

Dec 4, 1967

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NOTES
MR. GORMAN'S COPY
DEC 4 1967

with comments

(none marked for DEP A)

... and Gorman

NOTES 12/4/67 BALCH

B 12/7

S-II-4 Testing - Entry has been made into LOX tank for removal of debris and X-Ray inspection. Some debris has been removed, and X-Ray inspection is still in progress. Current impact to static firing date of 1/17/67 is minus 3 days. ✓

S-II-3 Modification and Inspection - LOX tank was temporarily closed out on 11/30/67, and stage has been removed from Vertical Checkout Building and placed in a horizontal position on the transporter to permit LH₂ tank entry for dye-penetrant and X-Ray inspection. Stage is scheduled to be reinstalled in the Vertical Checkout Building on 12/8/67 for completion of modifications. Date for shipment to KSC has now been changed from 12/25/67 to 12/23/67. ✓

S-IC-D Stage - Hardware shortages continue to impact the start of fuel flow drain tests. Stage contractor now expects to start tests by end of this week. ✓

S-IC-6 Stage - Stage contractor is planning for delivery to MTF sometime in February, although no schedule has been received from MSFC Stage Office. ✓

Stage Handling Derricks - Failure Mode and Effects Analysis of the S-II and S-IC derricks has been received and recommendations for additional modifications are being reviewed. All previously recommended modifications have been incorporated. ✓

GE Service Contract - Certain NASA Headquarters comments on amendment covering second through fourth quarters of Fiscal Year 1968 are still unresolved. It is now planned that representatives from MTF and MSFC will go to NASA Headquarters this week to try to get these comments resolved. ✓

Civil Defense - Air Force representatives from Keesler Air Force Base made a qualitative inspection of the Civil Defense emergency supplies at MTF on 11/27/67 as part of a nationwide DOD survey of Civil Defense supplies. ✓

Damage Claim from Stage Firing - Complete file on claim of M. O. Pigott against the Government for damages resulting from S-IC-5 firing on 8/25/67, in the amount of \$11,705.00, has been forwarded to MSFC with recommendation that claim be denied. ✓

ORBITAL WORKSHOP MATERIAL REVIEW: A presentation which included the history, test data, and status of nonmetallic material in the OWS was given to twelve MSC personnel (including crew systems) by the Materials Division (P&VE) on November 28. These people feel their sign-off is required and they still did not feel appropriate attention had been paid to damage modes of the foil which would expose it. MSFC agreed to conduct some additional tests. ✓

OWS PROCUREMENT PLAN: Mr. Newby concurred in the NASA Headquarters version of the OWS Procurement plan on November 28. As of that date, the Procurement Plan was being reviewed by NASA Headquarters Legal Office. Headquarters personnel are aiming to obtain our required approval by December 1 for long lead items, but are not very optimistic about an approval before December 10. ✓

OWS DELTA PDR: The OWS engineering mockup delivery from MDC, Huntington Beach, has been changed from December 29 to January 3, 1968. S-IVB stage 503 is now scheduled for December 29 and has priority. The OWS Crew Station Review has been changed to January 29 - February 2, 1968, to accommodate the later mockup delivery date and to avoid interference with the MDA Documentation Review in mid-January 1968. ✓

AIRLOCK PDR: Over twenty MSFC personnel participated in the Airlock Preliminary Design Technical Review at St. Louis on November 29 and 30. The "formal" PDR Board will convene December 6 to dispose of RID's generated during this technical review. ✓

The review was facilitated by dividing into functional groups after a general two-hour briefing on all systems. Participants were encouraged to ask questions and to write RID's. Due to lack of sufficient time available to review the data packages, which were handed out the first morning, it is felt that this technical review only touched the high spots. MSC has stressed that MSFC be thoroughly ready for PDR's on MSFC hardware including early data packages and mockup hardware yet neither condition was met by MSC/McDonnell who have been through these before. *What's that? B*

INTEGRATED LM/ATM TESTS AT MSFC: The Martin Company has been studying for the past two months routing of the flight LM through MSFC. A meeting was held with them on December 1 to discuss the results of their efforts. ✓

ATM THERMAL VACUUM TESTING: A meeting is scheduled at AEDC on December 15 to discuss ATM thermal vacuum testing. ✓

ATM CMG DEVELOPMENT: Jim Igou along with Jim Rowell of Astrionics Lab visited the Bendix facility in Teterboro, New Jersey, on November 18 and 19 to review the ATM pointing control system hardware status. The development and fabrication of all contracted hardware appears to be moving along satisfactorily. Bendix had just completed running the first inner gimbal assembly (includes wheel) for some 300 hours with what appeared to be excellent results. The wheel ran at nominal speed (7850 rpm) and bearing temperatures were well within expected tolerances. The wheel was gimballed over the range of $\pm 90^\circ$ at rates up to $6^\circ/\text{sec}$. The unit was disassembled and undergoing inspection last week. The second inner gimbal assembly is scheduled to be shipped to MSFC on December 5. ✓

B 12/7

J-2 ENGINE We are considering cancellation of Rocketdyne's effort leading to a 15 to 30-minute restart capability on the present J-2. The laboratories have been unable to confirm a clear cut need for restart in less than 80 minutes. Further, it appears that this requirement will conflict at AEDC with the testing of the J-2S. Since we now have (and hopefully it will continue) a clearer recognition of the J-2S (via the SRT Channel), and since the J-2S can inherently fulfill the 15 to 30-minute restart requirement, the better approach may be to concentrate on the J-2S. Do you have any additional guidance for us?

← BB I tend to agree B

One test was conducted at AEDC on November 27, in the reduced S-II tank pressure validation series. The remainder of the tests scheduled for that air-on period were canceled due to an anomaly in the performance of the gas generator control valve. Prime suspect is ice in the pressure equalization line connecting the GG control valve housing and the sequence valve vent port on the main oxidizer valve. The main oxidizer valve was removed and sent to Canoga Park for analysis. During a second air-on period on December 1, five tests were conducted successfully. ✓

NOTES 12/4/67 CONSTAN

B 12/7

Eighteen members of the Office of Manned Space Flight Executive Group, in New Orleans for a three-day meeting, visited the Michoud Assembly Facility Friday afternoon for lunch, briefing and tour of the Manufacturing Building.

In addition to Dr. George E. Mueller and Mr. Edgar M. Cartright, the visitors included:

Lt. Gen. Frank A Bogart USAF (Ret.)

Brig Gen. Julian H. Bowman USAF (Ret.)

Mr. Andrew Conversano, Jr.

Mr. Harold B. Finger

Mr. Willis B. Foster

Capt. Robert F. Freitag USN (Ret.)

Mr. William C. Hittinger

Maj. Gen. James W. Humphreys, Jr. USAF

Mr. Jerome F. Lederer

Mr. William E. Lilly

Col. V. John Lyle USAF (Ret.)

Mr. Charles W. Mathews

Maj. Gen. Samuel C. Phillips USAF

Mr. William C. Schneider

Maj. Gen. John D. Stevenson USAF (Ret.)

Mr. George S. Trimble, Jr.

Col. Maynard E. White USAF (Ret.)



B
12/7

MSFC SAFETY BOARD MEETING NO. 12

The Safety Board meeting was held on Thursday, November 30, 1967. The significant item of the meeting was the discussion of the MSFC comments (R&DO, IO, and Staff) to the Headquarter's document, Apollo and Apollo Applications Program Safety Plan. *

Some results of the discussion include:

1. The document will be issued as a guide to safety requirements.
2. The document will be restricted to system safety guidelines only, i. e., it will not include industrial safety guidelines.
3. A Center Program System Safety Plan will be prepared by MSFC in response to the guidelines, i. e., all program offices will work from a single overall safety plan as applicable. ✓

* Messrs. Bolger, McGuire, and Cohen from Headquarters, Mr. Atkins from KSC, and Mr. French from MSC participated in the discussion.

NOTES 12/4/67 FELLOWS

B 12/7

Jim Shepherd
FYI B

1. Neutral Buoyancy Equipment: In order to focus the responsibility for all aspects of Neutral Buoyancy Equipment in one person, R-DIR selected Dr. Siebel as the Manager of MSFC Neutral Buoyancy Test Equipments. ✓ Dr. Siebel, in this new role and in addition to his present duties, will assure that all activities necessary for operational readiness are identified and fully coordinated, and then will be the Senior Manager for scheduling and conducting experiments in the Neutral Buoyancy Test Equipments. ✓

2. Work Packages: While overall MSFC Work Package guidelines are being finalized, a limited trial run has been agreed to by NASA Headquarters and Marshall. Two laboratory divisions have been selected for preparation of the trial run Work Packages, one in P&VE and one in QUAL. A Headquarters team plans to visit MSFC December 14 - 16, to review those division-level Work Packages. ✓

E.F.
 What will
 manuever →
 CSM/LM
 configuration
 do after
 LM
 extraction?
 B

1. AS-503 Mission Summary: Re: your questions on item 2, Notes 11/13/67 Geissler, copy attached. Mission profile presently considered for 503 manned mission is: (A) Boost to 100 N.M. circular orbit, using S-IC, S-II, and first burn of S-IVB; (B) Launch vehicle remains in earth parking orbit for 3 revolutions (~4 1/2 hours), while CSM separates from vehicle, transposition and docking with LM occur, followed by LM extraction. LM/CSM configuration then maneuvers to "clear" S-IVB/IU stage. "Clear" defined as having sufficient separation from LV so no possibility of subsequent collision exists; (C) at end of third revolution, S-IVB restarts and burns ~70 seconds (no S/C attached). Fixed vehicle attitude is used throughout burn, which occurs over ETR, and is of such duration to permit acceptable tracking and communication during succeeding third S-IVB burn; (D) After second S-IVB cutoff, S-IVB/IU coasts in waiting orbit ~80 minutes, to demonstrate capability of S-IVB to meet Headquarters' requirement that stage must be capable of restart after minimum earth orbital stay time of 80 minutes; (E) S-IVB is restarted again (third burn - no S/C attached), and burns with fixed attitude, until remaining propellants simulate those to be left on-board the 504 type Lunar Mission Simulation Vehicle (~70-80 K pounds); (F) After third S-IVB cutoff, proepllant dump experiment may be planned, to provide data on effect of large residual propellants on Lunar Mission Simulation Vehicle. Attitude for third S-IVB stage burn will leave S-IVB/IU in long lifetime elliptical earth orbit. Unmanned 503 mission planning proceeds per program directive 4H, i.e. LV profile to simulate planned 502 profile, and will include optimum guidance S-IVB second burn, to simulate translunar injection. No S/C objectives will be considered, and no separation or recovery of BP-30 S/C is required. ✓

2. AAP-3 Performance: At the AAP-1-4 Configuration Meeting at Michoud on November 27, 1967, the latest weight and performance data showed a -1350 pound margin for AAP-3. Main prospects for removing this negative margin are (1) use of 2 1/2 stages to orbit, or (2) removal of the SPS in the CSM. The payload margins for the other vehicles are positive. ✓

3. Astronaut Communications during Lunar Operations: Re: your comment to note on this subject in Notes 11/20/67 Geissler, copy attached. An ad hoc group has been formed to look into the development of the hardware package proposal you suggested. Mr. O. Vaughan, of our Aerospace Environment Division, will chair the group, with participation as follows: AERO: Trajectory and Flight Performance; ASTR: Communication Package and Power Supply; P&VE: Propulsion System and Launcher; AS: LSSM and LFV Interfaces. This group will meet soon to discuss the problem, and we shall keep you informed of progress. ✓

URGENT

E.F.
 Request

4. Trip to Grumman Aircraft Company: We were requested by R-SE to provide some technical support to the MSFC group that is going to Grumman Aircraft Company to study the LEM descent and ascent phases. Representatives of our Project Office and our Dynamics and Flight Mechanics Division will participate.

briefing on this. I know only of a rather vaguely worded request by MSC for some assistance, but of no specific requirement defined by MSC, or a hard commitment to meet it by MSFC. B

NOTES 11/13/67 GEISSLER

B11/20

11/13 JVS

1. Mission Requirements Panel: The Fifth Meeting of the Mission Requirements Panel took place at MSC on November 3, 1967. Among the items covered included a review of the October 12 and 13 Mathew's Baseline Meeting, further discussion of 2 1/2 stage to orbit and SLA/nosecone jettison, status of AAP-1A mission planning, and rendezvous and docking for the AAP 3/4 mission. Payload margins estimates of 2900 to 4000 lbs presently exist on the AAP-1A mission (assuming SA-207) for northerly launches into orbital inclinations of 50 deg and 40 deg respectively. ✓ Payload margins for the AAP-1/4 cluster were shown to be 2,792 lb, 4,151 lbs. - 1,409 lbs, and 2,956 lbs respectively. ✓ Prime candidates for improving the AAP-3 margin include 2 1/2 stage to orbit on RCS only for the CSM. At present, the AAP-3 deorbit impulse is baselined to be provided by the service propulsion system with two solid motors on the CM as backups. Eliminating the two solid motors and going to the RCS only mode will not provide as much improvement as the 2 1/2 stage concept which is estimated to improve the payload performance by 2500 lbs. ✓

2. Guidance and Performance Sub-Panel Meeting: The thirtieth meeting of this sub-panel was held at MSC on November 2, 1967. Topics of interest follow. (1) AS-205 Mission Summary: Propulsion sequence for orbital venting and orbital safing portions of 205 flight are not yet finalized due to demands on MSFC manpower by 501 flight preparations. Need for detailed sequence is not urgent, since sufficient details are now available to establish software logic. Orbital attitude limits for 204 propellant dump sequence are also valid for 205 orbital safing sequence. These include thrust vector control to maintain stage attitude during initial portion of propellant dump, with APS controlling stage attitude when attitude error > 12 in pitch or yaw. (2) AS-206 Mission Summary: MSC planning shows 206 as backup to 204, using LM-2 hardware. No primary mission for 206 is presently defined, and if 204 is successful, 206 mission will be reevaluated. If 204 is unsuccessful, 206 will fly about 3 months after 204, using 204 flight program and profile. Propellant dump simulating 205 orbital safing sequence will be included in 206 profile, (3) AS-503 Mission Summary: MSFC presented results of 503 mission profile analyses conducted by Aero-Astro dynamics Laboratory. Analyses include a second S-IVB burn of 70 seconds duration occurring at end of 3 revolutions in earth parking orbit, with no spacecraft attached, and a third S-IVB burn occurring no sooner than 80 minutes after second burn. Two options available for third burn are: (A) leave S-IVB/IU in long lifetime elliptical earth orbit, or (B) impact S-IVB/IU at a predetermined location in Atlantic Ocean. Either option can be accomplished with acceptable tracking and communications coverage. MSC had no comments or objections to profiles presented ✓

E.G. →
 This refers to the 2nd burn, not the second one. Correct?
 B
 If I'm wrong please explain latest thinking on AS-503 mission profile.



Handwritten initials and scribbles at the bottom right of the page.

B 127

1. SPRAY-ON FOAM INSULATION (SOFI): The decision by Space Division of North American Rockwell (NAR) to utilize SOFI caused this Laboratory to initiate activities to develop specialized quality assurance equipment and techniques. Studies at NAR and ME Laboratory have indicated that the major problems have involved thickness measurements and the detection of internal voids and debonds.

NAR uses a needle penetrating gauge for thickness measurement which leaves a small hole in the SOFI. Testing of the large scale tank at Sacramento revealed that the hole is a preferred patch for cryopumping during LH₂ fill. This frequently caused a plug of SOFI to be blown from the wall when the liquified air vaporized after the tank was drained. The use of penetration gauges has, therefore, been eliminated. A non-penetrating eddy current thickness gauge is being developed for foam measurement by R-QUAL-ARM. A Laboratory device has been breadboarded and the feasibility demonstrated for the measurement of foam thicknesses of 3/4 to 3 inches. NAR is developing a similar eddy current device from plans furnished by R-QUAL-ARM.

A sonic brush is presently being used to detect internal defects in the SOFI. The interpretation of this device is dependent upon the operator's ability to distinguish changes in audio response during testing. The interpretation of test results is, therefore, highly subjective. High noise levels make the sonic brush practically useless on insulation thicknesses above 2 inches. This Laboratory has requested the development of selective audio circuits to discriminate flaw indication signals and eliminate noise. ✓

2. ATM PROGRAM: Five representatives of Ball Brothers Research Corporation visited with us recently to discuss NASA/MSFC workmanship standards and their application on the ATM telescopes. Areas represented were design, projects, manufacturing and procurement, and interests included NPC 200-4 printed circuit board construction, potting and molding. Our training facility, the RCA tubelet repair operation and GE's potting and molding facility were toured. Information interchanges of this nature should assist materially in avoiding program quality and reliability problems. ✓

B_{12/7}F-1 ENGINE

Test FW-074 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 November 30, 1967. Cutoff was initiated by the S-1C lox low level cutoff sensors as planned. Primary test objectives were to evaluate engine performance during lox depletion utilizing helium pressurization, and to evaluate the thrust vector control system with modified Hydraulic Research actuator springs. An evaluation was also conducted on the S-11 forward skirt attached to the Mobile Acoustics Research Laboratory (MARL). ✓

S-1C STAGE (MSFC)

Lox tank fill and drain tests are scheduled for December 5-7, 1967, for further evaluation of the S-1C stage tanking and de-tanking procedures. These tests will be accomplished in accordance with request from R-P&VE. ✓

S-11 STRUCTURAL TEST PROGRAM

The facility construction is progressing on schedule. ✓

H-1 ENGINE (MSFC)

Tests P1-520 and P1-521 (Engine H-T6B) were conducted at the Power Plant Test Stand on November 28 and 30, 1967, respectively. P1-520 was a calibration test and P1-521 was a bomb instability test. The engine H-T6B dampened within the specification limit. Test (P1-521), and all other test objectives were met satisfactorily. Engine H-T6B is ready for installation on the flight stage (S-1B-211) for the planned stability program. ✓

NOTES 12-4-67 HOELZER

B_{12/7}

NEGATIVE REPORT.

1. Next MSF Supporting Development Quarterly Review: Meeting is presently planned for second week in January at the Cape. Included will be a review of obligation schedules and plans for fiscal year FY 68 funds in the Supporting Development Program. ✓
2. Welding Research/NDT Work: In response to Dr. Gilruth's request at the annual Supporting Development Payoff Review (10/24/67) for additional information on MSFC's welding research and non-destructive testing work, a number of informative documents have been forwarded to him with a cover letter signed by Mr. Weidner. Copies were also sent to Mr. Claybourne (KSC) and Mr. Waugh (MSF). ✓
3. Preliminary Quarantine Review: Meeting was held in ME Lab 11/30/67 with Mr. Larry Hall, Bioscience Division, OSSA. Messrs. Wilson, Beyerle, Van Aller of ME and Coons of EO attended. FY 68 funding was discussed for the following activities:
 - Bioscience methods and possibly, flexible film coupon development.
 - Sterile insertion (i. e. insertion of objects into a sterile assembly or system).
 - Work, yet to be defined, relating to the Lunar and Planetary Program. ✓

From indications at this time, the Bioscience Division, OSSA will not be providing us funds in FY 69. ✓

Mr. Hall was interested in learning about the degree of information exchange between groups working in the related activity of contamination. AVCO (Capsule Recontamination Study) was of particular interest to him. It was pointed out that information on our work, including that performed by Ball Brothers on ATM contamination, is being relayed to AVCO. ✓

B 12/8

1. Modification of Boiler Plate Payload for AS-503: We have accepted the task of preparing and modifying the boiler plate spacecraft BP-30 for the unmanned flight of AS-503. The schedule is tight as usual with delivery to KSC required by December 29. We will meet the shipping date. ✓
2. S-IC/S-II Structural Test Tank: We are presently modifying the S-IC section of the "A" test structure which is to be welded to the S-II section after arrival from Seal Beach. The edge of the S-IC section has been trimmed and the weld land has been machined down to the right thickness to match the S-II cylinder. Trimming of T-stiffeners has been accomplished over the weekend. At the present we are only a few days behind schedule. ✓
3. Rack Payload: This project is about seven weeks behind schedule. The lower ring of this structure is complete while the upper ring is held up waiting for fittings from outside. Release of an adjusted schedule is expected soon. ✓
4. Neutral Buoyancy Simulation of S-IVB Tasks: All scheduled tests on the crew quarters mock-up of the S-IVB Orbital Workshop have been completed. The trainer will now be removed from the tank for a one "g" review by MSC tomorrow. ✓
5. MSFC Research Achievements Review No. 11: This achievements review of manufacturing technology research at MSFC was conducted last week as one of the regular achievement reviews scheduled and organized by Dr. Johnson, Experiments Office. Our presentations covered such topics as Contamination Control, Mechanical and Neutral Buoyancy Zero "g" Simulation Techniques, Use of Lasers for Drilling and Welding, Electron Beam Welding Gun for Welding Experiments in Orbital Workshop, etc. The sessions were attended by 159 people, 59 of whom were from outside MSFC. ✓

B 12/8

1. S-II FRACTURE MECHANICS: While we were preparing with North American Rockwell (NAR) (on the West coast) for the DCR on the S-II structure to be held 12-4-67, Boeing Technical Integration Engineering (TIE) representatives revealed a draft of a memo on the eve of the Quarterly Review (11-27-67) proposing a cryogenic proof test in addition to what we had recommended to General Phillips in October (Reduction of tank pressure so as to qualify practically all the weldments with the 35 psi pneumostat) and what we and NAR were preparing to present at the DCR. It was discovered that most of the work to support the Boeing TIE Proposal was done by Boeing/Huntsville (supported by Boeing/Washington and Boeing/Seattle) at the request of Don Jacobs (Boeing TIE). Jacobs allegedly was responding to a request from Roy Day (Phillip's staff), but Day vigorously denies that he requested Boeing to check our October proposal. Obviously, the Boeing expression of concern resulted in postponement of the DCR. We had the local Boeing people in on Friday, 12-1-67, to explain their concern. The local people couldn't explain the situation adequately and stated that the Boeing position wasn't firm at that time. They were bringing all the appropriate people to Huntsville for a week-end meeting to establish a position and would make a presentation to us on 12-5-67. We urged Boeing to consider a responsible position with respect to the total program rather than an ultra conservative position on one element of the system. I was in contact with Boeing on Friday night and Saturday afternoon, and spent 3 hours with Don Jacobs and Chuck Tiffany Sunday afternoon. We will meet separately with Boeing Monday morning and NAR Monday afternoon and with them jointly on Tuesday. My estimate of the outcome is that Boeing will agree to fly S-II-2 and S-II-3 "as is," but they will insist on cryogenic proof test of manned vehicles with the possibility of a waiver of the cryo proof on specific flights. We don't know who will be invited to be a party to the consensus next.

2. AS-501 FLIGHT EVALUATION: Reference Notes 11-20-67 Geissler "501 Flight Evaluation" and Notes 11-27-67 Rudolph "AS-501 Longitudinal Acceleration (POGO Effects)". The quoted maximum amplitude value of .3 g's peak-to-peak represent a quick look oscillograph evaluation. Our preliminary computer evaluation shows negligible amplitudes in the 4 to 5 cps frequency range. The measured data agree well with our calculated design values. The highest acceleration amplitude noted in the instrument unit during S-IC burn was .038 g's. Measurements on the center and one outboard engine gimbal blocks showed max amplitude of .063 g's in the frequency range of 4 to 5.8 cps. Spacecraft tapes have not been received, however, from all indications spacecraft accelerations will also be insignificant from structural loads and crew comfort standpoint (approximately 1% of design loads). It is too early for a conclusion on the cause of the 5 cps oscillation, as engine and structural data have not been completely analyzed, but at this point in flight evaluation, the oscillations appear to be of forced response, rather than "POGO" coupling.

Bill Lucas

I guess that the Apollo Program now needs is a TIE of the TIES of the TIES. B

Will the reduction of SII tank pressure to 27 psi C to be decided on in Jan '68 after completion of the 60 BRDC tests with the J-2 engine) be enough to allay Tiffany's fears?

B 12/8

FY-69 BUDGET - The chart below compares the President's FY-68 Budget with the FY-68 appropriation and latest available FY-69 information.

| | <u>President's Budget FY-68</u> | <u>Appropri- ated FY-68</u> | <u>NASA Request FY-69</u> | <u>BOB Mark FY-69</u> |
|--------|---|-------------------------------------|-----------------------------------|-------------------------------|
| R&D | 4,352.0 | 3,925.0 | 4,021.7 | 3,575.0 |
| AO | 671.3 | 628.0 | 628.0 | 628.0 |
| C of F | <u>76.7</u> | <u>35.9</u> | <u>110.6</u> | <u>44.8</u> |
| TOTAL | <u>5,100.0</u> | <u>4,588.9</u> | <u>4,760.3</u> | <u>4,247.8</u> |

H.M.

Does this support the "2x2" production?

B

The significance is that NASA's FY-69 "going in" position was approximately \$340 M below the President's Budget for FY-68 which was subsequently cut by Congress by more than \$500 M. Considering BOB's cut of \$512 M to the NASA request and the present national and international situation an FY-69 appropriation below \$4.0 B is very possible.

MSF is placing a reclama with BOB on the cuts made by BOB to Apollo (\$137 M) and AAP \$87 M) but our contacts in MSF are not optimistic.

TASK WORK PACKAGE - The next iteration of task work package reviews for Marshall will be December 14, 15, and 16, 1967, by the MSF committee headed by Jerry Kubat. Advance copies of the new formats to be used for these work packages were received December 1. Formal notice and forms are expected this week. The team plans to review work packages from selected organizations as a trial application of a new MSF system. The selected organizations are Propulsion Division of P&VE, Quality Engineering Division of R-QUAL, the F-1 Engine Office, and Executive Staff. Summary packages will also be required for Industrial Operations, Engine Program Office, R&DO, P&VE, and Quality Laboratory. Mr. Kubat has advised that the committee will want Mr. Maus, Mr. Weidner, Gen. O'Connor, Dr. Lucas, Mr. Grau, and Bill Brown as well as the division directors and F-1 Project Manager to be able to discuss the packages. ✓

NOTES 12/4/67 RICHARD

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12/8

Review of LM-1 Separation System: On November 29, General Bolender requested this office to send several people to Grumann at Bethpage, N. Y. to review the LM-1 separation of ascent and descent stages. This review will be an overlook of the MSC and Grumann design and hopes to find any questionable areas. The team will be at Grumann December 6, 7, and 8, and will include personnel from AERO, ASTR, P&VE, this office, and KSC. ✓

MSFC Technical Liaison at KSC: As directed, we are establishing an office at KSC to work with Launch Operations. Rocco Petrone is providing office space and the kind of environment that should lead to a better and closer arrangement to solve technical problems with the total system at KSC. We have been working with Mr. Maus to define an operation that has a chance of improving our operation with the Cape and satisfying the requirements laid on us by MSF. We plan this office to be an extension of R&DO and not a totally new organization. ✓

B
12/81. AS-501/S-IVB Continuous Vent System:

Flight data evaluation groups, both at MSFC and McDonnell-Douglas Corporation, are in agreement that the continuous vent valve definitely closed as programmed by the flight sequencer prior to S-IVB second start. The original indication of improper operation is believed to have been caused by erroneous data from pressure transducers located in the continuous vent system nozzles. ✓

2. AS-501/AS-502 Problem Cross Check:

We are releasing a package today (Monday, 4 December 67) identifying the cumulative problems encountered from start of initial reviews on AS-501 and extending through the flight evaluation. This "experience" package will be used as a basic checklist for dispositioning each individual problem against AS-502 and subs. ✓ Nearly 500 problems are identified (including over 100 safety items). Wide distribution is being made to assure the experience is being passed on to those interested. You will receive a copy of the basic letter explaining the package. ✓

3. Cancellation of Design Certification Review (DCR) on S-II-2 and S-II-3:

As you know, the DCR on the S-II-2 and S-II-3 structure was cancelled due to questions raised by the Boeing TIE organization. We are currently investigating the methods by which Boeing implemented this study and have found not only this but other instances of investigation made by Boeing without our knowledge. We are taking immediate action to insure that such an incident does not happen in the future and will give you a full report on this subject as soon as our investigations are complete. ✓

4. Boeing Reorganization at MTF:

In order to strengthen their on-site management, Boeing has appointed Mr. Steve Krull as their MTF Manager. He reports to Mr. Gunning, the Boeing Michoud Manager. All Boeing organizations at MTF, formerly supervised by their respective "parent" organizations at Michoud, are now line organizational segments reporting to Mr. Krull. ✓

1. NASA AUDIT OFFICE REPORT ON LIEF: Last August the NASA Audit Office at KSC issued a draft report on NASA communications systems, including LIEF. After comments and discussion with the involved Centers, OTDA and OMSF, the original draft, which contained gross inaccuracies was withdrawn. The Audit Office last week informally submitted to OTDA a new reduced draft, which still contained some criticism of COMSAT and LIEF, and also still contained erroneous information. Following a meeting with OMSF and OTDA personnel on last Thursday which appeared to have clarified the remaining items, NASA Audit has withdrawn their second draft report.

2. AS-204 MISSION RULES REVIEW: Bill Schneider plans to review the AS-204 Launch Mission Rules with the Centers on December 6 at KSC and the Flight Mission Rules on December 8 at MSC. Gen. Phillips will not participate in these reviews as he did on previous missions, but will be given an overall review by Schneider on December 18. These dates are tentative and have already changed several times due to everyone's crowded schedules. We are preparing for these reviews with the IB Program Office and R&DO and expect no major problems. Schneider's Office is also working on general policy guidelines which should improve consistency between the Centers on mandatory instrumentation, redlines and other Mission Rules items. ✓

*Postponed
File Jan
B* 3. KRAFT VISIT: Meeting is scheduled for 12/13 and 12/14 with Luncheon on 12/14. All elements concerned are aware of your interest in this meeting and we are making every effort to insure a successful event in spite of the rather fundamental questions on AAP being raised by MSC. ✓ We intend to hold to the established agenda. ✓

4. APOLLO 4 NETWORK SUPPORT CRITIQUE: The Apollo 4 post-flight debriefing on network support is to be held at MSC on December 7. Following the debriefing will be a complete support assessment review. Included in the review is an evaluation of the total tracking, telemetry and command support both in quality of data and timeliness of data delivery. MSFC (ASTR) will present the results from the CCS test. ✓

1. ATM CONTAMINATION EXPERIMENTS: The integration meeting for TO27 was held on December 1. Biggest potential problem areas seem to be scientific airlock location, pointing accuracy and related attitude control needs, and lack of definition in data handling capabilities of the spacecraft subsystems (EDAS). However, none of these are felt to be too serious at this time since this is early in the attempts to match vehicular hardware with the experiment complement. ✓
2. SATCON: The possible transfer of SATCON to R-QUAL has been discussed between members of R-SSL and R-QUAL. Members of R-QUAL have expressed a definite interest in continuing Pegasus data recording for the purpose of lifetime studies of the satellites' systems and subsystems. Mr. Harvell Williams of SSL has provided various Pegasus documents to R-QUAL personnel and two members of R-QUAL will visit the Cape next week for orientation in SATCON operations. R-QUAL will also determine the feasibility of moving SATCON to MSFC to minimize manpower requirements. ✓
3. ATM FOLLOW-ON: This is in answer to your question on the November 20 NOTES (Copy attached): The Martin meeting was several days before the two-day weekend meeting with Dr. Mueller. ✓
4. IR STELLAR FLIGHT EXPERIMENT: As a follow-on to the visit of the Spitzer Committee to MSFC, we have established close contact with a member of this Committee: Dr. Frank Low who is an IR astronomer. Dr. Low is a member of Dr. Kuiper's observatory and professor of astronomy at Rice University in Houston, Texas. During Dr. Low's visit to MSFC, he was very much impressed with SSL's inhouse IR laboratory capability. Last week a co-worker of Dr. Low, George Aumann, was visiting with us to discuss support for an IR Stellar Flight Experiment. A visit is planned by Mr. Gerhard Heller and Mr. Don Cochran of SSL to the University of Arizona and Rice University to discuss further details, especially the status of the experimental flight hardware which is expected to be tried out next year on a jet plane of Ames Research Center at 40,000 ft. altitude. ✓

NOTES 12/4/67 TEIR

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The AS-204 launch vehicle and LM-1 are both on schedule and no significant new problems have been reported during the past week. Following are the major test milestones of the schedule:

| | |
|---|------------|
| Overall Test #1 (Plugs-in) & #2 (Plugs-out) | Dec. 8-13 |
| Flight Readiness Test | Dec. 21 |
| <u>Countdown Demonstration Test</u> | Jan. 10-13 |
| <u>Start Recycle for launch</u> | Jan. 13 |

In conjunction with the above scheduled events, we have rescheduled the Preflight Review to December 18 and 19, 1967. The Flight Readiness Review is scheduled for January 3, 1968, at KSC. NASA Headquarters has scheduled a Launch Mission Rules Review at KSC on December 6 and a Flight Mission Rules Review at MSC on December 8. ✓

B
12/81. Titan III Management within NASA:

It has come to my attention (unofficial at this time) that Lewis Research Center has made an official request to NASA Headquarters for the management responsibility for the Titan III System within NASA, if NASA should decide to procure such a vehicle in the future. I am attempting to get more details and will pass them along to Mr. Weidner and you if anything "factual" is found. Along this same vein - many of the rumblings we get out of OSSA indicate they are really pushing the Titan III for most of the future unmanned missions. We have been working with Vince Johnson and Joe McGolrick to provide them with the best "Saturn Family" data possible and attempting to "get in bed" with them; however, I feel that much of the cause is pressure from above and the desire to stay away from MSF systems/people rather than pure technical/mission reasons. We are presently releasing a report on the I B family which you requested several months ago.

I agree
B2. Seminar on Titan Family:

The Air Force and Martin Company gave a two-day seminar at Denver on the Titan Family of launch vehicles including present, proposed, and future. This meeting was attended by all NASA field centers and Headquarters. The Air Force gave a run-down on vehicle performance and costing and schedules. The meeting was classified. All presentation material and words will be forwarded to us within the next two weeks. They talked a good story and it appears that they have a lot to offer. The meeting was attended by R. Scott, B. Rutledge, A. Orillion, and Milt Page from R&DO. Chuck Mitchell and Jim Sisson attended from IO.

A more detailed report will follow. ✓

Dec 11, 1967

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NOTES
MR. GORMAN'S COPY
DEC 11 1967

Maus - Williams
notes had comment
for Mr Gorman .
To "U Boy" 12-22-67

SENSITIVE

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

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Memorandum

TO Dr. von Braun, Director

FROM Deputy Director, Administrative

SUBJECT Comments on Mr. Williams' December 11, 1967 Notes



DATE December 27, 1967

This is in response to your request that I comment on Frank Williams' December 11, 1967, notes to you. It seems to me there are two problems that must be pursued before we can "commit" resources to the work involving nuclear propulsion or other new efforts.

(A) We must find a way to determine what our commitment really is to Saturn/Apollo and to AAP and what our future capacity will be.

(B) We must find a way to propose work for MSFC which is acceptable in the light of the present (and future) political climate.

With regard to (A) - This Center has over the past two to three years shown a going out of business curve which is somewhat the same as the predicted Saturn/Apollo budget and the manpower curves of the primes involved in delivery of the hardware. This curve has consistently shown an ability and a capacity to take on AAP and other assignments. While we have been reasonably successful in AAP, we have paid a price in terms of the total personnel ceiling. As of January 15, 1965, MSFC's permanent ceiling was 7,464. As of January 15, 1968, three years later, our permanent ceiling will be 6,386, a loss of 1,078. R&DO was reduced by about 18%, a net decrease of 881. Staff and support offices were also reduced by 18%, a net decrease of 281. Industrial Operations was expanded by 8%, or a net increase of 84 positions.

The Center loss of 15% (1,078) overall, between January 1965 and January 1968, occurred over a period when conditions were more favorable for NASA, and for MSFC, than we can reasonably expect for the next three years ending in January 1971. In fact, the culmination of Apollo, the lack of enthusiasm for AAP as the next step forward, the competition for the budget dollar, and the failure to establish new and major goals makes

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the picture for the next three years more bleak for MSFC than the last three. Our approach in the past has been to fill up the "predicted" in-house capacity, and we went after future business with considerable gusto. Our willingness to predict a capacity to take on new work, combined with other circumstances not under our control, has put us in a much weaker position than three years ago. If one considers the worst case, i. e., another 15% reduction by 1971, or a net decrease of 950, the major reduction will undoubtedly occur in R&DO, which in my opinion would just about wreck the technical capability of MSFC for many years hence.

This is probably not the worst case - 1/2 JFS

I have some thoughts on how we might avoid further reductions which are by no means intended to be a solution. Obviously, there are eventualities completely beyond our control that we cannot predict.

(1) We should account for our personnel by what they are doing. We should not solely relate their activities to programs unless they are in fact contributing something directly to that program in the form of design, software, or hardware. I have estimated that 60% of the line and staff elements of MSFC are engaged in either project or technical management of contractors' effort, 25% in developing ideas, design and hardware, and the remaining 15% in institutional support.

(2) If 60% of the MSFC personnel are engaged with the management "product," then it is reasonable to expect that:

(a) This effort will not turn down on the same curve as the prime contractors' effort but rather will continue on a somewhat stable effort through the high density launch period; i. e., launch readiness reviews, quality control and reliability, configuration management, logistics, etc.

(b) The capacity available at MSFC in the future (three years) will likely occur in the management area - both project and technical.

(3) If 25% of the MSFC personnel are engaged with the technical product, then it is reasonable to expect that they will be fully engaged in the currently assigned AAP projects - (unless we are able to engage support contractors at a higher level than currently predicted.)

With regard to (B) - The present policy as I understand it will not permit a NASA Center to compete with industry for state-of-the art projects. Only work which involves new technology and innovation and which enhances the technical judgment and leadership of MSFC and which does not encroach on other NASA Centers' future will be looked upon favorably for in-house assignment.

Other Centers, including KSC and MSC, will be able to demonstrate a need for a stabilized level of personnel and perhaps some increase over the next three years. This combined with a prospect of further reduction in the budget does not favor MSFC, particularly if we openly predict a capacity for new work to be performed in-house.

The current controversy involving the use of support contractors to supplement the Civil Service effort will probably continue. We can expect new policy or even legislation which will restrict the use and growth of the support contractors at the Center level.

We can expect the use of "TIE" contractors at the Washington level (to assist the Washington based managers) to continue and even increase. These contractors will undoubtedly assume a managerial role which by definition is a management responsibility of Government. My point here is that industry is willing to accept the management role; perhaps the NASA Centers are not but are inclined to assume the more traditional role of industry. Unless the Centers recognize that industry has the upper hand in this paradoxical situation, the outlook for continued pre-eminence of Centers in the total NASA picture is doubtful.

The public support of NASA's programs will likely be centered on the Apollo and to a lesser extent on scientific applications. On the other hand, there will be a great deal of public pressure on applying national resources to the defense and domestic issues. Unless the picture changes very rapidly with respect to the latter, it is unlikely that decisions on major goals to follow Apollo can be made in time to avoid a hiatus in the 1971/73 time period.

Considerations

From a political point of view, we can probably effectively compete for the management work such as "TIE" without incurring the opposition of industry that we would incur if we compete for major systems in-house. Therefore,

our bid approach to any new work would depend on our ability to manage the effort, including systems engineering and integration, and our willingness to propose that industry deliver the technical product.

Assuming that public support will not demand major new objectives in space by 1971, we have very little time to build a scientific and technological capability at MSFC which would make MSFC a very attractive and essential element of NASA's future.

It is not clear that we can do both for the following reasons:

(a) The "RIF damage" will probably take a year to repair. We will have to re-balance the Center's organizational strength; we will have to correct the unworkable assignments (the bumping effect); and we will have to hire into some gaps created by outgoing personnel. (This will have to be done regardless of whether we take on new work or not.)

(b) It is unlikely that the required effort on the Saturn/Apollo for the next two or three years will give us "head-room" to build a stronger scientific and technological capability.

(c) It may be that MSFC has matured over the past seven years to a point where the personnel cannot adapt to a changing situation. I believe most of our personnel, including key personnel, refuse to believe that we should not compete with industry and with other Centers for new work. I consider this aspect a major problem for Center management.

(d) It may be that we as a Center do not have the mobility, the flexibility, the desire, or the incentive to do the thankless job of such management tasks as systems engineering and integration.

(e) We may be unwilling to volunteer for permanent assignments away from Huntsville, particularly in Washington, to help in the decisions which affect the NASA-MSFC future.

There are other considerations. Most of them add up to a need for putting some of our senior people to work as a group on the general problem and to come up with some answer to the general problem before we try to answer Frank Williams' specific issue. Somehow we've got to avoid fighting the problem and recognize it for what it really is. I don't believe it has to be a "shrinking world."


Harry H. Gorman

B 12/15

1. Nuclear Program. Over the past years, MSFC has been one of the prime sources for nuclear systems work and a strong supporter of the nuclear program and in fact, because of our work on mission requirements and system designs, the Nerva engine and flight stage concepts were evolved.

As you know, MSFC was in no way involved nor asked to participate or support Headquarters on the SNPO in any of the deliberations which led to the recommendation/decision to revert to the Nerva I system. During the past two months, we have been aware of the tendency of Headquarters/SNPO not to depend/work as closely with MSFC as they have in the past. The exact cause of this situation is not too clear; however, I feel it can be boiled down to two causes:

- a. MSFC has not made a specific commitment as to what support (magnitude/type) we are willing to offer, and
- b. Headquarters/SNPO's desire to have a completely responsive group working for them.

Harry Forman
 Another reason may be Mr. Webb's renewed statements against too much in-house work on major systems.
 Please give me your appraisal and let us thoroughly discuss all aspects of this before we make that suggested firm commitment. Also, what commitment can we honestly make after the RIF, particularly its effect on Test Lab.

The latter of these points is based on general comments over the past several months and the fact that they are currently investigating (and seriously considering) the possibility of hiring a "Systems Engineering Contractor" to work directly for SNPO (along the same line as MSF has Bellcomm). They presently have a proposal from TRW and hope to have a decision in the near future. As a matter of interest, the TRW proposal is based on the system analysis, etc. which they have done for us over the past two years. With Dave Gabriel now in the picture, Lewis Research Center is now making a renewed effort to obtain more of a role in the nuclear program as well.

As far as what MSFC should do at this time, I feel we should not back out but rather make a firm commitment to a specific future effort (small as it may be) and have a clear understanding with Milt Kline and higher authorities as required, as to MSFC's future in the nuclear program. If you are in agreement with this, then I will prepare several alternatives of a "center position" and attempt to get a feel from Milt Kline as to what his desires are.

2. Launch Vehicle Symposium. Dr. Mueller has requested an all day symposium Saturday, January 6, 1968, at Headquarters on "Low Cost Orbital Logistics Systems". His interest apparently was spurred by McDonnell's and Lockheed's proposals on integral launch and entry systems consisting of 1-1/2 stage concepts in which high cost items are integrated into a reusable "core" vehicle and low cost items are staged and expended. Mr. Dan Schnyer (Lord's office) is setting up the symposium. Presentations (45 minutes each) are planned by six contractors. Presentations will be attended by NASA and the Department of Defense personnel. Presently, no Government presentations are planned; however, it seems advisable to establish our position on this subject. Presentations are not limited to 1-1/2 stage concepts. Groundrules from Lord include: low cost logistics, minimum number of stages (procurement, operation, etc.), maximum reusability, and aircraft-type operation (on-board c/o, horizontal landing). Among invited companies are: McDonnell-Douglas, Lockheed, General Dynamics/Convair, NAA Space Division, Boeing, Northrop, and Martin/Denver. We will keep you informed as the session evolves and as we better define our participation and formulation thoughts.

F.W.
 Here we go again with these symposia.
 I'd like to see these proposals.
 B

its effect on Test Lab.
B

WJH
B 12/15

RIF IMPACT - The impact of the RIF upon Executive Staff has been greater than we had anticipated. It has directly affected four of our promising junior engineers and has caused two other engineers to resign. This loss is concentrated with the Program Planning and Resources Office. This group has been responsible for much of our effort relating to Budget Submissions, Task Work Packages, Manpower, and other program planning and resources activities. Of seven people (five engineers) assigned to this group only one will remain.

*Harry
Gorman*

*I guess we'll
have to reassign a
few
people
here
B*

MSFC TDY SUPPORT TO KSC - The first contingent of MSFC people to serve as Special Assistants to KSC Division Chiefs will visit the Cape next week to work out an agreement on the nature of the work at KSC which creates the need for MSFC TDY support, and the total number, type, and grade levels of additional people deemed necessary which might be provided by Marshall. Separate agreements will be negotiated with each LVO Division Chief. This procedure is the result of agreement with Dr. Gruene and has the support of Petrone and Van Staden. After the KSC requirements are determined in this manner, we will then proceed to provide support wherever possible. ✓

*12/11/67
WJH
note*

NOTES 12/11/67 BALCH

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S-II-4 Testing - LOX tank inspection and rework have been accomplished, and tank has been closed out. Power was applied to stage on 12/7/67, three days behind schedule. Tanking test is impacted by this delay and is now expected to start by 1/11/68. Additional modification requirements and lack of firm hardware delivery dates may cause an additional impact. ✓

S-II-3 Modification and Inspection - Stage was reinstalled in the Vertical Checkout Building on 12/7/67. Late delivery of redesigned pre-valve and LH₂ feed line is delaying the completion of modifications. Date for shipment to KSC has now been changed from 12/23/67 to 12/22/67, but this new ship date may be impacted by as much as three or four days. ✓

S-IC-D Stage - Start of fuel flow drain test is delayed by late mod kit deliveries and open paper work. Current expected date for start of test is 12/14/67. ✓

S-IC-6 Stage - No definite schedule has yet been received from the MSFC Stage Office for delivery of stage to MTF. ✓

B-1 Position of S-IC Test Stand - Beneficial occupancy has been accepted, and it is anticipated that punch list items and those modifications required for safe stand-by operations will be completed by 3/1/68. ✓

GE Service Contract - At a meeting in NASA Headquarters, attended by MSFC and MTF representatives, all NASA Headquarters comments on Amendment 122 covering the second through fourth quarters of Fiscal Year 1968 were resolved. Approval and release of the amendment is expected early this week. ✓

Damage Claims from Stage Firings - In compliance with the request of NASA Headquarters General Counsel, comments were furnished NASA Headquarters on the subject of claims for property damage stemming from NASA rocket engine tests. ✓

Public Affairs - Nine Executive Directors of the American Municipal League visited MTF on 12/7/67. Arrangements for the visit were coordinated by Mayor Guice of Biloxi, Mississippi. ✓

L.B.

Very famous and (I guess)
very expensive man, B

12/11/67

B 12/15

NOTES 12/11/67 BELEW

Loewy

LOEWY VISIT TO MSFC: Mr. Raymond Loewy is an industrial design consultant for the habitability aspects of the Orbital Workshop. Mr. Loewy visited MSC and MDC/Huntington Beach last week. Mr. Loewy seemed to be enthused with the idea of assisting on the first space station. He seemed to understand the programmatic constraints to proposed major changes. His emphasis was on color schemes. He is visiting MDC/St. Louis today and MSFC December 12. ✓

DELTA PDR PLANS: The delta PDR should be a fairly smooth operation; planning and dry runs have been completed. A very large number of MSC people are attending. The number of MSC people attending each sub-board are as follows: (a) Structures and Mechanics Sub-Board - 17 people; (b) Instrumentation and Communications Sub-Board - 15 people; (c) Crew Station Sub-Board - 21 people; (d) Electrical Sub-Board - 14 people. ✓

PAYLOAD INTEGRATION CONTRACT: The Payload Integration Contract with Martin has been extended from December 1 through January 15, 1968, and we are presently working together with R&DO to establish a scope of work for a 35-month contract covering the first cluster. However, it does not appear that we will be able to finalize a scope of work within the present extension.

Since these short extensions take effort away from the scoping of the Phase D contract and result in an inefficient mode of operation, we are looking at the possibility of a 6-months letter contract. This would allow us time to properly scope Phase D and to accomplish some of that effort concurrently. ✓

HEADQUARTERS BASELINE MEETING: An AAP Baseline Meeting was held on December 4 and 5. Agreement was reached on a weight control and reporting plan on AAP-1, 2, and 4. Mathews will hold about half of our existing margins with the remainder allocated to modules as Center control weights. The margin on AAP-3 remains about 1300 lbs. negative, and control procedures are being withheld pending resolving the negative margin.

Mathews had Bellcomm present their analysis of using CMG's on the OWS for cluster control during the AAP 1-2 mission. The results were similar to those obtained when we recommended an Auxiliary Attitude Control System instead of CMG's for the OWS application except for the consideration of inserting AAP-5 as a 56-day bio-med mission between AAP 1-2 and AAP 3-4. We agreed to re-examine our recommendation on this basis and inasmuch as Mathews' questions the reliability of a propulsion system as opposed to a CMG system for this type of application. No decision was made on the method of jettisoning the SLA/NC. ✓

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GENERAL Two significant conferences are planned for this week with HQ personnel: (1) Doug Lord briefing on J-2 S - Mr. Doug Lord, who will be here as a part of the HQ Task Review Team, has expressed an interest in a briefing on the J-2 S. In conjunction with the P&VE Lab, we are tentatively planning this briefing on Thursday or Friday evening. (2) Dr. Dorman/Del Tischler review of Production Support and briefing on J-2 S - As a result of questions raised by Mr. Finger relative to Production Support and/or Sustaining Engineering, Dr. Dorman has been asked to make an in-depth review of the methodology used for selecting the level of production support and how this level relates to other facets of the program, such as production rates. Of specific interest is a differentiation between: (a) sustaining engineering (so called) in support of production, (b) research and development, (c) product improvement, and (d) other related work. In addition, Dr. Dorman and Mr. Tischler will be briefed on the J-2 S engine work being done under SRT and its relationship to our overall program. Dr. Dorman will go from here to Rocketdyne to get their views on Production Support. (Incidentally, I understand that the review of engines is only "round one" and that a similar look will be taken at our vehicle programs.) ✓

F-1 ENGINE The fourth of nine scheduled production configuration thrust chamber injectors was bomb tested on 11/27 under the stability sampling program. The injector damped in 28 milliseconds, which is well within the Model Specification of 45 milliseconds. ✓

J-2 ENGINE Five successful tests were conducted at AEDC on 12/7 in support of the S-II stage fracture mechanics problem. No anomalies were noted in engine performance for these tests. ✓

H-1 ENGINE Reference TEIR Notes of 11/27/67 concerning stability testing of H-1 engines on S-IB-211. Rocketdyne has concurred in these tests. However, CCSD has questioned Rocketdyne's evaluation of the thrust oscillations resulting from the bomb induced instability. Tests are being conducted at MSFC and Neosho to further evaluate the impact of the instability tests on the stage. It is anticipated that CCSD will agree to the stability test program if the projected loads are within stage design limits. ✓

NOTES 12/11/67 CONSTAN

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Negative report.

NOTES - 12/11/67 - EVANS

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NASA SAFETY MANUAL

Headquarters, MSF, held a meeting on December 5, 1967 to discuss the preparation of a NASA Safety Manual which will cover Public, Industrial and System Safety. An outline for the Manual was discussed. Mr. Huth (the MSFC point of contact) attended from MSFC.

B 12/15

NOTES 12/11/67 FELLOWS

Neutral Buoyancy Equipment: An Operational Readiness Inspection (ORI) Committee for the Neutral Buoyancy Test Equipments (NBTE) was established on December 4 by MSFC Circular. Membership of that Committee is comprised of representatives from ME Laboratory, Safety Office, Medical Center, Facilities and Design Office, P&VE Laboratory, and Operations Management Office. The Committee will conduct, for the Center, an objective appraisal of the safety and operational procedures, as well as the equipments themselves. That appraisal is in addition to the careful continuing review by all operating and staff elements involved with construction and other aspects of readying the NBTE for service. In addition to the Marshall people directly involved with the inspection, the Committee is authorized and encouraged to obtain the advice of consultants from within the Center, and from other locations such as MSC, the U. S. Naval Air Station, Miramar, California, and the U. S. Naval Deep Sea Diving School, Washington. This approach to Operational Readiness Inspection employs the same techniques used by MSC in their reviews of potentially hazardous operations or tests. We also plan to avail ourselves of the offer of assistance by Dr. Gilruth in his November 21 letter to you and will welcome the advice and counsel of the MSC representatives. ✓

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NOTES 12/11/67 GEISSLER

1. Advanced Workshop: The following thoughts may help to clarify some of the questions raised during the interesting discussion on the advanced workshop on December 8, 1967.

a. In order to arrive at an optimum design, comparison between various approaches is necessary. The case for a completely new designed space station has been presented fairly often and an extensive presentation of a "dry" Saturn V launched workshop was made by ASO. In order to give an alternate solution for an analysis of the relative advantages and disadvantages, a very brief description of a potential "wet" spent-stage, Saturn V launch was given.

b. The only valid (technical) justification for a "wet" Saturn V workshop appears to be the usefulness (if there is any) for the extra payload of the 3-stage over 2-stage vehicle. For a typical, 260 n.m. altitude, 50° inclination orbit, the 2-stage payload is approximately 186 K lbs, against 246 K lbs for the 3-stages. Using rough estimates and approximations, the 2-stage, "dry" workshop vehicle can carry a "dry" OWS, power supplies, CSM, life support for 3 men/3 months, and three major experiments.

The additional 50 K lbs for the 3-stager, wet workshop (60 K payload increase minus 10 K for propulsion system), can be used for growth beyond this minimum, e.g.

| | |
|--|------|
| Dry volume (strap-on tanks, with access hatches) | 6 K |
| Extra shielding and modifications | 10 K |
| Artificial "g" devices and modifications | 10 K |
| Life support for 3 men, 6 months | 24 K |

If desired, the basic configuration could look identical to the Apollo, or to the "dry" workshop, and the added strap-on volume, etc. could be considered, as "open-ended" growth potential. However, one has to realize that the basic wet or dry versions lack flexibility, especially the capability of simultaneously operating several "sub-satelites" with different experiments, in free or tethered flight. A successful launch of one, or possibly two, wet S-IB workshops will hopefully remove the open questions concerning use of a spent stage. Some extra workload for the astronauts will probably remain; however, it has to be done only once for the full lifetime of the station and will be more than compensated by the potential increase in orbital stay-time.

2. Effect of RIF Action: We have 19 people affected by the RIF, 12 changing jobs and seven being separated. Of course, the loss of any of these people will impact our capabilities. However, several of the losses are extremely critical. We are losing our best Electronic Technician at the Wind Tunnel and one of our two civil service wind tunnel model designers. In addition, we are losing Mr. Richard Schmidt, GS-14, Mechanical Engineer, from our Aerophysics Division. Although Mr. Schmidt has ten years experience, he became career-conditional within the last year. In addition to the above losses, we are losing four additional people this month, probably caused indirectly by the RIF. Two of these are GS-13's and one is a GS-14. ✓

E.F.
MSC puts particular emphasis on the basic advantage of any dry workshop that everything can be preinstalled and checked out in situ.
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1. INSTRUMENT UNIT 502: Flight Control Computer S/N 506 experienced a hard failure at KSC on 12-5-67. The failure mode was no S-IC outputs. Failure cause is not yet known. The computer has been returned to E.C.I. at St. Petersburg, Florida, for failure analysis and subsequent disposition. Personnel from this Laboratory will be dispatched to E.C.I. to monitor repair and retest. ✓
2. TEST REDUCTION STUDIES: We have completed assessment of the North American Rockwell and Boeing proposals concerning re-evaluation of the current test programs. Generally, both proposals were found to be undesirable. We offered alternate proposals, which would satisfy program requirements, to the S-II Program Office on December 5, and to the S-IC Program Office on December 6, 1967. From all indications, our proposal was favorably received by the S-II Stage Manager. MTF representatives offered considerable opposition to our proposal on the S-IC stage, and the Stage Manager has the proposal under further consideration. ✓
3. APOLLO COMMAND AND SERVICE MODULES: Laboratory personnel visited the North American Rockwell, Downey facility for the purpose of evaluating Apollo Program spacecraft electrical cabling and wiring installation. Command and Service Module S/N 104 was inspected to the extent possible without disrupting manufacturing operations. The crew compartment main cable assembly for CM S/N 106 currently being modified in the manufacturing area was also inspected. Several discrepancies and unsatisfactory conditions involving both workmanship and design were found. However, the major concern of the team centered on the inadequate surveillance of contractor in-process manufacturing operations by Government personnel. Resident Government personnel are primarily depending on detection of discrepancies and unsatisfactory conditions in the final assembly and test operations area. A detailed report of the team findings, subsequent evaluation and recommendations were provided to the Deputy Laboratory Director, who is on TDY in support of Apollo Command and Service Module efforts, for further action. ✓
4. S-II BATTERIES: Representatives of this Laboratory, together with other MSFC representatives, visited Eagle Picher on November 30, 1967, in regard to current design and quality control status of S-II batteries. NAR Space Division has made an extensive survey covering production, quality, manufacturing, testing, and design. Eagle Picher has agreed to incorporate, or has incorporated, many of NAR Space Division's suggested changes to improve the quality and reliability of the S-II batteries for AS-502 and subsequent. We will discuss with NAR Space Division the delta between their survey and the survey conducted by this Laboratory to arrive at the final quality and reliability improvement program. ✓

B 12/18

ATM "B". Meetings were held at MSFC with JPL representatives to discuss the California Institute of Technology (CIT) photoheliometer. Roland Chase, OSSA, stated that incorporation of this telescope should be studied on the basis of no impact to the present ATM design. Accordingly, the criteria furnished to JPL were as follows:

- a. Limit experiment envelop to fit one specific quadrant. Weight not to exceed 700 pounds including any additional ballast for c.g. balance of the canister. Maximum length of experiment 123 inches.
- b. Provide a separate cooling system to radiate to the canister wall . temperature of 50°F. Trade-off on a 70°F wall.
- c. Total average power not to exceed 150 watts.
- d. A one foot by two feet notch in the spar would be allowed to fit all three cameras in a one quadrant arrangement.

JPL will subsequently advise whether or not they can redesign their instrument within the above criteria. ✓

2. ATM Rack. We previously advised of a consideration of a rack redesign. The major trade-off consideration was to achieve some weight savings versus changing the existing tooling and schedule impact. The conclusion was to stay with the present design and add another ring at the solar end to accommodate a relocation of the solar hinge point 19.75 inches toward the solar end. P&VE will reduce the weight on the existing design to offset the weight increase of the added ring. ✓

3. Serpentuator. A visit to ME with P&VE personnel was made last week to assess the design status and its potential application for ATM. We will locate the source for the initial funds required (\$30,000) to establish a more detailed design. The present model is at the breadboard level of design. ✓

4. Review Activity for Stratoscope II. By carrying out the thermal-vacuum cycling test with the modified, completely assembled and operative Stratoscope II, a malfunction was discovered which would have resulted in a total failure of the next (6th) flight. Finding: Armaflex thermal insulation material, used for pipes (cryogenic cooling), expanded under vacuum conditions. Due to this expansion, the azimuth motion of the telescope was blocked and a connector for the onboard TV system was dislodged. The Review Committee, chaired by Mr. Boehm, issued a mandatory recommendation for this test. Since the forthcoming flight is of decisive importance for the judgment on the continuation of the Stratoscope II program, the incorporation of the costly space chamber test has paid off with this finding. The cost for one flight of Stratoscope II is approximately one million dollars. ✓

B 12/15

S-11 STRUCTURAL TEST PROGRAM

The facility construction is progressing on schedule. The S-11 (V7-21) stage arrived at MSFC on December 5, 1967, and was transported to R-ME on December 6, 1967. ✓

S-1B

Test SA-48 on vehicle S-1B-11 has been scheduled for December 19. Special instrumentation for SA-48 and subsequent tests is being installed. ✓

ML-3 DAMPER ARM

The last piece of equipment to complete the ML-3 Damper Arm assembly was received from M.E. Laboratory on Friday, December 8, 1967. We will try to complete the test program by Christmas. ~~All the Test Engineers experienced with this equipment have resigned and will leave before the end of the year.~~ ✓

K.H.

↳ not hit by R/F?
B

B_{12/15}

1. THIRD GENERATION COMPUTER: Phase B installation has been completed. The 1X0 (1 Central Processor, no Input-Output Controllers) configuration is operating around-the-clock under UNIVAC's EXEC II System. The 1X1 (1 Central Processor, 1 Input-Output Controller) is operating around-the-clock in a testing, debugging atmosphere under the EXEC VIII System to be made available in an operational form February 1, 1968 (Phase I). ✓

In the EXEC VIII area many fundamental bugs exist at this point in time, but the rate of correction is also very high, enough to predict solid batch processing capability for Phase I. The compilers have improved steadily since the beginning of Phase A to the point that FORTRAN is one level behind the comparable compiler under the EXEC II and COBOL is about two levels behind. Demand processing is the most solid area of EXEC VIII with only a very few unique and rare ways to cause it to fail. ✓

2. PRESENTATION ON MIT'S ON-LINE SIMULATION SYSTEM ENPORT:

A presentation was given on the simulation system ENPORT of the Massachusetts Institute of Technology by its designer Dr. R. C. Rosenberg. This system operates successfully on MIT's time-sharing computer (Project MAC). Dr. Rosenberg demonstrated that a practical engineer can converse easily with a digital computer for simulating physical systems if the engineer can use a simple engineering-oriented language and can access a large memory containing many preconceived complex models directly via graphical display or typewriter. MIT's experience is of particular interest since Computation Laboratory, in cooperation with Quality Laboratory, is developing a program system for the simulation of large physical systems on the UNIVAC 1108 computer. This system will make costly mathematical models of any physical system widely available by using a central data bank so that the simulation can serve design engineers for analysis, checkout engineers for design evaluation and test engineers for fast failure analysis. ✓

3. ATM MOCKUP: The first phase of the human factors evaluation of manual control of the ATM cluster utilizing the control moment gyros will begin December 11. The ATM mockup in the Simulation Branch is an integral part of this evaluation. ✓

Goddard Space Flight Center Research Review: Dr. Decher (ASTR), Messrs. Heller (SSL), Carter (ASO), and Miles (EO) attended the annual GSFC Research Review. The two days of presentations are generally just sufficient time to give brief highlights of the progress of the past year in the discipline areas covered. The major value of the review appears to be the opportunity which it affords for introduction of personnel from other elements of the Agency to the GSFC programs and responsible researchers.

Aside from the purely technical reviews, Dr. Clark introduced two subjects of concern to the Agency into his opening remarks. The first was a concern about the availability of funding to the Centers to be used largely at Center discretion without extensive Headquarters coordination in the pursuit of frequently preliminary, frequently short, research tasks of the "seed" investigation type. As project funds diminish, Center resources for this type work become more limited. Therefore, fewer ideas (leading to new worthwhile projects) can be pursued. The second, was concern that the informal Center-to-Center coordination may not be sufficient to yield maximum return on the total agency research dollar by assuring only conscious and planned duplication of effort. Those are both matters of some importance to MSFC also as the resources available for R&D continue to decline.

B.J.

I couldn't
agree
with
all
this. But

Hq. is
absolutely
unwilling
to listen in the
present "reduction
of expenditure" climate.

B

B 12/15

1. S-II Structural Test Tank "A" Structure: The S-II portion of this structure has been received last week on December 6 instead of December 4 as scheduled. The handling and transfer operation to the support fixture in our tower building was complicated by the requirement of installation of 20 ft. long Vent Line in the S-II Lox Container. For this operation the pit in the building was not of sufficient depth. Also the Lox Container was pressurized with N_2 so that extensive purging was necessary before a man could enter this container. It is not known why NAR did not install these lines at Seal Beach. The operation was completed last Thursday in a completely safe manner. We have to complete the welding of the S-II and S-IC halves before Christmas, in order to meet the schedule. This will require 2 shift work and much overtime. ✓
2. BP-30, Boiler Plate Payload Modification for AS-503: This modification work is on schedule. The water containers for the S.M. will be ready for hydrostatic test beginning of this week. ✓
3. Damper Arm System: The Damper Arm System ML-3 has been delivered to Test Laboratory. ML-1 which is mounted on LUT-1 and had been used for the launching of AS-501 has been assigned to AS-503. According to agreements with Boeing and KSC we have to perform the upgrading and retrofit of this unit. P&VE is preparing the necessary design changes incorporating improvements as a result of the experience with 501. ✓
4. Neutral Buoyancy Activities: A problem was encountered last week in the operation because certain mock-up components, made of nylon, made the water in the tank opaque in color. The water had to be drained, the components removed, and the tank to be filled with fresh water. The manufacture of mock-up or trainers for our neutral buoyancy equipment and also for MSC represents a substantial workload for our shops. ✓
5. Manufacturing Technology Presentation by Boeing, Michoud: Mr. C. Harris who is now in charge of manufacturing at Michoud (Bud Coenen is moving to KSC) gave a presentation last week to our personnel on some manufacturing innovations for such simple operations as drilling holes and cutting high strength material with a power saw. These innovations, however, are readily being utilized nationwide by many industries and will save many millions of dollars every year. The presentation will be repeated on December 13 in Building 4200, to Mr. Wiggins. ✓

B12/18

1. SPRAY FOAM INSULATION: Reference Notes 11-20-67 Lucas: We have available a complete set of the current S-II purged insulation which we can use if the spray foam insulation concept cannot be utilized on S-II-8. ✓ However, some modifications would be required in the application of the purged insulation to S-II-8 since normally that insulation is applied to cylinder quarter panels prior to any welding. We can accommodate these modifications but there will be some schedule impact if it becomes necessary to pursue this approach. Recent developments in the spray foam program add to our confidence that the spray foam concept of insulation will be acceptable for S-II-8. ✓ Although North American Rockwell (NAR) has not completely resolved the problem of a seal coating for the foam, recent results have been favorable. Personnel from our Materials Division have been at NAR to provide guidance in the coating development. ✓
2. CRITIQUE OF MSC PROPOSED AAP APPROACH: Critique data developed on all major aspects of the proposed approach show a very difficult design problem as proposed, experiment accommodation deficiencies, major weight/performance feasibility questions, and the applicability of most "Warning Flag Items" raised by MSC with respect to the orbital workshop. ✓
3. SATURN V CONTROL RELEASE MECHANISM: The AS-501 flight data were finally received on 12-1-67. Evaluation of the data indicates that the average preload in the mechanisms just prior to engine ignition was 7.2 kips and increased to 57.7 kips due to engine ignition. At launch holddown arm release or lift-off, the preload increased to 61.5 kips. (The data recording system was not capable of recording loads in excess of 61.5 kips.) The data also indicate that first motion or lift-off was initiated between T-0.40 and T-0.50 seconds. The mechanisms finished operating at approximately T+0.70 seconds. These results corroborated that the mechanisms operated satisfactorily. ✓
4. S-II-502 LOX LOADING: The KSC proposed facility modifications to provide fast filling for AS-502 are unacceptable to us. Liquid slugging could still occur in the lox sump area during initial chardown and initiation of fast fill. Additional modifications are required, which apparently cannot be incorporated prior to AS-502 launch. We have recommended for AS-502 the slow fill mode as used for AS-501. ✓
5. S-II-501 ULLAGE MOTOR FAIRINGS: Two nearly complete and one fragmented ullage motor fairings were recovered from the Atlantic Ocean following the AS-501 launch. The fragmented fairing shows evidence of burning, but tests reveal that short-time exposure to moderate temperatures are sufficient to duplicate the surface characteristics. The film from the onboard separation camera revealed that as the aft interstage separated it tumbled through the J-2 engine exhaust plume and that three of the ullage motor fairings (numbers 1, 2, and 3) were burned; furthermore, the films show that, after separation, the number 2 ullage motor fairing broke up in about the same size and manner as the recovered fragments. ✓

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NOTES 12/11/67 RICHARD

No submission today.

B 12/15

1. S-II Fracture Mechanics:

- Reference teletype to Gen. Phillips, Subject: S-II Fracture Mechanics, dated 6 Dec 67 (copy attached) ✓
- A meeting was held with Gen. Phillips on Friday, 8 Dec 67, to review the Boeing Washington TIE analysis of S-II Fracture Mechanics. Gen. Phillips reaffirmed his decision of 17 Oct 67, i.e., to fly S-II-2 as is, reduce the LH₂ tank pressure on S-II-3 and proceed without any further planning for cryogenic proof testing on those stages. He did, however, recommend that we establish a priority plan on the following:
 - Pursue AEDC J-2 engine testing to determine the real threshold for pressure reduction of the J-2. ✓
 - Continue our fracture mechanics as we have it planned with NAR, however, insure that the findings are presented and analyzed in an organized fashion. ✓
 - Pursue further upper air wind restriction study as it concerns bending moments in the Max Q region. ✓
- We will receive a follow-up teletype from Gen. Phillips today (Mon., 11 Dec 67). No date was set for the DCR on the S-II-2 and the S-II-3. A new date will be coordinated with you and the other DCR Board Members. ✓

2. AS-502 Launch Redlines:

Each of the Saturn V contractors is reviewing the redline data accumulated during CDDT and launch of AS-501 and comparing this data with the flight results. The contractors are to submit their findings and recommendations to the Saturn V Program Office by Friday, 15 Dec 67. This information will be submitted to R&DO for review. Through these actions we plan to eliminate, widen or otherwise adjust the AS-502 redlines. ✓

3. Overtime:

We have just completed an analysis of all overtime worked in the Saturn V Program Office during the past 12 months. The analysis indicates that the Saturn V employees worked over 12,000 hours of unpaid overtime (not Compensatory Time). This is an equivalent donation of over \$75,000 of free time to the Saturn V Program. Unpaid overtime also exceeds the paid overtime.

B 12/15

1. AS-204/LM-1 MISSION RULES REVIEWS: KSC held an inter-Center review of the AS-204/LM-1 Launch Mission Rules last Wednesday. MSC held a corresponding Flight Mission Rules review on Friday. Mission Director Bill Schneider attended both and will brief General Phillips on the rules at a later date. These briefings replace the Phillips-chaired mission rule reviews held on previous missions. The major MSFC open item is final internal review of the Flight Mission Rules, which is late due to the previous AS-501 priority. A meeting with R-P&VE and MDC is scheduled this week. ✓

2. APOLLO 4 FLIGHT OPERATIONS POST FLIGHT REVIEW: An overall review of Flight Operations Support of the Apollo 4 mission was held at MSC on Dec. 7, 1967. Each agency which participated in the operations (included MSFC) presented a summary of their activities, carefully pointing out problems they experienced and what corrective action is being taken. Considering the magnitude of support there was a surprisingly small number of problems encountered. Most problems with the Manned Space Flight Network (MSFN) were due to human errors and, we hope, will not be repeated as the crews become more experienced and better procedures are defined. The mobile support (1 Apollo ship and 5 Apollo Range Instrumentation Aircraft) operated nearly perfectly. COMSAT utilization was successful. This will allow MSC to completely remote the MSFN on AS-204/LM-1. Real-time tracking support was good, but both real-time telemetry and command did experience some malfunctions. These malfunctions in no way hindered the mission and will be resolved by AS-204/LM-1. No major onboard communication system problem was encountered. ✓

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1. GSFC PROGRAM REVIEW: During a program review at GSFC, Jack Clark, Les Meredith and others discussed current astronomy programs with Gerhard Heller. GSFC places much emphasis on stellar astronomy, both optical and high energy, and is greatly interested in close cooperation with MSFC in the ATM Follow-On Program. There was no evidence of feelings of competition with MSFC in astronomy projects. As you may know, GSFC is presently our main source of information for the large-aperture orbiting telescope (LAOT) system which is part of the ATM Follow-On Study for Jesse Mitchell. ✓

2. VISIT BY MR. STROUD: Bill Stroud, GSFC, whom Jesse Mitchell requested to represent GSFC in the ASTRA project study, will visit MSFC on December 19. He asked for briefings on ATM, ATM Follow-On, OWS, and OTS, while he will brief us on ASTRA and other NASA and also European astronomy projects. This briefing will be prepared jointly by the AAP Office and R&DO Laboratories. ✓

E.S.
There goes AAP 12!
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3. NAS RECOMMENDATION: As we learned through OSSA, the National Academy of Sciences has rendered an official written recommendation to NASA with the statement that they see no justification for manned participation in orbit to accomplish natural resources program objectives. This opinion seems even to fall in line with the thinking of some members of OSSA. It looks like the astronomy and the biomedical programs may be the only potential customers for the OWS in the early seventies. ✓

4. ASTRONOMY MISSION PLANNING BOARD MEETING ON 11/30 AND 12/1: The Astronomy Mission Planning Board apparently failed to reach any decision on the question of solar vs. stellar astronomy for ATM-B. Mr. Chase indicated that Mr. Mitchell will certainly take no position on this very delicate matter, since any position which he might take would result in criticism from certain strong groups in the scientific community. The dry workshop has the capacity to do both solar and stellar astronomy simultaneously and could relieve OSSA of the either/or situation which presently confronts them. This is a strong argument why the dry workshop should be designed to accommodate stellar as well as solar astronomy. ✓

5. SOLAR CONSTANT EXPERIMENT: The total-energy meter for a precision determination of the solar constant from orbit is almost completed. A proposal for a first flight experiment on the Convair 990 aircraft based at Ames Research Center is being prepared. The next flight is tentatively scheduled for late April 1968. Present plans are to use the heliometer in an evacuated, liquid nitrogen cooled chamber attached directly to the aircraft window for a study of variations in solar radiant flux as a function of altitude, solar elevation, and inherent solar activity. ME Laboratory is being requested to do the container design and fabrication. ✓

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12/15

SA-204/LM-1: Checkout is presently running approximately two days behind schedule. Overall Test #1 (Plugs-in) which was scheduled to start on December 9, was delayed due to LM problems. We understand that the start-time for the test is now scheduled for 1300 today. No evaluation of the effect of this delay on the launch date has been made. There are no known launch vehicle problems. The 204 LVDC (flight) and SLCC (Saturn Launch Control Computer) final software programs were delivered to KSC on December 6. The delivery was made two days ahead of schedule to honor KSC's request of having the final computer programs available for the Overall Tests. ✓

SA-204/LM-1 FLIGHT READINESS REVIEW REPORT: This report has been distributed in preparation for the Preflight Review to be held on December 18 and 19 in the LIEF Conference Room located in Building 4663 (Computation Laboratory). ✓

Dec 18, 1967

NOTES
MR. GOPMAN'S COPY
12/18/67 w/comments

7 w/comments
Berman

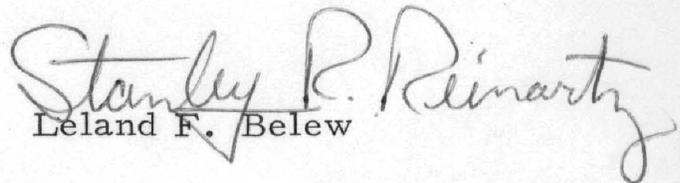
None marked for DEP-A

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DEC 18 1967

NOTE TO: Dr. von Braun, DIR

SUBJECT: Additional Item for Weekly Notes, 12/18/67

DR. NEWELL'S COMMITTEE ACTIVITY: I understand from a discussion with Ed Cortright last Friday that the Newell group's proposed agenda currently anticipates one day at MSFC to review the AAP program with emphasis on hardware, engineering activity, laboratory activities, etc. In anticipation of an early visit (perhaps first week of January), we have taken action to get the Orbital Workshop mockup shipped from McDonnell Douglas in December. I will keep in touch with this activity.


Leland F. Belew

Copies to:
R-DIR, Mr. Weidner
I-DIR, General O'Connor

NOTES 12/18/67 BALCH

12/18/67

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S-II-4 Testing - Late delivery of stage and GSE modification hardware has further delayed start of tanking test. Target date for start of tanking test has now been changed from 1/11/68 to 1/18/68, and static firing is now set for 1/27/68. ✓

S-II-3 Modification and Inspection - Stage inspection has been completed. Removal of stage from the Vertical Checkout Building is expected on 12/19/67, and shipment to KSC is planned for 12/21/67. ✓

S-IC-D Stage - Testing of the anti-vortex modification was started on 12/14/67 and is expected to be completed on 12/20/67, after which additional changes to the modification are planned. Final tests after these changes are expected to be completed on 1/2/68, and stage is to be removed from the test stand by 1/15/68. ✓

S-IC-6 Stage - Stage contractor activities are being planned on the basis of a delivery date to MTF of 3/3/68. No official MTF delivery date has yet been received from the MSFC Stage Office. ✓

GE Service Contract - Information has been received by telephone from MSFC that NASA Headquarters on 12/13/67 approved Amendment 122 covering the second through fourth quarters of Fiscal Year 1968. ✓

MTF Mail Operations - In response to our request, U. S. Post Office Department representatives have visited MTF for the purpose of discussing the possibility of establishing a U. S. Postal Facility on site. They are to make a detailed study of the situation, with input to be completed next month. ✓

Hancock County Airport - Bids for construction have been opened, and it is understood it will be possible to make an award within available funds and amount approved by FAA. Contract is expected to be consummated early next month. ✓

Public Affairs - A film crew working on a film for the U. S. Information Agency was at MTF on 12/11/67. ✓

Departure of GE-MTSD Chief - Mr. W. R. Eaton officially ended his tenure as General Manager for GE-MTSD, the service contractor at MTF, on 12/11/67. He has been succeeded by Mr. Paul Sage in an "Acting" capacity. ✓

12/18/68

ORBITAL WORKSHOP DELTA PDR: The Documentation Review portion of the delta PDR was held December 11-14 with NASA Headquarters, MSC, KSC, McDonnell Douglas (MDC), and Martin Marietta (MMC) personnel attending. There were about 115 attendants at each meeting. Eighty-three Review Item Discrepancies (RID's) generated. It was generally agreed to have been a very successful PDR. Most of the RID's were proposals for improvements rather than discrepancies. One RID includes a strong proposal from MSC that a full scale thermal vacuum test be conducted on the S-IVB OWS. The next major event for the OWS Project is the Crew Station Review (Astronaut Walk-Through) portion of the OWS PDR scheduled for January 29 through February 2, 1968. ✓

OWS ENGINEERING MOCKUP: Preparation of the OWS engineering mockup is on schedule at MDC and the mockup is scheduled for arrival at MSFC January 3, 1968. We are attempting a one week speed-up in case the Newell Committee visits MSFC at an early date. Approximately three weeks of work on the mockup will be required at MSFC to prepare the mockup for the Crew Station Review. ✓

CREW BUY-OFF OF DESIGNS: During the delta PDR a discussion ensued with Gordon Cooper and Tom McElmurry of MSC concerning the design authorizations from this point forward. The crew position was that no design should be authorized for detailing or for production until the crew itself had "bought-off" the design by two methods: (1) Neutral buoyancy testing; (2) Zero "g" aircraft testing. The MSFC position was that we were not able to wait on such results and that MSFC understands that this is a risk basis and changes will be made as required. ✓

VISIT OF RAYMOND LOEWY: Raymond Loewy, the Industrial Designer, and three of his associates visited MSFC on Tuesday, December 12. He met with Mr. Belew and was given a brief introduction to AAP. After a rather thorough briefing on the MDA and associated crew systems, Dr. Lucas and others lunched with Mr. Loewy at P&VE, followed by a tour of the MDA mockup hardware in Building 4755. Mr. Loewy was supplied with drawings and copies of presentation material for study during his 2½ month contract. ✓

ATM STATUS REVIEW: An ATM status review was held at Headquarters on December 14. Mr. Mathews was unable to attend. The review consisted of programmatic status by Mr. Ise, detailed experiment schedules by Mr. Keathley, and technical status by Mr. Horton. Richard Davidson of MSC presented comments concerning probable nonavailability of the LM 2A T/R test article to support ATM vibration testing and stated that cleanliness tests in their T/V facility could not be performed until August 1968. ✓

ATM EXPERIMENT REVIEWS: An Astronaut Interface Review of the HAO experiment was conducted on December 12 and 13 at Boulder, Colorado. MSC personnel have expressed their satisfaction with the reviews held to date (includes AS&E and HCO-C on December 5, 6 and 7). The next review will be of the NRL and HCO A and B experiments to be held in mid January. ✓

ATM CONTROL AND DISPLAY MEETING: On December 18 and 19, a meeting will be held at MSC between MSC, MSFC, GAEC and Martin/Bendix to discuss the ATM control and display (1) structural interface with the LM, (2) thermal control, and (3) human factors. ✓

NOTES 12-18-67 BROWN

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12/18/67

J-2 ENGINE Five successful tests were conducted at AEDC on 12/14, making a total of 27 tests conducted to date in support of the S-II fracture mechanics problem. This completes testing at the 225K thrust level (502 and 503 configuration). Testing will continue after installation of a 230K fuel turbopump and recalibration of the engine at the 230K level (504 and subs configuration). Present plans call for approximately 20 tests to be conducted at the 230K thrust level prior to making a final decision on changing to a 27 psia fuel pump inlet pressure on the S-II stage. ✓

GENERAL: Total tests and time (including cluster testing and flights) accumulated on our Saturn engines as of December 1, 1967 are:

| | <u>Seconds</u> | <u>Tests</u> |
|-----|----------------|--------------|
| H-1 | 507,025 | 6,908 |
| F-1 | 200,919 | 2,496 |
| J-2 | 336,721 | 3,210 ✓ |

NOTES 12/18/67 CONSTAN

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VISIT OF PRESIDENT JOHNSON

President Lyndon B. Johnson, hosted by top officials of Louisiana and the National Aeronautics and Space Administration, spoke to some 25,000 persons Tuesday, December 12, in the Manufacturing Building of the Michoud Assembly Facility in New Orleans. ✓

Before the speech, the President toured the facility with Gov. John J. McKeithen, Mr. James B. Webb, Dr. von Braun, and Astronauts Walter Shirra and Walter Cunningham. Included in the group were Mr. R. H. Nelson, General Manager of The Boeing Company Launch Systems Branch, and Mr. H. Lowrey, President of Chrysler Corporation Space Division. ✓

After being introduced by Mr. Webb, the President stated during his speech that there was no turning back in the quest for superiority in space and called on the American people to support the United States effort to maintain a strong technological position in the world. ✓

Management Instruction for the "Aerospace Safety Advisory Panel"

This Panel was established under Section 6 of the NASA Authorization Act, 1968, and is responsible to Mr. Webb.

Mr. Webb recently signed the Management Instruction, which sets forth the authority for and the duties, procedures, organization, and support of the Panel.

The duties of the Panel are repeated below:

- a. "the duties of the Panel are set forth in Section 6 of the National Aeronautics and Space Administration Authorization Act, 1968, as follows:

"The Panel shall review safety studies and operations plans referred to it and shall make reports thereon, shall advise the Administrator with respect to the hazards of proposed or existing facilities and proposed operations and with respect to the adequacy of proposed or existing safety standards, and shall perform such other duties as the Administrator may request."

- b. Pursuant to carrying out its statutory duties, the Panel will review, evaluate, and advise on all elements of NASA's safety system, including especially the industrial safety, systems safety, and public safety activities, and the management of these activities."

Also, a broad definition of industrial, system and public safety is included. Support for the Panel is to be provided by a staff to be comprised of full-time NASA employees. ✓

MSFC Safety Board Meeting No. 13

The Safety Board Meeting was held on Tuesday, December 12, 1967. The most significant item of the meeting was the announcement by Mr. Neubert of the letter (copy attached) from Dr. Mueller to you about the safety organization, dated December 8, 1967. The letter requested that a modified chart of the MSFC organization which showed the position of the Safety Office reporting directly to the Center Director be formally established before the end of this month. The Executive Staff is taking action to prepare the necessary information. ✓

NOTES 12/18/67 FELLOWS

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12/18/67

GAO Investigation. A relatively low level GAO investigation of possible program impact caused by certain facilities requested in C of F budget submissions (since FY 65) not being approved as requested, is nearing completion. The investigation is being conducted at the request of Congress and the GAO investigators appear to have no axe to grind of their own. They have had entrance and exit conferences with the Laboratory Directors who were visited (P&VE, Test, Qual) and seem to want their report to Congress to accurately reflect the Laboratory Directors opinion without slanting one way or the other. There do not appear to be any surprises. ✓

NOTES 12/18/67 GEISSLER

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12/18/67

1. AS-503 Mission Planning: Re: your question in Notes 12/4/67 Geissler, "What will the manned CSM/LM configuration do after LM extraction?" Emphasis will be placed on LM systems evaluation and a demonstration of combined LM/CSM operations. The activities will include demonstration of intra- and extra-vehicular crew transfer from LM to CSM and investigation of LM solo flight functions. ✓ The mission duration will be approximately 10 days. A brief chronology of major events is: (a) Four service propulsion system (SPS) burns while CSM and LM are docked, (b) LM checkout and extra-vehicular activity (EVA), (c) Docked Descent Propulsion System (DPS) burn, (d) LM active rendezvous, (e) Unmanned Ascent Propulsion System (APS) burn to depletion, (f) CSM active flyby of LM, and (g) Deorbit and entry.

2. Apollo-Saturn Prelaunch Detailed Wind Profile Support: For several months we have been engaged, through I. O. and KSC, in a critical technical and policy debate with the Air Force at Eastern Test Range, concerning our insistence on the use of the FPS-16 Radar/Jimsphere system for pre-launch monitorship of in-flight winds. Just prior to the launch of AS-501, the Air Force stated that AFETR range safety had a mandatory requirement to use the Air Force's developed spherical balloon (ROSE). The Jimsphere balloon and sensor is more responsive to the winds due to controlled vortex shedding. In addition, it has a 20% faster rise rate and is a stronger radar target. On December 6, 1967, representatives of our Aerospace Environment Division presented the technical arguments for our FPS-16 Radar/Jimsphere system to AFETR, in response to KSC's request. KSC supported our position. Col. Montague, of AFETR, reported on December 11, 1967, that the Eastern Test Range would support NASA's requirement for use of the Jimsphere Wind Sensor. ✓

3. AS-501 Flight Evaluation: Most of the inputs for the FEWG AS-501 flight evaluation report have been received from the contractors. A large percentage of this input was received later than anticipated, due primarily to late delivery of processed data in many areas. We and the Boeing FEWG technical staff are working very hard to make up the lost time. We still hope to meet our schedule of January 15 for report distribution. The FEWG has scheduled a presentation of AS-501 flight results, in Morris Auditorium from 2 to 4 p. m. January 5, for MSFC personnel. ✓

4. Lunar Targeting Exercise: An exercise is presently underway between MSFC and MSC to check out Boeing quick response lunar targeting computer programs. The targeting phase was completed, for three launch dates, on December 4, within the scheduled three-week period of time, using data received from MSC. Guidance presetting cards will be sent to Astrionics this week for their check out. ✓

2

12/18 JFS

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1. AS-502 FLIGHT CONTROL COMPUTER (FCC): It has been determined that failure of the AS-502 FCC was due to intermittent failure of a General Electric relay. Failure analysis revealed a weld splash particle of sufficient size to interfere with the armature movement. Relay failure resulted in an open circuit in the relay switching circuit board, in a non-redundant circuit, which, if it had failed in flight, would have caused engine failure. Five additional relays from the same lot have been examined with negative results and additional failure analysis is being pursued by several organizations. There are 160 of these relays used in each FCC, and they are also used in the CSP, Q-Ball, and AC-DC amplifiers. Our parts personnel are tracking the problem for determination of the need for ALERT, retrofit, etc. The defective relay was replaced, the AS-502 FCC reassembled, acceptance tested, and prepared for shipment to KSC. ✓

2. S-II PROGRAM: Representatives of this Laboratory traveled to the Mississippi Test Facility to monitor the dye penetrant inspection of the liquid hydrogen tank interior on the S-II-3 Vehicle. The dye penetrant examination included welds, milled bosses, and stringer ends. Also, visual observation was made on other installed hardware such as brackets and baffles. Dye penetrant examination revealed three cracks which were removed satisfactorily by grinding. One cracked gusset was removed and replaced.
 - o A representative of this Laboratory attended the final meeting of the S-II stage wiring concepts task team. All action items initiated by this group were reviewed and closed out. The results of the NASA inspection of S-II-6 cabling were reviewed and a cursory examination of the stage was performed. The inspection resulted in five (5) hazardous and seventy-one (71) other significant defects which NAR has agreed to correct. ✓

3. AS-204 AND AS-502 ENGINE PROFILE: As of November 29, 1967, 219 UCR's (33 of which were classified as significant) had been written against AS-204 engines, and all but two (significant) closed. One of the two was on a spare H-1 engine. There had been 687 UCR's written against AS-502 engines (55 of which were classified as significant). All but 15 (none of which were classified as significant) had been closed. There has been an overall reduction of approximately 25% on engine UCR's from AS-501 to AS-502. ✓

12/18/67

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1. Status of Resident Research Personnel via the National Research Council.
Dr. Frik, Technical University Stuttgart, is working in Brooks Moore's
Division on attitude control systems.

Dr. Miura, University of Tokyo, is working in Carl Mandel's group on gyro
bearing problems.

Dr. Reinel, of the German Experiment Station for Air and Space Flight,
Oberpfaffenhofen, will report about April 1, 1968 and be involved in laser
gyro systems. ✓

2. ATM Monthly Review. The monthly review for Mr. Mathews was held last
week at NASA Headquarters. Messrs. Forsythe and Mitchell represented OMSF
and OSSA, respectively. No significant developments resulted from this review. ✓

NOTES 11/18/67 HEIMBURG

12/18/67

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S-1C STAGE (MSFC)

One lox fill and drain test was accomplished on the S-1C-T stage December 14, 1967, to further evaluate fill and drain procedures for flight stages. ✓

F-1 ENGINE

The West Area F-1 Test Stand is being secured to a standby status. Testing will be limited to critical high priority programs that may be generated in the future as a result of flight malfunctions. ✓

S-1VB (MSFC)

Test No. S-1VB-047S using engine J-2SE, S/N 108, was conducted at the S-1VB Test Stand (MSFC) on December 14, 1967, for a duration (from ignition) of 2.43 seconds. The planned duration was 15.0 seconds, however, an erroneous signal was inadvertently fed into the stall monitor which gave an early cutoff. A review of records and inspection of engine indicated all systems operated satisfactorily except as mentioned above. This was the first test conducted on the J-2S R&D engine at MSFC. The next test (S-1VB-048S) is scheduled for December 21. ✓

S-1B

In addition to the special instrumentation requested by Chrysler, special strain gauge instrumentation has been installed for R-P&VE in selected areas of the S-1B-11 structure in support of the proposed stage H-1 engine bomb tests. The 30 seconds test, SA-48, is scheduled for December 19, 1967. ✓

12/18/67

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1. PLANNING FOR AAP DATA FLOW AND EXPERIMENT DATA ARCHIVAL:

The AAP Data Flow Plan studies coordinated by Mr. Sam Fordyce, NASA Headquarters, are nearing completion with Bellcomm finishing a summary of the sub-tasks allocated to centers. Computation Laboratory performed tasks on planning for data processing and archival storage, and reported on these in July. We arranged an MSFC review of preliminary Bellcomm results on October 24. MSFC comments were collected and submitted to Bellcomm on November 20. In response to Bellcomm requests, further efforts are being made by Computation Laboratory and Mission Operations Office to quantify the expected MSFC processing requirements for AAP data. A preliminary verification of MSFC's ability to handle this work without additional equipment has been reported verbally to Bellcomm. On December 12, Computation Laboratory hosted a visit from Mr. Moroney, Electronic Research Center, and Mr. Williams, VARCO (United Aircraft), who are studying archival storage for AAP experiment data. Current interest of that study group is concentrated on Flight 1A. ✓

2. EXEC VIII STATUS FOR UNIVAC 1108: The basic EXEC VIII operating system which will be used in Phase I (February 1, 1968) has been received. In this system multiprogramming has been achieved with a mixture of assembly language programs and FORTRAN compilations. FORTRAN execution of jobs which failed under previous EXEC VIII system has been successful in almost all cases. However, there has been no multiprogramming of the execution of FORTRAN programs. Communication handlers have not yet been successfully integrated in the system and Checkpoint/Restart capability is not yet available in EXEC VIII. ✓

UNIVAC Systems Programming will be providing updated versions of this system approximately every week until February 1, 1968. Daily meetings are being held with UNIVAC to coordinate the status of the checkout of EXEC VIII locally. ✓

3. IMPLEMENTATION OF COMPUTER PROGRAM FOR FACT COMPUTER:

A computer program has been developed by the Data Center Division in support of the "Hughes" Flexible Automatic Circuit Tester (FACT) machine for Manufacturing Engineering Laboratory. The primary function of this computer program is to generate data for the checkout of resistors, diodes, relays and all associated wiring for cable wiring assemblies and distributors to be tested on the FACT machine. As a result of this computer application the required manhours for the checkout of 1000 circuit items has been reduced by 80 percent. ✓

NOTES 12/18/67 JOHNSON

12/18/67

B2/5

Regular notes will be delayed. The houses of two Experiments

Office employees were severely damaged by wind. Charles Howard,

his wife and three boys are at the Huntsville Hospital. Mrs. Polly

Mumford, her husband and young daughter are at the doctor's office.

We will keep you advised.

12/18/67

1. S-II Structural Test Article: Joining of the S-II and S-IC halves for this LH₂ tank required welding of 2214 Al. alloy to 2019 material. In order to produce an optimum quality for this weld we have decided last week to use the Pulsed Arc Mig welding process for this tank. In order to apply this technique we had (1) to qualify the process for this material combination, including repairs and (2) to design and build collapsible tooling for making a close-out girth weld from the inside of the container. Both tasks were accomplished in less than two weeks. Approximately 80 test specimens were manufactured, tested and results evaluated in a fine cooperative effort by ME, P&VE, and QUAL. The PAM process was then accepted by the Materials Laboratory of P&VE for this application. (For comparison: NAR received the directive to manufacture, test and evaluate the Pulsed Arc Mig welding process for LH₂ dome to cyl. #6 weld in May and has up to now not produced conclusive but only doubtful data). The new tooling was also completed and installed by Friday last week. The pre-production weld samples were excellent and the inside girth weld was made by this technique on Saturday. The X-ray inspection was made on Saturday. Preliminary evaluation looks very good. The final weld pass from the outside will be accomplished this week. ✓

2. Erection of Neutral Buoyancy Test Equipment: The clean-up of the interior of the tank has been completed and cover plates have been installed making the tank ready for sandblasting and painting. The erection of the observation platforms and staircase is also complete. Installation of piping for water circulation and filtering system has been started last week. The trailer for instrumentation, communication and operating control and diver suiting room has been delivered. ✓

12/18/67

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1. S-II PULSE ARC MIG (PAMIG) DEVELOPMENT: Reference your comment on Notes 11-26-67 Kuers. North American Rockwell/Space Division (NAR/SD) recommended discontinuance of the production development program on PAMIG work on 11-15-67, based on the low elongation of weldments at -423°F made for the PAMIG process. People from both Materials and Structures Divisions have carefully reviewed the NAR/SD data and have not found reason to question these data. We are aware of testing equipment problems and also significant equipment problems encountered during the welding of test cylinders but we believe that these can be overcome. Virgin welds made by NAR had properties essentially equivalent to those made at MSFC but NAR repair welds were significantly inferior. Since NAR/SD has concluded that the properties obtained will not satisfy their design, and have stated that they will continue a low priority lab study to overcome these problems, I believe directing them to do otherwise will not be beneficial. NAR/SD has proposed also to investigate opposed nugget TIG welding from which they were beginning to obtain favorable data last June (before NAR/SD was directed to stop in favor of PAMIG). I do not concur that we give up further attempts to improve the welding of the S-II structure, particularly in view of favorable MSFC experience. On the contrary, I propose that we use whatever resource necessary to assure that NAR gives us the best possible welding.
2. S-II FRACTURE MECHANICS: Reference Notes 12-4-67 Lucas. Reducing the LH₂ tank ullage pressure range to 27-29 psig will assure that the 35 psig room temperature tests verify all the longitudinal welds to a proof factor of at least 1.0. However, with this pressure reduction, most of the circumferential welds will remain unverified by the current proof tests if one believes that the Saturn V will ever experience the design bending loads which are based on a 75 meter/second omnidirectional wind. Our experience has shown, however, that the probability of experiencing these loads is extremely remote, and that under normal flight conditions utilizing a wind biased trajectory the current proof tests do verify the circumferential welds. It is doubtful, however, that these arguments will ever satisfy Messrs Tiffany & Brown, and it is my opinion that nothing short of a LH₂ proof test will.
3. ORBITAL WORKSHOP (OWS) DELTA PDR: The technical review was conducted by sub-boards at MSFC December 11-14, 1967, and resulted in the generation of 82 Review Item Disposition (RID) actions; the specific areas were structures and mechanics (38), instrumentation and communications (3), crew stations (32), and electrical (9). The second portion of the PDR, the Crew Stations Review of the updated mockup, is scheduled for 1-29-68 thru 2-2-68 and probably will generate an equal number of RIDS when the flight crews evaluate the hardware configuration. The data package which was prepared jointly by DAC and Marshall was very comprehensive and many favorable comments were received from the off-center participants. Average attendance at the sessions was greater than 100, including representatives of KSC, Headquarters, MSC, the Airlock contractor, MDC, the Martin Integration Contractor, and Bellcomm. Gordon Cooper has replaced Alan Bean as lead astronaut for AAP, and his practical experience was evident during some of the reviews. The formal board meeting will be late in February.
4. DR. LINDSEY M. HOBBS: Dr. Hobbs, Chief of Polymer Chemistry Section, died unexpectedly of a coronary on 12-9-67. Dr. Hobbs had been most aggressive in developing and directing our polymer research and most recently had lead our efforts to assist OART in the development of seals for the SST.

12/18/67

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This is in reply to the question you raised relative to the FY-69 budget as reported in our December 4, 1967 notes (copy attached).

BOB FY-69 "MARK" - Headquarters has advised us that the BOB reduction to NASA's FY-69 "going-in" position was based on the current production schedule (which includes a 2 x 2 follow-on program) and it was BOB's feeling that the program could be accomplished within their figure. We will not be in position to assess the impact at MSFC until we have the break out by Centers. ✓

EXTENSION OF SYSTEMS ENGINEERING TO KSC - We are preparing a memorandum on this subject for your signature. We are also working closely with Messrs. Cook, Heuter and Colonel Montgomery in developing the necessary working arrangements. The people who will be on temporary duty at KSC or an extension of Ludie Richard's office and the R&DO design laboratories have been identified. This group will provide close engineering liaison between MSFC/R&DO system engineers and designers, and the KSC Launch Vehicle Operations, through the AS-204/502-3 launch time frame. Normal commitment channels through the program manager will be used for implementation of solutions to problems. ✓

SAFETY OFFICE - As requested by Mr. Neubert we are preparing a proposal for submission to NASA Headquarters, establishing a Center-level Safety Office as requested by OMSF. A number of alternatives have been prepared, showing possible locations of the new Safety block within the MSFC structure for review by top management. Information in the recent safety structure and functional arrangements at MSC and KSC has also been studied. ✓

WORK PACKAGE - As a result of last weeks meetings with the Headquarters review team, MSFC is preparing a work package proposal to be submitted to Washington this week. ✓

NOTES 12/18/67 RICHARD

12/18 Q/S

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Hydrogen Vent Line Back Pressure Problem: Cur current understanding of the hydrogen vent line back pressure problem is as follows:

Both MSFC and KSC are shooting for an agreement of 1.5 psi across the S-II and S-IVB interface. KSC has been experiencing icing of the bubble caps and is in the process of increasing their size from 4-1/2" diameter to a 9" diameter which will theoretically decrease the back pressure from 2.25 psi to 1.35 psi. The back pressure will be verified during CDDT, and KSC expects, through past experience, to approach at least 1.4 psi. P&VE is presently re-evaluating these new numbers and is expecting to resolve any impact by December 21. ✓

12/18/67

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1. S-II Stage Structural Confidence:

In TWX dtd 15 Dec. 67, Gen. Phillips directed additional measures be taken to obtain the highest practicable level of assurance in the S-II stage structure:

- Reduction of flight loads by all practicable means including: Wind biasing trajectories and other wind restrictions; adjustments in acceleration profiles; further reductions in ullage pressure and utilization of narrow band dual range relief valves. ✓

- A high priority J-2 Engine test program at AEDC to establish lower bounds of fuel inlet pressure (i. e., lower than 27 psia, if possible). ✓

- Additional testing to extend the spectrum of data on fracture mechanics. ✓

- Careful identification and assessment of those existing portions of the lightweight structural test program, as well as any new tests which contribute significantly to increased confidence. ✓

2. S-II Stage Pulsed Arc MIG Welding:

Reference Notes 11-27-67 Kuers, and Notes 11-27-67 Lucas (attached). NAR has informed us that Pulsed Arc MIG Welding cannot be used for the S-II-9 No. 6 cylinder to dome weld due to reduced properties in elongation and weld repair. We will continue effort to solve the Pulsed Arc MIG problems. ✓

3. 80-Minute Re-start Capability on AS-503 (Manned):

Quite some time ago, MSF placed a requirement on MSFC that AS-503 demonstrate an 80-minute J-2 Engine Re-start capability. To assure this capability, it would be necessary to measure the temperature of the LOX bootstrap line after 80-minutes in orbit on AS-204 and AS-502. Inasmuch as the installation of this measurement on AS-204 could possibly delay the launch, we asked MSF to postpone the 80-minute re-start requirement from AS-503 to AS-504. On Fri., 15 Dec. 67, we received verbal approval waiving the 80-minute Re-start requirement on AS-503, if necessary. ✓

4. Removal of Launch Operational Constraints:

On Wed., 13 Dec. 67, we called a meeting with R&DO and KSC to investigate launch vehicle and GSE changes that might simplify operations at KSC. Among items to be studied are: Reduce size of S-II electrical container covers; Extend life of batteries from 120 to 180 hours; Eliminate requirement for re-calibration of PU electronics; Eliminate requirement for use of antenna hats; Elimination of soft release mechanism; Elimination of damper system. ✓

Attachment: (DIR, I-DIR, R-DIR cys only)

11/27/67

B 11/30

S-II Pulsed Arc MIG Welding Development

A decision has been made by NAR/SD to postpone again the application of the Pulsed Arc MIG (PAM) welding technique on S-II stage hardware. We, at ME Lab, believe that we have all evidence that the PAM technique will produce LH₂ dome to cylinder #6 welds with a substantially lower number of defects than the present process. The engineering data for the PAM technique have been thoroughly evaluated by P&VE, and the results of this evaluation have been summarized by Dr. Lucas in a memo to Dr. Rudolph, July 5, 1967, as follows: "The analysis of the enclosed data demonstrates that for all properties considered, and at all temperatures considered, the PA MIG welds are equivalent or superior to the TIG weld used currently in the S-II stage circumferential welds." The NAR/SD manufacturing management has repeatedly stated that the shops at Seal Beach are fully prepared with their equipment and training of personnel to apply the new technique and that they also believe that they can make higher quality welds by use of this process. The NAR/SD engineering support group has been engaged since June in an engineering evaluation program of this process. This group has repeatedly demonstrated their unwillingness to perform an objective and unbiased evaluation of the PAM technique in support of the hardware program. As evidence of this lack of support, we can cite adverse reports based on test results which were later found to have been obtained on faulty test equipment or on tests performed to determine material properties not called out as engineering requirements; further evidence lies in the fact that the efforts of the engineering support group are clearly not scheduled in support of the hardware program.

Bill Lucas
 Do you
 agree with
 view?
 Ref.
 Dec. 4
 Lucas
 NOTES
 11-27-67
 ↓ B
 What do
 you
 recommend?

For these reasons, which can be summarized as our inability to get through the system, I recommend that we give up any further attempts at introducing improvements in the welding of the S-II structure and that we direct NAR/SD to stop the PA MIG welding development program.

B 11/28

1. NUCLEAR GROUND TEST MODULE: Reference comments to Notes 11-6-67 Lucas, item 8: The \$2.1M of FY-68 nuclear rocket system funds would be used to investigate basic problem areas peculiar to the nuclear vehicle, e.g., radiation effects on liquid hydrogen, materials, components, and equipment. A program to obtain large scale experimental test data on LH₂ heating and stratification by nuclear radiation will be continued. The experimental data will be obtained from a 105-inch diameter surplus tank, with the tests to be conducted by the contractor at the company operated reactor. Also, the contractor will perform irradiation tests on a ground test insulation system, structural materials, cryogenic seals for valves, seals for high pressure quick disconnects, etc., at the LH₂ temperature. The plan within MSFC is to continue the development and verification of computer codes for predicting the nuclear radiation environment and shielding criteria. Sponsored studies to establish a nuclear propulsion module flight system definition considering the new thrust level are proposed. The total funding needed for FY-68 will slightly exceed the \$2.1M; however, a significant and meaningful program can be realized at this funding level. ✓

2. LANCE COORDINATION (ARMY): Herb Fuhrmann and James Kingsbury met again with personnel from the Lance Project Office on 11-17-67. They were most enthusiastic about Fuhrmann's proposal and indicated that they would pursue it with haste. ✓ They also indicated a desire to use MSFC specifications for selecting materials which come in contact with strong oxidizers (MSFC-SPEC-106B) and MSFC methods for cleaning components used in the oxidizer system (MSFC-SPEC-164). We have provided them all necessary information. Furthermore, we agreed to test their existing seal material (butyl rubber) in a gaseous oxygen environment. They have contracted with Rocketdyne to test their seal in IRFNA. * They are most anxious not only to fix their existing problem but to get some data which indicate what the problem was. ✓

3. AAP MECHANICAL PANEL MEETING: The following significant technical agreements were made in the 11-21-67 Mechanical Panel Meeting: (a) MSFC will provide an MDA complete with all structural and functional subsystems installed. MSC will define their requirements for components, systems, etc. for MSFC design and/or installation. (b) Present location of ATM solar arrays was accepted; MSC will modify platforms and umbilicals; (c) Recommend the LM dual purpose docking as a baseline approach with rogue in MDA port 1 and with this modification use 500,000 in/lb bending moment as design limit value for MDA design. (This would solve two of our big problems.); (d) Accepted the 45° rotation of the MDA. Approximately 10 action items were accepted. ✓

S-II PULSE ARC MIG WELDING PROGRAM (PAMIG): As a result of an NAR/SD presentation at MSFC on their PAMIG welding program, representatives from P&VE, QUAL, and ME went to NAR/SD to establish additional work necessary to complete the program. After discussing these additional items, NAR/SD personnel stated that they did not believe PAMIG could be used successfully on the S-II stage regardless of additional effort. That conclusion was based on the low elongation of welds made with this process. NAR/SD plans to submit this position officially to the stage manager. They reportedly will propose an opposed nugget TIG study in lieu of the PAMIG. ✓

Bill Lucas
see my
remarks on
S-II notes
of 11-27-67

inhibited Red Fuming Nitric Acid

A.K.

12/18/67

B 2/15

1. AS-204/LM-1 PRELAUNCH TESTS: The Overall Test (OAT) Plugs-In was successfully completed on 12/12 on the second attempt. There were 3 holds during the terminal count. One of the holds was due to problems associated with the overall Engines Running Test Program. A blown fuse in the S-IB/S-IVB interface voided the transfer to internal power. The other two holds during the test were for functional catch-up. The first OAT Plugs-In was scrubbed on 12/11 due to ground computer problems and an RF problem in the LM. The OAT Plugs-out was completed on 12/15. Holds were encountered during the test as follows: (a) Problem with S-IVB ordnance, (b) Spacecraft battery voltage reading out of specification, and (c) LM swing arm problem. In addition, a Flight Computer/RCA-110 interface problem was encountered. ✓

2. FLIGHT CONTROL OFFICE AT MSC: Mr. Charles Casey has asked me to be relieved of his duties as manager of this office due to his poor health conditions. After obtaining concurrence from R-ASTR-I, have asked the senior MSFC engineer, Mr. Robert Wolf, to assume responsibility of this office. Prime Flight Controller assignments will be William Brady: Apollo 5 (204) and Robert Wolf: Apollo 6 (502). Chris Kraft is kept fully informed and in agreement. All who have worked with C. Casey during the past four years know that he has given a great deal more of his energy and time than could be expected of him. In an unrelated coincidence, Ron Ammons, the MDC lead engineer at MSC has resigned. Mr. Dixon has assumed lead responsibility. ✓

3. DOUGLAS FLIGHT CONTROL SUPPORT: In a recent meeting with MSFC key IO and R&DO personnel Ted Smith explained the results of an internal MDC critique of the Apollo 4 mission. Although not specifically mentioned, it was obvious that the continuous vent incident had triggered this exercise. Ted criticized three major items (applying them to both MDC and NASA): (1) Inadequate depth of reviewing Flight Mission Rules and pertinent operating procedures; (2) Inadequate support responsibility assigned to HOSC and KSC's Central Instrumentation Facility (CIF); and (3) Inadequate communications between the flight controllers and all support engineers. He had a great number of recommendations, some of which have definite merit and all of which will be carefully reviewed for implementation. He proposed to increase the MDC personnel at MSC from four to 15 and to revive the orbital support from the CIF to Houston. As I pointed out to you during the LIEF review (12/15), our orbital support needs some improvements; however, we want to be careful and not overreact to singular incidents. ✓

4. HOLIDAY LOCATOR SERVICE: Upon Hdqtrs. request we have set up, jointly with the two Program Offices, our LIEF locator service during the holiday week for all key MSFG personnel. ✓

1. SPACE-ELECTRIC POWER SOURCES: As a consequence of the letter to Dr. Mac Adams, OART, on the need of space-electric power sources which you signed on August 11, a meeting was held between Dr. F. Schulman, OART, Dr. G. Grover, LASL, D. Beard, AEC, members of MSFC, and GD/GA (now Gulf General Atomic) in San Diego on the question of space power requirements. For the first time, the representatives of OART, AEC, and MSFC agreed that a power source on the order of 100 kWe for the support of technological and scientific activities on orbital stations will be needed around 1976-78. ✓
would like to prepare now a follow-on letter for your signature in which the requirements and features of such a power source are specified in more detail. ✓
Hopefully, a directed effort toward power source development can, at long last, be initiated. ✓

2. EMR-EXPERIMENT: Dr. Glenn Frye and a group from Case Institute of Technology visited SSL this week in connection with their spark chamber experiment, which has been approved by OSSA and is a candidate experiment for EMR. Dr. Frye made some interesting and valuable points regarding the particular requirements for astronaut judgment in carrying out his experiment. Also, Dr. Frye made the usual astronomer's plea for a low inclination orbit to minimize radiation degradation of film. ✓

3. EVALUATION OF SCIENTIFIC EXPERIMENT: Dr. Alan Rosen, Director of the Space Sciences Laboratory of TRW-Systems and supplier of the electron spectrometers for the three Pegasus satellites, visited SSL of MSFC on December 14, and presented as our SSL bi-weekly colloquium a review of the scientific results of the Pegasus radiation data. He emphasized the wealth of valuable scientific information which has yet to be retrieved in detail from the data tapes. He also discussed with members of the Nuclear and Plasma Physics Division of SSL, the possibilities of funding support for the data analysis effort which they hope to keep alive under company sponsorship. ✓

4. METEOROID IMPACT TESTING: In response to a request of P&VE, we are investigating the effects of meteoroid bombardment on large solar arrays and structural components. Projectiles of several milligram are shot into test panels at 8.0 km sec^{-1} . Although the effect of an impact on a solar panel is catastrophic for several cells in the immediate vicinity, the total loss of power for the array is only very small.

Our light gas gun now provides consistently projectile velocities above 8.0 km sec^{-1} . As far as we know, this is the fastest light gas gun in existence for projectiles of 0.5 to 1 mm diameter. ✓

5. Ph.D - DEGREE: Joe Cortez of SSL, Physics and Astrophysics Division, received his Ph.D. degree from the University of Michigan on December 16. His thesis dealt with "Long Range Electrostatic and Electromagnetic Interactions Between Atoms." ✓

NOTES 12/18/67 TEIR

12/18/67

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AS-204 LAUNCH: The Flight Readiness Test is now scheduled for Friday, December 22. If we complete the test then or even as late as Saturday morning, chances are good that we can launch as early as one day later than the current official schedule. If we do not complete the Flight Readiness Test by Saturday morning, the test will slip until after Christmas and chances are that the launch date will slip up to an additional three days. ✓

MERRY CHRISTMAS AND HAPPY NEW YEAR! ✓

1. Visit to University of Tennessee Space Institute and Arnold Engineering Development Center (AEDC): Last week (Dec. 8), H. Becker and a number of our ASO and co-located personnel visited the University of Tennessee Space Institute and toured AEDC. The trip was arranged by H. Thomae who has had various working relations with the group. Dr. B. Goethert has gathered about him what appears to be an outstanding faculty (which he is attempting to expand) of 35 professors, and the Institute currently has about 90 students working toward Masters and Doctors degrees. We gave Dr. Goethert and his staff a brief rundown on our advanced study activities and were, in turn, briefed on the activities of the Institute by Dr. Goethert and areas of individual research by the faculty members. The facilities are quite nice, and they appear to be doing some excellent and creative work. Dr. Goethert has been conducting symposiums and lectures at the Institute. Recent speakers have included Dr. George Welch, Executive Secretary National Aeronautics and Space Council, and Dr. A. H. Flax, Assistant Secretary of the Air Force (R&D). Dr. Goethert would greatly appreciate your visiting the Institute and possibly speaking there at your convenience. Brig. General G. E. Lundquist, Commander, AEDC, greeted us at AEDC, taking time from what was a very busy day. He expressed sincere pride in their association with the Saturn V program as a result of their engine testing and was very complimentary on the flight of 501. He stated his sentiments in looking toward a continuing participation in the program. After the introductory remarks, we toured all the test facilities with Air Force guides. We are preparing letters of appreciation to both Dr. Goethert and Gen. Lundquist.

2. OSSA Mission Planning: It appears at present that OSSA FY-68 and 69 efforts will be aimed primarily toward two prospective new missions, e.g., (1) a Mariner 69 type Mars orbiter in 1971, and (2) a Titan III Mars orbiter in 1973. Boeing and GE are both doing studies (non-contract) of the 1973 Titan III Mars Orbiter mission. There are indications that GE expects a funded study through Langley to continue this work. We have informal sessions planned with Boeing and GE to keep up-to-date on their work, and we are planning a small in-house effort to keep up with this area in order to contribute to it and to insure future MSFC participation. Our earliest efforts are to concentrate on: (1) mission and launch vehicle alternatives for 1973-75, and (2) 1975 Voyager mission analysis/design, that is a necessary prerequisite to Voyager up-date for 1975.