dr. H. Friedman, NRL (X-Ray experiment). Our capabilities in the physical realization of scientific experiment concepts have been acquired by our support to R-SSL for which much apparatus have been designed and built by ME. In the future we desire to extend our contributions in this field of endeavor. ✓

Fair B

10/9/68

B10/15

1. S-II STRUCTURES TEST PROGRAM: (Reference your comment on Notes 9-25-67 Lucas) The schedule of the "A" Structure (LH₂/Lox Tank and Aft Skirt Assembly) is still slipping. It now appears that the structure will not arrive here before December and then our testing would be completed in June 1968 rather than May. If S-II-504 is flown unmanned next summer, perhaps we could compromise our test program somewhat and have a go-no go answer for that situation in early summer.

B.L.
How does situation look against MSF's latest official schedule (The one released about a week ago)?
B

2. S-II STAGE FLIGHT WORTHINESS CRITERIA EVALUATION: The forward skirt, aft skirt, thrust structure, and interstage of the S-II stage were evaluated to determine if recent high force vibration data would impact the 501 S-II stage with additional requalification. It was determined that no additional retest will be required of any components that have been successfully tested to either IN-P&VE-S-63-2 or SID-62-199.

3. S-II-7 WELD REPAIR PLAN: North American Rockwell Corporation is evaluating weld repair coupons to determine if reinforcing doublers will be required to repair the defective welds of S-II-7 in the welds of cylinders 5 to 6 and 3 to 4. Both defects occurred in a high stress region at a vertical weld crossover point. S-II-4, 5, and 6 will be inspected for cracks in these areas of high stresses.

4. DELAMINATION OF KOROTHERM INSULATION ON S-IVB-501: Delaminated Korotherm insulation on S-IVB-501 stringer surface will have to be repaired following CDDT and prior to launch. Rainwater penetrated pinholes in the sealer and loosened the insulation. Procedures have been worked out for repairing the defective areas and McDonnell Douglas Company (MDC) lab tests have been made to verify these procedures. We are also evaluating a proposal by MDC to put a metal cap over the Korotherm.

5. S-IVB THIN STRINGERS: Improper machining used in the shaping of stringers on S-IVB/Saturn IB and S-IVB/Saturn V skirts and interstages has resulted in strength degradation of 1792 stringers inspected; 82 were found to be defective. MDC strength engineers have checked the capability of AS-501 based on all stringers being reduced to the strength of the poorest stringer discovered to date. The MDC analysis shows a factor of safety in excess of the required 1.25. Based on this analysis MDC recommends that AS-501 not be inspected. We are checking MDC strength analysis.

B.L.
Long term solution?
B

6. S-IC SLOW RELEASE: Slow release strain gages were monitored during propellant loading. So far, we have not received the propellant loading curves that are required for the analysis, but we are optimistic that the slow release is satisfactory. Data analyzed so far indicate (incomplete) that retorqueing after Lox loading will not be necessary.

URGENT
B.L.
Please pass this on to Rocca Petrone by TWX B

7. HAZARDOUS GAS DETECTION SYSTEM: The hazardous gas detection system appeared to operate satisfactorily during CDDT, but it was obvious that irregular procedures were used, and that there was considerable confusion among the Boeing people operating this equipment. Established procedures were not followed. Boeing must clean up procedures immediately.

8. S-IB-204 H-1 ENGINE CORROSION: Rather severe corrosion has occurred on the stainless steel thrust chambers of seven engines on 204. The rust was not present during a similar inspection three months ago. The rust is located in crevices between the brazed tubes and in the manifold area. The depth of actual pitting is about .001" while maximum allowable metal thinning on the .012" wall thickness tubes is .003". Repair techniques have been agreed upon by Chrysler, Rocketdyne, and MSFC and rework will begin immediately. This will be a hand cleaning operation and will require considerable effort.

9. ORBITAL WORKSHOP: The interim design review planned for 10-6-67 has been rescheduled for 10-10-67, in the interest of obtaining MSC representation at the review.

10/9/67

MSFC TRAINING STUDY - We are nearing completion of a comprehensive study of all training activities at Marshall including Graduate, Undergraduate, Career Development, Quality, Technician, Short Course Programs, etc. We presented a "mid-term report" on the study to Mr. Gorman on September 26. Major findings to date are that university training has been geared to problems of today, with training incentives being almost completely degree-oriented and with university short courses being relatively ineffective. In addition in-house training at Marshall is not being planned for the mission-related requirements of Marshall's future activity. The University training aspects of the study are being investigated for us by Dr. Robert Braswell, Chairman of the Industrial and Systems Engineering Department, University of Florida. Completion of the study, with recommendations, is scheduled for October 31, 1967. ✓

↳ Would like to have briefing on final findings & recommendations

Shep,
please
arrange
B

FY-68 RESOURCES - We received word Friday that the Senate had approved the Appropriations Bill as reported out of the Committee. This Bill adds \$115 M in R&D and C of F funds and reduces AO funding by \$20 M for a net increase of \$95 M. MSF personnel feel that this will not ultimately result in additional resources. Their opinion is that the President will withhold resources even if they were approved by Congress. ✓

The conference between the House and Senate to resolve differences in the Appropriations Bill is expected in the next 10 days. A firm date for the meeting will be set today. ✓

NCTES 10/9/67 RICHARD

10/9/67

B 10/15

No submission this week.

10/9/67 RB

B 10/15

1. AS-501 Launch Vehicle at KSC:

- S-II Stage insulation cracks have been repaired; and diagnostic tests and preventive maintenance have been completed on the RCA 110A computers. ✓
- The wet portion of the countdown demonstration test is now scheduled to begin tonight, Monday, 9 October 67, with "T-O" scheduled for 8:00 am, EDT, Tuesday, 10 October 67. ✓
- General Phillips Flight Readiness Review is now scheduled for Monday & Tuesday, 16 & 17 October 67. ✓
- The launch vehicle digital computer program (flight tape) is now being revised to incorporate the winter time tilt profiles. Verification and delivery to KSC will be made prior to the Flight Readiness Test, now scheduled for Wednesday & Thursday, 18 & 19 October 67. ✓

2. General Observers for AS-501 Launch - I wish to send as many of my employees (both Huntsville and West Coast) as practicable to KSC to witness the AS-501 launch; however, I have not received any firm instructions concerning the:

Make Neibert
I believe
you volunteered
to handle
this B

- general observer space allocations
- plans for providing Government transportation for the employees
- leave and travel policies for the employees who are not provided Government transportation
- contingency plans to be implemented in the event of a launch scrub, etc.

Inasmuch as the AS-501 launch date is getting quite close, the MSFC plans and policies concerning the above must be firmed up as soon as practicable. ✓

3. S-IVB-505(N) Stage at SACTO: The full duration captive firing is scheduled for Wednesday, 11 October 67. ✓

NOTES 10/9/67 SPEER

10/9/67

B 10/15

1. AS-501 CDDT LIEF OPERATION: The HOSC was fully activated for support of the AS-501 Countdown Demonstration Test (CDDT). We had 140 MSFC and 50 Contractor support engineers present. Starting at T-39:30, 16 holds were experienced. Between T-39 and T-9, 63 hours hold time accumulated for 30 hours count. From T-13 hours to scrub at T-30 min, 13 hours hold time was encountered. Most holds were called for procedural reasons and should not repeat themselves. The RCA-110 computer was involved (but usually not the only cause) in five holds. We are evaluating the utilization of our support by KSC. During the 26 hour exercise we established 17 teleconferences with Dr. Rudolph on various L/V problems. However, direct requests for support from KSC were less than expected. I believe it would be well for you to review our total AS-501 LIEF experience after launch. ✓

R.S.

Will do
B

NOTES 10-9-67 Stuhlinger

10/9/67

B 10/15

1. ATM CONTAMINATION EXPERIMENT: Our proposed ATM Contamination Experiment which consists of two parts (photometer; surface array) was submitted to the MSFEB on 9/18.

When Maurice Dubin of OSSA expressed some reservations, Dr. Mueller requested him to discuss the experiment again in the Contamination Committee which Maurice Dubin chairs. This review took place on 10/3. To our great satisfaction, both parts of our experiment, together with another proposed contamination experiment (mass spectrometer), made the top of the voting list among 20 experiments under consideration. We expect that our experiment will be accepted now without difficulty at the special MSFEB meeting on 10/10. ✓

B 10/15

10/9/67

AS-205 CREW BRIEFING AT IBM, HUNTSVILLE: The briefing was held on 10/3/67 as scheduled with the AS-205 prime crew and three other astronauts attending. The briefing was well conducted by IBM. After the briefing, the astronauts inspected the swingarm test setup at Test Laboratory and observed swingarm testing. ✓

ESE BATTERY PROBLEMS: During the past 8 months we have been experiencing cell failures with the Gulton Battery which is used at the launch site as an emergency backup to the primary launch complex power source. The cell failures now appear to be increasing. If this is true, the failure of the battery cells could cost the Saturn IB Program alone approximately \$250,000.00 over the next 2 years. G.E. has determined that the positive plate separator material disintegrates after many discharge/recharge cycles. G.E. is working on 3 solutions which entail changing the Gulton manufacturing processes, obtaining replacement batteries from another source, and changing to a completely different source of power for emergency backup such as a diesel generator. ✓

B.T.

1/4 Megabuck buys a

VLF-37B CSM MODIFICATION: The KSC effort to modify VLF-37B to provide the capability for a CSM launch is being slowed or held until schedule assessment or direction from NASA Headquarters is received. They do not plan to meet the October 1968 completion date on this modification as scheduled. ✓

lot of diesels!

If diesel is acceptable why did we

SATURN IB FOLLOW-ON PROCUREMENT PLANS: During the past 2 weeks we have been working with George Woods, Headquarters' Procurement, to update the AAP S-IB and S-IVB stage procurement plans in Headquarters to conform to POP 67-2 guidance and reduce the quantity from 16 to 4 stages each. The S-IB/Minuteman is not to be included, but instead requires a separate procurement plan due to its special situation of requiring a development program and modification of Apollo vehicles. ✓

pick batteries in the first place?

B

B 10/15

10/9/67

1. Voyager:

The current Phase B contracts with the three Voyager spacecraft contractors are nearing completion (Boeing, General Electric, and TRW). Final reviews on the studies, performed during June - October 1967 period, under MSFC contracts will be held at MSFC on October 17 and 18. One-half day will be spent with each contractor. ✓

Don Hearth and other OSSA representatives are expected to attend these reviews, along with representatives from Langley, KSC, and JPL. ✓

Contracted Phase B studies have been conducted by these three contractors continuously over a period of approximately 2 1/2 years (beginning with Saturn IB/Centaur mission). However, there is at present no planned extension beyond completion of the MSFC-sponsored Phase B, "Task D" studies in mid-October 1967. ✓

2. Study Summary Reviews:

One-hour briefings to you are scheduled on October 13 and October 17 covering the results of two very important studies:

10/13/67 Boeing contract for MSC

This study developed a 33' diameter early space station and analyzed the commonality of such a station with a planetary mission module. ✓

10/17/67 Douglas contract for MSFC

This study analyzed several S-IVB advanced workshop concepts emphasizing the ground fitted workshop launched on Saturn V. ✓

I am certain these results will be of great interest to you.

↳ Most certainly!
B

October 16, 1967

A

NOTES
MR. GORMAN'S COPY
OCT 16 1967

with comments

*No comment directed
to DEP-A*

1. Phase B, Task D Studies:

Final reviews will be held on October 17 (all day) and October 18 (a.m.). Don Hearth, Earl Glahn, and Dr. Fellows of OSSA plan to attend.

Draft final reports have been reviewed, and comments given to contractors. Publication and distribution of final reports will conclude the Phase B contracted studies, which have been in progress for approximately 2½ years.

2. Boeing Briefing:

A Boeing briefing on possible alternates to Voyager missions in 1971-75 period will be given on Thursday, October 19, 2:00 - 4:00 p.m. This briefing was given to Nicks, Hearth, and Company on September 29.

3. JOVE Study:

Will Jordan is at Auburn today (Friday) for clean-up work on final report.

LTS
L. T. Spears

cc:

R-TO, R. Smith

AST-S, D. Newby ✓

*1/a.
weekly notes*

B
10/17

Damage Claims from Stage Firings - No new complaints or formal claims have been received this week. ✓

B-1 Test Position - Completion of construction remains on schedule for December. Cleaning of piping is in process with the helium system completed and under purge for future use. Final alignment of holddown arms is in process. Plans to perform the holddown arm load test have been cancelled. ✓

Public Affairs - Two foreign nationals visited MTF this week. Mr. Joachim Schultz, Toronto, Canada, and Mr. Peter Whelan of Ireland. A NASA exhibit was erected at the State Fair in Jackson, Mississippi. ✓

Facilities - Total certification of LOX and LH₂ barges by the U.S. Coast Guard remain pending due to: (a) requirement of Coast Guard to inspect the inner and outer tanks and annular spaces. (b) boiler code certification, and (c) GN₂ storage bottle certification. ✓

S-II-3 Testing - Post static checkout continues on schedule. Removal from the A-1 Test Stand remains scheduled for November 16. Preliminary processing plan has been submitted by local SD to their Seal Beach management for proposed change of schedule reflecting the incorporation of major modifications at MTF prior to shipment to KSC.

S-II-4 - Current schedule for arrival at MTF on November 24, 1967, is marginal. Stage Office is currently investigating reschedule for delivery due to holiday allowances ✓

S-IC Testing - Schedule pending MSFC approval. ✓

General, T&E Office - Meeting was held at MTF with representatives from Saturn V, S-II, S-IC and R&D offices. Agreement was reached as to the desirability and nature of "Project Directive," which will be furnished to MTF by the Stage Offices by means of a Program Directive issued by Dr. Rudolph's office. ✓

Jack B
Has about
the cryogenic
pressure
test (fracture
mechanics
issue) ?
B

B 10/17

AAP BASELINE MEETING: Met with MSC and Chuck Mathews on Oct. 12-13 for AAP Baseline Review and changing to solve operational and weight and performance problems. Major changes are: (1) Orbital Workshop (OWS) orientation during AAP 1-2 now near solar (OWS longitudinal axis perpendicular to orbital plans) instead of gravity gradient. Solves OWS thermal and cluster electrical power problems. (2) OWS controlled by an Auxiliary Attitude Control System located on S-IVB (APS Removed) providing: powered flight control, rendezvous and docking, AAP 1-2 operational period (28 days) and storage. (3) Solar array (approximately 1200 ft.² active area) incorporated on OWS. (4) OWS design lifetime one year and ATM 6 months. These and several minor changes result in large negative margins on all four flights. In order to alleviate this problem, several performance improvements were either baselined or further study was directed. These are: (1) MSFC will commit L/V performance based on acceptance test data. Mr. Mathews requested that we commit as much as possible but still retain the flexibility to change L/V assignments from one AAP flight to another. (2) The AAP-2 (OWS) orbital attitude will be decreased from 260 NM to 230 NM (essentially equal orbital lifetime) with associated reduction in the insertion orbit of the LM/ATM (from 240 NM to 210 NM). This is primarily a result of decreased solar activity at the projected launch dates. (3) SLA panels and nose cone jettison during powered flight (payload gain about 2900 pounds). (4) LM/ATM free flight deleted as a weight saving measure (1260 lbs.). (5) 2½ stage to orbit (SM as third stage) was not baselined; however, Mathews wants to utilize this method if necessary later on. These performance improvements result in positive margins on all flights except AAP-3 which is about 1600 pounds negative. We must now determine means to reduce this margin by such things as expendable reduction, off-loading to AAP-2 or AAP-4 weight reduction since Mr. Mathews stated that minuteman strap-ons will not be included in the program.

The major problem remaining, in addition to the weight problem above, is the operational difficulties involved in the LM/ATM-CSM rendezvous and docking to the Cluster. The combination of these problems if not solved could result in decreasing program content that would in all probability decrease the usefulness of the OWS.

ATM FOLLOW-ON PROGRAM STUDY (HALPERN): A mid-study meeting was held on Oct. 11 at MSFC with representatives from OSSA, contractors and MSFC. Systems of the current ATM requiring modification to accommodate future ATM payloads have been identified. We are working to submit the resulting report to OSSA by Dec. 1, 1967.

LUNAR PROJECTS: We received a letter from Chuck Mathews requesting a MSFC presentation on Nov. 9 on the capabilities of a small wheeled vehicle (LSSM type) for a 3-day extended lunar AAP mission. MSC will also present data on a lunar flying unit at the same meeting. Advanced Systems Office will prepare material.

ELECTROMAGNETIC RADIATION (EMR): I understand OSSA has begun coordinating their position for an EMR type payload with OMSF. OSSA's going in position was for a flight within the currently approved AAP 10 flights.

F-1 ENGINE Reference my Notes of 10/9. An engineering change proposal for modification of the AS-501 F-1 engines thermal insulation panels to provide additional venting has been approved. The thermal insulation panels will be modified in the lower skirt area by cutting semi-circular vents across the bottom of the panels to preclude insulation damage from excessive water. The modification will be initiated as soon as the stage is available after CDDT. ✓

J-2 ENGINE Burst diaphragms for the 501 LOX pump cavity seal drain lines are at KSC and will be installed this week. ✓

There was a successful 428-second acceptance firing of S-IVB-505 at SACTO, 10/12. ✓

Testing at AEDC was resumed last week after installation of a new engine in the J 4 Test Cell. However, the shakedown test series was cancelled after the first of four planned tests due to failure of an ignition detection probe. The series has been rescheduled for this week. After the shakedown tests are completed, a program will be initiated to explore the possibility of reducing the S-II fuel tank pressure. This program basically is confidence testing of the engine at lower than specification fuel inlet pressures. A parallel effort will be pursued at Santa Susana. ✓

NOTES/10-16-67/CONSTAN

B 10/19

Visit of House Oversight Subcommittee Staff

The House Oversight Subcommittee Staff group, studying the Apollo and Apollo Applications Programs, visited Michoud October 9 for briefings by the Chrysler Corporation Space Division and The Boeing Company Launch Systems Branch. Staff committee members were James E. Wilson and Peter Gerardi. They were accompanied by Capt. Robert F. Freitag, Jack Cramer, Col. Maynard White and Joseph Clemente, all from the Office of Manned Space Flight. Of special interest to the group were the impact on Chrysler manpower and organization due to stretchout of follow-on vehicles and limiting production to four follow-on stages; impact on Boeing manpower and costs due to stretchout of launch schedules; contractors' systems safety activities and the extent of NASA review of safety organizations, functions and activities; and Boeing studies on launch vehicle derivatives of Saturn V to include the S-IC single stage to orbit, S-IC-D and the S-IC/S-IVB capability. The group appeared satisfied with the information they received from the contractors at Michoud. ✓

NOTES 10/16/67 FELLOWS

B
10/12

1. Neutral Buoyancy Equipment: In my October 2 NOTES (copy attached), it was reported that, at that time, a schedule slip of about one month was occurring in the welding of the Neutral Buoyancy Tank. It now appears that the original completion date of January 1, 1968, can be met. Through the cooperative efforts of several laboratories (TEST, P&VE, ASTR, and ME) and the Technical Services Office, sufficient welders have been made available to Fritz Vandersee so that, with the judicious use of overtime, welding can be completed as planned by the January 1 date. ✓

2. Warehousing of Supplies and Materials: Lou Crouch, Chief of the Technical Materials Branch, and I are working together to see what improvements can be made in consolidating inventories of R&DO supplies and materials and new purchases for those items. No major changes are contemplated in the supplies and materials program; rather, we are working toward the better use of our limited dollars through improved inventory identification and control. ✓

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10/19

1. S-II External Insulation: Proposed test of S-II spray foam insulation for S-II-8 and subs is to be ready for flight on X-15 in November (Ref: Item 1 in Notes 9/18/67 Geissler). Test plans were discussed with NAA engineers here on Thursday, October 12, 1967. A meeting with NASA Flight Research Center (FRC) at Edwards, to assure that all test objectives are attainable, is planned for October 17, 1967. FRC has told us that weather is a large factor in planned X-15 flights through winter months, including late November. Therefore, test sample should be prepared as soon as possible so that test can be made before the wet season causes flight cancellations. ✓

2. Lightweight SLA Proposal for AAP # 3: As was mentioned in last week's notes, NAA had proposed to build a special shorter - and therefore lighter (at the most, 2600 lbs. lighter) - SLA for the AAP # 3 flight to help alleviate the payload deficiency problem. The less favorable aerodynamics of such a blunt (30° half-angle) SLA is the most significant objection to this proposal.

Now that we have reasonably accurate aerodynamic data, we can state the following: (1) Controllability of the vehicle would be no problem; (2) Effective payload loss (compared to slender SLA) is 1059 lbs. due to increased drag; (3) The fluctuating pressure environment of forward portion of the vehicle is drastically changed to the worse; specifically, the Service Module will be exposed to strong oscillating shocks that ride on a cone of separated flow.

While this would have to be analyzed by MSC, Marshall's prime concern would be the structural feedback to the IU where aerodynamically caused excitation had previously caused problems with acceleration sensitive instruments.

Because of these problems and the diminished net gain in payload because of increased drag, the proposal is not very attractive and it does not rank among the preferred alternatives that are presently being discussed with Mr. Mathews. ✓

3. Specialist Conference on Molecular Radiation: Our Specialist Conference on Molecular Radiation (see Notes 9/25/67 Geissler) was successfully concluded last Friday. It dealt with question of how to calculate radiation coming from an inhomogeneous, hot gas mass (e.g. rocket jet plume), and with inverse question of how to determine thermodynamic properties of an inhomogeneous gas mass (e.g. solar atmosphere) from its radiation signature. Following highlights may be worth mentioning: (a) Papers and discussions featured advocates of whole spectrum of approaches, from line-by-line integration over literally millions of spectral lines (40 hours IBM 7094 time for 1 line of sight in a relatively simple case) to the rough grey gas approximation; (b) Our band model program for rocket flames, between the 2 extremes of a. above, was well received, and members of the audience expressed interest to apply it to their problems; (c) The above mentioned inversion techniques are widely used to investigate planetary, solar, and stellar atmospheres, with some success; (d) The majority of our guests (\approx 120 people) took part in the MSFC facility tour. ✓

B
10/19

1. HYDRAULIC RESEARCH ACTUATOR BIAS SPRINGS: Twenty sets of new actuator bias springs ("clock" springs) have been examined and fifteen sets accepted. Rejections were for minor scratches. Manufacture of the new springs was accomplished in accordance with proper procedures and a representative from R-ASTR Laboratory observed the process. Three sets provided P&VE Laboratory for examination have revealed no defects to date. Six sets were assembled into S-IC-2 actuators and spares, four sets were sent to Boeing to incorporate into their critically needed actuators, and two sets went to Astrionics Laboratory for actuator modification. P&VE feels that previous problems were caused by extreme difficulty in controlling material temper, and is considering other materials from which the springs may be manufactured. ✓
2. BENDIX-TETERBORO QUALITY & RELIABILITY SURVEY: The Bendix-Teterboro Quality and Reliability Assurance survey has been completed with no major discrepancies noted. The Bendix Reliability Group appeared to be the most effective reliability organization which the survey team has observed among MSFC prime contractors. ✓ Bendix operates a High-Reliability Facility that does an excellent job of testing and screening parts to assure that only highly reliable parts are assembled into the ST-124M inertial guidance platforms. The reliability organization has permanent representatives assigned to this facility and to the design functions, and thus can make positive contributions to all phases of design. ✓

B 10/10

1. AS-501 ST-124 Platform. (Reference Notes 10/2/67 Haeussermann) The ST-124 platform for AS-501 has been removed from the vehicle based on the problem of accelerometer errors reported in referenced note. The platform is being tested at the KSC Labs and, dependent upon the results of these tests, we will insure that the necessary corrective action is taken. We will keep you advised on this subject. ✓

2. Failure Analysis of S-II Stage Instrumentation Battery Failure on October 11, 1967, During CDDT. The subject battery was manufactured by the Eagle-Picher Company as a backup for the S-II Stage batteries. During the test, the voltage decreased from a normal 36 volts to approximately 31.5 volts when the heater supply circuit was energized. Preliminary investigations indicated a short circuit between the battery positive and the heater supply circuit. The CDDT was scrubbed at that time.

The battery was removed from the vehicle, taken to the Materials Analysis Branch for analysis. Radiographs and pin-to-pin voltage measurements were made during the investigative procedures.

The analysis verified a short circuit between the battery heater circuit and the positive terminal of cell 19 where the heater wire passed under the intercell connector. This short circuit was a manufacturing defect caused by human error in workmanship during assembly.

The fault could have been detected with an insulation resistance test between heater circuit pins and the battery power pins. Insulation tests are run on all pins to case and between pins in the same connector; however, there was not a test between connectors. This test has been added to the acceptance test procedures. ✓ In addition, steps have been taken to insure an inspection before potting of the battery. ✓

3. AAP Baseline Meeting. Several organizations will probably report on this meeting but from the Astrionics Laboratory view we are well pleased with the results and decisions made at the meeting. We feel that the elimination of the LM/ATM free flight mode was a good decision. The use of this mode was based on minimizing the possible contamination problem from the cluster. The cluster may be cleaner since use of RCS may virtually be eliminated by use of the gravity gradient momentum dump scheme whereas free fly may have required RCS for station keeping. The best scheme for determining the contamination problem with respect to the workshop and CSM is to fly a good contamination experiment on the workshop mission. Dr. Stuhlinger's Laboratory is preparing to incorporate such an experiment on the workshop mission. ✓

4. November Wind Flight Tape for 501. The flight Tape 8 which incorporates the November wind has been verified and delivered to KSC over the weekend. This tape will be used for the upcoming Flight Readiness Test. ✓

5. Last week, I learned from Dr. Rees that you had desired to meet Dr. Letov. I regret very much that such a meeting did not take place; it was strongly opposed by Mr. Slattery with whom I had discussed this before I met Dr. Letov. I asked at that time that Mr. Slattery inform you on the matter.

W.H. ↑ NASA Hq Public Relations (Julian Scherer)
opposed the idea, since State Dept. had
not liked Letov's visit here B

B10/19

F-1 ENGINE

Test FW-071 was re-scheduled for October 19, 1967, at the West Area F-1 Test Stand due to removal of the lox pre valve actuator for inspection and incorporation of a modification to the spring disks. Primary purpose of this test will be to evaluate engine performance during lox depletion utilizing GOX pressurization. The thrust vector control system will also be evaluated with modified Hydraulic Research actuator springs. ✓

SOLAR PANELS ATM

Due to schedule slippage to July 1970, and new requirements, R-ASTR is presently re-designing the solar panels and test fixtures. They have made a preliminary test plan and test fixture design available to us for comments. ✓

S-1B

Stage S-1B-11 is scheduled to be shipped from Michoud on October 20, 1967. By this schedule, the stage will arrive in Test Laboratory approximately one week later. The first firing test is expected to be on November 21, 1967. ✓

SATURN V TAIL SERVICE MAST

In the meeting with Dr. Rees and Mr. Richard on the AS-501 Flight Profile, a question arose as to whether the Tail Service Mast would disconnect without damaging the vehicle if the vehicle were to rotate 4 inches at liftoff. Tests to check this new condition were made last week and the Tail Service Mast will satisfactorily disconnect under these conditions. ✓

ANSWER TO COMMENT ON 10/2/67 NOTES

There are three 'Mobility Test Articles'; one each built by Brown Engineering, General Motors and Bendix. These are the test beds for the 'Lunar Scientific Survey Module' motive systems. Dr. von Braun drove the Bendix model at R-P&VE in August 1967. Their purpose is to gain basic data on the various schemes of wheels, drive systems, etc. R-TEST is providing this testing for R-P&VE to determine power requirements, dynamics, human engineering, etc. ✓

NOTES 10-16-67 HOELZER

B
10/19

Negative Report.

NOTES 10/16/67 JOHNSON

B 10/18

Supporting Development Program: Materials for the annual review of the Supporting Development Program have been provided Headquarters for their use in the preparation of a document describing briefly each of the tasks completed in the period October 1, 1966, to October 1, 1967. The presentation is to be made to Dr. Mueller on October 24, 1967. Indications this morning were that this is still a firm date and that Mr. Trimble will chair the session.

I have scheduled a meeting on October 19, with Mr. Waugh (Trimble's office) to discuss the presentation; and to discuss the plans for the FY 68 program. As of this morning, only the J-2 Improved engine appears as a firm item in the FY 68 program approvals. It is my hope that I can obtain from Waugh commitments for the support of other essential research items originally planned in this year's Supporting Development Program and that we can establish a final level of effort for the year. ✓

In connection with the Improved J-2 program, it is reported from Mr. Trimble's staff that the supporting development budgets planned for FY 69, FY 70, and FY 71 have been increased to cover J-2 Improved effort as shown in our POP submission of last week. Therefore, unlike the FY 66 and FY 67 budgets, from which C-1 engine monies were taken from a fixed ceiling, at the sacrifice of the individual research items which could be carried under the program, the ceiling is being raised to accommodate the Improved J-2 effort above the fixed base program. ✓

NOTES 10-16-67 KUERS

B10/14

No significant items to report.

1. PULSED ARC MIG (PAMIG) WELDING: A review of the PAMIG welding process for the S-II stage, scheduled for 10-16-67, has been cancelled because of weld cracking on the test specimens. Mr. R. Schleicher, North American Rockwell Corporation/Space Division (NAR/SD), advised MSFC of the delay because surface crack indications have been discovered in 5 test panels (4' x 2' in size). Dye penetrant inspection revealed 50 to 60 crack-like indications in each of the 5 panels in the as-welded condition. The welds have been sent to the NAR laboratory for investigation. ✓
2. AAP ORBITAL WORKSHOP: As a result of coordinated study, R&DO has committed and IO has agreed that the S-IVB orbital workshop Auxiliary Attitude Control System and the Solar Arrays should be MSFC inhouse projects. The Solar Array will be based upon ATM solar module technology. The analyses leading to the definition of additional clearly defined AAP tasks is continuing. ✓
3. STRESS CORROSION PROBLEMS: Although we are surveying all contractors as quickly as possible to review the materials used for springs in mechanical components, we have made a special effort to determine where 17-7 PH-RH-950 is being used. Very preliminary reports have disclosed that some such components are being found made from this material that were not reported to us during the overall stress corrosion survey that was requested from the contractors last year. A list of these components and conditions of the use of the material is being prepared. ✓
4. FAILURE OF F-1 ENGINE THRUST OK PRESSURE SWITCH: Approximately two weeks ago a thrust OK pressure switch was removed from AS-501 due to faulty calibration. Subsequently, the switch was examined by Rocketdyne and found to contain a broken spring; the material was 17-7 PH-RH-950 stainless steel. Preliminary investigation by Rocketdyne indicates that the material was severely carburized during heat treatment, resulting in a brittle material. A survey of the heat treating vendor is in progress and Rocketdyne is checking other switches that may be affected by this problem. ✓
5. TESTING OF HUMAN TEETH - ANOTHER FALL-OUT OF THE SPACE PROGRAM: James W. Clark, D.D.S., of the University of Alabama Medical School conceived the idea of adapting to medical research some of the equipment used by our Vibration and Acoustics Research Test Section in structural impedance tests. In an "after-hours" situation, we did some preliminary testing to determine the effectiveness of various cements in mounting false teeth. More recently, we have done a test with an impedance head mounted on a natural tooth in the mouth of Dr. Clark. He believes that impedance techniques can be useful in diagnosing tooth abscesses, degradation of teeth, pre-natal conditions in expectant mothers, and other conditions. So far, the test results have been very encouraging to Dr. Clark and an article on these tests will appear in the Marshall Star soon. ✓
6. NUCLEAR GROUND TEST MODULE (NGTM): Limited effort is continuing toward completing and documenting NGTM design data. The significant portion of this effort will have been completed by the end of October 1967. Thereafter, the primary effort required will be in support of the technology oriented activity. SNPO is still undecided as to what engine development program to pursue; however, today's consensus has the lower thrust NERVA I as the more likely choice. ✓

B
10/19

B
10/19MSFC'S ROLE IN CHEMICAL PROPULSION

Recently, we delivered a document on Marshall's role in chemical propulsion to Del Tischler of OART. It was prepared in response to his request to provide information needed to give Headquarters' people a better understanding of the Center's accomplishments and current and future capabilities in chemical propulsion.

The document covers the broad experience, the outstanding accomplishments and the current and future capability of our personnel and a description of MSFC facilities related to the field of chemical propulsion. Principal input came from R&DO, IO, and F&D with Hans Paul's division making the major contribution.

Del has advised us that the document was adequate for his requirements. ✓

TASK WORK PACKAGES

The Task Work Package Team met for three days in Washington and divided the MSF, MSC, KSC and MSFC work packages into the following categories:

- A - Program Critical
- B - Program Related
- C - Future Program Oriented ✓

The category B and C items were further subdivided into priority groupings. The team plans to visit the Centers to allow for discussion of the priority allocations prior to submission to Dr. Mueller and the Management Council.

The majority of the MSFC packages are Category A. A meeting is planned for this afternoon with Dick Cook and Chris Andressen to develop a position on which Categories B and C priority designations we will plan to rebut when the team visits MSFC. ✓

IB Minuteman Strapon: During the AAP baseline meeting at NASA Headquarters on October 12 and 13, Mr. Mathews flatly stated that Minuteman Strapon was "out of the program." We think these circumstances justify submission of a written report in place of the Headquarters presentation scheduled for late October or early November. ✓

Changeout of S-II Depletion Sensors after CDDT on AS-501: To make certain that it was absolutely necessary to enter the LOX tank to change-out the depletion sensors on the S-II, we took the following actions on Saturday:

1. We reviewed the failure history of these sensors and found a definite failure trend that the number of LOX loading cycles sensors are exposed to. ✓

2. We reviewed the requirement for depletion sensed cutoff versus starving the engines or giving a timed S-II cutoff by the IU. We felt the starvation cutoff, which would occur with each engine separately, would not be a correct primary mode from both the engine and the vehicle dynamics standpoints. To give a timed cutoff, the time would have to be early enough to avoid any possible engine LOX starvation. This would require more flight performance reserve than is available. (Astrionics has gone ahead and worked out this solution in hardware and software in case it may still be needed.) ✓

3. We determined again that two working sensors are required to indicate a "dry" condition to initiate stage cutoff. Since the sensors fail "wet", a minimum of two of the five sensors are required at the end of S-II flight. Without the changeout we would start LOX loading with only three sensors working and a good possibility that we would lose one or more of them. Because of these facts we recommended to IO and General Phillips that the sensors be changed so that we could start with five good sensors at the time of LOX load for launch. ✓

1. AS-501 Launch Vehicle at KSC: During CDDT, the S-II Stage LOX low level sensors failed; and on Sunday, 15 October 67, the S-II LOX tank was entered to repair the sensors. It was discovered the baffles in the LOX tank sump had been broken and damaged. It is believed the damage occurred during LOX tank fast fill. A MSFC/NAA Team has been assembled at KSC and is investigating cause of damage and determining plan for locating debris and repairing damage. ✓

The Flight Readiness Review (FRR) is now scheduled for Thursday and Friday, 19 & 20 October 67. ✓

2. S-II-4 Checkout: Reference Notes 10/2/67 Grau (Attachment #1) As you well know, Headquarters is studying changes to the Apollo mission assignments and it is possible AS-503 may be solely a launch vehicle development flight. If so, it may be more advisable to put the light weight S-II-4 stage in the AS-503 stack. This is only in the investigative stage and no firm decision has been given. ✓

3. AS-501 ST-124 Platform: Reference Notes 10/2/67 Haeussermann (Attachment #2) The ST-124 platform on AS-501 was removed immediately after the CDDT and is now being checked in the KSC labs. ✓

4. S-IC Debris Valves: Reference Notes 10/2/67 Lucas (Attachment #3) At the request of Dr. Debus and Dr. Gruene we provided help to KSC, since Boeing could not deliver this modifications within the required schedule. Both R-TEST and R-P&VE did an excellent job in a short time. Boeing, however, would not accept the MSFC work and neither our office nor KSC was aware of this problem until the following week. The Boeing Managers, Dick Nelson (Boeing/Michoud) and Tex Johnston (Boeing/KSC) were immediately notified of this incident and the personnel involved have been admonished. ✓

5. S-IVB-505 (N) Stage at SACTO: The full duration captive firing (452 seconds) was successfully accomplished on Thursday, 12 October 67. ✓

Attachments: 1. Notes 10/2/67 Grau (DIR, I-DIR & R-DIR's copy only)
2. Notes 10/2/67 Haeussermann (DIR, I-DIR & R-DIR's copy only)
3. Notes 10/2/67 Lucas (DIR, I-DIR & R-DIR's copy only)

B
10/19

NOTES 10/16/67 SPEER

1. AS-501 CDDT: To complete the AS-501 Countdown Demonstration Test (CDDT) it took five attempts of variable length and a total time of 16 days. We recycled three time to T-13 hours and once to T-20 min. There was a grand total of 26 holds or approximately 100 hours cumulative hold time. In none of the five attempts would we have been within the five-hour launch window. The last three attempts resulted in nearly the same $7\frac{1}{2}$ hours cumulative hold time each. As you know, the reasons for these holds varied widely; however, the RCA 110, the 224 display computer and the S-IC ground H_e supply system caused repeated holds. All HOSC systems performed well under this strenuous test. We had the enthusiastic support of key personnel of the Laboratories, the Stage and Program Offices, and the prime contractors. In all problems we became aware of, we reached the same conclusion as KSC. However, our inputs were limited to MSFC personnel and it turned out to be difficult to influence in a direct manner the problem sessions conducted by Rocco Petrone. Our indirect support can be measured by the number of conferences established with the Launch Control Center during the 76 hours the HOSC was activated during the CDDT. The total was 170. ✓

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10/19

1. ATM-FOLLOW-ON STUDY: Roland Chase, OSSA member in charge of the Follow-on Study, spent two days with Downey (SSL), Corbett (R-OM-V), Lutkefedder (I-AAP), and others in discussions of our study work. Several promising payload configurations have been identified; no firm plan for an ATM family has evolved yet. The major part of the Brown Engineering Company work on the Follow-on Study was completed last week. The results were turned over to the Integration Contractor (Martin) for continuation of the study until December 1 when the present Follow-on Study will be finished. ✓

2. FAR UV STELLAR SPECTROPHOTOMETRY: Dr. Morton, Dr. Jenkins and Mr. Lowrance of Princeton visited MSFC on Thursday. They brought with them two stellar UV spectrophotometers they have flown on Aerobee rockets and have proposed to include in EMR with slight modifications. Discussions with Astrionics revealed that the instruments could indeed be flown on the EMR stabilized platform developed by Astrionics. ✓ ← *What's that? B*
E.S.

3. MATHEMATICAL RESEARCH PROGRAM: A meeting of the proposed NASA Research Advisory Committee on Applied Mathematics was held in June 1967 at NASA Headquarters. Dr. Wilson, OART, presented the proposed funding in mathematics from 1968 to 1973, indicating an increase in annual budget from 1.6 M to over 3M. Suggested areas which might receive increased emphasis include: automata theory, computer sciences, information theory, optimization problems (discrete as opposed to continuous problems currently being heavily investigated), and statistics (especially reliability theory). ✓

4. OBSERVATION OF LUNAR ECLIPSE: The lunar eclipse on October 18 will be observed by Don Cochran (SSL) and his associates with his IR radiometer through a 30-inch telescope in Georgia (University) Athens, Georgia. Joe Michlovic (SSL) will observe with his IR photometer through the 21-inch RCAA telescope in Huntsville. The objectives of both observations will be the cool-off and warm-up functions of selected spots on the lunar surface. ✓

B01/13

ALTERNATE DEE-6 CAPABILITY: It was necessary to scrub the Saturn 501 CDDT on October 4 because of a power supply failure in the KSC provided DEE-3 equipment and there was no alternate capability during the propellant loading. Because of this we are reviewing our MSFC provided DEE-6 equipment to insure that we have an alternate capability in the event of a similar failure. We are considering adding an additional magnetic tape station or providing a random access disc to provide flexibility in operation. ✓

MINUTEMAN STRAP-ON PRESENTATION: A Center presentation of the Up-rated Saturn I Minuteman strap-ons has been scheduled for 2:00 PM on October 25 in the 10th floor conference room. Following this we plan to make a final presentation to Mr. Mathews. ✓

CRACKED "B" NUTS IN THE I. U. WATER METHANOL LINES: Several cracked "B" nuts were found at IBM on I. U.'s 503, 205 and 206. A subsequent inspection found one cracked nut on 501 (which has been replaced) and on 502. A preliminary inspection by KSC personnel revealed no cracked nuts on 204 but a more detailed inspection is planned by IBM personnel using a zygo inspection technique. IBM has conducted pressure and vibration tests which indicate that even with cracked nuts the sub-assembly will withstand pressures 2 1/2 to 3 times normal operating pressures without leakage. ✓

MISSING S-IB-9 FLOW TUBE: During the post static checkout and refurbishment of the S-IB-9 stage at Michoud, CCSD noted that the flow tube was missing from inside the ball portion of the flight fill and drain valve in the fuel system. A detailed analysis of the assembly process at Parker (manufacturer) as well as at CCSD established that the flow tube was in the valve prior to the time of installation on the S-IB-9 stage; however, the exact time of loss after that date has not been determined. According to CCSD the valve was removed from S-IB-9, packaged and sent to the clean room. When the valve was removed from the box, it was noted that the flow tube was missing. Investigation to date indicates that the missing flow tube may have been collapsed and torn out of the ball by fuel during the fill or drain operation. We believe there is a possibility that the flow tube was mislaid during the refurbishment after static test. If the flow tube was lost in the system there are three possible places that this flow tube could be: 1. In the fuel system of the S-IB-9 stage; 2. In the fuel storage and transfer system at the static test tower; and 3. In the S-IB-10 stage, in the event it was lost in the fuel storage system and flushed back in the S-IB-10 stage. S-IB-9 has been rotated with negative results. An x-ray procedure is being developed to detect the tube if it is in the stage. Inspection of S-IB-10 has not started yet. Inspection of the GSE at the static test tower is complete with the exception of 400 feet of underground line and the fuel storage tank. A test will be run at MSFC this week to verify whether or not the flow could have collapsed this tube during the fill or drain process during propellant loading. We plan to complete the search of both stages and the fuel storage system and get the results of the above test prior to coming to any definite conclusion of whether we may still have a possibility of having a contaminated stage. We have confidence that the flow tube is intact on 204 since the LOX and fuel valves have been changed out at KSC. We plan to establish that the flow tubes are intact in the valves in all of the other stages. ✓

NOTES 10/16/67 WILLIAMS

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10/19

1. Boeing Space Station Study:

We are prepared to give you a brief (approximately one hour) review of the MSC study conducted by Boeing on the Saturn V launch early space station at your convenience. This is the companion/parallel study to the one which DAC did for us.

Oct 23, 1967

4

NOTES
MR. GORMAN'S COPY
OCT 23 1967

with comments

(none directed to DEPA)

file w/ 10/23/67
NOTES.

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

11-20

Memorandum

TO : Dr. von Braun, DIR

FROM : Manager, Saturn I/IB Program
I-I/IB-MGR

SUBJECT : ESE Battery Problem

DATE : November 8, 1967

Reference is made to your note on my weekly notes dated October 23, 1967, to the effect that you understood why batteries were considered more reliable for an immediately available emergency power source but could not understand why we now suddenly considered a diesel adequate.

We did not mean to infer that we have changed our opinion that batteries are preferable in this case, but since KSC is now using them for more than the hazardous applications originally intended, G.E. is considering as one possible solution use of diesel generators for backup power during non-hazardous operations. This would limit the use of the batteries as originally intended to emergency power backup to critical busses during hazardous operations. In addition, G.E. has developed several fixes to the present system to reduce the cell failure rate but these fixes have not yet been fully tested. We have made no firm decision and G.E. is still continuing to investigate a number of solutions. We will press for a good solution and keep you informed.

William Teir

- cc:
- DEP-T, Mr. Neubert
- I-DIR, Gen. O'Connor
- R-DIR, Mr. Weidner
- I-DIR, Dr. Mrazek
- I-V-MGR, Dr. Rudolph
- I-V-G, Mr. Smith
- I-I/IB-G, Mr. Dunlap



Surprise

B 10/24

NOTES 10/23/67 TEIR

10/23/67

ESE BATTERY PROBLEMS: Reference your question on my notes of 10/9/67 (copy attached) concerning why we picked batteries in the first place as an emergency backup to the primary launch complex power source if a diesel generator was acceptable. We understand from available information that at the time the decision was made batteries were considered more reliable for an immediately available power source for the intended use than the diesel generator. Furthermore, the design intent for the emergency backup supply was only for hazardous testing, such as propellant loading tests. It is suspected that part of our current problem of increased failures is a result of the batteries now being used by KSC as a backup for routine testing. It is still felt that batteries are the most reliable choice for a backup supply for hazardous testing. We are looking into a possible means to reduce requirements on the backup supply and to increase the life of the Gulton battery. We will keep you informed on the results of our current investigation.

B.T.
 ← I understand.
 But I still don't see why now a diesel is suddenly adequate
 (Your NOTES 10-9)
 B

CRACKED "B" NUTS IN THE I. U. WATER METHANOL LINES: Reference my notes of 10/16/67 (copy attached) concerning cracked "B" nuts being found on I. U. 's 501, 502, 503, 205 and 206. IBM, in conjunction with R-P&VE, has concluded that the cracking was probably caused by stress corrosion which could result from improper heat treating. All "B" nuts in stock at IBM (282) were tested for heat-treat condition and 114 of these were determined to be at the T-6 heat-treat condition. It was also determined that any "B" nut with a heat-treat condition of T-6 or less is very susceptible to stress corrosion, therefore, those 114 with a T-6 condition were declared unuseable. The "B" nuts installed on I. U. 's are being tested for heat-treat condition and will be replaced as required. Thus far all of the "B" nuts which have cracked or have been of the improper heat-treat condition were purchased from Teledyne and were from two heat-treat lots.

We have also been informed that CCSD has purchased 228 "B" nuts out of two lots of a T-6 temper made by Linair (in Florida). CCSD is presently tracing through their system to determine on which stages these "B" nuts are located.

NOTES 10/23/67 BALCH

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10/24

S-II-3 Testing - Post static checkout continues on schedule. A potential impact to the scheduled off-stand date of 11/16/67 is the rework of the Augmented Spark Ignition (ASI) line on Engine #3, which was considered necessary because of the discovery of residual hydrogen in the line. Rework of the LOX tank baffles will be accomplished concurrently with stage systems automatic preflight acceptance. ✓

S-II-4 Stage - Scheduled arrival of the S-II-4 stage has been changed from 11/24/67 to 11/27/67 because of the Thanksgiving holidays. ✓

S-IC-6 Stage - Date for delivery to MTF is still indefinite pending MSFC approval of revised test program schedule. ✓

LH₂ Barges - LH₂ Barge #3 is being modified to provide an auxiliary vent system and is expected to be out of service until about 11/20/67. The same modification will be made on the remaining two LH₂ barges, one at a time, as soon as Barge #3 is back in service. ✓

MTF Transportation - Start of the NASA/GSA study to determine feasibility of assigning transportation responsibilities at MTF to GSA was rescheduled from 10/16/67 to today, 10/23/67. ✓

Damage Claims from Stage Firings - Five of the six formal claims received as a result of the S-IC-5 static firing on 8/25/67 were forwarded to the Chief Counsel's Office, MSFC, with recommendation that they be denied. The remaining claim is being held for additional information from the claimant. ✓

Safety Activities - Committed the support of NASA/MTF in the organization of a Gulf Coast Area Federal Safety Council, Field Chapter. ✓

Public Affairs - On 10/19/67, I spoke to some 450 persons from all parts of the United States at a National Pulp and Paper Industry meeting in Mobile, Alabama. I covered the Apollo/Saturn V program in general with special emphasis on the upcoming Apollo 4 launch. ✓

NOTES 10/23/67 BELEW

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ORBITAL WORKSHOP (OWS) MATERIALS COMPATIBILITY: We met with MSC last week to discuss materials compatibility of the OWS. The objective of the meeting was to establish a plan to increase materials compatibility in the Workshop for human habitability. Working meetings are planned for the near future which will lead to design review prior to the delta-Preliminary Design Review. A report from MSFC documenting all materials testing to date will be forwarded to MSC shortly. ✓

OWS ELECTRICAL DESIGN REVIEWS: The Electrical Panel met at MSC last week and concluded the primary design approach for electrical wiring in the OWS should be the "installed pre-launch" approach. Secondary design approach will be "drag-in" by the astronauts. ✓

OWS PROCUREMENT PLAN: The Procurement Plan for the OWS, with the AACS and Solar Array system deleted as contractor effort, was handcarried to NASA Headquarters this morning. ✓

Active Attitude Control System

APOLLO TELESCOPE MOUNT (ATM) VEHICLE IU STRUCTURE: A schedule problem has been identified in procuring the three-foot IU spacer for the ATM. Current plans indicate AS-216 to be the last Saturn IB vehicle and, on this basis, NAA (structural subcontractor to IBM) will produce the last IU structure in May 1968. This problem has been discussed with Chuck Mathews and he will document his agreement to the three-foot spacer and give us long-lead hardware procurement authority soon. ✓

INSTRUMENTATION AND COMMUNICATION PRESENTATION: The I & C Panel (MSC and MSFC) gave a presentation to Chuck Mathews and his staff last Friday. The presentation covered the Cluster Mission (AAP 1-4) and included the following items:

- a. Communication links (L/V and payloads) through the 7.5 hour "L/V lifetime."
- b. Communication links (down-links and up-links) for the various cluster on-orbit configurations.
- c. CSM, LM and AM I & C Subsystems.
- d. ATM and OWS/MDA I & C Subsystems.
- e. Interface management.
- f. Mission Operations (Ground Stations, etc.)

The presentation was very well received by Mathews.

Weights estimates for the OWS/MDA system were reviewed and considered reasonable considering the number of measurements provided for.

Additional work is required to adequately define a cluster "caution and warning" system. Mathews will soon forward a letter to the Centers requesting that the Crew Safety Panel work on this problem. ✓

LUNAR FLYING UNIT/MANNED ROVER PRESENTATION: We are preparing for a combined MSC/MSFC presentation on November 9 to Chuck Mathews on the Lunar Flying Unit/Small Manned Rover. We are working closely with Frank Williams' people on this. A dry run is scheduled with you for November 3. ✓

10/23 JDS

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10/24

H-1 ENGINE The H-1 stability problem has been identified as a chugging mode resulting from mechanical transmission of vibrations rather than an acoustic mode resulting from fluid coupling as originally thought. ✓ A 24-cycle resonant frequency in the actuator support members is the prime suspect in Neosho test stand 1-2. A program of six bomb tests is being conducted with stiffening members bolted to the actuator support members. Three of the six tests have been conducted satisfactorily. The damp times of these three tests are extremely short. The balance of the tests should be completed next week. ✓✓

EFIR H1-22A has been issued for the removal of corrosion deposits from the thrust chambers on engines installed in vehicle S-IB-204 at KSC. Work on six of the engines has already been completed. The remaining two engines are expected to be completed by the first of next week. ✓

F-1 ENGINE Reference my Notes of 10/16. Evaluation of the wet F-1 engine thermal insulation panels mentioned is continuing. Based on data from simulated heat flux and altitude testing, Rocketdyne submitted a second ECP which proposed drilled vents for all additional thermal insulation panels on vehicle 501. The ECP was approved by Level I Change Board during the Flight Readiness Review at KSC. Investigations relative to possible solutions for vehicle 502 and subs are continuing. ✓

(Partially) J-2 ENGINE All of the LOX pumps on the J-2 engine installed on S-II-501 are being partially disassembled in search of the missing pieces of the LOX tank baffles. Two of the five pumps have been inspected and reassembled. The largest of the three remaining pieces of baffle was found in one of the LOX pump outlet volutes down stream of the impeller. ✓ The other three pumps are currently being disassembled. All pumps are scheduled to be completed by Monday, 10/23. ✓

NOTES 10/23/67 CONSTAN

10/23/67

Nothing of special significance.

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10/24SA-204/LM OPERATIONAL SYSTEM SAFETY REVIEW

The task team - Civil Service/Contractor - made a presentation on October 19, 1967, at MSFC on the results of their analysis of the operating procedures, analysis of special operational safety requirements and efforts to establish the configuration baseline of vehicle and ESE as of September 5, 1967. Findings were similar to those for SA-501 with only four hardware problems for MSFC resolution. ✓

MSFC SAFETY COMMITTEE

Mr. Huth is Chairman of this committee with members including Messrs. McCartney, Sorensen, Dyer and Herring. Meetings have been conducted with R&DO Labs, P&VE, TEST, ME and Astronics, with an initial meeting conducted with Mr. Weidner. The major purpose is to see if these are adequate written policies and procedures, whether or not safety coordinators have been appointed, how and when safety meetings are conducted, the use of safety posters, etc., and safety provisions made for hazardous conditions or operations. These reviews have been very successful, primary reason being that the Lab Directors have participated in these meetings themselves. ✓

Note: Jim Shepherd and myself (Neubert) are of the opinion that the Secretary of the Safety Board should report to you, for the time being, on a weekly basis. ✓ The Headquarters input soon will be felt more and more. ✓

NOTES 10/23/67 FELLOWS

10/23 JB

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10/24

1. Administrative Operations (AO) Budget Impact: The R&DO laboratories and offices are heavily engaged in assessing impacts on performance of assigned responsibilities with a reduced target personnel ceiling and resulting curtailment in some functional areas. The individual organizational responses to this study are being consolidated by R-OM for review by R-DIR prior to submission to the Center Staff within the extremely limited time available to us. ✓

2. Work Packages: An approximately 15 man team comprised of representatives from NASA Headquarters, MSC, and KSC is here at Marshall to review our work packages. This review provides the opportunity for clarifying questions to the team, as well as responding to their points of interest. Discussions include the content, per se, of the work packages, as well as the basis used and methods for calculating associated manpower requirements. ✓

1. Flight Mechanics Panel Meeting: The Twenty-Second Flight Mechanics Panel (FMP) Meeting was held at MSC on October 11 - 12, 1967. Important items from this meeting are: (a) MSFC and MSC agreed that AS-503 mission profile will consist of launch into 100 n.mi. circular orbit, orbital coast, transposition, docking and extraction, two restarts of S-IVB with possible propellant dump following last burn; (b) FMP intercenter mission planning for all missions will proceed based on officially approved missions and will incorporate changes only when approved by NASA Headquarters; (c) MSFC and MSC are investigating S/C land landing probabilities for aborts early in S-IC stage flight; (d) LV/SC attitude control interface for crew control of S-IVB while in coast mode will be exercised on AS-205; and (e) MSFC/MSFC work on LV/SC engine-out problems is continuing. MSC is proceeding with plans for S/C structural testing of critical stations. Results will be compared with previous analyses and extrapolated to ultimate capability. MSFC will generate new baseline specification for this effort by incorporating updated S/C weights and stiffness. ✓
2. Guidance Scheme for 2 1/2 Stage to Orbit: One of the more promising possible methods of obtaining the increased performance required to meet the AAP 3 payload is utilizing the Service Module as a propulsive stage (the "2 1/2 Stage to Orbit" scheme). This has the obvious drawback of putting MSC in the launch vehicle business and possibly further overlapping the functions of the Centers. In their presentation to Mathews in the AAP Baseline Review (October 12 - 13), MSC indicated shortcomings in their M.I.T. guidance scheme and recommended examining the possibility of using the three-stage Iterative Guidance Mode we have developed for Saturn V. Using this system will help to maintain our position in launch vehicle guidance; therefore, we are actively pursuing with MSC the implementation of 3-stage IGM through the Guidance Performance and Dynamics Subpanel of the Mission Requirements Panel. ✓
3. AS-501 S-II LOX Low Level Sensor Failures: As a result of the three failures of S-II low level LOX sensors on AS-501, we have been working the problem with R-T0, R-ASTR and R-P&VE. (Nominal S-II shutdown is given when any 2 of 5 LOX low level sensors or any 2 of 5 LH₂ low level sensors are uncovered, sending signal for simultaneous shutdown of all S-II engines). This type shutdown is our primary mode due to high confidence by R-P&VE-P that safe engine operating conditions will result. As reported in Mr. Richard's Notes of 10/16/67, our first indication was that use of a timed cutoff which would give 3 sigma confidence in achieving simultaneous cutoff (i.e., no LOX or fuel depletion cutoff) while simultaneously giving 3 sigma confidence of having sufficient flight performance reserves to compensate for other perturbations in the flight was not feasible. We have since conducted simulations which indicate use of a timed S-II cutoff may be feasible for AS-501. We are currently carrying about 15,000 lbs. of S-IVB useable residuals which is about 5,400 lbs in excess of the 9,600 lbs. 3 sigma Flight Performance Reserve (FPR) requirements. Our simulations show use of an S-II timed cutoff set 13 seconds prior to our nominal S-II cutoff signal results in about 11,000 lbs. FPR. Since the LOX low level sensors show a failure trend directly associated with the number of LOX loading cycles, recycles or delays experienced during launch procedures may result in further failures which cannot be replaced without entering the LOX tank. R-P&VE-P is still analyzing the problem from a propulsion view point. They will probably request a mission rule which states that S-II LOX loading may be initiated with any 2 of 5 LOX sensors reading open or "wet." ✓ This will assure 2 out of 3 voting logic. If more than 2 sensors show wet prior to LOX loading, there is a P&VE concern that LOX starvation may result. S-II/S-IVB staging would probably be acceptable even in ^{event} of LOX starvation, with resulting individual engine shutdown, provided no catastrophic condition occurred. Perhaps the analysis of use of the backup timer mode should continue, to be prepared for future sensor failures. ✓

- 10/23/67
1. S-II STAGE BATTERIES: AS-501 CDDT was completed using Eagle Picher batteries. NAR/SD recommends that Eagle Picher batteries be used for AS-501 launch. R-QUAL and R-ASTR concur. A Certificate of Component Qualification has been signed on the Eagle Picher batteries. R-ASTR does not consider that the ESB battery is qualified. To preclude the recurrence of the Eagle Picher battery failure experienced during the CDDT, the following actions have been taken:
 - a. All batteries will have continuity and megger tests run prior to installation. ✓
 - b. Eagle Picher has added a mandatory inspection point (MIP) in the battery assembly prior to potting to insure that wiring is correctly installed. ✓
 - c. DCAS has been informed of the problem, which could have been prevented by an adequate visual inspection, and requested to perform mandatory 100% visual inspection of all wires and wire routing prior to potting. This requirement has been implemented. ✓
 - d. NAR/SD was notified that their source inspection was inadequate and requested to initiate action to provide mandatory inspection of wire routing by both NAR and the battery supplier. ✓
 - e. NASA personnel are presently at Eagle Picher to conduct a thorough review of the inspection coverage being provided by the DCAS. ✓
 2. KR SURVEY OF MSFC QUALITY & RELIABILITY ASSURANCE: Due to travel fund restrictions, the NASA Headquarters (Code KR) evaluation of MSFC quality and reliability assurance has been postponed from October 23 through November 3, 1967, to November 27 through December 8, 1967. An exit interview with you is presently scheduled at 2:30 on December 7, 1967. ✓
 3. S-IVB Q-BALL SENSOR: The failure analysis performed on the Q-Ball pressure sensor manufactured by Rosemount Engineering Company has been completed. The metallic particle responsible for electrically shortening the device was identified as Kovar. A survey of manufacturing techniques and materials used in the device identified the most probable source of the contaminant as the spot weld used to attach the lead stand-offs to the Kovar sensor plates. The analysis revealed shrinkage cracks and "blow-holes" in the weld. The weld joint appeared to have been scraped after welding and other metal surface areas were non-uniform due to rough abraded areas. Laboratory representatives were dispatched to Rosemount Engineering Company to assist in optimizing the spot welding process and affiliated inspections and to minimize this source of contamination. ✓
 4. S-IVB PROGRAM: This Lab has reviewed and supplied comments to the S-IVB Stage Office on the MDC reply to SR-QUAL-67-11, Survey Report on failure reporting and corrective action. The MDC response was not adequate to resolve any of the 15 discrepancies identified in the report. The Stage Office has again been requested to initiate priority action in directing MDC to immediately correct these discrepancies. ✓

10/23/67
1. Launch Vehicle Backup Control in the Event of ST-124 Failure. MSFC was given an action item in the August 10, 1967 EDS Review Meeting to investigate the possibility of implementing a backup launch vehicle control scheme for first stage flight. The purpose of the backup scheme is to enable the space vehicle to continue flight, following a failure of the inertial reference system, to a time and altitude where a safe abort may be accomplished. Astrionics accepted the action item and has subsequently been pursuing several schemes. The simplest scheme would enable the space vehicle to merely continue a controlled flight to a time and altitude which would be safer for abort. The most complex scheme (essentially a strap-down platform) would enable flight into an acceptable earth orbit and continuation of the primary mission.

To facilitate an early and relatively uncomplicated implementation, the candidate scheme now receiving primary emphasis would require hardware changes in present flight equipment and would enable a controlled, pitch-biased flight at least through the S-IC stage operation. The scheme amounts to the following. Upon detecting an attitude reference failure during S-IC burn, attitude error information would be derived from the integration of the EDS-control rate gyro outputs. The rate outputs would be combined with the integral of the rates and a bias would be added to effect a constant pitch rate.

It is anticipated that a design release on this scheme will be made within three to four weeks, at which time a more detailed report will be made to you on the scheme, its potentialities and limitations, and the anticipated impact on its incorporation into the present vehicle hardware.

2. AAP. The data management and communications systems for AAP missions 1 through 4 were reviewed by Mr. Mathews on Friday, October 20. Significant new features are feeding of LM/A flight control telemetry data through the ATM after docking and transmission of all OWS/MDA data through the Airlock Module. Review was well received and there were no changes or action items.

10/23/67

S-IB STAGE

Stage S-IB-11 departed Michoud Assembly Facility on October 20, 1967. The stage is expected to arrive for installation in the Static Test Tower East on October 27, 1967. The first test, SA-48, is tentatively scheduled for November 21, 1967. ✓

F-1 ENGINE

Test FW-071 was conducted on the West Area F-1 Test Stand with F-1 engine S/N F-5038-1 for a mainstage duration of 45 seconds on October 19. Primary purpose of the test was to evaluate engine performance during lox depletion utilizing GOX pressurization. Cutoff was initiated by the S-1C lox low level cutoff sensors. The thrust vector control system was also evaluated with modified hydraulic research actuator springs. ✓

S-11 STRUCTURAL TEST PROGRAM

The facility construction is progressing on schedule. Stage delivery to Test Laboratory is scheduled for March 25, 1968. ✓

S-IVB (MSFC)

O₂-H₂ burner test number S-IVB-H09 was conducted on October 20, for a duration of 250.0 seconds. The primary objective was to test with one igniter out to ascertain the satisfactory operation of the O₂-H₂ burner and pressurization system. The objective was met successfully and the system operated properly under the above conditions. ✓

STAGE STORAGE

The risk of storing all S-1B and S-1C stages under one roof is being assessed since, in the event of a catastrophe such as a hurricane or fire, we would have no boosters. ✓

S-1B GROUND SUPPORT EQUIPMENT

The modified S-1B Apollo Access Arm, planned for use on the first manned flight, has been successfully tested in the swing arm test facility and is being removed for shipment to KSC today. ✓

10/23/67

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10/24

ADVANCED ON-BOARD COMPUTER DEVELOPMENT: In response to Computation Laboratory's proposed plan for the design of an advanced on-board digital computer for the period after 1970, MIT gave a presentation on the design status of its multi-processor computer. This computer will be one hundred times more powerful than the digital computer in the Apollo spacecraft, and its development has been funded generously by MSC for more than one year. Electronic Research Center (ERC) followed up last week with a presentation on its concept of an advanced on-board computer of the same capability. We feel that new technology such as large scale integration (LSI) (of microelectronic circuits) will lead to considerably more capable and reliable computers at smaller physical dimensions and power consumption to handle all data processing for more complex missions. The development of computer programs (software) requires the same magnitude of effort as the hardware development and utilizes the same techniques as for large ground computers such as the UNIVAC 1108. ✓

NOTES 10/23/67 JOHNSON

10/23/67

B 10/24

Negative Report.

B10/24

10/23/67

of duty served in W

1. Neutral Buoyancy Testing: We have just completed the first neutral buoyancy test on the ATM mock-up. The purpose of this test was to investigate the translation of the astronaut from the LM end workstation to and from the Sun end workstation by passing between the solar panels and to identify problem areas with regard to structural obstructions, translation hardware, and maneuvering techniques. Only one translation concept, a handrail, was utilized in this test. A pair of dutch shoes mounted on a platform which slides along the handrail served as foot restraints. Test subjects in a pressurized suit translated both with and without the foot restraints. Two different test subjects performed four test sessions with seven replications per session. Test data is currently being summarized for evaluation. ✓

2. Surface Cracks on Pulsed Arc Mig Welded Test Panels at Seal Beach: A number of fine surface cracks have been detected on weld panels produced by this technique after transfer of the weld equipment from the shop area to the weld laboratory. Since such surface cracks have not occurred before at ME or Seal Beach it was suspected that contaminated shielding gas or a leak in a gas line created the problem. However, NAA has not yet succeeded in clearly identifying the causes of this occurrence. We are sending some of our personnel to Seal Beach today to find the solution to the problem. This support is given on special request of NAA's manufacturing organization. ✓

B 10/24

1. SUPERINSULATION MATERIAL TEST: ^{10/23 JVS} The first rocket sled test run for the final phase of evaluation of the Aluminized Mylar Superinsulation material was completed at Holloman Air Force Base, Alamogordo, New Mexico. The material was mounted on a simulated fuel tank (105 inches diameter and 120 inches long and containing liquid nitrogen) subjected to the combined environments of vibration (7.7 - 8.5 Grms) acoustic (146 db) steady state acceleration (6.9 g) and cryogenic temperatures onboard a rocket sled. The test environments were designed (except for acoustics) to exceed those anticipated during any typical Saturn vehicle flight. The insulation was not degraded by the test. ✓ One additional test run is scheduled. This sled, weighing nearly 19,000 lbs., is the largest ever launched on the Holloman Air Force Base track. Full photographic coverage of the test will be available within three weeks. ✓
2. IU "B" NUT STRESS CORROSION PROBLEM: One "B" nut used in the MC fittings in the IU ECS system of SA-501 failed from stress corrosion. Although the "B" nut is specified to be 7075-T73, the nut which failed was 7075-T6. We inspected all "B" nuts procured by IBM (from Teledyne) which are in IBM stock, and found that although the specification required 7075-T73 nuts, approximately half of those received were 7075-T6. Using procedures which we developed, IBM inspected all "B" nuts on the MC fittings installed on SA-501 IU and found four 7075-T6 nuts which were changed over the week-end. Teledyne processed over 2000 MC fittings when the bad batch was made and other prime stage contractors have procured the remainder of those processed. Currently, we see no way to assess all MC fittings on SA-501. We will require all prime contractors to inspect the nuts in their stores to attempt to eliminate any 7075-T6 nuts. ✓
3. OART INQUIRIES FOR RESEARCH ASSISTANCE: We have received inquiries from OART in Washington as to our capability to assist in aeronautics research. Such topics as stress corrosion of titanium and polymer developments have been discussed. The interesting point is that there is some preliminary indication that they would be pleased if we would do contract research for which they would provide the money. We have stated that we cannot assist currently with inhouse effort.
4. S-II STRUCTURES TEST PROGRAM: (Reference Notes 10-9-67 Lucas, Item 1) The "A" structure delivery ondock date at MSFC is now 12-3-67. This still makes test completion date extremely tight with respect to the new "4H" schedule. A status presentation will be arranged for you through IO after 501 launch. ✓
5. HAZARDOUS GAS DETECTION SYSTEM (HGD): (Reference Notes 10-9-67 Lucas, Item 7) Irregularities in The Boeing Company operation of the HGD during CDDT have been discussed in detail with personnel from I-V-E and they are preparing a letter to KSC recommending additional operator training prior to SA-501 launch. ✓
6. SUBSCALE MODEL TESTING USING SOLID MOTOR STRAP-ONS: The second test of a 1/58 scale S-IC stage with 120" diameter solid rocket motors strapped on was conducted 10-9-67, at the Test Laboratory. Quick look data indicate the solid motors functioned properly and visual inspection reveals little or no damage to the subscale launch complex. ✓

Thru
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to
B.L.
While
we
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door
open.
We may
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protection in
case of more
cutback threats.
B

10/23/67

B 10/24

POP 67-2 (5 YEAR PLAN THROUGH FY 73) - The first reaction from MSF Headquarters to the MSF POP 67-2 (final submission on Apollo, Supporting Development, and Advanced Missions and preliminary submission on AAP) is that final authorization for Apollo will most likely be less than shown in the plan. There was no indication as which centers would be involved in these changes. Little overall assessment of the MSFC submission on AAP can be made until the MSC AAP submission is made, current estimates by MSC indicate their submission will be ready around November 1, 1967. Based on this outlook, it may be well into November before the "Headquarters Mark" is received on the AAP portion of POP 67-2. ✓

APPROPRIATIONS STATUS - The latest information available from MSF is that the House members of the Conference Committee will go to the floor of the House at 1 p.m. today to request instructions on the areas of disagreement with the Senate. The current areas of disagreement are the increases passed by the Senate in its appropriations bill for AAP, Voyager, NERVA, NRDS, and OTDA. Apparently the Conference Committee has agreed to the \$20 M reduction in AO funding. ✓

SPACE APPLICATIONS INTERIM REPORT - An interim report has been issued by the National Academy of Sciences (NAS) on the conclusions and recommendations resulting from their study of NASA's Space Applications Plans that was held at Woods Hole, Massachusetts last July and August. At OSSA's request we are reviewing the report and will submit informal comments back to them. Since the summer study covered many areas (e.g. geodesy, meteorology etc.), we have had each separate section reviewed by the MSFC element that is most familiar with that area of endeavor. Our only major comment related to their position which was: ---" The use of manned vehicles per se does not at present appear necessary or economically desirable for the operation of the various space systems considered by this study group. It is believed that the systems proposed as candidates for providing near-term practical and economical benefits to the U. S. public and to mankind generally will be achieved more effectively and economically with automated devices and vehicles."

NOTES 10/23/67 RICHARD

No submission today.

10/23/67

B
10/24

10/23 Q/S

B 10/24

1. AS-501 Flight Readiness Test (FRT) - The Flight Readiness Test (FRT) for AS-501 will be held at KSC on Tuesday and Wednesday, 24 - 25 October 67. ✓
2. S-II-3 Cryogenic Proof Testing - General Phillips accepted the MSFC recommendation of no cryogenic proof testing for S-II-3, S-II-4 and subs based upon the technical presentations made by Dr. Lucas during meeting at Headquarters on Tuesday, 17 October 67. A letter to this effect will be issued from Gen Phillips to MSFC. ✓
3. Soft Release Holddown Bolts on AS-501 - A requirement for a relook at the physical properties for the soft release holddown bolts on AS-501 was established by P&VE Laboratory. This required removal of a bolt from AS-501 LUT #1 Friday night, 20 October 67. The bolt was delivered to P&VE at approximately midnight Friday. Tests were started Saturday morning, 21 October 67, but difficulties were encountered causing postponement of testing until Monday. Test results are not yet available this morning, Monday, 23 October 67. ✓
4. S-IVB Stage Stringer Machining Problem - The longitudinal stringers on S-IVB-501 and 502 were inspected to determine if there were any problems on these stages. The inspection has been completed and both stages are satisfactory with no rework required. ✓
5. ST-124 Platform Accelerometer Failure on IU-501 - The cross range accelerometer problem from the ST-124 platform on IU-501 has not been completely determined as to source of the problem. Malfunction testing is currently continuing by R-ASTR. The platform, together with a new complete servo loop including J-2 cable and accelerometer, has been replaced in AS-501 at KSC. ✓
6. Apollo/Saturn V Delivery Requirements - We received a new delivery schedule from General Phillips on Tuesday, 10 October 67. Contractual deliveries are no longer considered MSF controlled milestones. The MSF control milestone is now defined as the "availability for delivery" on-dock KSC date. This change will provide us with much greater flexibility in determining our interim milestones than we have had in the past. You have a copy of the CONFIDENTIAL MSFC Schedule document. ✓

NOTES 10/23/67 SPEER

10/23/68

B 10/24

NEGATIVE REPORT.

NOTES 10-23-67 Stuhlinger

10/23/67

B 10/24

No submission this week.

B10/24

10/23/67

ESE BATTERY PROBLEMS: Reference your question on my notes of 10/9/67 (copy attached) concerning why we picked batteries in the first place as an emergency backup to the primary launch complex power source if a diesel generator was acceptable. We understand from available information that at the time the decision was made batteries were considered more reliable for an immediately available power source for the intended use than the diesel generator. Furthermore, the design intent for the emergency backup supply was only for hazardous testing, such as propellant loading tests. It is suspected that part of our current problem of increased failures is a result of the batteries now being used by KSC as a backup for routine testing. It is still felt that batteries are the most reliable choice for a backup supply for hazardous testing. We are looking into a possible means to reduce requirements on the backup supply and to increase the life of the Gulton battery. We will keep you informed on the results of our current investigation.

B.T.
 I understand.
 But I still don't see why now a diesel is suddenly adequate
 (Your NOTES 10-9)
 B

CRACKED "B" NUTS IN THE I. U. WATER METHANOL LINES: Reference my notes of 10/16/67 (copy attached) concerning cracked "B" nuts being found on I. U. 's 501, 502, 503, 205 and 206. IBM, in conjunction with R-P&VE, has concluded that the cracking was probably caused by stress corrosion which could result from improper heat treating. All "B" nuts in stock at IBM (282) were tested for heat-treat condition and 114 of these were determined to be at the T-6 heat-treat condition. It was also determined that any "B" nut with a heat-treat condition of T-6 or less is very susceptible to stress corrosion, therefore, those 114 with a T-6 condition were declared unuseable. The "B" nuts installed on I. U. 's are being tested for heat-treat condition and will be replaced as required. Thus far all of the "B" nuts which have cracked or have been of the improper heat-treat condition were purchased from Teledyne and were from two heat-treat lots.

We have also been informed that CCSD has purchased 228 "B" nuts out of two lots of a T-6 temper made by Linair (in Florida). CCSD is presently tracing through their system to determine on which stages these "B" nuts are located.

B 10/24

10/23/68

1. MDC Study Presentation:

Final presentations of the MDC S-IVB station module study (presented to you on 10/17/67) were given at MSC on 10/18/67 and at MSF on 10/19/67. The presentations were well received both places, and the MSC people have requested a repeat of the summary briefing for Dr. Gilruth within the next few weeks. Representatives of Dr. Orr Reynolds' group at Headquarters were particularly pleased with the concept of a separated bio-science module and requested use of some of the presentation material for an upcoming conference of the American Institute of Biological Research. ✓

2. Phase B, Task D Spacecraft Studies:

"Voyager"

Final oral reviews with Boeing, GE, and TRW were held on October 17 and 18. Don Hearth, Earl Glahn, and Dr. Fellows attended from OSSA.

Most of the reports and brochures have been received. It is expected that the contracts can be closed out, from our standpoint, within the next week.

Work has been started to prepare an MSFC "Executive Summary Report".

History does repeat itself. The Task B final reviews were held in early 1966, shortly after cancellation of the 1971 mission; then, Task D orals immediately after "cancellation" of the 1973 mission. ✓

Oct. 30, 1967

★

1

NOTES
MR. GORMAN'S COPY
10/30/67

*With comment
(none directed
to DEP-A)*

1967 NOV 3 PM 3 36

RECEIVED DEP-A

B 11/2

1. SPITZER COMMITTEE: The Large Orbiting Telescope Committee, chaired by Dr. Lyman Spitzer of Princeton, held a 2-day meeting at MSFC last week. Contributions by this Center included presentations on ATM (ASTR): ATM Follow-On (SSL); space radiation effects (SSL); manned orbiting stations (ASO); and multipurpose astronomical observatories (ASO and SSL); and tours through the mock-up area (ME) and optical technology activities (ASTR). Committee members (8 from universities, 2 from NASA) expressed great appreciation for the interest and the activities of this Center in space astronomy. It was indicated repeatedly that much closer working relations between astronomy program planners and this Center will be maintained in the near future. ✓

2. VISIT BY DR. NANCY ROMAN: Dr. Nancy Roman, during the Spitzer Committee visit, inspected our infrared astronomy work in the RCAA observatory. Her reaction was very positive; she encouraged us to continue and expand our work in IR astronomical observations (moon, planets, eclipsing binaries, proto-stars) as well as in our basic IR research presently underway in the laboratory. ✓

3. ATM FOLLOW-ON STUDY: One of the ATM Follow-On payloads we have been studying under OSSA directives is a stellar ATM ("LA OT" = Large Aperture Orbiting Telescope). In the absence of detailed guidelines, we used the proposals by GSFC, Northwestern University-Chrysler, and others as inputs to our study. More recently, Dr. Roman issued a new nation-wide RFQ for a LAOT; answers are due in OSSA by Nov. 1. We hope to receive study guidelines from OSSA as soon as these proposals are evaluated.

Members of the Spitzer Committee differ in their opinions about the stellar ATM. Some of them prefer an evolution of ATM-A into a system with better pointing capability, longer periods of operation, high precision optics, and the possibility of automated operation, while Dr. Roman assumes little evolution in ATM, and an early shift to the ASTRA concept which represents, in essence, an OAO being visited and maintained by astronauts every two or three months. ✓

It is evident that the ATM versus ASTRA route involves an element of competition between OMSF-MSFC and OSSA-GSFC. If we wish to have an active part in the stellar astronomy program during the next years, we must give now very careful attention and conscientious effort to the ATM Follow-On program, and to the possibilities of evolving the ATM-A into a stellar telescope carrier.

4. RIF-ACTION: Much effort was spent last week in an attempt to cope with the impact of the RIF action. SSL was directed to reduce its strength by 15.3%. Regardless of what persons we put on the list, we will end up losing many of our young, capable, eager scientists whom we picked during recent years in the belief that MSFC will take part in space science projects. ✓

know.

Shep

This is very important. I would like to stay close to these plans. Please discuss w/ Weidner and Stuhlinger the desirability and timing of an MSFC-internal meeting on this subject. B

Done in orbital astronomy mtg on Nov. 21, 1967. ny

APOLLO TELESCOPE MOUNT (ATM) FOLLOW-ON STUDY: A meeting was held at Martin Company on October 23-24 to discuss status of the ATM Follow-on Study. This meeting was attended by Messrs. R. Chase and W. Green of NASA Headquarters, who requested a study by November 20, on certain options for an ATM-B mission to support Dr. Newell's request to the BOB for ATM-B funding support. Six solar payloads or modifications to payloads and three celestial payloads should be evaluated from a feasibility, schedule, and cost viewpoint by November 20. This additional effort, although partially required for ATM Follow-on Study, would result in changing the due date of the total study report from December 1 to February 1. Official confirmation of the study request has not yet been received from NASA Headquarters. ✓

DESIGN STUDY ON LUNAR ROVING VEHICLE (LRV) FOR SINGLE LAUNCH: Two design approaches have evolved: The first is a single piece four-wheel folding configuration (fits inside one bay of the Lunar Module (LM) ascent stage, 32" to 35" wheels). The second approach is a two piece vehicle (segments stowed in opposite LM descent bays). Both vehicles weigh approximately 575 pounds; are capable of transporting 200 pounds of cargo (in addition to one astronaut with Portable Life Support System); have a range of 25 kilometers/excursion with a top speed of 16 kilometers/hour. The effort is being coordinated by Advanced Systems Office with P&VE, the Martin Company, and R-AERO. Preliminary results of these studies will be presented to you on November 3. ✓

ORBITAL WORKSHOP (OWS) PROCUREMENT PLAN: The OWS Procurement Plan was delivered to Headquarters on October 23. This plan specified that the Active Attitude Control System (AACS) and Solar Array would be done in-house at MSFC. We will push to get the plan approved since we could impact McDonnell Douglas Corporation (MDC) schedule, by delay of long lead items, if we do not get approval by December 1, 1967. ✓

✓ ORBITAL WORKSHOP SYSTEMS CHECKOUT ACTIVITIES: The first OWS Checkout Group meeting was held October 25, with representatives from R&DO, MSC, MDC, and KSC. The first meeting of the group was to establish plans for defining future activities for checkout definition. ✓

ORBITAL WORKSHOP INSTRUMENTATION SYSTEMS: Comments were received this week from R&DO evaluating the MDC proposal for the OWS Instrumentation System. MDC will be given authority to proceed (ATP) with preliminary design of the system. ✓

ATM PROGRESS REVIEW AT HEADQUARTERS: At the request of Mr. Mathews, an

ed in the same meeting (liquid) thermal control liquid system, which

EVERY: MSFC received schedule will be slipped the prototype (first same time frame that the impact of the six underway to bring ting. ✓

We have asked Lee Belew and Bill Horton to conduct a joint briefing for you on the Orbital Workshop/ATM checkout philosophy and plans. ✓ After yesterday's meeting at Quality, it is quite evident that clarification needs to be given this item.

JTS
10-31-67

Nancy
O.K.
B 11/2
I asked Lee Belew to cover this in his scheduled AAP Program Review (MSFC) *Belew*
This probably will become a regularly scheduled event - 11/28 9FS

NOTES 10/30/67 BALCH

10/31/67

B 11/2

S-II-3 Testing - Leaky Augmented Spark Ignition (ASI) assembly on Engine #3 has been replaced. Engine leak checks were completed on 10/28/67, with final sell-off expected today. Insulation modifications and repairs are progressing satisfactorily. Removal from stand is still set for 11/16/67. ✓

S-II-4 Stage - Preparations are under way to support scheduled delivery of stage to MTF on 11/26/67, but schedule is uncertain because of present planning with respect to program stretchout. ✓

S-IC Activities - Feasibility of stage contractors plans to place the S-IC-D stage in the B-2 position of the S-IC test stand to perform full-scale anti-vortex test with water is being considered. These plans, if approved, will be coordinated with regular test program schedules presently being formulated to avoid conflict with S-IC-6 acceptance testing. ✓

B-1 Position of S-IC Test Stand - Beneficial occupancy is still expected to be obtained on 12/1/67, with all punch-list items to be completed by 3/1/68. ✓

GE Service Contract - Amendment covering second through fourth quarters of Fiscal Year 1968 is expected to be approved by NASA Headquarters this week. Request for proposal covering extension from 7/1/68 through 9/30/69 is expected to be submitted to GE on 12/1/67, with a due date of 1/15/68 for GE's proposal. ✓

State of Mississippi Tax on Diesel Oil - Because of possible unconstitutional aspects of tax, the Government (AEC) is suing the State of Mississippi. If this suit is successful, MTF would not be required to pay state tax on petroleum products. ✓

Public Affairs - I conferred with Mr. Jim Tanner of the Wall Street Journal when he visited MTF this past week at the invitation of General Electric. ✓

10/31/67

B #1/2

APOLLO TELESCOPE MOUNT (ATM) FOLLOW-ON STUDY: A meeting was held at Martin Company on October 23-24 to discuss status of the ATM Follow-on Study. This meeting was attended by Messrs. R. Chase and W. Green of NASA Headquarters, who requested a study by November 20, on certain options for an ATM-B mission to support Dr. Newell's request to the BOB for ATM-B funding support. Six solar payloads or modifications to payloads and three celestial payloads should be evaluated from a feasibility, schedule, and cost viewpoint by November 20. This additional effort, although partially required for ATM Follow-on Study, would result in changing the due date of the total study report from December 1 to February 1. Official confirmation of the study request has not yet been received from NASA Headquarters. ✓

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ORBITAL WORKSHOP INSTRUMENTATION SYSTEMS: Comments were received this week from R&DO evaluating the MDC proposal for the OWS Instrumentation System. MDC will be given authority to proceed (ATP) with preliminary design of the system. ✓

ATM PROGRESS REVIEW AT HEADQUARTERS: At the request of Mr. Mathews, an ATM Progress Review was held October 26. Included in the same meeting was a presentation on trade-offs of an active (liquid) thermal control system. This Center's recommendation was for a liquid system, which was accepted by Mr. Mathews. ✓

ATM EXPERIMENT POINTING CONTROL SYSTEM (PCS) DELIVERY: MSFC received official notice that the Perkin-Elmer delivery schedule will be slipped six months. The slip in schedule will result in the prototype (first article) delivery in July 1968, which is in the same time frame that the 3-axis simulator is scheduled to arrive. While impact of the six months slip can probably be absorbed, efforts are underway to bring hardware in earlier to avoid crowding of PCS testing. ✓

10/31/95

B 11/2

H-1 ENGINE The corrosion has been removed from all of the engines on AS-204 and they have been repainted. All engines on AS-204 remain in flightworthy condition. ✓

F-1 ENGINE The fuel balance cavity return line on F-1 engine F-6053 on vehicle S-IC-7 leaked during a routine 10 psig leak check at MAF. Examination of the line revealed cracks in the conductive teflon liner. The cause of failure has been traced to defective process control at the vendor, TITEFLEX. It has been determined that 21 engines are affected. Of these, nine are installed on stages (S-IC-5, -6, -7, and -8). No impact is expected. ✓

The modification of the thermal insulation panels on AS-501, to provide additional venting was completed at 4 a. m. on 10-23-67, 20 hours ahead of schedule. This item, which was open at the Flight Readiness Review, is now closed. ✓

J-2 ENGINE J-2 engine open work items are being closed out at KSC on AS-501 at an acceptable rate. The present engine status is:

S-IVB Stage - Open work closed. ✓ The engine flowmeters were inadvertently spun dry during a spacecraft interface test. The flowmeters have been tested and found satisfactory for flight. ✓

S-II Stage - (a) Engine modifications are complete. (b) The search for stage baffle pieces has been completed in the engines. All components have been reassembled and leak checked; one piece remains lost. (c) Redundant helium tank pressure transducer on engine J-2035 has been reading 100 psi low during FRT and an investigation is underway. Since the measurement is a redline parameter corrective action must be considered. (d) Pressure transducer recording LOX turbine inlet pressure on engine J-2043 failed during FRT. The measurement is not flight critical and will probably be waived. (e) The first two tests of the reduced fuel inlet pressure verification series were conducted at AEDC on 10-24-67. Inability to control the LOX inlet conditions (too cold) scrubbed the third test. LOX loading and conditioning tests ran on 10-26-67 revealed a leak in the helium purging system which created helium bubbling effect. ✓

NOTES 10/30/67 CONSTAN
10/31/67

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Nothing of significance to record.

NOTES 10/30/67 EVANS

10/31/95

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11/2

MSFC SAFETY BOARD

The MSFC Safety Board held its 9th meeting on October 24, 1967. The Board made the decision to include its safety review requirement for SA-502 in Saturn V Program Directive No. 44A, which is currently in preparation by the Saturn V Program Office. ✓

NOTES 10/30/67 FELLOWS

10/31/67

B 11/2

Review of Procurement Categories: A meeting last week with Mr. Katz and Mr. Hardeman to discuss communications services provided by MSO pointed up the need for increased reviews of selected types of equipment and materials to avoid duplication of use and services within the Center. To achieve that result, there are, for instance, established practices for review of computer requests by the Computation Laboratory and review of communications equipment by MSO. It is the consensus that better utilization of inventories, improved use of present equipment, and more judicious use of limited current year money can be effected by selecting additional discrete categories of procurements which could benefit from rapid management review in parallel with the flow of procurement requests to the Purchasing Office. A follow-up meeting is planned this week with MSO, FMO, F&D, TSO, and the Purchasing Office to see what types of procurements would best lend themselves to such a review to strengthen the procurement system. Our actions are also being coordinated with Mr. Huth. ✓

1. AS-501 Liftoff Motion Clearance: All close in ground support equipment that could potentially result in vehicle interference and/or collision has been analyzed and found to exhibit positive clearances with exception of hold-down arm blast protective shields. These clearances are based on measured values for ground equipment on LC 39 and measured error sources for 501 which contribute to translation of vehicle. Some of the available clearances are small but deemed to be of an acceptable level of risk for launch. Measurements were made at KSC for 501 on distances between hold-down arm blast protective covers and vehicle. Minimum distance of 5.3" was measured. Our analysis has shown that with the vehicle errors measured on 501 (0.9° center engine cant, 0.13° thrust vector misalignment of control engines, 0.1° average servo amplifier offset, 0.05 deg/sec rate gyro error, 0.1° yaw and 0.25° roll platform alignment errors) and a 95 percentile ground wind (28 knots peak) blowing from south, vehicle thrust structure would collide with hold-down arm #II cover. KSC was informed that minimum clearance of 9" was required. We understand KSC is adjusting positioning of covers to give this clearance. Our dynamic analysis had indicated that the vehicle could drift laterally 4" by time of tail service mast release in back up mode of retraction. R-TEST has conducted tests on S-IC stage aft umbilical/tail service mast mechanical release system simulating 4" of vehicle lateral motion and verified that successful retraction could be accomplished. No problems were apparent for primary system relative to vehicle motion. ✓

2. Panel Flutter: Current schedules reflect 204 launch only a few days prior to 502. Therefore, we have reassessed need for anti-flutter kit on 502 versus current plans to fly 502 without flutter kit, but with special flutter instrumentation. As you recall, Phase I flutter tests of S-IVB panels, based on Saturn IB exit environments, conducted at AEDC, were not conclusive in determining requirement for flutter kit due to failure to simulate proper environment (primarily due to compressor failure in tunnel). Currently, flutter kits are installed on S-IVB 501 and 503. Also, 502 and 204 are equipped with special flutter instrumentation. The decision to instrument the 502 stage for flutter rather than install the structural fix was based to a large degree upon assumption that 204 flight data would be available several months prior to 502 launch and might prove by extrapolation to 502 vent area (200 in² compared to 150 in² for 204) and Saturn V dynamic pressure (about 8% higher than Saturn IB) that flutter was not expected to be a problem on later Saturn V flights. A series of Phase II flutter tests of S-IVB panels, based on Saturn V exit environments, is planned by P&VE for completion by November 6, 1967. Tests will be conducted up to Mach 1.4 with a 50% dynamic pressure margin (tunnel compressor problems have been corrected). A vacuum pump will be provided so that pressure differential across panel can be reduced to ≈ zero (simulating 200 in² vent area). Compressive load capacity sufficient to buckle panels is available. We are in agreement with P&VE that, provided these tests can be conducted as planned without destructive results, residual danger of destructive panel flutter would be much smaller than previously considered and within acceptable risks. In event test results are negative, i.e., destructive flutter occurs, there should be no question as to necessity for installing flutter kit on 502. Since these negative results could be experienced as late as 11-6-67, a request for installation of flutter kit on 502 would come rather late. A joint R-AERO/R-P&VE memo explaining the above to Dr. Rudolph has been prepared and is awaiting P&VE concurrence. ✓

B 11/2

1. S-II FOAM INSULATION: Electrogen Industries, Inc., of Westbury, New York, have indicated their willingness to loan one of their newly developed portable electric field-intensity meters to NASA/MSFC for evaluation. The equipment capabilities for determination of internal structural discontinuities of the S-II spray-on polyurethane foam insulation will be evaluated. This equipment performs the interrogation by measurement of the negative electric field intensity associated with plastic materials. Preliminary scanning of MSFC test panels at Electrogen Industries several months ago showed capability of detecting sub-surface foam defects by deviations in the electric field intensity in the vicinity of the defect. ✓
2. RELAY TESTING: We have been invited to participate in an Ad Hoc Committee meeting, October 31 - November 1, 1967, in Washington, D.C., to discuss the revision of Relay Specification MIL-R-5757D. One of the principal revisions under consideration is the area of hermetic seal testing of relays by radioactive tracer gas methods. This Laboratory uses radioactive tracer gas for hermetic seal testing of relays and is very interested in the preparation of the revised specification to assure compatibility with methods presently used. R-QUAL and the Navy (Crane, Ind.) are the only two Government agencies that have radioactive tracer gas equipment and extensive experience in this type of hermetic seal testing. ✓
3. RELAY TESTING AGREEMENT: An agreement was made with KSC to perform radiflo and electrical testing at MSFC on relays procured by KSC from the General Electric Company under Contract NASw-410. It is anticipated that approximately 1000 relays per year will be tested. ✓

B 11/2

1. Inertial Platform for AS-502. The inertial platform for AS-502 has been returned from KSC to Astrionics. The platform had excessive noise on the output of one of the accelerometer servos. Also, some discrepancy in the drift measurements taken at KSC and R-ASTR-G was found. A preliminary test shows that the servo amplifier electronics card is noisy; it is a function of temperature. A platform checkout with a new servo card will be run for gyro drift tests; further results will be reported. ✓

2. ATM Monthly Review at Headquarters. The first monthly review was held last week. The most significant discussion came from Mr. Mathews' request that all ATM planning should be based on a four month pad. Astrionics and IO took exception to this, and IO will readvise Mr. Mathews of the MSFC position on this matter. The active cooling system was accepted by Headquarters and they want a further review in about three months. ✓

W.H.

I thought we had his thing
completely Qual - tested !?!

B

NOTES 10/30/67 HEIMBURG

B
11/2

S-1B STAGE

Stage S-1B-11 arrived at Redstone docks Friday evening October 27, 1967. Test SA-48 is tentatively scheduled for November 21, 1967. ✓

S-11 STRUCTURAL TEST PROGRAM

The facility construction is progressing on schedule. The stage is expected to arrive from NAR/SD on November 30, 1967. Expected delivery date to R-TEST is March 25, 1968. ✓

F-1 ENGINE

Test FW-072 was conducted on the West Area F-1 Test Stand with F-1 Engine S/N F-5038-1 for a mainstage duration of 43.7 seconds on October 26, 1967. The test was terminated by the S-1C lox low level cutoff sensors as planned. Primary purpose of this test was to evaluate engine performance during lox depletion utilizing GOX pressurization. The thrust vector control system (modified Hydraulic Research actuator springs), and the Saturn IB I.U. (installed on the Mobile Acoustic Research Laboratory - MARL) were also evaluated. ✓

NOTES 10-30-67 HOELZER

B₁₁₂

Negative Report.

B
11/2

MSFC Plan for Engine Noise and Response - On 11/4/66, Dr. Adams requested that the Center take the lead in formulating and developing a continuing Agency wide research program in the vehicle structural vibrations associated with engine noise and its effects. Mr. Ron Jewell, of P&VE, assisted by personnel from AERO Lab, HQs. (Mr. Doug Michel), and Lewis Research Center has developed a long range (3-5 year plan) for this area. This plan has been submitted to HQs. for review and use. Mr. Jewell has done a very excellent job of reviewing work in progress and laying out a program to fill in gaps in knowledge in an orderly and systematic way. ✓

*B.W. Be careful not to overcommit TEST Lab with in-house testing
TEST may be hit pretty hard in case we have to go thru a RIF action! B*

MSF Supporting Development Review - The Supporting Development Payoff Review was held in HQs. on 10/24. Mr. Trimble chaired the meeting. Presentations were made by Mr. Trimble, as Advanced Manned Mission Program Director, OMSF, Mr. Heberlig of MSC, Dr. Vinograd, Mr. Claybourne of KSC, and me.

Mr. Trimble showed the proposed FY 68 budget breakout. MSFC is scheduled to receive \$18.3M, of which \$12.5M is for J2-S work and \$1.6M is for Advanced Systems Support, beyond AAP. The \$1.6M is currently shown as overceiling.

Mr. Weidner, Mr. Miles, and I attended for MSFC. Because of a change in the meeting schedule, we arrived after Mr. Trimble's Presentation. However, we were informed that there was no adverse reaction to the plan for the J2-S work nor the \$2.8M planned increase in the MSFC effort. ✓

Dr. Gilruth expressed keen interest in our welding technology work. Reports are being collected to be sent to him. ✓

NOTES 10-30-67 KUERS

B_{1/2}

No significant events have occurred since your visit. All our people were very glad of the opportunity to tell you about our activities.

→ I enjoyed it!

1. STRESS CORROSION SURVEY OF SATURN V MECHANICAL COMPONENT SPRINGS:

We have completed the stress corrosion survey of the spring materials used in the Saturn V mechanical components. Although we have found springs made from 17-7PH and 15-7 PH stainless steel in the RH 950 condition in all stages (and engines), these applications are acceptable for SA-501 either because of the environment surrounding the springs or the sustained stress experienced by the springs. One troubling situation revealed by the survey is the apparent widespread use of 17-7 PH RH 950 springs in both flight and GSE components. We will initiate action to correct this situation. ✓

2. APOLLO TELESCOPE MOUNT (ATM) ACTIVE (LIQUID) THERMAL CONTROL SYSTEM:

A decision was made by Mr. Mathews on 10-26-67 to go ahead with the active (liquid) thermal control system. ✓

3. S-II-1 LOX LOADING: As a result of the damaging of the lox antivortex baffles during loadings for CDDT, we have agreed with KSC to slow fill (approximately 1000 gpm) the S-II-1 lox tank. Apparently during the chilldown of the 14" cross country lox fill line and at initiation of fast fill, two phase flow in the facility line occurs with gas pockets approaching sonic velocity. ✓ This condition imposed high loads at the lox tank inlet and damaged the baffles. ✓ The new (slow) loading procedure will extend the countdown by approximately 60 to 90 minutes. This time will be absorbed by a hold after completion of S-II lox loading. ✓

4. MULTIPLE DOCKING ADAPTER (MDA): The first MDA monthly status review by R&DO to I-S/AA was held 10-19-67. Major decisions were: (a) permitting cluster testing at MSFC and astronaut training at MSC in the same time span, and (b) using the test article first at P&VE for structural testing and then updating at ME to the dynamic test article to permit more time for finalization of interior details. ✓

5. LUT #1 HOLD-DOWN ARMS: Although information was forwarded, KSC elected the use of Molykote Z dry film lubricant for the hold-down arms at launch complex 39 instead of the MLF-9 lubricant used at all other sites. Failure of shear plates has occurred on at least two occasions on LUT #1, the latest during the CDDT, apparently due to the lack of lubrication which did not allow proper radial movement and redistribution of load during tanking. Cracking of unlubricated slide plates was also reported on the S-IC stage. ✓

6. PACKAGE TRANSFER SIMULATION: Package transfer and package mount/dismount zero "g" simulations (KC-135) initiated at Wright Patterson Air Force Base were completed at MSC on October 18-19, 1967. Astronauts Lousma, Kerwin, Garriott, McCandless, and Col. Tom McElmurry, Assistant Director of Flight Planning, MSC, served as test subjects. One hundred and one parabolas were flown, and subjects operated both suited and in shirtsleeves. A complete report is in preparation. ✓

TASK WORK PACKAGE - The MSF team headed by Dann Linn and Colonel John Lyle reviewed Marshall work packages on October 23, and 24. The results of this review were presented to General Bogart on October 25. Dr. Mueller will be briefed on October 31. A later meeting is planned between Dr. Mueller and Center directors for discussions of the task work package system and results. During the review at MSFC, the team commented upon the following:

- A. The number of people (perhaps 1000) working on AAP but charged to Apollo.
- B. Large effort on vehicle support.
- C. Large Civil Service effort on the I. U.
- D. SRT, Supporting Development, etc. could be reduced without impacting Apollo/early AAP.
- E. Computation-workload controls lacking.
- F. "Cosmetic" painting of local buildings.

The exact use which MSF will make of this system and the data which they now hold is not clear at the moment. ✓

PHOTOGRAPHIC OPERATIONS COMMITTEE - A recently completed survey by GAO of motion picture film processing and printing capacity of both MSFC and the Army Missile Command indicated less than full utilization of either the MSFC or MICOM capacity. As a result GAO has recommended MSFC management consider entering into an arrangement with MICOM for motion picture film processing and printing services on a regular basis. ✓
A joint MSFC/MICOM committee, chaired by Executive Staff, has been formed to look into this matter and make comments to GAO. ✓

NCTES 10/30/67 RICHARD

B 11/2

Possibility of Inadvertent Cutoff of AS-501 at Liftoff: We have been through various exercises and explanations to assure ourselves and others that the possibility of a cutoff during the liftoff process is extremely small. We have discussed this subject with Dr. Rees, Dr. Rudolph, KSC, Bellcomm, Mr. Schneider, and Mr. Hage (General Phillips' new engineering deputy). In summary, the multiple ground and "break-last" system we have is an adequate design to prevent these problems. KSC's final inspection will ensure the ground system is still correct and complete. There are still a few vehicle relay contacts (common also to the entire S-IC flight) and two ground valves which are single point failure possibilities in this system. We feel that these failure possibilities represent reasonable risks since (a) the relay circuits are the same kind we have always had and feel confident in their use, and (b) to cause trouble, the ground valve (prevalve control) failures must occur during, and not before and not after, the time from -1.0 second to +.5 seconds.

L.R.

What's that?

B

B 11/2

AS-501 Launch Vehicle at KSC:

1. Status of Delaminated Clips on S-IC Ordnance Cowling:

o Inspection revealed that 33 clips had debonded from the propellant tank skin.

o Instructions were given to KSC to inspect all clips on the LOX and Fuel Tank Ordnance Cowling and remove all clips that were loose or appeared to have a weak bond.

o KSC completed the job Saturday night, 28 October 67 - 38 clips were removed out of a total of 103. ✓

2. Status of Cracked Hold-down Plates:

o On Friday, 27 October 67, KSC advised that the steel friction plates on the S-IC hold-down posts were cracked at Positions I and III.

o The P&VE and Boeing Michoud recommendation is to leave the plates alone provided the bond between the plate and the hold-down post is sound. The plates should be replaced if they have debonded from the post. This recommendation was provided to KSC on Friday, 27 October 67. ✓

o Inspection of all four hold-down posts was completed on Saturday, 28 October 67, with the result that the plates at Positions II and IV were cracked but bond was sound, therefore use as is. The plates at Positions I and III were debonded from the hold-down post and were replaced. ✓

3. Electrical Overload to the S-IC Hydraulic Checkout Valve on Engine #1:

o On Friday, 27 October 67, the S-IC Stage experienced an electrical overload condition for 2 - 3 seconds at 25 amps. Cause was determined to be a bent connector supplying power to the motor driven hydraulic checkout valve on engine #1. This connector is difficult to insert because it is located underneath the engine insulation and not readily accessible.

o A circuit analysis was conducted by Boeing Michoud to determine if any damage could have been done to the stage cabling. This analysis determined that the smallest wire size in this circuit is number 20 which can take up to 100 amps for short durations.

o The connector was replaced and the whole circuit retested satisfactorily. ✓

4. IU/S-IVB Hypergol Protective Curtains - As you know, MSFC has provided curtains for limited protection of equipment against hypergol leakage. During the final arguments for the use of these curtains, General Phillips ruled out their installation for AS-501. The use of these curtains is recognized as a controversial subject and MSFC's position was to use them. However, in recognizing the operational problems at KSC and the decision made by General Phillips, MSFC has accepted the ruling. ✓

1. AS-501 LAUNCH VEHICLE SOFTWARE INTERFACE TEST (SIT):

The AS-501 Launch Vehicle SIT was conducted during the period October 17-20. Three significant problems were encountered during the test: (1) inadvertent execution of a L/V command (Single Word Dump) a large number of times (estimated to be 212); (2) continual malfunctioning of MCC-H Software/Hardware System resulting in a scrub of the first SIT attempt; (3) the Command Communication System (CCS) onboard receiver was driven off frequency. The inadvertent L/V commands and the malfunction of the MCC-H Software/Hardware System were caused by a noise problem within the MCC-H grounding system. The CCS problem resulted from a procedural error by the MILA site operational personnel. I have talked to J. Hodge and am satisfied that MSC has taken adequate corrective action on all problems. ✓

2. AS-501 FLIGHT READINESS TEST: The AS-501 Flight Readiness Test for the Launch Vehicle was completed October 26, 1967. There were seven holds accumulating 8 hours 56 min. The primary reasons for the holds were GSE, KSC/MCC-H communications and procedural items. The MSFC Flight Controllers successfully completed the L/V command sequences. No L/V problems were encountered during the plus portion of the test. MSC experienced problems with the update sequence for the Apollo Guidance Computer, and that portion of the test was successfully rerun later. The HOSC was manned by 30 MSFC and contractor engineers who provided support as required to both launch and flight operations. ✓

3. SEISMIC RECORDINGS AT KSC FOR AS-501: We have obtained KSC approval for Dr. Dalins (R-SSL) and four associates to operate three battery powered Seismic stations during the AS-501 launch. The stations will be located 5200, 6400 and 8000 meters south of the Launch Control Center (outside the danger zone). Equipment calibration required to eliminate local ocean oscillations will be performed this week. ✓

4. MANNED SPACE FLIGHT NETWORK SUPPORT: Because of the complexity of reverifying the software required to strip out flight control parameters, any changes of the Remote Site Data Processing (RSDP) programs from mainstream Apollo to contingency missions could cause a significant impact on the launch dates of the AS-206LM and AS-503BP contingency missions. MSC stated that the spacecraft could live with identical programs from AS-204LM1 to AS-206LM2 and from AS-502 CSM to AS-503 BP. MSFC, on the other hand, does require a change on the AS-502 to AS-503 programs (addition of O₂H₂ burner). We do not anticipate a change on the AS-204 and 206 programs even though the instrumentation is different on the two vehicles. The impact of these changes is being evaluated and a written report will be submitted to the Mission Director by November 3. I feel confident that we will be able to minimize the required changes. ✓

1. SPITZER COMMITTEE: The Large Orbiting Telescope Committee, chaired by Dr. Lyman Spitzer of Princeton, held a 2-day meeting at MSFC last week. Contributions by this Center included presentations on ATM (ASTR): ATM Follow-On (SSL); space radiation effects (SSL); manned orbiting stations (ASO); and multipurpose astronomical observatories (ASO and SSL); and tours through the mock-up area (ME) and optical technology activities (ASTR). Committee members (8 from universities, 2 from NASA) expressed great appreciation for the interest and the activities of this Center in space astronomy. It was indicated repeatedly that much closer working relations between astronomy program planners and this Center will be maintained in the near future. ✓
2. VISIT BY DR. NANCY ROMAN: Dr. Nancy Roman, during the Spitzer Committee visit, inspected our infrared astronomy work in the RCAA observatory. Her reaction was very positive; she encouraged us to continue and expand our work in IR astronomical observations (moon, planets, eclipsing binaries, proto-stars) as well as in our basic IR research presently underway in the laboratory. ✓
3. ATM FOLLOW-ON STUDY: One of the ATM Follow-On payloads we have been studying under OSSA directives is a stellar ATM ("LA OT" = Large Aperture Orbiting Telescope). In the absence of detailed guidelines, we used the proposals by GSFC, Northwestern University-Chrysler, and others as inputs to our study. More recently, Dr. Roman issued a new nation-wide RFQ for a LAOT; answers are due in OSSA by Nov. 1. We hope to receive study guidelines from OSSA as soon as these proposals are evaluated.

Members of the Spitzer Committee differ in their opinions about the stellar ATM. Some of them prefer an evolution of ATM-A into a system with better pointing capability, longer periods of operation, high precision optics, and the possibility of automated operation, while Dr. Roman assumes little evolution in ATM, and an early shift to the ASTRA concept which represents, in essence, an OAO being visited and maintained by astronauts every two or three months. ✓

It is evident that the ATM versus ASTRA route involves an element of competition between OMSF-MSFC and OSSA-GSFC. If we wish to have an active part in the stellar astronomy program during the next years, we must give now very careful attention and conscientious effort to the ATM Follow-On program, and to the possibilities of evolving the ATM-A into a stellar telescope carrier.

4. RIF-ACTION: Much effort was spent last week in an attempt to cope with the impact of the RIF action. SSL was directed to reduce its strength by 15.3%. Regardless of what persons we put on the list, we will end up losing many of our young, capable, eager scientists whom we picked during recent years in the belief that MSFC will take part in space science projects. ✓

Shep

This is very important.
I would like to stay close to these plans.
Please discuss w/ Weidner and Stuhlinger
the desirability and timing of an
MSFC-internal meeting on
this subject. B

I know.

B 11/2

S-IVB WORKSHOP ATTITUDE CONTROL SYSTEM (WACS): Reference Dr. Lucas' notes of 10/16/67 (copy attached) concerning the possibility of doing the WACS in-house. The concept of the control system has changed considerably from its initial version in that it no longer is an Auxiliary Attitude Control System (AACS) which takes over after completion of the primary S-IVB mission. The new concept is completely integral and controls the workshop from the initial guidance of the S-IVB through completion of burn and the complete attitude controlled requirement in support of AAP. Because of this, Ted Smith has called me and expressed considerable alarm at the thought of anyone other than MDC having design responsibility for such a fundamental part of the S-IVB stage system. If a decision is made to do the WACS in-house, we will have to change the incentive portions of the contract with MDC which pertain to performance. ✓

Yes. B

SATURN IB MINUTEMAN EFFORT: Reference my memorandum to you dated 10/18/67 (copy attached) concerning the cancellation of the subject effort and our understanding that Mr. C. Mathews was sending a TWX requesting copies of the final report and cancelling the requirement for a Headquarter's presentation. The TWX has been received and Mr. Mathews stated he still desires a presentation in the near future on the summary results. We, in conjunction with the S/AA Office, will schedule a briefing for you before the end of November covering a summary of the Minuteman Study results and the proposed method to close the performance gap on initial AAP missions. ✓

B.T.

I'm very eager to hear about this

B

NOTES 10/30/67 WILLIAMS

B11/2

1. Voyager FY-67 Funded Tasks:

MSFC contracts totaling approximately \$1M were funded by OSSA-Voyager from FY-67 funds. With the understanding that no continued Voyager funding would be available in FY-68, we recommended to OSSA that most of the tasks be continued to completion. However, two of the tasks are being terminated:

a. LMD Engine Verification Tests (R-P&VE):

This test was to have continued with FY-68 funding. Action has been taken to terminate the contract in order to keep costs within the FY-67 funds available.

b. Data Reduction for Saturn V/Voyager Ground Winds Testing (R-AERO):

This testing has not yet begun; therefore, at least some of the funds are recoverable. We would like to continue this, on a general basis, to get data on Saturn V with a 260-inch shroud; however, probably will not be able to do so due to:

(1) Priorities for wind-tunnel time at Langley, and

(2) R-AERO manpower requirements for the wind-tunnel testing and supervision of contracted efforts. ✓