

Sept. 6, 1966

NOTES 8/6/66 BALCH

Bg/8

9/6/66

S-II-1 Testing - Installation of mechanically fastened doublers in place of bonded doublers in the LH₂ tank is complete. Cracks have now been discovered around the feed duct connections to the LH₂ tanks. One feed duct has not yet been checked. Time for repairs and impact on test schedule are being evaluated. ✓

Detailed Operating Procedure for GSE Automatic Checkout Equipment (DOP-M-G082) has been completed, and other GSE checkouts are progressing satisfactorily, excepting those which cannot be run while repairs are being made to the LH₂ tank and feed ducts. ✓

S-IC Test Stand - Final welding on all four holddown arms is complete. Welding on actuators is in process and is expected to be complete within three weeks. Work on air, helium, and nitrogen systems and on main and auxiliary derricks is progressing in support of Boeing need dates. ✓

S-II Test Stand A-1 - Installation of the auxiliary crane, one of the pacing items, has begun and is expected to be complete by the last of September. Brick and mortar construction is lagging, particularly in electrical, welding and pipefitter crafts work. The Corps of Engineers has been asked to take remedial action. The contract change order to S&ID's contract which provided for management services in connection with the activation of the A-1 stand has now been superseded by a new change order which includes facility, technical systems, GSE, and integrated systems checkout. ✓

S-II Vehicle Service and Vertical Checkout Building - The structural load tests on the 60-ton derricks have been completed, and the derricks have been accepted. This leaves only the installation of the pulling mechanism for the vehicle dolly to make this facility fully operational. ✓

MTF LOX Barges - Four MTF LOX barges loaded with LOX are en route to KSC. The first two left on 8/30/66 and the last two left on 9/3/66. ✓

S-IC Management Review for S-IC-3 Stage - This review meeting was attended by the MTF Manager and the S-IC Project Manager for MTF and was very beneficial as preparation for similar meetings to be held prior to shipment of S-IC stages to MTF for testing. ✓

United Givers Fund Drive - The MTF United Givers Fund Drive for 1966 is being organized. Mr. Eaton, General Manager of GE, has agreed to be this year's campaign chairman. Drive period will be during the month of October ✓

ORBITAL WORKSHOP: An Experiments Meeting is scheduled with Air Force (DOD) September 7, 1966, at MSFC. Discussions will include, (a) possible areas of overlap and duplications between DOD and NASA experiments, (b) the integration of DOD experiments into the Orbital Workshop and, (c) schedules. ✓

An Experiments Meeting is scheduled with Astronaut Lt Comdr Alan Bean (MSC Flight Crews Operations) at MSFC September 6 and 7. MSC is particularly interested in the Passivation and Habitability Preparation of the S-IVB Orbital Workshop. Meeting includes a visit to the S-IVB Mockup and discussions with the experimentors. ✓

ARMY CALIBRATION SATELLITES: The ARPA Headquarters has contacted NASA Headquarters concerning MSFC's involvement in their program. The ARPA has withdrawn their request to have NASA consider taking on this task. The reasons for their decision are:

1. They cannot be assured of a flight in the time period 1968 to early 1969 because the AAP flights are secondary to the mainstream Apollo flights.

2. The program costs would be considerably more than ARPA presently has (less than \$1 million) to spend. ✓

ATM: A meeting was conducted with four representatives from MSC headed by Hal Gartrell to discuss our interface with Houston on AAP activities. Specifically, we explained the LM/ATM attached concept, reviewed our study ground rules, and submitted five questions for their consideration and reply as inputs to this study. Also, discussed was the intercenter panel outlook for AAP and MSC's latest planning in this area. Their feelings were generally consistent with ours in that activities should be phased over to the panels as soon as possible. ✓ They are in the process of identifying their AAP participants in panel activities. MSFC took as an action the preparation of a letter with specific questions needing MSC's attention before the panel interface is worked out. ✓

RACK: An access review for the Mapping and Survey System is planned for October 15, 1966, at MSFC. Plans now call for assembly of a payload module into the Rack, installation of the Rack into the SLA, and mounting of the SLA on the S-IVB/IU mockup. ✓

Lea B Has the issue with the Air Force re use of our rack been settled?

9/6/66

B
2/2F-1 ENGINE

The F-1 Engine System and Component Qualifications are continuing. The Qualification Limits Engine Testing completed the 14 scheduled tests and the 44 objectives on 8-31-66. Data and hardware analysis of test results is now underway. The Qualification Endurance engine has completed 2090 seconds in 16 starts and 9 full durations. Five more starts and 160 seconds remain in the test program. Three components of the 48 in the Component Qualification Test Program remain, they are currently in test.

Production engine F-5042 was delivered on dock at Michoud 8-29-66. Engine F-6044 was bought-off at Canoga Park 8-30-66, and is being held for installation of kits. ✓

H-1 ENGINE

Inspection of the engines on AS-207 after the static firing on 9-1-66 indicates no hardware damage. There were no tube splits on this test as were encountered on previous cluster hot firing tests. Site data shows the engines performed generally on the high side of nominal. Sea level data will be available by 9-7-66. ✓

C-1 ENGINE

A basic engine was sent to MSC for testing at the same conditions utilized on the SM RCS engine testing. ✓

J-2 ENGINE

An S-II Battleship test was conducted 8-31-66. The test was terminated after 233 seconds from an electrical short in a connector on engine #4 (J2036). The connector had been disconnected pre-test to replace the ASI assembly.

The remaining four Battleship engines will be replaced with the 205K engines prior to the next hot firing scheduled for 11-11-66.

The LOX pump on engine J-2046 installed on SA 206 S-IVB stage has been replaced and a duration firing is scheduled for 9-14-66.

The second test at AEDC was terminated approximately 700 milliseconds after the start command by the engine fuel pump overspeed device. A phenomena exists in the fuel pump RPM signal to the GSE which multiplies the actual RPM by two. It is thought that this double count is caused by the extreme cold which exists in that test cell (temperatures are approximately 100°F below other test locations). The next test will be attempted with the fuel pump overspeed device removed from the automatic sequence. This is possible since there are other parameters which can be monitored to give an indication of those failures which would result in a pump overspeed. ✓

NOTES - 9/6/66 - CONSTAN

9/6 JAS

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Negative Report

NOTES 9/6/66 FELLOWS

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Supporting Development Program: Last week, we were visited by Messrs. Walt Beckwith, Merle Waugh, and Norm Peil of Ed Gray's office to review the MSFC supporting development program and relate our portion of the program to MSC and KSC. Of a \$23 million FY-67 program, we have a plan for \$10 million; MSC \$10 million; and KSC the other \$3 million. Gentry Miles of the Experiments Office and Martin Koslow, IO Saturn V, met with us and substantial progress was made in obtaining a common interpretation of the definition for items to be included in the supporting development program. A general discussion of the total MSFC efforts, which might be considered supporting development led to a better understanding by the Headquarters representatives of our program and the arrangement of priorities. We, with Mr. Miles, will continue to work with Mr. Beckwith to maintain a balanced supporting development program within the reduced funding currently planned for supporting development. ✓

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9/12

1. S-IVB Stage Dynamics and Control Working Group: Subject working group met at MSFC on August 31, 1966 to discuss S-IVB impact due to mission change on AS-207 and 208 to a dual launch. MSFC presented current mission planning information including mission objectives, configuration, aerodynamics, flight profiles, coast attitude maneuver requirements, and venting constraints. DAC discussed the hardware impacts due to the dual launch and proposed that certain engineering analyses be conducted relative to the mission change. These are mostly thermal, venting, and APS propellant consumption analyses pertinent to the 7 1/2 hour coast requirement. There appears to be no major S-IVB problems associated with the mission change. ✓

2. Saturn V Aerodynamic Drag: Recent analysis of base pressure data from Lewis Research Center's 10 ft. X 10 ft. supersonic wind tunnel indicate a reduction in base drag coefficient. These data were obtained from a model with the present base configuration, without scoops on the engine fairings, and with cold flow through the nozzles. The effect of this change on total vehicle drag will be a reduction of approximately 10% throughout the Mach range encountered by S-IC. We shall make necessary calculations to determine the effect of this drag decrease on vehicle performance. ✓

3. Reusable Launch Vehicles - Design Considerations: Final results of "A Study of Design Considerations of Reusable Launch Vehicles" were presented by DAC to Ames' Mission Analysis Division. Purpose of study was to analyze parametrically the performance and cost of (1) large ballistic reusable launch vehicles and (2) maneuverable (lifting) reusable vehicles. For (1), it was found that for annual transport volumes of \approx 6 million pounds or less, the optimum (in cost) reusable ballistic 2-stage launch vehicle will have to be much smaller than 500,000 pounds orbital payload capability, and certainly smaller than the old NOVA or Post-Saturn concepts. ✓ For (2), significant findings are: Scramjets (Mach 9-10) offer the most potential, in spite of late availability. In terms of performance, airbreathers are superior to rockets. In terms of cost, VTO rockets are cheaper than airbreathers for offset (crossrange) distances under 400 n.mi., and the optimum size of a maneuverable vehicle will be in a payload range between 30,000 and 80,000 pounds. ✓

4. Hypersonic Transport Study: Final oral review of the study: "Performance Potential of Advanced Hydrogen-Fueled Airbreathing Cruise Aircraft" was presented by GD/C to Ames' Mission Analysis Division. Most of the significant findings of this study have already been reported to you. However, fuel costs appear to be the most serious problem of the whole hypersonic transport program. For a hypersonic hydrogen-fueled aircraft to become competitive with a JP-fueled Mach-3 transport, the hydrogen production costs would have to be lowered by two orders of magnitude, from 30 cents per pound (mass produced) to 0.3 cents per pound. ✓

E.F.
It might be of interest to determine whether with compound -

user nuclear plants (breeder reactors for desalination and electric power generation) this kind of cost reduction is in the cards (long range) B

9/6/68

B 9/11

1. S-IC-1 CHECKOUT: Regarding your comments to NOTES 8-8-66 GRAU and NOTES 8-15-66 GRAU (copy attached), present planning is for the Boeing Company to provide redesigned hardware in the affected areas for installation and verification on the S-IC-2 stage during post-static checkout. This will provide additional confidence for the adequacy of the new design prior to installation of similar hardware on S-IC-1. Concerning the seriousness of the lox pre-valve internal nuts which are unwired, this condition has been reviewed within R&D Operations, and it is understood that P&VE feels confident there is no problem. However, we still maintain that a potentially serious problem exists (if the nuts work loose they would follow the propellant flow into the turbines) and have written UCR's against the design accordingly. The lock nut torque on two valves which had to be disassembled for other reasons was measured for both tightening and loosening. On one valve which failed in receiving inspection the values were 1 to 7 and 1/2 to 7 inch-pounds respectively. On the other valve which had completed more than 2300 seconds firing time on the F-1 single engine test stand, the values were 0 to 7 and 0 to 5 inch-pounds tightening and loosening respectively. Our concern is somewhat supported by the fact that a design change has been approved to correct this situation on Boeing-built stages S-IC-3 through S-IC-10. A Center decision has been made, however, that no changes will be made to the valves on S-IC-1 or S-IC-2. ~~The balance of unscheduled rework required at KSC is not of consequence when compared with rework requirements of other stages shipped to the Cape Manufacturing Engineering Laboratory estimates only 30 man-hours of rework required to correct these deficiencies.~~

*omitted
by Mr. Kraus.
Bh 9/8*
2. S-IC-2 CHECKOUT: Post-static checkout of the S-IC-2 stage has been delayed as a result of late installation of Engine #1 and the F1-PAM/FM Assembly. Both of these items are now installed and it is expected that lost time will be regained. ✓
3. J-2 ENGINE FIRST ARTICLE CONFIGURATION INSPECTION (FACI): The J-2 Engine FACI was recently completed at Rocketdyne. Seven corrective actions were posted by the Documentation and Specification Committee, primarily affecting definition rather than configuration of the Contract End Item. Twelve corrective actions posted by the Hardware Committee and one by the Test Procedures Committee were considered more serious. Those posted by the Hardware Committee could affect hardware configuration. The one posted by the Test Procedures Committee involved an unauthorized deletion of a required test. ✓

ATTACHMENTS: NOTES 8-8-66 GRAU and NOTES 8-15-66 GRAU
(Dr. von Braun's and Mr. Weidner's copy only)

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1. AS-202 GUIDANCE & CONTROL SYSTEM EVALUATION: Post-flight evaluation indicates an accumulation of 1.7 m/s crossrange (Z) velocity by the LVDC before 8 seconds of flight time. This is a very high acceleration in Z at this time but not impossible. However, other sources such as tracking and spacecraft guidance do not show this change. This is similar to the problem encountered on 203 but not explained. However, on 203 the condition occurred during holddown and was on the downrange accelerometer.

Preliminary results of the 202 evaluation reveal that correlation exists between the times that the computer had a large velocity output and the saturation of the crossrange accelerometer pickoff. This occurred at 2.4 to 2.6 seconds where the computer showed a velocity of 12 pulses (0.6 m/s) and at 5.7 seconds where the computer showed a velocity of 22 pulses (1.1 m/s). This problem also has been correlated in the 201 and 203 flights. A review of this problem reveals that a high concentration of vibration energy (acoustical) at the frequency range of 30-50 Hz exists. The concentration of vibration energy in this spectral region appears unique to the honeycomb structure of the IU. The critical frequency associated with the accelerometer servoloops is also in this spectral region (42 Hz). Investigation of the characteristic response of the platform attached to the honeycomb structure versus the platform response of the SA-10 structure indicates that this spectral frequency vibration is more prominent for the honeycomb structure. Solution to the problem would require improvement of the dynamic environment to which the platform is subjected. It is necessary to either stiffen the primary IU structure or redesign the platform brackets so that it would attach on or as near as possible to the IU closeout rings. It is believed that the latter suggestion would be the simplest and would result in little or no weight penalty. Various fixes are being investigated jointly by P&VE and ASTR.

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S-1C

The S-1C-3 stage will be shipped on September 22, 1966, and installed in the MSFC test stand on October 3, 1966. The test stand is ready to receive the stage. ✓

F-1

F-1 Engine S/N F-3014 was installed in the West Area F-1 Test Stand on August 30, 1966, and preparations were made for test FW-052 scheduled for September 7, 1966. ✓

S-1B

Test SA-38, the short duration firing on stage S-1B-7, was conducted on September 1, 1966, for a duration of 35.46 seconds. Functional performance of all stage systems was satisfactory. The first line supervisors of S&ID, (MTF) were here to witness Chrysler and Vitro perform the countdown. ✓

IU SKIN PANEL FAILURE

Reference the IU Skin Panel failure in the test area during 501 Arm Test in June 1966. A test program was run for P&VE with a modified IU skin panel to further evaluate the apparent structural problem with the IU. During calibration with approximately 650 pounds force applied normal to the vehicle skin, the IU umbilical again debonded. This was corrected by bolting doublers around the debonded area. The tracking tests were conducted on the 2nd of September with the following results:

Excessive flexure of the skin panel in the area of the IU vehicle plate was experienced, even at 0.3 cps oscillation of the vehicle simulator. The test was halted to prevent damage to the structure, and no further testing will be conducted until the problem is solved. ✓

NOTES 9-6-66 HOELZER

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Negative Report

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FLIGHT COMPUTERS AND CONTROL FILTERS FOR ALTERNATE AAP MISSIONS: You will recall that at the Management Council meeting on August 23, 1966, the Saturn IB presentation included coverage of our problems in developing flight control computers and associated control filters for the alternate AAP missions. Our primary purpose was to acquaint the Council with the fact that, in accordance with our present development schedule, we need early decisions on whether we are to fly primary Apollo or alternate AAP missions, and that we need early definition of the alternate missions. You will also recall that the lead times we presented were completely unacceptable to Dr. Mueller following which you gave clear direction that MSFC must find ways to accept the needed decisions a relatively short period before launch. In response to this direction, I have scheduled a meeting for this coming Thursday with the laboratory directors and their involved personnel to develop possible courses of action. We will keep you informed of our progress. ✓

SINGLE POINT FAILURE IN EDS SYSTEM: An MSFC team has recently completed hardware review of the EDS design in all stages. The review has revealed that although we have redundant wires, these wires in some cases pass through a single connector. This is regarded as a possible single point failure on AS-204 and subsequent. Technical Systems Office has sent us an ECR requesting contractor ECP action to correct the possibility. We expect quite a severe impact from all three stages. Saturn V will have the same situation. We will keep you informed of results. ✓

REWORKED PC BOARDS FOR THE RCA 110A COMPUTER: You will recall that we had to rework the PC boards from our RCA 110 computers at KSC to correct for cracked solder joints. The rework procedure involved installing a small copper tubelet on the component lead at the solder joint. The repaired boards have functioned very well since their installation in the computers at KSC. In addition, RCA has recently completed life testing of the repaired boards and the tests indicate that we can expect at least five years of life from the repaired boards. ✓✓

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MSFC Proposed Experiments Status - The MSFC proposed experiments status summary charts have been updated and revised, in conjunction with I-S/AA personnel, to show the status of feasibility studies, definition studies, Experiment Coordination Panel actions and MSFEB actions. ✓

MSFC Experiments 3-7, Project THERMO - During the 9-1-66 Project THERMO Panel meeting the "Rack" was chosen over the LEM descent stage as a carrier for the experiment definition effort. ✓ The first cut of the experiment proposal (Form 1138) is scheduled to be completed on or about 10-1-66. A status briefing to you is scheduled for 10-3-66. ✓

Chrysler Electrostatic Gripping Device - We have started an action to investigate the applicability of the electrostatic gripping device demonstrated to you recently at Michoud. A telephone conversation with Mr. Vehko and a Mr. Hagen (the inventor) indicated that they were going on with development of the device, and welcomed our active interest and support. Since they do not yet know precisely what the holding mechanism is (but assume electrostatic attraction), there may be some fairly severe problems arising in the design of a space qualified tool. A man from my office will work with Chrysler and ME Lab on this. We will set up a short briefing for you and interested MSFC personnel, to occur later this month. ✓

9/8/66

B 2/12

1. National Machine Tool Builders' Association Visit: Last week the Board of Directors of the National Machine Tool Builders' Association held one of its meetings in Huntsville by invitation of R-ME. The Board included presidents and officers of companies like Cincinnati Milling Machine Co., Bullard, Grey, Landis, etc. These people were most impressed by what they saw at R-ME, R-ASTR, and R-TEST and expressed a desire to use technology development from the space programs in their equipment, e.g., flat cable, magnetic hammer, tube flaring. Any formal requests for information will be routed through the Technology Utilization Office. ✓

2. Aeronautic and Space Manufacturing Engineering Forum: (See attached pamphlet) The Society of Automotive Engineers is conducting this Forum October 3-4, 1966, in Los Angeles. As a part of this activity, a panel meeting will be held on the subject "Maximum Utilization of New Manufacturing Engineering Technology" under the chairmanship of Dr. R. L. Leshner, Assistant Administrator for Office of Technology Utilization, NASA Headquarters. Participants in the panel meeting will be: Mr. Kotanchik, Chief, Structures and Mechanics Division, MSC; Mr. Weidner, MSFC; Mr. Boucher, Senior Director of Manufacturing, DAC; and Mr. Nezbeda, Vice President, Grumman Aircraft Corporation. The panelists' presentations will be centered around new manufacturing engineering technology and will describe their particular postures toward dissemination of information to NASA Centers and industries engaged in space work. Headquarters personnel are also very interested in obtaining information which can be used in preparing reports for FY-68 budget requests to Congress -- using examples of technology interchange which have affected savings, prevented duplication of effort and the like. ✓

Pamphlet attached for DIR only.

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9/6/66

1. NUCLEAR GROUND TEST MODULE (GTM) - The preliminary Research and Development plan was reviewed by Mr. H. B. Finger and his staff at AEC Headquarters on September 1. Messrs. Hellebrand, Brooksbank, Connell, and Jordan participated for MSFC. Mr. Finger congratulated MSFC for the quality of the plan and accepted the technical scope and schedule included. While he will do his utmost to increase his funding for GTM in FY 67, it is apparent that he will not be able to completely fund our requirements, primarily in support for the R&DO Single Support Contractor. ✓

2. RACK/PM - Negotiations between MSFC and MSC have resulted in the acceptance by MSC of interface activities through the established Saturn Apollo Interface Panels. It is not known what Air Force reaction to this method of operations will be since MSC doesn't have a direct contract, or direct control, over the PM contractor. It is mandatory that some configuration control be established immediately on the PM or MSFC will be unable to continue design of the RACK for this application. MSFC, MSC, and the Air Force will discuss this subject this week. ✓

3. AS-202 FLIGHT RESULTS - MSC still hasn't determined why the 202 CM landed 200 miles short. (The start of re-entry conditions was correct.) It appears that the lift-over drag ratio was not as high as expected. (This was the first closed loop re-entry guidance.) This is not significant enough to delay manning. We have been able to confirm that we did get a breakup of the S-IVB main tanks by abrupt loss of signal at two stations. ✓

4. CONTRACT NAS8-18117 - On 8-12-66, a 12-month contract was initiated with General Electric to develop human factors engineering design data for maintenance and repair of advanced space systems, using the ME Laboratory Water Immersion Facility. ✓

5. DYNAMIC DESIGN CRITERIA - NERVA II ENGINE - A meeting was held on 8-25-66 between personnel of the Vibration and Acoustics Branch (R-P&VE-SV) and representatives of Space Nuclear Propulsion Office (SNPO) Cleveland, Westinghouse Astronuclear, and Aerojet General for a final review of Nerva II engine dynamic design criteria. All the contractors' questions pertaining to the criteria were answered and the criteria are to be included in the preliminary design criteria document by SNPO. ✓

NOTES 9/6/66 MAUS

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FY-1968 AO BUDGET - Messrs. Bernie Johnson, Charles Bingman, and John Forley, MSF, will be at MSFC on Wednesday and Thursday, September 7 and 8, to conduct a detailed review of FY-1968 AO funding requirements. They desire to discuss in detail the following areas: (1) Manpower requirements and personnel compensation, including overtime; (2) All support contracts, whether AO or R&D funded (emphasis on total manpower); (3) Operations of installations; and (4) Travel.

The primary purpose of this visit is to convey Dr. Mueller's philosophy regarding AO/R&D FY-68 funding problems with emphasis on reductions to the Administrative Operations requirements as discussed in the Lake Logan Hideaway Meeting. ✓

NOTES 9-6-66 RICHARD

Negative report.

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A.R. If we do not insist on this, we might as well notify Dr. Mueller that our responsibility ends with arrival of a stage on dock KSC. I doubt that we will ever buy that. B

1. SA-501 Status:

- o S-IC-1 Stage - in route to KSC via Poseidon which is currently in dock at Michoud. Scheduled to depart Michoud on Wednesday, 7 September 66, and is expected to arrive on dock KSC on Monday, 12 September 66. ✓
- o S-II-1 Stage - in test stand at MTF. Bonded doublers have been replaced by mechanical doublers. First acceptance firing forecasted for Wednesday, 24 September 66. On dock KSC date forecasted for 5 November 66. ✓
- o S-IVB-501 Stage - at KSC. No problems todate. ✓
- o S-IU-501 Stage - at KSC. No problems todate. ✓

2. S-IC-T Stage - (Ref Notes 8/29/66 Kuers - copy attached). The S-IC-T is not being updated to SA-504 configuration. The stage is being updated to the minimum configuration required to conduct facility system demonstration test at MTF. Changes are relatively minor. ✓

3. S-II Battleship Stage - test fired for the last time on Wednesday, 31 August 66, for 233 seconds (full duration planned). Early termination by automatic cutoff apparently caused by an intermittent short in electrical control assembly package on outboard engine #4 position. ✓

The Battleship stage will now be prepared for boattail environmental tests to be conducted in late September or early October 66. ✓

4. LOX Barges for KSC:

- o KSC expects to be ready to reload LOX into repaired storage tank during time period of September 10-15, 66. ✓
- o KSC requested the loan of four (4) barges of LOX from MTF to permit timely replenishment of LOX storage tank in order to minimize schedule impacts on 500F and, in turn, the readiness to accept 501. ✓

o KSC request can be fulfilled without MTF impact. First two (2) barges departed MTF on Tuesday, 30 August 66 and are expected to arrive on Thursday, 8 September 66. Last two (2) barges departed MTF for KSC on Saturday, 3 September 66 and expected to arrive at KSC on Monday, 12 September 66. ✓

5. Configuration control of MSFC hardware at KSC - Brian Montgomery at KSC was informed by Gen Shinkle on Friday, 2 September 66, that approval of a Field Engineering Change by a MSFC Resident Stage Representative is not acceptable to Gen Shinkle or Dr. Debus. Gen Shinkle will submit his counter proposal this week (expected on 8 September 66). ✓

Your 9 March 65, MSFC/KSC Relations stated in Part III - Specific Responsibility Relationships, paragraph 1: "MSFC shall be responsible for the determination and control of configuration of the launch vehicle and MSFC-designed GSE. MSFC shall be responsible for approval of all changes in configuration."

This is to alert you of a potential problem, however, I will keep you advised.

Attachment: a/s (DIR, I-DIR, & R-DIR's copy only)

9/6/66

Bj/12

1. A 204/205 and 501-502 operations support requirement review meeting was held at GSFC. The Eastern Test Range (ETR) and Manned Space Flight Network (MSFN) was reviewed to ascertain their readiness to support these missions. No serious problems were uncovered and the networks will be ready for adequate support. ✓
2. A two part meeting was held at NASA Headquarters: The first part concerned MSFN configuration and the second a status report on the MSFN. ✓

OTDA has money problems and is trying to tighten its belt and eliminate the nice-to-have support sites. The elimination of Kano, Canton Island (CTN) and Tananarive (TAN) was discussed. It was agreed that CTN would be phased out sometime next year. Its coverage will then be supplied by a re-entry ship. Kano will be phased out after GT-12. Voice relay will remain through 204 and 205. TAN, presently a STADAN station, will remain in its present configuration except for the addition of an FPS-16 C-Band Radar. It is anticipated that the two Gemini ships, Coastal Sentry Quebec (CSQ) and Rose Knot Victor (RKV) will be phased out after 206. MSC is pushing to keep these ships through 278. Dual S-Band update capability will be added to all single USB sites, except for Grand Bahama Island. The injection aircraft are having problems finding suitable staging bases. Cocos Island in the Indian Ocean is a serious case. It will cost approximately \$2.3 million to make this island suitable. Without Cocos there will be gaps in coverage on the 3rd orbit injection on flight azimuths 72 to 95°. This coverage is now classified as mandatory. MSC has the action to evaluate this impact.

GSFC presented the MSFN status. A severe Apollo support ship problem exists. There have been many slippages in schedule and the tendency to eliminate ground stations and substitute their coverage with these ships is causing a large impact. The injection aircraft also have a general slippage in schedule, but no impact on the Apollo program is anticipated. The rest of the network seemed quite satisfactory. ✓

3. Most data, other than telemetry tapes, being received for AS-202 evaluation has been both late and, in general, of poor quality. The close launches of 203 - 202 probably caused an overload on KSC with resultant data problems. A data critique of 202 will be held shortly, where the problems encountered on this flight will be reviewed and corrective action taken to insure against their repeating. ✓

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Keith
Wible
Request
your
comment
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1. PROBLEMS IN HIRING YOUNG PH. D. 'S: In the attempt to build up MSFC's capability for space science type projects (ATM and the like), we encounter a grave difficulty: young Ph. D. 's, even with a few years of past - Ph. D. experience, often cannot be offered more than a GS-11 at MSFC. This is about three thousand dollars less than industry offers under similar circumstances. We are working closely with Mr. K. Wible and Mr. A. Sanderson to find a way of improving this untenable situation. Any support that M-DIR could give Mr. Wible and Mr. Sanderson would be highly appreciated. ✓

2. FURTHER DEVELOPMENT OF EMR PROJECT: Bill Taylor, MSF, called on September 2 and requested information on our EMR work; Dr. Mueller had asked him to familiarize himself with our proposal. We described to him the present status of EMR along the lines of my recent memo to you, copy attached, and we sent him the short paper that you showed to Dr. Mueller on August 19. ✓

NOTES 9-6-66 WILLIAMS

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1. Joint Space Station Effort: An all-day working session of the space station activities will be held at MSFC on Wednesday, September 7, 1966. ✓

2. Planetary Joint Action Group: As a result of the JAG meeting at the Cape with you and Dr. Mueller, we are preparing a new "report." Rather than a Preliminary PDP, we are now writing a "Summary Report" which will describe only one solution to a manned Mars/Venus flyby system and what the schedule and cost will be. For this we will use the "product improved" Saturn V (1.8M lb. thrust F-1 engine and elongate the S-IC stage accordingly) and the modified S-IVB stage for the orbit launch vehicle. This approach still takes four total launches/mission with no backup vehicles. The first launch will carry the 180 K "spacecraft," 2nd, 3rd, and 4th launch a S-IVB with orbital stay time of approximately 20 to 40 hours. ✓

3. Lunar JAG: We are just winding up our effort on the Lunar JAG, which is to be reviewed at the September Management Council Meeting. I plan to set up an internal review as soon as we get the material completed and definitely before the Management Council Meeting. ✓

4. Combined S-IVB Workshop/LEM/ATM: I am supporting Ludi Richards in pulling this story together for R&DO and will assist Lee Belew as he desires. ✓

Sept. 12, 1966

NOTES 9/12/66 BALCH

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S-II-1 Testing - All five LH₂ feed duct connections to the LH₂ tank have cracked welds and are being repaired. Dr. Mueller, Gen. Phillips, Gen. O'Connor, Gen. Greer, and others met at MTF, Saturday, September 10, to review the situation and its impact on 501 schedule. S&ID estimates repairs can be accomplished and LH₂ tank closed out by 9/21/66. LH₂/LN₂ tanking is currently projected for 9/29/66 and first firing for 10/4/66. ✓

Received for review and concurrence S&ID's data requirements for tanking and static firing. Release is expected by 9/13/66. ✓

Overall installation of hardware instrumentation to support checkout of stage electrical control systems and static firing is about 90% complete against current scope and is expected to be complete by 9/16/66. Checkout is about 60% complete. Channelization and calibration for static firing is proceeding in support of current test schedules. ✓

High Pressure Gas Facility - LH₂ pump and vaporizer system has been checked out and is ready for use in S-II-1 tanking. ✓

S-IC Test Stand - Installation of holddown arms and actuators is still progressing satisfactorily. Installation of the erection derrick for use in erecting the main derrick has been completed, and work on the main derrick is proceeding with no major problems. ✓

MTF LOX Barges - The first two MTF LOX barges loaded with LOX arrived at KSC on 9/8/66. The remaining two are scheduled to arrive on 9/13/66. ✓

Educational Opportunities at MTF - Plans have been finalized for Board of Institutions of Higher Learning of State of Mississippi to organize extension program at MTF for site personnel and their dependents. Eight state educational institutions will participate, and both undergraduate and graduate courses will be offered. ✓

NOTES 9/12/66 BELEW

B 9/12

ASTRONAUT INTERFACE: 9/8 9/12 A meeting was held last week with Lt. Commander Alan Bean of the MSC Flight Support Systems Office to discuss astronaut/experiment interface as well as astronaut participation in the area of integration activities. Lt. Commander Bean's office will take an active part in experiment and integration activities. Lt. Commander Bean went through each orbital workshop experiment in minute detail using the full scale mock-up. ✓

ORBITAL WORKSHOP EXPERIMENT MEETING: In addition to the astronauts, DOD Experimentors were here for a one-day data exchange. Colonel Ballentine is the DOD lead on these experiments. ✓

AIRLOCK CONTRACT: Negotiations are complete between MSC and McDonnell Aircraft. MSFC had two men participate in the final negotiations. The contract will be sent to McDonnell next week for signing. ✓

ATM EXPERIMENTS: Contract transfer from GSFC to MSFC - GSFC has had difficulties in finalizing the contract actions prior to transfer. Harvard and GSFC have contacted MSFC for direct design and development support for their respective experiments. These requests are being considered.

(Experiment development Plan)
EDP Status -

A preliminary review of the EDPs with Headquarters representatives was held on September 7, 1966. Several recommendations were made and are being incorporated. Submittal to Headquarters will await a review with Mr. Dishar, which is scheduled for September 14, 1966. ✓

S-027: A negotiation with the University of Wisconsin was held at MSFC on 9-7-66. It is estimated that it will be October 1 before contract go-ahead. ✓

LUNAR MAPPING AND SURVEY SYSTEM (LM&SS): A meeting was held with North American and with the Payload Module Contractor for the LM&SS during the week of September 6. It was decided that MSFC would study the feasibility of providing platforms to be mounted on the Rack for servicing the Payload Module prior to launch. ✓

SECOND MONTHLY REVIEWS: The Second Monthly Reviews were held this week with Lockheed Missiles and Space Company and Martin Company. The next reviews will be a formal review at the completion of the three months study phase. These reviews will also be at MSFC sometime after mid October. ✓

1" Please

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C-1 ENGINE Tests were continued with the basic engine in a nozzle-up attitude to determine the susceptibility of the Block II injector to oxidizer face failure when maintained in a continuous altitude (100,000 feet) environment. To date 5,715 pulses and over 1,060 seconds of hot firing have been completed by RMD under a variety of pulse widths and fire fractions at 60°F, 40°F, and 20°F propellant inlet temperatures without failure. Pulse widths as low as 0.010 seconds at 60°F and 0.020 seconds at 40°F and 20°F have been successfully demonstrated. Tests with as many as 2,000 pulses per duty cycle will be demonstrated at various fire fractions with both fuels, MMH at 20°F and 50-50 at 40°F. ✓

H-1 ENGINE Oil contamination was discovered this week at KSC in the nitrogen purge supply line to the LOX seal cavity on Engine H-7065, Position No. 4, SA-204.

Swab checks revealed that the LOX seal cavity and the final section of internal nitrogen purge supply tubing are not contaminated. All of the parts which were contaminated will be removed, cleaned, and reinstalled on the engine. Vehicle schedules have not been affected.

Apparent cause for contamination was a combination of a faulty seal in the gearcase cross fitting and a leaky check valve in the gearcase pressurization line which would allow gearcase preservative oil to back up into the LOX seal cavity purge line. Corrective action is being taken to prevent recurrence. ✓

F-1 ENGINE The procurement plan for Apollo Applications Program F-1 Engines submitted to NASA Headquarters under date of 8-12-66 was returned without action by letter from Dr. Mueller dated 9-2-66. This action will jeopardize the ability to provide F-1 engines in a timely manner for AAP. ✓ The procurement cycle according to the most recent experience, is in excess of twelve months. The procurement lead time for F-1 engines is 81 weeks from receipt of contract proceed authority. In order to provide for continuity of production after delivery of the 106 engines now under contract, the Contractor should have proceed authority by March 1967. The suggested resubmittal of the procurement plan in December as proposed in Dr. Mueller's letter will result in a serious production gap unless lead time requirements can be drastically reduced. A study of what we can do to reduce some of the lost times involved will be repeated and a reclama will be prepared if in fact we are convinced that a serious production gap and/or inability to support the AAP will result from this lack of approval. *I don't think PEM has another choice at this time B*

The formal F-1 Engine Qualification Test Series was completed on 9-6-66. However, approval of this incentive milestone will not be given until all test data has been reviewed and disposition of problems encountered during the test series has been determined. A backup test program was initiated in order to properly determine the disposition of the previously reported injector baffle erosion which is the only critical component in question. ✓ *See Grav NOTES 9-12-66 B*

J-2 ENGINE Engine J-2060 sustained a rough combustion cutoff last Friday at the Test Laboratory. The cutoff occurred during transition after an 80 minute recycle following an abort due to no detection of ignition. It is suspected that the instability was due to ice forming on the injector as an unheated LOX dome purge was used. There was no obvious hardware damage but a Rocketdyne injector expert has been flown in to assist in hardware and data evaluation.

Thirty-one of forty-one components have completed the Component Qualification Test Program. The Component Qualification Program is scheduled for completion by mid-November.

The next test at AEDC is scheduled for Tuesday, 9-13-66. This test will be attempted with the fuel pump overspeed cutoff device removed from the automatic sequencer. Fuel pump speed will be observed visually on strip charts.

The J-2 Program Review is scheduled for 10-11-66 at Rocketdyne. The formal teardown inspection of the Qualification II 230K engine hardware will be included in this review. ✓

NOTES 9/12/66 CONSTAN

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Nothing of special significance

NOTES 9/12/66 FELLOWS

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Quality Training Program - During the two day review of POP 66-3, September 7 and 8, Bernie Johnson and a staff from Headquarters reviewed the Quality Training Program, with particular emphasis on AO funding activities. During the discussions, Fred Sittason, representing Quality, reported that as of January 1966, there were 35 single support contractor employees assigned to the school. Current plans are to phase down to 22 contractor employees by April 1967. It was pointed out to the Headquarters representatives that school courses are prepared in response to an expressed need by an R&DO lab and are conducted for our own benefit. Attendance by students from other centers, contractor facilities, etc. is on a space-available basis. We do not schedule courses because other people want to attend. The NASA representatives appeared satisfied with the points made concerning the training program. Further review of this program will be performed in about two weeks by the ad hoc committee of which Mr. Huth is chairman. At that time, Quality will provide to the committee a position on other facets of reliability and quality assurance training. ✓

1. Compression of Required Apollo/AAP Mission Change Lead Time: Of the areas contributing to lead time requirements in which our laboratory is involved, i. e. software for guidance, control, mission planning, and timelines, the first two, and related hardware problems, were discussed in a meeting called by Col. James on Sept. 8, 1966. It was concluded that an extension of the validity of a set of equations and data to relatively large varieties of similar missions, is one way of achieving the desired flexibility. However, particularly in the control area, and to a lesser degree in the guidance area, it appears that not all foreseeable AAP missions can be covered by broadened tolerances around one typical standardized profile. A first estimate is that in the control area up to six such profiles may be needed. Therefore, to supplement this broadening of tolerances, a parallel approach of several potential profiles for one flight has to be investigated. Limitations of manpower dictate that for the earlier missions, profiles presently in existence should be used as a baseline. Gradually, these will be supplemented, until the entire spectrum of missions is covered. The availability of manpower (primarily Chrysler and mission support contractors) is one of the most serious remaining problems.
2. High Reynolds Number Facility: Dr. Smelt, Lockheed's Chief Scientist, recently inquired about any new developments concerning our High Reynolds Number (Hi-Re-No) Facility proposal. His interest was stimulated by some experimental difficulties with Supersonic Transport Wind Tunnel experiments. Nature of these difficulties seems to verify the validity of our arguments for such a facility. While the Hi-Re-No Facility proposal is presently inactive as far as official channels are concerned, the concept and need for the facility are still under consideration in the NASA Research Advisory Committee on Space Vehicle Aerodynamics. I intend to follow up on this facility proposal at the next committee meeting in late October.
3. Orbital Wind and Micrometeoroid Velocities Detection: Since October 1964, we have been developing a laser heterodyne technique for measuring gas velocities. The instrument employed when using this technique, measures a selected component of the instantaneous gas velocity, by sending a laser beam through the flowing gas, and heterodyning the light scattered from tracer particles (dust, smoke, other natural tracers) with the original beam. Successful measurements have been made in a laboratory setup, and subsequently in our wind tunnel over a wide range of velocities using smoke as a tracer. A three-dimensional instrument is expected to be available by January 1967. Further in-house wind tunnel tests are in progress. Present equipment is being modified to handle flows with appreciable turbulence (e. g. turbulent jets, boundary layers, ground wind). Using this technique, we have initiated a five month program to prove the feasibility of measuring wind velocities. One experiment to be conducted, will be to measure wind velocity across a 20 mile wide valley. Long range potential of this program will be to measure wind velocities from satellites. Another potential application is in the detection of micrometeoroids. Studies are in progress to determine feasibility of measuring micrometeoroid velocities. Measurements will be made using existing hypervelocity facilities.

E.F. →

I understand "Jule" Schuler in Test Lab has also played with Lasers as flow and velocity meters,

but he has been disappointed with the results

B

NOTES 9-12-66 GRAU

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1. S-II POST-STATIC CHECKOUT DEFICIENCY REPORT: With reference to your suggestion on NOTES 8-22-66 HEIMBURG (copy attached), we have established the UCR reporting system, effective on the S-II stage also, which will record all deficiencies discovered from the time the stage is assembled until it is launched. The system also provides a positive correction action and follow-up loop. ✓
2. S-II-1 POST-STATIC CHECKOUT: A meeting was held at MTF recently between representatives of MSFC and S&ID to define the post-static checkout activities for S-II-1. An abbreviated checkout was decided upon due to the time limitations placed upon checkout by MSF through I-V-S-II. It was acknowledged by all concerned that the proposed checkout would only partially validate the stage, and that stage acceptance would have to be accomplished at KSC after further checkout there. We view this approach as highly undesirable, and it is understood that the practice of sending incompletely checked out stages to KSC will be discontinued after S-II-1. ✓
3. F-1 ENGINE COMPONENT QUALIFICATION: F-1 component qualification testing has been completed, and we are in the process of evaluating 43 final reports which have been submitted recently. Preliminary findings indicate that the reports, in general, are not acceptable. This Laboratory and P&VE Laboratory will select sample discrepancies and forward them through IO for answer and/or correction. Until the reports and/or tests are revised or rerun, as applicable, the F-1 component qualification program will not be considered complete. ✓
4. CCSD UNSATISFACTORY CONDITION REPORT (UCR) SYSTEM: A representative of this Laboratory attended the negotiation with CCSD on implementation of an automated system of UCR reporting. It is anticipated that the proposal which was originally submitted for \$319,000 and later changed to \$124,000 will finally be settled for approximately \$95,000. Pending approval by I-I/IB-SI/IB the program should be operational by October 1, 1966. ✓

ATTACHMENT: NOTES 8-22-66 HEIMBURG
(Dr. von Braun's and Mr. Weidner's copy only)

NOTES 9/12/66 HAEUSSERMANN

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No submission this week.

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S-IVB-206 (SACTO)

S-IVB-206 remains on schedule for the re-firing on Wednesday, September 14, 1966, with no problems foreseen. The duration of the firing will be 70 seconds in lieu of the planned full duration. The side load restrainers will be dropped, but the engine will not be gimbaled. The simulated static firing was successfully completed on Friday, September 9, 1966. ✓

S-IB-7

Data evaluation of the short duration firing, performed September 1, 1966, showed Engine Positions 3 and 4 performed slightly above the specified thrust limits. Engine No. 3 increased 3.1 K above the thrust value measured during acceptance firing at Neosho and engine No. 4 gained 2.4 K. No explanation for this performance shift can be found. The duration firing is scheduled for September 13, 1966. No re-orificing of the engines will be made for this test in order to find out whether the high thrust values are repeated. ✓

S-IVB (MSFC)

Test S-IVB-035 and S-IVB-036 were conducted on September 9, 1966. Test S-IVB-035 was terminated at X+1.47 seconds by the engine control package when an "ignition complete" signal was not received. The problem was traced to a faulty ignition detect probe. Test S-IVB-036 followed the previous test by approximately one hour and 33 minutes. Cutoff was initiated at X+3.5 seconds from engine start by the VSC (vibration safety cutoff device). Chamber pressure was approximately 480 p.s.i.g. (63% of total). Preliminary visual inspection revealed no damage to the hardware. An investigation will be started to determine the cause. Personnel from Rocketdyne arrived this morning. ✓

502 SERVICE ARM DELIVERIES

An evaluation of the test program, considering hardware shortages, was made. In a meeting on September 8, with KSC (Buchanan) and Col. Russell of NASA Headquarters, it was agreed to ship the 502 service arms at the end of December. This supports the 502 vehicle stacking based on a one month slip in the S-II Stage Schedule. This is approximately a one month slip from previous schedules. The test schedule is a "Success-Only" schedule with no allowances for hardware problems and is based on a six day, 60-70 hour work week. It does not consider the Arm 7 problem (see below). ✓

ARM No. 7 (S-IVB FWD) I.U. UMBILICAL PROBLEM

Ran tests last week to determine the loads from the harpoon gun of the service arm on the I.U. structure. Load data were erratic. I.U. structure was not designed for continuous loading. KSC to present today to R-TEST and R-P&VE a feasibility study of a "modified" lanyard system, which would eliminate these loads, but make utilization of existing system. R-TEST will evaluate and meet with Saturn V Office September 13. To convert to a Saturn IB lanyard would require five months to fabricate, test and refurbish. ✓

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9/121. WIND LOADS IN "REAL TIME":

For the first time engineers of P&VE could watch, here in Huntsville, the wind load on the Saturn booster while on the launching pad. Strain gages were attached to the Saturn 202. The signals which were relayed to the ground station in the Computation Laboratory and in the Simulation Branch were used to calculate and to record in real time the wind's torque and its direction. ✓

An input/output system of Honeywell 3C has been installed and undergoes acceptance tests. This system records the output of the analog computers on a digital computer tape. The data then can be stored, cross plotted or manipulated in any manner desired. Not only can results be stored accurately over long periods of time but the labor of cross plotting and gathering statistical data by hand is eliminated. Also, the machine can be used to produce special driving functions for analog simulations. ✓

2. INSTALLATION OF AN IBM 1050 TERMINAL AT KSC: An IBM 1050 terminal has been installed at KSC for the purpose of transmitting Fedstrip and Milstrip supply requisitions through the 7740 computer in the Data Center to the Communications Building at MSFC, for retransmission via Autodyn to the proper supplier. At a later date this terminal will also be used by KSC to inquire into Marshall inventory concerning the availability of excess quantities of items stocked by MSFC, thereby providing better utilization of Marshall excess. ✓

3. COLONEL GOULD VISIT: Colonel H. A. Gould, Special Consultant to the House of Representatives' Committee on Science and Astronautics will visit MSFC on September 21, 1966. The plans call for Colonel Gould being with Computation Laboratory for about three hours. A presentation of the Computation Laboratory covering the points provided in the guidelines furnished by NASA Headquarters is being prepared. This presentation will be held in the Computation Laboratory, Building 4663. ✓

NOTES 9/12/66 JAMES

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LEAD TIME FOR ALTERNATE AAP MISSIONS: We had a meeting on September 8, 1966 to examine the problem of reducing the lead time for flight control computers and to enumerate the other long lead time items involved in supporting the alternate AAP missions. We met with Mr. Richard, Dr. Geissler, Mr. Horn, Mr. Hellebrand, Mr. Fichtner, Mr. Mack, Mr. Moore and other key Astrionics, Aero and P&VE lab personnel plus Mr. Reinartz from the AAP office. We assumed that we would have sufficient definition of the alternate missions to permit us to conduct parallel design and fabrication of control filters and assessed that this would permit us to select the required flight control filter as late as three months prior to launch. At this time the instrument unit would either be at the Cape or about to be shipped there. This would mean that the control computer with the selected filter could not go through IU checkout with the IU. The computer would be put through IU checkout using a standard filter, not necessarily the one for flight. Thus far, only the 204 computer has gone through IU checkout with the IU. The computer with the selected filter could be installed in the IU at KSC at a point in the test schedule mutually agreed to with KSC. We have not coordinated these aspects with Dieter Grau but we agreed at the meeting they are practical and necessary. We also have not impacted required changes to our contracts or the costs involved in pursuing the parallel design and production approach. Mr. Richard will have further meetings with the labs to insure that our tentative conclusions are valid. In addition, Mr. Horn agreed to take the lead in conjunction with Astrionics in pursuing other possibilities such as relaxing critical tolerances in the hope of permitting us to develop a more standardized filter or set of filters with broader capabilities. This approach needs encouragement. We will schedule additional meetings in conjunction with Mr. Richard to further discuss significant matters, such as orbital sequencing, mission operations requirements, orbital maneuvers, propulsion prediction, guidance, AAP payload to vehicle interface, and vehicle interface to launch vehicle GSE which could impose a more severe constraint in determining the AAP mission decision points. We will continue to keep you informed.

NOTES 9-12-66 JOHNSON

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Air Force Discussion on Orbital Workshop Experiments - Col. Ballentine and Lt. Col. Sanders, from the AF office at MSC, visited MSFC on 9-7-66, to discuss possible duplication of activities between DOD and NASA experiments. MSFC-MS-C-HQ's management arrangements were reviewed by Mr. Ferguson, I-S/AA, and Col. Ballentine presented the DOD experiments. There appears to be no duplication between DOD and MSFC in present plans. ✓

Discussion of Orbital Experiments with Astronaut - Commander Bean visited MSFC on 9-6/7-66, to review with the principal investigators the intentions of the Orbital Workshop Experiments. The major benefits of this review was to give the experimenters a better appreciation of the needs of detailed information, and the difficulties and limitations under which the astronauts will be performing. ✓

Pegasus Rendezvous and Retrieval - The Study Group headed by Mr. James Belew, R-AS, is continuing the preparation of a consolidated NASA Form 1138. An Experiment Development Plan (EDP) will be started as soon as possible, using inputs from the NAA and Emerson contracts. ✓

A NASA HQ's group, consisting of Messrs, D'Aiutolo, Keller, Novik of OART, and Dr. Werner, MTX, will be at MSFC on 9-14-66 for a status review of the experiment. ✓

Re your questions on NOTES 8-22-66 and 8-29-66 - (Attachment 1 & 2) - The Experiment is now planned to fly on SA-210, in the I. U. as a passenger experiment. MSFC was initially brought into the experiment at the direct request of Mr. Dick Ashworth (who works for Nancy Roman). Information is going back to her through established channel (Forsythe) in the S/AAP Office at Headquarters. We are also keeping her informed through informal contacts. ✓

A contract has been negotiated with the University of Wisconsin, which is Dr. Kraushaar's home institution, to provide the experiment hardware and conduct the experiment. It will be forwarded to Headquarters for review this week. ✓

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ME Laboratory Interface Activities with Lt. Commander Alan L. Bean, S-IVB Astronaut: (Four photographs attached) As a result of the arrangements by Bill Ferguson, on Tuesday afternoon of last week, Lt. Commander Bean spent about 2 hours in the ME Laboratory neutral buoyancy Zero "g" simulator, executing typical astronaut activities as anticipated for the S-IVB Workshop. He used the Arrowhead Mark IV suit, air pressurized and ballasted to a neutrally buoyant condition. Underwater movies and a video-audio taped recording were made of the activities and his conversation. These should be available for critique purposes by the middle of next week. Lt. Commander Bean was quite enthusiastic and outspoken about neutral buoyancy as one of the mandatory methods of simulation for all the S-IVB Workshop experiments. In addition, he apparently had been told of our plans regarding the new large neutral buoyancy type simulator, and in response to his point blank questions regarding this, he was candidly shown the design blueprints by responsible ME personnel. Consequently, Houston is now aware. He expressed sentiments of urgency regarding the completion of the big facility in time to assist in the S-IVB, 209 experiment development. ✓

On Wednesday, Lt. Commander Bean spent almost the entire day with the S-IVB Workshop 209 experimenters in the mock-up area. The first half day was allotted to the four ME Laboratory experiments (ST-124 removal, P.U. valve removal, electron beam welding, and exothermic brazing). The only reservations he expressed concerned the P.U. valve removed from the J-2 engine, primarily on the grounds that: (a) absolutely two astronauts are required, one to work and another to observe, (b) translation way back to the engine area and entering a potentially dangerous area such as the engine compartment is "hairy". He suggested a task board approach for this one. ✓

Tethers were discussed, and he demonstrated considerable interest in the ME Laboratory pneumatic tether concept. As a result of his experience in removing bolts from a simulated S-IVB hatch cover in the neutral buoyancy tank, he recommended 4 hand holds on the cover---this is being done. ✓

In conclusion, the entire 2 day experience was unbelievably beneficial to the Marshall personnel who participated. ✓ Lt. Commander Bean proved to be extremely alert and cooperative, and urged continuing consultation and communication with him in the future. He also promised to return at any time his assistance is desired. It appears more fortunate for Marshall that Lt. Commander Bean was selected for this task. ✓

Photographs for DIR only.

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NOTES 9-12-66 LUCAS

1. PROJECT THERMO - The October 3 presentation to you on Project Thermo, for which P&VE is designated the Lead Laboratory, will be attended by MSFC personnel only. We have promised to give MSF (Doug Lord, E. Z. Gray, Taylor, and others) a similar presentation in Washington right after October 3 with the hope of an early mission assignment (213, 510). On request from OMSF, PIO, information was furnished for their use in a Defense Marketing publication on this project. ✓
- 360-11 ✓
2. SATURN V SYNCHRONOUS ORBIT STUDY - A final presentation of the results of an inhouse study on Synchronous Orbit Missions for Saturn V will be given on 9-16-66, at 9 a.m., in room 409, building 4200. The objectives of this study are to analyze means of adapting the Saturn V Vehicle for selected synchronous orbit missions and to define the necessary modification kits which are to be installed at KSC. Modification kits defined will be based on (1) no modification to the Saturn V prior to KSC delivery, and (2) minimum modifications. A summary of the final presentation will be given to you on 9-13-66, at 11 a.m., in room 915, building 4200. ✓
3. MSFC LUNAR SURFACE ACTIVITIES/PROGRESS REPORT - The film which depicts MSFC vehicles and mock-ups related to lunar surface activities is complete, and a copy is available for loan to interested groups. The film was made at the request of Mr. Shepherd and is to be used in the September Management Council Meeting. ✓
4. F-1 QUALIFICATION TESTING IS COMPLETED - Qualification testing of the F-1 Engine was completed on 9-6-66. During this testing, engine F-5039 was successfully subjected to 32 safety limits and 11 malfunction test objectives. The endurance engine F-5037 was successfully subjected to 20 tests for a total duration of 2284 seconds, which included 10 full duration runs. After both engines have been subjected to the second electrical and mechanical checkout, the endurance engine will be completely disassembled for inspection. ✓
5. SATURN V S-IVB/IU UMBILICAL TESTING - Saturn V S-IVB/IU umbilical testing in the swing arm farm has shown that the harpoon gun on the KSC arm is putting excessive loads into the IU. This problem has been discussed with KSC, IO, and Test Laboratory. KSC asked for additional tests which would permit an attempt to balance the forces of the harpoon gun. After this balancing of forces has been completed, a determination will be made if the IU can withstand these forces which are unknown at present. If the harpoon gun forces are too great for the IU, it may be necessary to utilize the lanyard system presently employed on the Saturn IB Vehicles or modify the IU. ✓
6. TITAN II SILO SUPPORT BLOCKS - We were queried this week by Air Force people on our experience with 7079-T6. The Titan II is mounted in silos and supported on four 7079-T6 forgings. These are cracking. We informed the Air Force of our problems with this alloy. ✓

B 9/15

REVIEW OF AO FUND REQUIREMENTS A detailed review of MSFC AO fund requirements and manpower levels for FY-67 and 68 was conducted on Sept. 7 and 8 by Messrs. Bernie Johnson, Charles Bingman, and John Farley of MSF. This review resulted from the MSF Hideaway action item to investigate the pros and cons of reducing FY-68 AO manpower and dollars and to report the results to the Executive Session of the Management Council in September. The review included (a) detailed discussions of our requirements for manpower and for AO funds in all areas; (b) general discussions of the use of AO and R&D funds and the rationale which Marshall applies. The result of this review was a request, placed by Mr. Johnson, for revised FY-67 and 68 AO fund requirements. This information will be used in Dr. Mueller's preparation for the Management Council Session. Data is due in MSF on September 14. FMO is generating the necessary data under assumptions specified by Mr. Johnson as follows:

- a. FY-67 fund requirements should be within the guideline of \$127.994 M plus the pay raise costs of \$2.657 M which will be provided for by Headquarters. Increased relocation costs resulting from the recent legislation will not be additive to the guideline figure.
- b. The FY-68 level of support and effort will be the same as that which can be provided in FY-67 within the FY-67 ceiling. Cost increases such as escalation in wages and prices for goods and services may be submitted but must be thoroughly justified and substantiated.

Additional details were requested on our maintenance and repair fund requirements and on overlap costs for third generation computer equipment.

Mr. Johnson stated that the likelihood that we will receive the additional spaces (150) which we requested in FY-68 is, in his opinion, very small. ✓

MSF POP 66-3 An advance copy of the MSF position for MSF POP 66-3 has been received. The MSFC Apollo total and the amounts for projects in FY-67 are consistent with MSFC POP 66-3 except that our requirements in excess of the original guideline provided by MSF are dropped.

MSF specifies the amounts for cost and end of year uncOSTed carryover for major Apollo contractors. These values are the target values (provided to MSF by IO) which Dr. Mueller is placing by letter on major contractors. The difference between these targets and the MSFC estimate for the major contractors will be carried in the Saturn V account not identified with the major contractors or shown as uncOSTed carryover into FY-68.

The FY-68 total for MSFC Apollo effort is \$1,239.5 M (\$.6 M less than MSFC's POP 66-3 requirement of \$1,240.1 M). However, MSF includes a \$30 M management reserve within this total and directs that operations be planned so that the amount could be withdrawn without major program realignment.

The attached chart shows a detailed comparison of MSFC's POP 66-3 to the MSF POP 66-3. ✓

NOTES 9/12/66 RICHARD

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R&D Operations Support of Program Assessment: A plan is being developed with Industrial Operations and R&D Operations Laboratories, which provides for an R&D Operations assessment at each testing milestone in the Saturn IB and V programs. The main objective is to provide an environment which allows a better technical status of the stages prior to their transfer to the next testing site. This will provide a more efficient and better technical assessment to the respective stage managers in making transfer decisions. In addition, it will identify and expedite action on technical problems. ✓

NOTES 9/12/66 RUDOLPH

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Negative Report

NOTES 9/12/66 SPEER

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Negative Report

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E.S.
taken off the agenda! more time available to develop a good coherent plan!
B

1. LUNAR WORK AT MSFC: In a number of conversations last week with Culbertson and Beattie (MSF), Piland (MSC), and F. Williams (ASO), the following plan to help define MSFC's future activities in lunar exploration evolved. F. Williams and I will jointly present our proposals to MSFC management this week. A Center position should be developed during this presentation. On September 21 the following presentations are planned for Dr. Mueller during the Executive Council Meeting in Washington:

- a. Lunar Exploration Program as Visualized by MSF and OSSA - Culbertson
- b. Comparison of Augmented LM with LM Shelter - ?
- c. MSFC past activities in lunar exploration; present status of program and contracts; desired future activities - Stuhlinger
- d. MSC past activities in lunar exploration; present status of program and contracts; desired future activities - Piland
- e. Discussion and decision of future Center activities and responsibilities in lunar program - Mueller, von Braun, Gilruth

I told Culbertson that we will probably bid for responsibility for the LSSM, drill, staff, and several well-defined experiments (IR, UV, gravimeter). He said that this sounded very reasonable to him. Piland's reaction was similar to Culbertson's, although it was evident that MSC's plans had not yet been developed very far. These discussions were completely non-committal, of course.

2. VISIT WITH DR. SHOEMAKER: During very interesting and fruitful discussions on lunar exploration with Dr. Shoemaker and his associates at the USGS Institute of Astrogeology, Flagstaff, last week, we learned that Dr. Shoemaker is now taking the initiative in the formulation of lunar exploration missions. He will form an experimenter team, to prepare a proposal on an AAP lunar surface geological reconnaissance experiment program for submission to OSSA's Space Sciences Steering Committee. Dr. Shoemaker will request us to furnish two or three members of this experimenter team.

3. VISIT TO UNIVERSITY OF ARIZONA: Last week Jim Downey and I visited the University of Arizona. Dr. Kuiper is very deeply interested in plans for planetary exploration. He recommended very strongly that the second ATM project be a 40" telescope for planetary observation, particularly for UV spectra of Mars, Jupiter, and Saturn. He also recommended that the first instruments to be landed on Mars be UV spectrographs to reveal (1) composition, mass and density of the atmosphere, and (2) the UV environment with which life has to cope on the Martian surface.

We also discussed the UV experiments proposed for the EMR stabilized platform with Dr. Tiff of Arizona and Dr. G.R. Carruthers of NRL. Since the UV experiments on the platform must all point (view) in the same direction, it is necessary to establish a viewing program mutually attractive for both experimentors. Other interfaces between the NRL and Arizona experiments were also discussed. It seems that the far UV experiments being pursued by NRL and the photographic UV experiments of Arizona will be completely compatible.

NOTES 9-12-66 WILLIAMS

9/8 9/12

B 9/18

1. MTA: The GM MTA passed the Acceptance tests at Aberdeen Proving Ground on September 7 and 8, 1966.

September 19, 1966

9/20 JFS

B 9/26

NOTES 9/19/66 BALCH

S-II-1 Testing - Repair of LH₂ feed duct connections is continuing. Completion of repair and tank close-out is now expected on 9/25. LH₂/LN₂ tanking is currently projected for 10/2/66 and first firing for 10/8/66. ✓

S&ID's data requirements package for tanking and static firing was approved and released on 9/13/66. ✓

Installation of instrumentation, channelization, and calibration for S-II-1 static firing is proceeding in support of current test schedules. ✓

S&ID's Detailed Test Plan for first static firing is expected to be submitted for approval this week. ✓

Stage Electrical Control System Checkout (DOP-MO1-B010) was started on 9/15/66 and first phase was completed on 9/16/66 with no major problems with stage or GSE. ✓

Overall status of detailed operating procedures (DOP's) was reviewed on 9/15/66, and though there is some delay in submissions, no major problems are expected. ✓

S-IC Test Stand - Installation of holddown arms and actuators is complete. Main derrick boom cradle has been set, boom is being assembled on apron, and hoisting engine is being set in place. Technical systems installation is proceeding satisfactorily. All activation activities are presently on schedule, and no problem in meeting current schedules is foreseen. ✓

S-II Test Stand A-1 - GSE end item deliveries are still lagging although some improvement has been made. Postponement of modifications to GSE with consequence that they must be installed at MTF continues to be a problem. Technical systems installation threatens to slip because of prospective slippage in JOD's and partial BOD's. Work-arounds with extended shifts will be explored as remedy to this problem. ✓

MTF LOX Barges - All four LOX barges have been unloaded at KSC and No. 4 and No. 5 are returning to MTF. At approximately 10:40 p. m., EST, Friday, 9/16/66, LOX Barge No. 5 was significantly damaged and LOX Barge No. 4 superficially damaged while making transit of a manually operated swing bridge on the Caloosahatchee River approximately 18 miles east of Fort Myers, Florida. Preliminary damage estimates for the two barges, based on assumption of all valves being inoperable, is a minimum of \$250,000. The bridge was dislodged from its center pier of approximately 4 feet and bridge tender estimates approximately two weeks repair of the bridge. Barges have been checked for safety and were released for movement at approximately 6 p. m., EST, Saturday, 9/17/66, for remainder of trip to MTF. ✓

J. B.
Who pays for the bridge damage?
B

→ probably at 2 mph! B

✓ 1.0. Investigation under way? B
(Ed O'C.)

NOTES 9/19/66 BELEW

Bg/28

9/20/66

ORBITAL WORKSHOP PROJECT FUNDING: NASA Headquarters is in the process of preparing substantiating paperwork for releasing funds to MSFC for the Orbital Workshop. It appears that they are prepared to release in the neighborhood of \$2.5M to AAP if MSFC can provide justification for Workshop IU software and systems engineering. ✓

209/210/211/212/213 TETHERED MISSION CONCEPT: The payload integration contractors made an "interim" report to our in-house people on their analysis of this mission concept. In view of the discussions which have been taking place at MSFC, we will follow up to "update" our contractors on: 1. the status and direction of our in-house study, and 2. particular problem areas we are working. ✓

ATM EXPERIMENTS: The GSFC contracts have been transferred to MSFC and reorientation of the efforts has been initiated. ✓

INTEGRATION CONTRACTOR SUPPORT FOR EXPERIMENT DATA: A review of experiments has been held with both LMSC and Martin this week in specific areas where they lack data. Other centers are being contacted as required to provide the necessary support for experiment/integration analysis. ✓

MAPPING AND SURVEY SYSTEM: A study has been initiated to determine the feasibility of flying the Rack with the M&SS payload in order to carry additional experiments along with the M&SS payload. Two approaches are being considered in preventing intersection of the mapping view angles with the Rack. One approach is to "scallop" the upper ring to provide sufficient view angle. The second approach is to raise the Payload Module in the Rack for reducing the clearance between the Payload Module and the service module engine. Both adaptations would require significant Rack re-design and would have an effect on the Rack delivery schedules. ✓

RACK FUNDING: R&DO is preparing a break-out of projected expenditures of the Rack funding between laboratories. It is expected that the funding will be released to the laboratories this week. ✓

B 9/27

9/20
9/20
C-1 ENGINE The operating characteristics and durability engine testing were continued. As of 9-7-66, a total of 63,494 seconds of hot firing time had been accumulated in 137,222 engine starts.

The test of the basic engine in a nozzle-up attitude at continuous altitude (100,000 feet) was continued. The engine has successfully accumulated 2,000 starts with 0.020 seconds pulse on-time with propellant temperatures of 20°F and relative long off-time (3 to 14 seconds) between starts. ✓

F-1 ENGINE Engine F-6044, the first engine for Vehicle SIC-6, was delivered to Michoud on 9-12-66, ahead of stage need date. ✓

An F-1 Engine Quarterly Program Review will be held at Rocketdyne, Canoga Park, California on 9-27-66. Program progress, problem areas and solutions, and the results of the Qualification II Program will be discussed.

Backup testing of the original qual endurance engine injector has been initiated in an effort to determine the cause of erosion and effect of the resultant fuel leakage on engine performance. Several tests, including a bomb induced instability which damped satisfactorily, have exhibited normal engine performance. The eroded baffle section has been removed from the injector and replaced with a new section. No discrepancies were found upon removal of the eroded baffle section. This injector has been returned to RETS for further testing in an engine system. ✓

H-1 ENGINE There is no apparent H-1 engine hardware damage from the full duration firing of Vehicle SA-207. Preliminary performance data indicates very good repeatability with the short duration firing. The thrust is on the high side of nominal, but there will not be a requirement to reorifice. ✓

J-2 ENGINE On 9-14-66, a test at AEDC was prematurely cutoff by the vibration safety cutoff system (VSCS) after approximately 650 milliseconds of operation. Investigation of the test data and hardware by MSFC, Rocketdyne, and AEDC indicated that the cutoff was caused by ice forming in the injector. The investigation is continuing and a procedure for the next test is being prepared by MSFC.

It has been concluded that the rough combustion cutoff at Test Laboratory on 9-9-66, resulted from ice on the injector. As a result of the joint investigation by MSFC and Rocketdyne, it was decided to use heated purges on subsequent tests.

The S-IVB stage 206 was re-acceptance test fired on 66.6 seconds to verify the integrity of J-2 engine (J-2046) following replacement of the LOX turbopump turbine wheels. The wheels were replaced because they exhibited excess rubbing during the original acceptance firing. The re-acceptance test was accomplished without impacting the stage schedule.

All modifications on the five J-2 engines for S-II 501 have been completed. The only effort remaining is some minor leak checks that will be completed within the present stage schedules.

Three J-2 engines were delivered this week. Two engines were allocated as spares and the third engine completes the set for S-II 505. ✓

9/20/66

B 9/27

S-IC

S-IC-3 - successfully passed Simulated Static Firing (SSF) milestone and is undergoing incorporation of "changes" prior to shipment to R-TEST on September 25. ✓

S-IC-4 - very little testing accomplished during the week with "change outs" in progress and scheduled to continue thru September 29. Two deep scratches were found in the lower bulkhead of the fuel tank. They are approximately one half inch apart, and it appears as though a tool had been dropped in the tank. Further investigation is in progress and an engineering evaluation is forthcoming.

S-IC-5 - moved September 13, from the VAB to the horizontal assembly station. Installation of internal and external work scaffolds in progress and will be the major effort for the next 5-6 days. ✓

S-IC-6 - thrust structure and intertank are complete; the fuel tank is being painted; the forward skirt and LOX tank are complete and the LOX tank is to be pressurized about October 1, 1966. ✓

S-IC-7 - thrust structure is 55% complete; the intertank is 35% complete, and the forward skirt is 20% complete. Build-up of the fuel and LOX tanks is progressing on schedule with the close out weld on the fuel tank made on September 15.

S-IC-8 - center engine support 90% complete. Fabrication of the skins and lower fuel bulkhead for build-up of the fuel tank complete. Lower fuel bulkhead and the Y-ring presently being prepared for welding.

George C.

Let's find out why the man who dropped it did not report it! If people start hiding goofs like this, we'll find ourselves in endless trouble! B

NOTES 9/19/66 FELLOWS

NA
9/20

B
9/27

Research and Development Plans for Lead Laboratory Task Assignments:
Preliminary Research and Development Plans (RDP) have been furnished by R-DIR to IO for three of the five lead laboratory task assignments in which IO is involved. The preliminary RDP for the Damper System was presented orally to Dr. Rudolph on August 11 and 12. The preliminary RDP's for the Nose Cone and the Rack were furnished IO on August 16. The final RDP for the Damper System was furnished IO on September 15. The final RDP for the Nose Cone is being forwarded this week. The initial RDP for the S-IVB Workshop is being coordinated within R&DO. NASA Headquarters requires a Project Development Plan (PDP) for the Apollo Telescope Mount (ATM). A preliminary PDP for the ATM was sent to IO on July 25. Astrionics, the lead laboratory for the ATM, is working closely with IO in finalizing that PDP. ✓ Close cooperation among the laboratories, the R&DO staff, and IO is making it possible to move out rapidly with mutually agreeable Research and Development Plans at the same time work on the tasks themselves is being done. ✓

9/20/78

B 9/27

1. Hypersonic Transport Study: Re: your comments on this subject in Notes 9/6/66 Geissler, copy attached. (Note should have read "from 30 cents per pound to 3 cents per pound.") Ames' Mission Analysis Division has just contracted with Airproducts Company to conduct a study of methods of producing liquid hydrogen cheaply, including nuclear breeder reactors. ✓ We shall report results as soon as available. LINDE (Sacramento) is not optimistic about achieving the 3 cents per pound production cost. They estimate a reduction to 10-23 cents per pound to be realistic. One more problem concerned with producing LH₂ for the hypersonic transport: To produce LH₂ for 1000 flights per day by present methods (from natural gas), it would require power equivalent to the generating capacity of the whole country, as well as the amount of natural gas consumed by all of American industry. In addition, the large amounts of CO₂ produced as a by-product would have to be disposed of. ✓

2. Voyager Parachute Tests: At the recent AIAA Aerodynamic Deceleration Systems Conference in Houston, Texas, one of the interesting papers dealt with earth based testing of Voyager/Mars parachutes. In this paper, J. C. McFall and H. N. Murrow of Langley reported on the NASA Planetary Entry Parachute (PEP) Program, which uses rockets and balloons to conduct recovery of Voyager-like payloads under deployment conditions envisioned for Mars entry, i. e., high Mach numbers ($M \geq 1.2$) and low densities (earth altitudes between 30 and 90 km). "Quick Look" data of the first test successfully conducted on August 30 at Walker AFB, were presented. The 1600 pound Voyager capsule was launched in an upward direction by 12 solid rockets from a 26 million cubic feet balloon floating at 39 km altitude. At Mach 1.2, an 84 ft. ringsail parachute was deployed and the conical aeroshell jettisoned. The recovered 200 pound payload (plus 325 pounds ballast) included the onboard cameras which operated successfully. ✓

3. SA-501 S-IVB LOX Tank Baffle: Evaluation of 203 orbit data and recent simulations of SA-501 show a need of one baffle in the S-IVB LOX tank of SA-501. A memo is being sent to I. O. requesting installation of the baffle at the LOX surface at S-IVB injection. ✓

I.O.

Com-
patible with 501 schedule?

B 9/27

9/20/66

B 9/27

1. SATURN IB PROGRAM: A recheck for contamination found in the gearbox pressurization line on engine No. 4 on S-IB-4 was negative and the engine will be used "as is". However, to preclude the possibility of lube backing up from the gearbox into the lox seal cavity when the stage is in the horizontal position, a CCB directive has been issued to remove the gearbox pressurization check valve and cap the lines any time the stage is in horizontal position. ✓
2. ECA PACKAGE THERMAL CYCLE TESTING: Findings from the thermal cycle test program at Rocketdyne lead us to predict that there are cracked solder joints in all delivered ECA packages. However, cracked joints don't necessarily result in functional failure. Tradeoff of alternatives for the ECA on 204 at this time lead us to recommend going with the package presently installed. This recommendation is based on the extensive engine test program without a functional failure due to a cracked joint on the block IV ECA. Consideration is being given to the addition of external insulation. KSC is being advised to take special precautions in conducting checks which involve the ECA. This is the kind of position we detest being put into; however, the only better alternative from the Reliability viewpoint at this time is to redesign the P.C. board assemblies.
3. KSC SUPPORT CONTRACTOR REVIEW: Representatives of this Laboratory assisted KSC in a review of S&ID and DAC support contractor operations at that center. These reviews were requested by Dr. Rudolph after a presentation given to MSFC Saturn V personnel by the support contractors and by KSC personnel on August 31 on Quality and Reliability operations at KSC. The time utilized for formulation and conduct of this KSC managed review did not permit a very detailed survey of all existing or potential problem areas. However, the review conducted did not reveal any severe problem in the support contractors area. It does appear, however, that KSC Support Contractor interface problems exist which require action on the part of KSC management.

D.F.

How about later birds? →

B
(What action is I-Engine taking?)

Have they been so advised?
B

NOTES 9/19/66 HAEUSSERMANN

B 9/27

9/20/66

1. ST-124M ACCELEROMETER VIBRATION PROBLEM: As a result of excessive vibration experienced by the platform on AS-203 and 202, a change in the 204 flight program is being considered as a temporary fix. This fix would be to reduce the reasonableness test constant in the X and Z channel to ± 0.3 m/s; the previous value was 30 m/s. In other words, any change which exceeded 0.3 m/s per comp cycle would be rejected and a pre-stored value substituted for the accelerometer reading. This change would be in effect for the first 10 seconds of flight only and would keep any error from the accelerometer to a small value (± 0.5 m/s or less). An investigation is being made on possible modification to the ST-124M mounting bracket and/or relocating the mounting points in the IU. Also, Astrionics and Bendix are looking into design changes in the platform which would allow the platform to accept higher vibration levels. A meeting has been scheduled 9/27 to review all investigation results and make recommendations on the approach for a permanent fix in the platform area. It is hoped that this permanent fix can be incorporated in S-IU-501 since it is an R&D vehicle.

2. STRATOSCOPE II PROJECT: On 9/13 and 9/14 the review committee, under the chairmanship of Mr. J. Boehm, for the Stratoscope II Program had the first opportunity to see the assembled hardware and witness actual tracking operations at Perkin-Elmer Corporation. The schedule encompassed the following: (a) presentations on the development and testing of Stratoscope II, the optical systems applied, the TV systems and the ballon system (launch-recovery operations); (b) description and reference to both the Stratoscope II hardware in view of the assembled flight system in the Stratoport and the ground equipment in the Astronomer's Van; (c) actual tracking demonstration in the Stratoport and Astronomer's Van. ✓

Lee James

Has this recommendation been accepted and incorporated into the 204 flight plan?

B 9/27

9/20 JFS

B 9/27

F-1

Test FW-052 was conducted at the West Area F-1 Test Stand on September 13, 1966, with F-1 engine S/N F-3014 for a mainstage duration of 41 seconds. Cutoff was initiated by the facility panel operator as planned. The engine will be removed from the facility on September 19, 1966, and returned to R-ME (S-1C-1 spare). ✓

S-IVB-206 (SACTO)

A successful 66.6 seconds duration firing was accomplished on S-IVB stage 206 on September 14, 1966. The purpose of the test was to verify the stage subsequent to the engine turbopump being replaced. The turbopump was found to be defective after the initial full duration firing. All systems performed satisfactorily in the September 14, 1966, test. ✓

S-IB-7

The full duration firing was performed on Tuesday, September 13, 1966, at 14:49 CST. The duration from ignition command to outboard engine cutoff was 139.7 seconds. All engines operated within thrust specifications except engine position No. 7 which was slightly above specification. A fuel leak developed at the connection of the bootstrap line to the gas generator on engine position No. 1. No other discrepancies were noticed after the test. Data review showed satisfactory performance of all systems. After functional and leak checks the stage will be prepared for removal, scheduled for September 20, 1966. ✓

ARM No. 7 (S-IVB FWD) I.U. UMBILICAL PROBLEM

Reference Notes of 9/12/66 (copy attached for Dr. von Braun and Mr. Weidner). In the meeting with the Saturn V Program Office and local KSC representatives, it was agreed to change Arm No. 7 to a modified lanyard system utilizing the existing harpoon gun system, but minimizing the loads introduced into the umbilicals. Change will result in a three week schedule slip for delivery to Cape for 502 Arm. A modification kit will be supplied KSC for retrofit to the 501 Arm. A meeting is scheduled Thursday, 9/22/66, at KSC to discuss design and schedule impact on 501 and 502 vehicle checkouts. ✓

HYDROGEN FIRE IN PLANTS AREA 1

Hydrogen fire occurred on 9/13/66, in the old Jupiter M-1 site as a result of bourdon tube failing at 7500 p.s.i. in high pressure gauge. Three storage bottles of 104 cubic feet were being tested for hydrogen embrittlement investigation requiring pressure cycling up to 8000 p.s.i. System required five hours to bleed and burn at gauge failure leakage point. No remote shut-off was possible as control lines immediately burned. Corrective action provides transducers rather than gauges and auxiliary remote control system. No major damage resulted from fire. Damage consisted of loss of electric cabling and three high pressure gauges.

K.H.

Should we apply this lesson to the flight hardware also?
What action if any has been taken? JB

B
9/27

9/20 FD

1. CSC STATUS: Our support contractor has 447 people on board as opposed to the 477 which is the average approved manpower ceiling. We feel that the contractor is doing a good job recruiting. The costs, however, are going to be greater than expected due to the fact that CSC could not pick up as many local personnel as expected, and because the airline strike caused recruiting to be more difficult and expensive. We do not have a firm feel for additional cost, but it is expected to be significant. Otherwise, things are progressing with no real major problems. ✓

2. AAP DATA HANDLING STUDIES: Computation Laboratory has been requested to perform two related study details for OMSF-MLD: "Plans for Post Flight Data Handling", and "Plans for Archival Storage of Experiment Results." This request was received through the AAP Office of Industrial Operations. The Laboratory is preparing an affirmative response outlining a five-man effort for approximately four months. ✓

NOTES 9/19/66 JAMES

9/20/66

Bg/27

KSC RESIDENT OFFICE: I think you are aware that General Shinkle, in a letter concerning Field Engineering Changes (FEC's), has questioned the role of our resident office in the configuration control that we exercise at KSC. General O'Connor is answering this in writing and that should satisfactorily take care of the problem. It appears that KSC has decided to question resident offices in general. Joe Shea in August decided to set up a strong resident office at KSC. We understand that Dr. Debus objected and that Dr. Gilruth had to go to Dr. Mueller to obtain permission to set up this resident office. It is reported that Dr. Mueller agreed but stated that after a trial period he would evaluate the role and the assistance of the resident offices. Therefore, on 13 September Joe Shea announced his resident office at KSC under the leadership of a Mr. Kapryhan. It is interesting that each of the design centers strongly see the need for resident offices at KSC and are able to make them work but KSC has continued to resist them. ✓ *LBJ Let's hold the line i B*

FOLLOW-ON SATURN IB PROGRAM: We have been checking Headquarters carefully on the follow-on program. As you will recall, Dr. Seamans agreed in principle to ordering long leadtime items for the S-IB and S-IVB stages. We have had a continuous struggle getting the MA's through Headquarters so that we could begin negotiations. Friday, the MA's passed through John Disher's office and are now with Sam Phillips. I have talked to Sam and he will expedite getting the MA's through his office and Mueller's and back to us. We expect to begin negotiations on these items by the end of this week. ✓ *2 B*

CHANGES FOR MANNED SAFETY: As one might expect now that we are near to possible manned flight, we are having a rash of proposed changes involving manned safety. Many of these involve the software which is already delayed until the last possible KSC need date. Examples of these changes are: changing the ignition time of the S-IVB retros to avoid a small possibility of bumping with one retro out; adding redundant connectors in the EDS redundant circuits to avoid the possibility of losing both circuits if a connector is broken off; etc. We are evaluating all such changes carefully with a view to making the change if the probability of mishap approaches the criteria for manned flight. It is possible that some of the changes now being considered will impact the present schedules. ✓

NOTES 9-19-66 JOHNSON

9/20/66

B 9/27

Cross Beam Correlation Technique Presentation to Headquarters -
Arrangements have been made for a 9-22-66 R-AERO (Dr. F. Krause) presentation at Headquarters on the status and future program plans for Support Research and Technology activities in this area. Indications are that representatives from MSF, OART, OSSA, and possibly GSFC will attend. ✓

A New Task for Project SUPER (Support Programs for Extraterrestrial Research) - The AF project contact at Arnold Engineering Development Center has informally asked Mr. Miles, the NASA Project SUPER Co-Chairman, to consider a new project task. The project would provide machine shop support for their wind tunnels. All MSFC Labs were canvassed to see if they had available man-hours, but only R-TEST answered affirmative to the extent of 200 hrs. per week on a low priority basis. On 9-15-66 representatives from Tullahoma met with Mr. Miles and were taken to R-TEST, Messrs. Hamilton and Vandersee, to talk about the type of jobs that might be included in the new task. - In the near future, the Air Force will initiate a request to establish a Project SUPER for this purpose.

Who would pay for this work? Are they trying to free-load on our shops? How about turning that work over to one of our lab support contractors?

Pegasus C - Rendezvous & Retrieval - A status review of the proposed experiment was held on 9-14-66 with representatives of OART and OMSF. A basic problem which was brought to light is the requirement for a maneuvering unit for astronaut and equipment translation between the vehicles. The experiment proposers have been planning on the basis of the availability of an AMU. ✓

Latest information on Pegasus Orbital Dynamics has changed the estimates on re-entry time which reduces the urgency behind this experiment. Latest estimate of nominal re-entry time is November, 1971, with a -2 Sigma limit of October, 1969. ✓

our lab support contractors
B
9/27

9/20/68

B 9/27

Damper Arms Fabrication:

4130 steel is the structural material for the damper arms. It is a difficult material to weld, and the high requirements for weld quality (Class I) are a challenge to our technology. The pulsed arc welding process, very recently developed by the British Welding Research Association and by Airco, is being used to distinct advantage.

Here now is a brief description of this process: In normal metal arc (MIG) welding, two regimes of metal transfer from electrode to work pieces exist: (a) At relatively low currents, a large molten globule forms at the end of the electrode and under the action of gravity falls into the molten pool in an uncontrolled sort of way every few seconds. (b) At higher currents (above the "threshold" value), the spray range of transfer is reached. It should be noted that even in the spray range, the material is not transferred as an atomized spray of ultrafine particles, but in the form of small droplets of a diameter similar to that of the wire. The transfer forces are electrical and welding in any position becomes possible. If the welding current is switched at an appropriate rate between a low (globule transfer) value and a high value which is slightly in excess of the spray threshold value, then the following mode of metal transfer is obtained: At the low current level the arc is maintained and no metal is transferred. Only a small amount of the wire tip is melted, the amount being that which the high current (pulse) can readily transfer in a single droplet. The current tolerances for this process are surprisingly quite wide. ✓

The "pulsed arc" represents an excellent method for the control of the metal transfer mechanism and has the following advantages: (a) The total energy input per inch of weld is appreciably lower than in conventional MIG welding. This leads to a reduced heat affected zone in the parent metal and to less weld distortion. (b) The process is extremely reproducible. (c) The finish is regular. (d) The penetration is extraordinarily uniform. (e) Very low average current capabilities exist for the welding of thin gage materials. (f) Larger wire sizes can be used thus reducing the possible amount of contamination introduced into the weld from the surface of the wire. (g) Elimination of weld spatter. ✓

The X-ray quality of the welds produced so far has been quite excellent. ✓

The equipment had been initially procured to assess its applicability to the welding of the S-IVB stage. Preliminary welding of 2014 aluminum indicates that the pulsed arc process is superior to the MIG process. A thorough evaluation is underway. ✓

W.K.

Occasionally

yes.

Slow motion movies of this process showing the mode of metal transfer are available and we can arrange to show these to you if you are interested. ✓

How do we feed this info to our contractors? B

9/20/98

1. S-II-4 DEFECTS - Many serious problems requiring Materials Review actions continue to occur during fabrication of S-II-4. ✓
2. NUCLEAR GROUND TEST MODULE - Mr. Finger has received approval from the Administrator to proceed to the preliminary engineering design effort for engine/stage test stand (E/STS 2-3). MSFC will be required to support this design effort by vehicle/Ground Test Module (GTM) inputs. This is the first encouraging milestone leading to a nuclear flight program in the future. ✓
3. S-IB PRE-VALVE CONTROL AIR CYLINDERS - Stress corrosion cracking of these cylinders was discovered recently. The principal contributor to the cracking appears to be overtorquing of the fitting in the cylinders. A careful inspection plan for the components has now been implemented, and the torquing procedures have been revised to be consistent with specification limits. ✓
4. IU-ST-124 - Dynamic testing of an operational ST-124 stabilized platform generated functional problems similar to those experienced during flights of AS-201 and AS-203. Dynamic analysis has indicated that the resonance coupling of a rotational structural vibration with the control accelerometer can be solved by several methods, one of which would be a redesign of the ST-124 mount frame to attach to the upper and lower instrument unit rings. It was determined in a meeting with IO that no structural "quick fix" will be required for the AS-204 flight. The problem can be handled by a modification of the ST-124 circuitry or change in the computer programmed flight tolerances. A permanent fix for subsequent vehicles is being investigated by P&VE. ✓
5. IU/S-IVB SWING ARM TESTING - I-V-MGR has decided to eliminate the present harpoon gun retraction mechanism and install a Lanyard Retraction System for the IU umbilical area. This system, while still utilizing a "Harpoon Gun", would not allow the gun to load the IU structure. Because this Lanyard is only a backup retraction system for another primary retraction mechanism which loads the IU umbilical with 1800 pounds pull-off load, the IU will still require a modification. The modification submitted by IBM appears structurally adequate. ✓
6. AS-204 H-1 ENGINE CONTAMINATION - Inspection of the lox seal cavity and purge part on engine 4 revealed no contamination, and it has been determined that a safe condition exists for launch. The purge system on other engines and the stage have been determined to be clean. No further action is required on S-IB-204. Effective on S-IB-5 and subsequent stages, the lox seal cavity purge line will be disconnected from the gear case pressurization system during stage horizontal orientation to prevent recurrence of this contamination problem. ✓
7. C-1 ENGINE VIBRATION ANALYSIS - An analysis to determine the vibratory response loads acting on the universal C-1 engine test configuration resulted in a failure condition of the supporting cones. ✓

9/20 9/28

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9/27

1. ECONOMIC IMPACT STUDY - We have initiated a study, at Dr. Mueller's request, to determine the impact on the National Economy, of the decline in the Apollo program. The study is based on the assumption that there will be no follow-on program.

The principle use of the results will be a data bank to supply excerpts for FY 68 BOB negotiations and subsequent congressional testimony to support the need for follow-on program approval.

At Dave Newby's suggestion, we are investigating the possibility of getting an Economist Consultant to help in this effort.

One major conclusion which can already be drawn is that the economic impact nationally is not impressive; in fact, considering Viet Nam many people feel that this decline could supply needed personnel for Defense. Consequently, study emphasis will be on a locality by locality basis since we can show major impacts on individual communities.

2. MSF POP 66-3 - The MSF POP 66-3 position has not yet been released by MSF. The questions which remain in the open are the values to be shown for major prime contractors in FY 67. It is therefore possible that the final MSF position will differ from the preliminary position which we reported in last week's notes.

3. WILSON VISIT - Mr. Jim Wilson, Technical Staff Member of the House Space Committee, visited MSFC on September 16 to review the status of the Apollo program. He was especially appreciative of the fact that MSFC was willing to move up its presentation by two weeks to accommodate schedule conflicts later in the month. MSFC presentations were very well done and were fully responsive to the purposes of the study. The Space Committee will probably publish this study before the end of the year.

NOTES 9/19/66 RICHARD

9/20/68

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9/27

No submission this week.

9/20/66

B₂/271. S-II-1 Stage Status:

- Currently installing mechanical fasteners in LH₂ feedline duct outlets.
- Static firing readiness review scheduled for Monday, 26 September 66.
- Tanking test forecast for Friday, 30 September 66.
- First acceptance firing forecast for Wednesday, 5 October 66.
- On dock KSC scheduled for Tuesday, 15 November 66. ✓

2. S-IVB/S-II Structural Interface Testing:

- Test specimen failed Monday, 12 September 66.
- Failure occurred in the S-IVB interstage approximately 3 feet above the interface at 140.5% of design limit load.
- No design impact expected but additional test objectives may be affected. Evaluation in process. ✓

3. S-IVB/IU Service Arm Umbilical System (Arm #7):

- Joint KSC/MSFC decision made to redesign harpoon gun to a lanyard withdrawal system.
- Redesign will possibly impact delivery to KSC by 3 weeks. (22 December 66 to 12 January 67).
- Detailed schedule for design, fabrication, etc., to be developed jointly by KSC or MSFC - targeted for Thursday, 22 September 66. ✓

4. Saturn V Flight Vehicle Damper System:

- On Thursday, 8 September 66, a decision was made to: Design, fabricate, test and ship an auxiliary damper system to KSC by Tuesday, 17 January 67.
- Overall damper system is on schedule except for a few areas which are being closely monitored. ✓

5. Configuration Control of MSFC Hardware at KSC:

- General Shinkle's counter proposal to the Field Engineering Change procedure was received. He objected to; the requirement for MSFC prior approval by the Level IV CCB located in the MSFC Resident Office at KSC.
- General O'Connor took a firm stand in his reply of Friday, 16 September 66, reiterating the need for on-the-spot approval of changes before the fact. ✓

B 9/27

NOTES 9/19/66 SPEER
9/20/66

1. AS-204 NETWORK SIMULATION: A complete exercise of all flight controllers is scheduled for a two-week period beginning on 9/28 as part of the Manned Space Flight Network Test (NS-2). Simulation tapes will cover all conceivable contingencies and malfunctions during the AS-204 mission. Messrs. Day and Hayes of our Flight Control Office at MSC will participate and are to be deployed on 9/23 to Carnarvon, Australia and Guymas, Mexico respectively. ✓
2. FLIGHT OPERATIONS PANEL: I have been informed by MSC that they want to continue the activities of this panel without change. This seems to conclude a period of indecision on MSC's part about the future of the panel. ✓
3. DAC FLIGHT CONTROL TEAM AT HOUSTON: Upon his request, Mr. R. E. Holman, the DAC Lead Engineer of the MSFC Flight Control Office at MSC, has been transferred back to the West Coast. Mr. R. A. Ammons (DAC) will become Lead Engineer. We had a thorough review of our operating procedures at MSC with Ted Smith (MSFC participants: Casey, Godfrey, Speer). It was agreed that no basic change in our joint MSFC - contractor flight control effort is required; however this discussion was very valuable in promoting a better understanding of the specific requirements and problems related to this task. ✓
4. LAUNCH WIND EVALUATION: We are continuing our efforts to improve the response time of the joint MSC-MSFC wind evaluation team in case of marginal in-flight wind conditions during launch. Programming efforts have been initiated through AERO and COMP to obtain space vehicle response data essentially in real time as the weather balloon rises through the most critical altitude regime. Essential for the success of this concept is proper scheduling of balloon releases shortly prior to launch, and the transmission of raw weather radar data from KSC to MSFC. KSC has not yet given agreement to the proposed approach. ✓
5. REAL-TIME DATA FLOW FOR LUNAR EXPLORATION: Mr. J. O'Connor of Dr. Shoemaker's staff was given a briefing on the LIEF/HOSC and its data reception and display capability. He is involved in SAA lunar exploration missions and wanted to get some insight into the means of receiving data in near real-time at the Scientific Data Center (SDC) established at Flagstaff. At present, field test sites have been set up which run simulated lunar exploration missions and transmit the data to the SDC (TV, TM, Voice). He is also looking for a means of getting data from MCC-H* back to the SDC such that near real time analysis can be made and feedback be given to the Crew through MCC-H such that the experiment could be modified. ✓

* Mission Control Center - Houston.

9/20/66

1. TRANSFER OF LUNAR PROGRAM: A detailed listing of present MSFC activities in the lunar program, annotated with the status and proposed disposition of each project as suggested by the Laboratory concerned, was compiled and discussed with R&DO management on September 15. Based on this discussion, a condensed version of R&DO's proposal for "transfer to MSC" or "bid for retention at MSFC" has now been prepared for presentation to you. This presentation will form the basis for a discussion between the Center management of MSFC and MSC, to be held before our joint presentation to MSF. We are working with Bonnie and Jim Shepherd to establish the time for the presentation to you. ✓

2. PEGASUS COUPON RETRIEVAL EXPERIMENT: Members of SSL attended a meeting which was held here last week to describe to Headquarters the status of the Pegasus III coupon retrieval experiment. Messrs. Keller and D'Aiutolo of OART and Dr. Werner and Mr. Novik of OMSF attended. The meeting covered the state of development of the equipment necessary to the mission. Headquarters' response was generally favorable except for the transportation of the astronaut from the Apollo to the Pegasus. Plans were based on the assumption of a proven AMU being used. At present there are no funds for the development of the AMU, and it will not be available for use on the SA-210 flight. If the Pegasus rendezvous stays on the 210 flight, it will be necessary to plan to use the present Gemini handgun. AERO has made a new prediction of orbit decay based on Pegasus attitude data from Bob Holland of SSL. The new predicted re-entry date is November, 1971. Headquarters seemed to consider the possibility of postponing the mission until an AMU is available, but it was not possible to tell how serious they were. The Form 1138 on this experiment will be presented to the MSFEB in November as originally planned. ✓

9/20/66

B 9/27

1. Space Station Joint Action Group: A meeting was held in Washington on 9/15 to review the latest status of the Space Station JAG. Mr. Donlan, heading the "Requirements" portion of the work reviewed extremely briefly their effort, which as yet has resulted in relatively little information which we at MSFC can use to do our part of the job. He was glad to have our help and indicated it was at least in the proper direction and a real help. As we had informed you earlier, the details which are needed will have to be developed by MSFC and we will make every effort to obtain as many concurrences as possible. ✓

Due to the lack of definition in the "requirements" area, Mr. Jim Elms (head of the overall Steering Committee for Seamans) has asked Seamans for and obtained an additional 30 days (October 1 to November 1) to finish the "design portion" (Gray's part) of the Space Station Study. We will still have the meeting with Seamans on the 29th of September. ✓

2. Project ABLE: The midterm reviews of all five Project ABLE studies are scheduled for October 4, 5, 6, and 7. It is expected that DOD representatives will attend. ✓

September 26, 1966

OFFICE OF DIRECTOR
QUALITY AND RELIABILITY ASSURANCE LABORATORY

ROUTING SLIP			
CODE	NAME	INIT	<input type="checkbox"/>
DIR	Mr. Shepherd		ACTION <input checked="" type="checkbox"/>
			INFO <input type="checkbox"/>
			SEE ME <input type="checkbox"/>
			FILE <input type="checkbox"/>

REMARKS

This was forwarded in response to Dr. von Braun's remark on the NOTES 9-26-66 GRAU, paragraph 3. Identical information was given the necessary distribution inside MSFC. We are also working with I.O. to pass the information on to the stage and engine contractors.

DG

cc:
DEP-T, Dr. Rees
R-DIR, Mr. Weidner



FROM	R-QUAL-DIR	Name	Date
		Mr. D. Grau	11-21-66



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA 35812

IN REPLY REFER TO: R-QUAL-AV

NOV 17 1966

TO See Addressees

FROM Director, Quality and Reliability Assurance
Laboratory, R-QUAL-DIR

SUBJECT Thermal Resistance Measurements of Transistors

For some time it has been recognized that thermal resistance is an excellent measure of how well a transistor is made. This resistance essentially measures the quality and effectiveness of the bond between the element (semi-conductor material) and the transistor case. Heat generated in the element while current is flowing must be removed as fast as possible to keep the device from destroying itself.

MSFC now has test equipment (Thermal Resistance Analyzer, Model TR1A manufactured by Bendix Semiconductor Division) that will accurately and rapidly measure the thermal resistance of transistors, rectifiers, and diodes. This equipment makes it practical to check thermal resistance on a 100% basis. In the past it was only practical to test thermal resistance on a very small sample basis as the previous methods were very time consuming, requiring the use of large heat sinks or thermal baths. Accuracy was dependent on the skill of the operator and the process was messy, since toxic oil was used for the thermal baths. With this new equipment it is now possible to test the thermal resistance of a device in a few seconds after a simple initial set-up. The set-up and measurements can be made by a semi-skilled operator.

The thermal resistance testing equipment is comprised of power sources to supply a controlled amount of power to the device under test, a measuring system to monitor the rise in junction temperature with time, and an oscilloscope display to present the pertinent information to the operator in convenient form. If the change in junction temperature is known, coupled with the power input which caused that change, then the thermal resistance can be determined. If the rate of change of junction temperature with time is known then the thermal time constant can be determined. All of this information is displayed on the face of the oscilloscope.

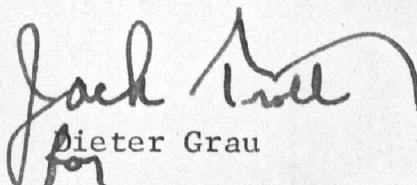


Thermal resistance testing has already begun at MSFC and on the second lot of transistors a significant number was found to be well out of the manufacturer's specified limits on thermal resistance. The significance here is that these transistors were purchased as high reliability units and had passed all quality tests both by MSFC and the manufacturer. There is a high probability these transistors would have actually failed after they were placed in service.

It has also been found in the use of the thermal resistance test set, that the thermal resistance values given by manufacturers on their data sheets are unrealistic. The number (in degree centigrade per watt) appears to be set so high that only the extremely poorly made transistors will be above the number given. MSFC is initiating a program to determine realistic thermal resistance values for each type of transistor that would better reflect good quality.

It is recommended that all transistors, diodes, and rectifiers in which the wafer is internally bonded to a heat sink be tested for this thermal resistance parameter. The results of this testing and the weeding out of units with high thermal resistance should significantly improve the overall reliability of systems in which semiconductors are used.

If any additional information is required please contact Mr. J. K. Morris, MSFC, telephone area code 205, 877-3763, Huntsville, Alabama.


Dieter Grau

Addressees:

NASA Hq., Code KR, Mr. John Condon
 NASA Hq., Code KR, Mr. D. A. Delve
 NASA Hq., Code MAR, Mr. G. C. White, Jr.
 NASA Hq., Code MAR, Mr. R. D. Cromwell
 NASA Hq., Code ML, Mr. H. Cohen
 Ames Research Center, Mr. G. DeYoung
 Goddard Space Flight Center, Mr. W. P. Corbin
 Jet Propulsion Laboratory, Mr. F. L. Lane
 Langley Research Center, Mr. W. M. Phillips
 Langley Research Center, Mr. H. H. Ricker
 Lewis Research Center, Mr. J. H. Wild
 Manned Spacecraft Center, Mr. J. E. Kahanke
 Wallops Station, Mr. Z. B. Barfield
 KSC, Code EA, Mr. J. M. Fisher
 KSC, Code EA, Col. Robert McDaris
 KSC, Code GF2, Mr. J. H. LaRowe
 KSC, Code RJ, Mr. Winston S. Caldwell

NOTES 9/26/66 BALCH

B 10/5

9/26 JS

S-II-1 Testing - Repair of LH₂ feed duct connections is not yet complete, but no major problems have developed. Earliest expected date for completion of repair and tank close-out is now 9/28/66. This causes slippage of ¹⁴ projected dates for LH₂/LN₂ tanking and first firing to 10/5/66 and 10/13/66, respectively. Entry has been made into LOX tank to replace two plug seals in the aft facing sheet of the common bulkhead, based on evidence indicating that similar seals on the S-II-3 and S-II-4 had been leaking. Replacements are on site and no impact on tanking or firing is expected. ✓

Detailed Test Plan for first firing was approved 9/22/66. ✓

MTF LOX Barges - LOX Barges 4 and 5 have been returned to MTF and LOX Barges 1 and 3 are enroute. ✓

Labor Relations - Late Wednesday, 9/21/66, operating engineers began to walk off the job because of a jurisdictional dispute with the electricians involving the checkout of the auxiliary derrick on the S-IC Stand. By Thursday, practically all operating engineers on site were off, and this continued through Friday. On Thursday, the matter was referred to the International office of the operating engineers' union (IUOE), and on Saturday, the operating engineers began to return to work. Today, it appears that all operating engineers are back on the job and will remain pending the outcome of discussions between the international offices of the unions involved (IUOE and IBEW). About 700 man-days were lost as a result of this work stoppage, and activation schedules for the S-IC and S-II A-1 Test Stands will definitely be affected. ✓

NOTES 9/26/66 BELEW

B1075

9/26/66

ATM: Advance copies of program authorization documents have been received from OSSA which authorize \$1,941,000 for the undisbursed obligations in the ATM Experiments contracts recently transferred from Goddard to MSFC. Receipt of this authorization will permit MSFC to pay for the vouchers when received from these contractors within the dollar level of the contracts as received here at Marshall. \$2.7M of new program authority will be received within the next few days for the ATM Experiments. This will permit additional scope to be added to the Experiments contracts. ✓

All Principal Investigators were covered on September 16, 1966, with authorization to proceed on the ATM effort. ✓

PAYLOAD INTEGRATION CONTRACTOR'S SUPPORT OF IN-HOUSE WORK

(ATM AND OWS): Planning has been initiated with P&VE for the Martin Company to assist the MSFC in-house work on Mission 209. This work will be part of the Payload Integration Phase "C" contract. Mission 209 tasks will be given to the contractor by mid-October as part of their specific mission assignment. ✓

OWS
deleted (circled)

Discussions with ASTR Lab are underway to develop the same type of relationship with Lockheed on the ATM. Both contractors will proceed with their overall final program definition studies in addition to these "Special Assignments". ✓

RACK FUNDING: We have furnished the \$500,000 rack funding to P&VE for development and fabrication of the LM&SS Rack. We have been advised by MSC that the additional \$85,000 will be made available to MSFC during the 2nd quarter of FY 67 at which time it will also be provided to R&DO. ✓

AS-209 MISSION: At the Management Council Meeting on September 20, Dr. Mueller stated that the AS-209 vehicle would fly the workshop mission whether it is Apollo or an alternate Apollo flight. ✓

VISIT TO McDONNELL: Four R&DO personnel (two from P&VE and two from ME) made a trip to the McDonnell Aircraft Corporation in St. Louis, to arrange for obtaining information (drawings and documents) to begin fabrication of the Airlock Mockup. ✓

PEGASUS "C" EXPERIMENTS: Fairchild-Hiller has proposed to MSFC a number of experiments utilizing the Pegasus "C" Satellite. These experiments require extensive EVA and as proposed would be a primary mission objective. A detailed presentation will be given by Fairchild-Hiller at MSFC on September 27, 1966. ✓

GENERAL The problem involving Air Force interpretation of government safety regulations previously reported on 8-15-66 has been resolved. The Air Force has advised Rocketdyne that they are in "substantial compliance" with the safety regulations. ✓

F-1 ENGINE The eroded baffle section from the injector used in the QUAL Program has been removed and replaced. Three tests for a total of 380 seconds have been accumulated with no apparent effect on the new baffle section. The original baffle eroded after 5 tests and 580 seconds. Testing to accumulate a minimum of 5 tests and 600 seconds is continuing. ✓

C-1 ENGINE Nozzle-up testing of the C-1 Engine was initiated at MSC on 9-21-66. Tests on both low and high dribble volume injector configurations will be conducted at continuous altitude (250,000 feet) with NTO and 50/50 hydrazine/UDMH propellants. The propellant and hardware will be conditioned to two temperatures (70°F and 40°F) while varying pulse widths from .012 to .020 seconds and pulse off-times from 0.050 to 5.0 seconds within pulse trains, and 3 minutes to 1 hour between pulse trains. Approximately 3,000 starts will be accumulated during testing (1,000 at 70°F and 2,000 at 40°F). ✓

H-1 ENGINE During checkout of engine H-7063, vehicle SIB-204, leakage past the gas generator control valve LOX bellows was indicated. The gas generator was removed and returned to Neosho to determine the cause of the leak and corrective action. Evaluation of the valve revealed a crack in the weld joint of the bellows to valve housing. The valve was repaired, tested, and returned to KSC on Friday, 9-23-66, for reinstallation on the engine. No schedule impact is anticipated. ✓

J-2 ENGINE On Saturday, 9-24-66, a successful programmed duration test (10 sec) was achieved at AEDC.

On prior test attempts at AEDC the test cell was found to be extremely moist prior to the test, much more than any environment the J-2 has seen at other test sites. This test was conducted with a heated LOX dome purge to insure that water was evaporated from the injector. A purge diffuser was added to the dome to better distribute the purge gases. Heat lamps were added to the thrust chamber for two hours pre-test to assist in evaporating any moisture from the cell. As a result of the prior test attempt which had an RCC (probably an iced injector due to excessive moisture), we are again recommending that all field test locations incorporate the capability to heat the purge gas to assure removal of all moisture from the injector prior to propellant loading.

BB

Particularly important for MTF and Cape. Santa Susana testing may have given some Rocketdyne people an unwarranted feeling of "no problem" with regard to humidity. Please make sure that this recommendation is heeded.

NOTES 9/26/66 CONSTAN

7/26/978

B_{10/5}

VISIT OF INTERIM COMMUNICATIONS SATELLITE COMMITTEE

A group of fifteen international members of the Interim Communications Satellite Committee, accompanied by Mr. Richard Colino, Director of International Arrangements for the Communications Satellite Corporation, were given a briefing and tour of the Michoud Assembly Facility on Friday, September 23, 1966. ✓

Good. Sld 'ave a Sat. V? B

S-IC-3

The S-IC-3 Stage departed the Michoud dock at 5:45 a. m. Friday, September 23, 1966, enroute to MSFC for static testing. ✓

NOTES 9/26/66 FELLOWS

9/26/66

B 10/5

1. Nose Cone Research and Development Plan (RDP): The first issue of the Nose Cone RDP was furnished to IO on August 16 so IO and the laboratories could proceed as early as possible with a common plan. An up-dated RDP, Revision A, for the Nose Cone was approved by R-DIR and forwarded to IO on September 20 with an estimated R&D Operations funding requirement of \$355,000 (\$120,000 less than the August 16 estimate). Assuming that the design requirements from MSC do not change drastically, a high confidence level exists in this estimate. RDP Revision A does not request outside funding for trajectory and control requirements nor for 20.1 man-years of support contractor effort. The Saturn IB Systems Contract with CCSC covers the trajectory and control work and the support contractor costs will be absorbed within the present Saturn IB funding level for R&DO. However, in absorbing 20.1 man-years of contractor effort for the Nose Cone, we have reached the limit of work we can do of this nature for Saturn IB without additional funding. ✓

2. Auxiliary Damper System: The primary Damper System for attachment to the mobile launcher was officially assigned to R&DO on July 14. P&VE was designated by R-DIR as the lead laboratory. Dr. Rudolph placed an additional mandatory requirement on R&DO on September 19 for an auxiliary Damper System to be attached to the mobile service structure. This additional system has been accepted by R&DO and is also being assigned to P&VE as lead laboratory. The auxiliary system is to be delivered to KSC by January 11, 1967, to support the AS-501 flight schedule. Both the primary and auxiliary Damper Systems are being accomplished within the R&DO FY-67 Saturn V funding level. ✓

9/26/66

B 10/5

1. Pegasus C Orbital Lifetime: Previous lifetime predictions for Pegasus C (SA-10) were based on a randomly tumbling vehicle. Research Projects Laboratory analysis of the satellite motion shows that the satellite is essentially in a flat spin with the plane of the wings in the orbital plane resulting in a decreased frontal area. Taking this revised orbital attitude history into consideration, we have found a resultant increase of 1100 days in the predicted orbital lifetime. This information was recently presented in a meeting with NASA Headquarters personnel ✓

2. NASA/USAF Hypersonic Aircraft Technology: On September 21 and 22, the new NASA/USAF Ad Hoc Working Group for Hypersonic Aircraft Technology met at Langley Research Center to discuss progress made in the areas of propulsion, aerodynamics, structures and application studies of hypersonic aircraft for commercial, space and military applications since the 1964/65 report of the USAF Ad Hoc Task Force on Scramjet and applications. As a major conclusion of the meeting, which featured 28 different presentations "across the board," it can be said that in the last 1 1/2 years a much better definition of the problem areas has been accomplished. In particular: (a) The closer attention directed at the serious problems connected with LH_2 has generated fresh interest in cryogenic hydrocarbons (e. g., liquid methane); (b) The need for better prediction methods of heat loads in the engine has been intensified; and (c) The structural problems (necessitating a strong tendency toward non-integral tankage concepts), and the fuel-cost problems reported to you earlier appear to overshadow the more propulsion-caused problems. A more detailed trip report will be prepared which will up-date and widen the briefing on Scramjet given to you earlier this year. ✓

3. Post Flight Trajectories: We have decided to retain the determination of the T + 48 hour post-flight trajectories in-house for both Saturn IB and V. This decision was made because of the difficulties of (1) having guidance data, a required input, done on the required expedited time schedule by the contractor, and (2) the resultant inter-contractor interface. This will require approximately 1 1/2 man-month effort for each vehicle, but will help to maintain our competence. ✓

9/26/66

B 10/5

1. S-III PROGRAM: Water has been found in the S-II-3 common bulkhead insulation. The exact cause of this condition is not yet known, but it is believed to have leaked through six poorly installed K-seal plugs on the aft facing sheet. Other possibilities being examined are that the water may have leaked through cracks in six welded caps on the aft facing sheet, or it may have been trapped behind the bolting ring during hydrostatic testing of the No. 1 and No. 2 rings and the common bulkhead sub-assembly. In that S-II-1 also has some cracked weld caps on the aft facing sheet, the lox tank of this stage will be examined for the presence of water. ✓

2. NASA QUALITY PUBLICATIONS REVISION: Revisions of NASA quality publications NPC 200-2 and 200-3 have been initiated. Laboratory representatives are members of a NASA Headquarters Office of Reliability and Quality Assurance task team established for this purpose. Implementation experience gained by all NASA installations since these documents were issued in April 1962 and the results of the industry (Council of Defense and Space Industries Associations) survey made of the NASA quality assurance program last year are being considered in developing the revision. Target date for issuance of coordination drafts is April 1967. ✓

3. TRANSISTOR TESTING TECHNIQUES: For some time it has been recognized that thermal resistance is a good indication of how well a transistor is made. This resistance essentially measures the effectiveness of the bond between the element (semi-conductor material) and the transistor case. Heat generated in the element must be removed as fast as possible to keep the unit from destroying itself. Thermal resistance measurements have not been made on any large scale in the past, as the time required by the available methods made such testing impractical. Our receiving analysis organization now has a thermal resistance analyzer (Bendix Model TR-1A) which uses the transistor junction itself as the temperature sensing device. Temperature is determined by measuring the change in forward voltage drop versus time across the junction. This technique eliminates the time consuming use of large heat sinks or thermal baths, and allows testing to be performed in seconds. Consequently, all transistors can be subjected to thermal resistance testing in the future. ✓

D.F.

Please
 notify
 - Astronics
 - all
 stage and
 engine
 contractors

- KSC
 - NASA HQ

Seems to be a real
 quantum jump in testing technique!

B

9/26/66

1. GODDARD REQUEST FOR ATM EXPERIMENT ASSISTANCE: At the request of Goddard Space Flight Center (GSFC), Principal Investigator for one of the ATM experiments (Mr. Milligan), Astrionics has examined in detail the possibility of MSFC's providing system design, fabrication, and test support to GSFC in the creation of the experiment hardware through use of MSFC inhouse and Astrionics single support contractor resources. The work would involve electro-mechanical layout and packaging, filter wheel design and fabrication, and photographic recording design and development. This experiment utilizes X-ray grazing optics, for which Mr. Milligan would retain design and procurement responsibility. We feel we could successfully accomplish this work essentially inhouse and have informally advised Mr. Milligan. His intention is to originate a formal GSFC request to MSFC for this support at an early date. ✓
2. HARVARD COLLEGE REQUEST FOR ATM EXPERIMENT ASSISTANCE: We have received a letter from Harvard College requesting certain assistance in support of their experiments. In this case, the request is for electro-mechanical assistance not including the scientific portions of the experiments, UV spectrometers. We are closely examining which aspects of the requested support could be provided without creating excessive interfaces within the experiments. Of particular interest to us are the hydrogen alpha telescope, the photographic recording device, and miscellaneous electronics. I will keep you informed on this matter. ✓
3. MSFC/LANGLEY CMG COORDINATION: A full day meeting was held at MSFC 9/23/66 with representatives of Langley Research Center to coordinate efforts regarding CMG (control moment gyro) development and testing. Highlights of discussion were:
 - a. MSFC will develop CMG flight hardware for ATM. ✓
 - b. Langley will continue their ground research program for CMG's in general. The two Centers will closely coordinate. ✓
 - c. Upon receipt of the Langley CMG from Bendix next month, Langley will commence performance testing on a three-shift basis with MSFC participation as observers. ✓
 - d. MSFC will procure the second Bendix CMG (delivery in December or January) for extended life testing and MSFC design improvement. This CMG would be transferred to Langley in June/July 1967 for their use in the ground research program. ✓
 - e. Langley will support to Headquarters the schedule objective of an ATM launch in 1968. ✓
 - f. MSFC and Langley will establish regular coordination meetings. ✓
4. EXPERIMENT FOR FOLLOW-ON ATM: We have been having discussions with Dr. Hallum and Dr. Kupperian, Head of the Astrophysics Branch, Goddard Space Flight Center, relative to their modifying the Goddard 38 inch Spectro Photometric telescope (known as GEP, The Goddard Experiment Package) to fit as an experiment on the follow-on (Stellar) ATM-D. Dr. Kupperian reports that he has discussed the matter with his management and they are quite in favor of it. He says that there is a letter on the way from Dr. Clark (GSFC) to Dr. von Braun stating their interest and formally asking for further cooperation. ✓

B 10/5

9/26/66

F-1

F-1 engine S/N 3014 was removed from the West Area F-1 Test Stand on September 22, 1966, and returned to R-ME Laboratory (S-1C-1 spare). F-1 engine S/N 4T2 was installed in the West Area F-1 Test Stand and will be subjected to a series of tests to determine engine performance conditions that will cause excessive gas generator chamber pressure oscillations ("buzzing"). ✓

GSE DELIVERY SCHEDULES

Completed delivery of all 501 Arms to KSC this past week. The S-IVB Forward Arm (No. 7) will require a modification kit to change it to the modified lanyard system. Before shipping this kit to KSC, we will test the 502 Arms. Meeting at KSC on 9/22/66, to discuss schedule impact on 501 and 502 vehicle checkouts as a result of change was unsuccessful. 10 has scheduled another meeting for Friday, 9/30/66. ✓

GSE TEST SUPPORT

As you are aware, we have had difficulty with KSC in delivering the swing arms, providing spare part support, and now, providing test area training/support personnel. Two weeks ago we had to commit ourselves to 502 Arm deliveries to NASA Headquarters and one of our assumptions was the continued utilization of 26 Boeing-LVO support personnel in order to meet the compressed test schedules. Friday, we were informed that LVO did not intend to continue this support beyond 9/30/66, which will have a major impact on the 502 schedules. (Possibly as much as a month) We have tried to discuss this subject with Buchanan and Petrone; however, they said we should solve our own problem. We have no choice but to go back to NASA Headquarters and inform them that the ground rules changed resulting in a schedule change. The Saturn V Office has been informed of our latest snag. ✓

NOTES 9-26-66 HOELZER

9/26/66

B/10/5

HYBRID FACILITY: The Simulation Branch is currently involved in the checkout and acceptance testing of a large hybrid computing system. Once the system is accepted, a hybrid demonstration will be presented to interested personnel. ✓

SATURN I/IB SYSTEMS ENGINEERING CPIF CONTRACT: Headquarters has approved our recommended prenegotiation position for the Chrysler systems engineering contract. Plans are now being made to start negotiations with Chrysler sometime this week. ✓

APPROVAL OF S-IVB STAGE WORKSHOP CHANGES FOR SA-210 THRU SA-212: As you know, we are now required to send all Saturn vehicle configuration changes, for other than mainstream Apollo missions, to the Headquarters Level I Configuration Control Boards (CCB's) for approval. We have just received approval on the first such changes submitted which included attaching the fittings and adding the dynatherm coating (after testing proves it is satisfactory) in the LH₂ tank for SA-210 thru SA-212. These changes are for maintaining flexibility to convert any of these stages into a workshop. After approval by General Phillips' Level I CCB, these changes were submitted through Dr. Mueller to Dr. Seamans for final approval. If all future changes for AAP missions flexibility must go to Dr. Seamans' level for approval, we will need to add one to two months to our configuration change planning schedules, and do everything possible within the laboratories and contractors plants to expedite initiation of change requests as soon as such changes can be foreseen.

SYSTEMS ENGINEERING EFFORT FOR SAA ALTERNATE MISSIONS: We have prepared and forwarded to the AAP office a memorandum setting forth the areas of systems engineering work which should be started immediately for AAP missions for 209 thru 212. If we are to be in a position where we can accept mission changes with minimum implementation time, we should start these CCSD systems engineering efforts in the very near future for SA-209. Our anticipated funding requirements for systems engineering for these SAA alternate missions were included for FY 1967 thru 1969 and amounts to approximately \$1.6M in FY 1967. To get started in this effort, we must obtain money from the AAP office who, in turn, must get it from Headquarters. ✓

Are you in touch with
Davy Jones' office on this?
B

→ LBJ I'm afraid that in the
strange twilight world of
AAP, even Webb couldn't
change this procedure at this time.
B

NOTES 9/26/66 JOHNSON

9/26/66

B 10/5

Negative report.

B1075

9/26/66

Tank Configuration Development: One area of strength and special competence of our Marshall Center has always been our knowledge, experience, and capability in the engineering, manufacture, and testing of structures for space vehicles. This is reflected in the skill mix in several laboratories. If it is the intention and plan to maintain this capability and competency here for future projects, then it is necessary to utilize these engineers and technicians in order to keep our experience up-to-date and our personnel in practice. This is the purpose of the joint P&VE/ME structural development program. This work should not be looked at as "nice-to-have" or "pet projects" which could be eliminated in order to save funds and manpower. It is vital to us not to destroy a team and a competency that is still existing here. Though these structural development projects have a very low priority in our programs, we are now nearing the final assembly status for the toroidal and the semi-toroidal experimental tanks.

W.K.
His!
B

The latter configuration features a substantial length reduction of stages, which can be achieved by the novel bulkhead shape in combination with a center support pipe resting on the thrust structure. Separate tanks of semi-toroidal configuration will equal the common dome version even with still some reduction in length and weight. Furthermore, insulation for long duration cryogenic storage can be more readily achieved with a separate tank arrangement.

The manufacturing requirements are comparable to normal cylindrical tanks and far below common dome type structures.

Advanced manufacturing processes and new type high strength aluminum alloys 7039 and 7106 are used. These materials have a natural aging property at room temperature. Consequently, high tensile strength is regained in the welded areas after about two months. Numerous tests of weld samples have proven that the weld efficiency increases to more than 80 percent. These alloys have been meanwhile used in the production of armored vehicles and cryogenic storage tanks.

The final close-out welds will be made within the next four weeks. Until then, the structural arrangement and slosh baffle locations can be seen best in Building 4705.

The semi-toroidal tank will be completed first and undergo structural load and slosh testing; furthermore, the propellant flow pattern and residuals will be determined.

W.K.
Arrange a visit to Bonnie, please B

9/26 958 B 10/5

1. AS-209 ORBITAL WORKSHOP - Major areas receiving primary attention are: Passivation of stage, e.g., propellant residuals and impulse studies, sequence and methods of tank venting, design of hardware required, identification of systems requiring passivation, time lines; Activation of stage, e.g., thermal control studies and internal tank configuration optimization, selection of equipment, surface coatings, vehicle orientation, determination of leak rates, selection of methods and design of hardware for plugging vents and leaks, design of quick disconnect manhole cover, design of mobility aids, layouts for padding of sharp corners and hazardous equipment, meteoroid protection design studies, human engineering and astronaut time lines, flame retardation material evaluation (A meeting was held 9-22-66 with Dr. Harris of MSC relative to the compatibility of the D-65 coating with the astronaut habitability. Dr. Harris seemed both pleased and impressed with the work to date. Dr. Harris' only unanswered concern was the effect of extended exposures of the coating in an oxygen environment. We will provide these additional data to him. This is the only item which he requires before recommending application of the D-65 coating to the orbital workshop); Experiment integration and time lines, e.g., development of overall workshop mission time lines and activities, development of environmental requirements for experiments for the 3 phases of (a) integration into the airlock for transportation into orbit, (b) transportation from the airlock into the workshop, (c) integration into the workshop for experiment activity; Identification of electrical, mechanical, human, and functional interfaces; Installation design of habitability and workshop hardware (cabling, ducting, lights, work aids, etc.); Activities in performance trade off, trajectories, orbital mechanics, mock-ups, overall time lines, etc.; Development of the R&DO program development plan (including schedule, manpower, and funding requirements); Design of 1/6th lunar floor, development of criteria for crew quarters design (to be designed, developed, and possibly manufactured in house).

B.L.
Please
Keep
Lukas
Richard
apprised
of this
work. It
is of vital
importance
for ATM
config-
uration
selection
letter
matters
etc.
B

2. NASA - USAF HIGH PERFORMANCE ADVANCED ENGINE PROGRAM - The fourth meeting of the High Performance Cryogenic Engine Sub-panel of the AACB (Aeronautics and Astronautics Coordinating Board) met on 9-16-66 in Washington. The joint RFP to industry is in preparation by NASA-MSFC and USAF-RPL and is expected to be ready in November. This RFP will call for the Phase II part of the joint NASA-USAF program which will provide for the build-up of breadboard demonstrator engines. Both the aerodynamic ^{spike?} as well as the high pressure bell concept are expected to be funded with the USAF and MSFC each taking the responsibility for one. ✓

with MSC
is shaping
up and
where
(if at all)
I can
help graze
the skirts
B

3. PEGASUS COUPON RETRIEVAL PROJECT - A layout (SK10-7292) showing a proposed location in the Command/Service Module for the tools and equipment packages required for the Pegasus Coupon Retrieval Project (SA-210) was prepared for use by the working group for this project which is under the chairmanship of Jim Belew. ✓ *How about the EVA involved? B*

4. HAZARDOUS GAS DETECTORS FOR SATURN IB - The hazardous gas detectors which were designed by this laboratory for use at the Saturn IB launch complexes have been built and installed on schedule. ✓

5. S-II LEAK DETECTION SYSTEM - A serious problem appears to be materializing at KSC regarding C7-55 leak detector purge gas venting. The present facility piping system which carries the S-II stage insulation purge gases from the C7-55 to the burn pond was found to have a back pressure which ranged as high as 50 psig under an overall facility venting load. Since the gas chromatograph leak detection inlet system operates with a positive pressure, excessive vent system back pressure could render the leak detection equipment inoperative. KSC and NAA are presently investigating. ✓

NOTES 9/26/66 MAUS
9/26/66

B 10/5

Negative Report

NOTES 9/26/66 RICHARD

9/26/68

B10/5

No submission this week.

B10/5

NOTES 9/26/66 RUDOLPH

9/26/66

1. S-II-1 Stage Status:

- Mechanical Fasteners in LH₂ feedline duct outlets complete. Installation of aluminum foil seals in progress. LH₂ tank closeout forecast for Tuesday, 27 September 66. ✓
- Tanking test scheduled for Friday, 7 October 66. ✓
- First firing test scheduled for Sunday, 9 October 66. ✓
- On dock KSC scheduled for Thursday, 17 November 66. ✓

} Really 232
B

2. SA-500F Vehicle Status:

- S-IC-F Stage manual LOX loading completed on Tuesday, 20 September 66. ✓
- S-II-F Stage manual LOX and LH₂ loading completed on Friday, 23 September 66. ✓
- S-IVB-F Stage manual loading scheduled for Tuesday, 27 September 66. ✓

NOTES 9/26/66 SPEER

9/26/68

B 10/15

Negative report.

NOTES 9-26-66 Stuhlinger

Negative Report.

9/26 NB

B1075

NOTES 9-26-66 WILLIAMS

9/26/66

B1015

1. Space Station Committee: The Gray part of the Space Station Committee met in Houston on Thursday, 9/22/66, for a final review prior to the Seamans' meeting scheduled for 9/29/66. I plan to give the 20-minute MSFC presentation and I understand that you (Dr. von Braun) and Mr. Weidner will be present. I will cover the experiment requirements, mission module requirements/layout, and the S-IVB Workshop evolution to a space station.

The Houston meeting was fairly good. The MSFC people (ASO and Laboratory) have continued to do an outstanding job and received praise from Gray and the Donlan side of the Committee. MSC has done very little (or at least showed very little) except a definite desire to keep from using anything that would resemble a growth version of the S-IVB Workshop. I personally feel that we have a good chance to work the Workshop growth (evolution) into a real job for MSFC.

2. Space Science Board: The SSB (including Dr. Seamans) was given the Manned Planetary Program story (results of the Planetary JAG) and several comments Seamans made may be of interest:

- a. He made it very clear that the Planetary JAG report/story is not a NASA position.
- b. A new NASA goal is needed.
- c. The type of program outlined by the Planetary JAG is "a most logical candidate" for the "next National objective."
- d. He discussed the situation--that a space station could be an element of a Planetary program.

agree B
NASA's lack of funds may indeed help us very much in using converted SIVB's as space station B

3. Project ABLE: After the midterm Project ABLE reviews, October 4-7, 1966, an all day review with our five contractors will be conducted in Washington, D. C., on October 11, 1966. This will be an Executive Summary primarily for a DOD audience in Dr. Mueller's Management Conference room. Discussions are underway among MSF, USAF, and DD R&E re: a possible one-hour Executive Summary presentation to top DOD officials, including the Assistant Secretary of the Air Force, Director of DD R&E, and the Provost Committee. Dr. Seamans would possibly attend. It is anticipated that you or Dr. Rees might want to attend this discussion.

will be out of country B

MOL, larger and offers much greater potential than MOL, suggest you hold a strategy meeting with Gray and Taylor, B

4. Voyager-Saturn V: ASO and Saturn V representatives attended a Voyager Quarterly Review at JPL on September 16. A JPL-OSSA meeting had been held earlier (September 14) and apparently resulted in agreement on a program plan to propose to Dr. Seamans around October 1. Mr. Cortwright participated in the September 14 meeting. We would like a chance to discuss the program status with you (including C. Chambers of I-V) prior to the Senior Council meeting at end of September.

if possible I.B.S.

Track 5.

Bill Taylor gave us a rundown on the latest Titan III/MOL vs Sat IB / AAP^{cost} exercises. I think NASA could really make for more political lay out the Sat IB's SIVB stage having the unique advantage of being convertible into a low-cost, temp-insulated, non-fuel contaminated space station which is far