

April 4, 1966

NOTES 4/4/66 BALCH

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S-II-T Stage - LN₂ tanking was completed Tuesday night, 3/29/66, and the LN₂ was kept on board for 18 hours. Detanking was completed late the next day. Only minor problems were encountered, and preparations are currently underway for LH₂ tanking, now scheduled for 4/8/66. ✓

S-II Complex High Pressure Gas Bottles - The hydrogen bottle obtained from the S-IC Complex at MTF is expected to be in service to support the LH₂ tanking of the S-II-T stage on 4/8/66, and work is scheduled to start early next week on the footings and manifolds for the hydrogen bottle being shipped from MSFC and those to be obtained from the west coast (S-II Battleship Stand). ✓

S-IC Test Stand - Air conditioning system in center pier was accepted on 3/25/66. Erection of flame deflector steel for Position B-1 started on 3/28/66. ✓

S-II Test Stand A-1 - Superstructure steel is being placed on seventh and eighth floors. Structural steel columns are in place to the tenth floor. Inspection for joint occupancy of first through sixth floors for technical systems installation was conducted on 4/1/66. ✓

Technical Systems, Phase II - Boeing is re-evaluating requirements for completed technical systems for the S-IC Test Stand, and Boeing, Phase II, and NASA representatives will review these requirements in a meeting next week. Staging of material is in progress for start of technical systems installation in S-II Test Stand and A-1 core on 4/4/66. ✓

Acoustic Horn is back in operation at its new location, and an operational type program has been started to simulate operations during static firings. ✓

Proposed Navy Bombing Range in Buffer Zone - A representative of MTF met with Captain Chaires, Commanding Officer of the New Orleans Naval Air Station, members of his staff, and two representatives of the Mobile District, Corps of Engineers, on 3/31/66, in connection with this matter. No action is to be taken until receipt of reply from Corps of Engineers to Navy's inquiry, which is expected next week. Captain Chaires is aware of NASA objections to proposed bombing range and the effect it would have on the proposed Hancock County Airport. He will not refer the matter to his higher authority without checking again with MTF. ✓

Press Interest in S-II-T Static Firing Continues - Plans are that the press will not be invited for the first firing but that they will be invited for the second, provided there are no developments to the contrary. ✓

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RL10 ENGINE RL10 personnel are scheduled to be at the Lewis Research Center on April 11 to transfer the project management. A one-week delay of this transfer was requested by the Lewis Research Center due to the delay of the Atlas/Centaur AC-8 vehicle launch.

The launch of Atlas/Centaur AC-8, scheduled for March 29, was postponed until April 5 at the earliest. Failure to launch was caused by a slow retraction of an interstage umbilical arm.

The first two production RL10A-3-3 engines are being tested. One engine will be ready for final acceptance test by April 13, and the other will be on the stand for "green run" on April 2. ✓

F-1 ENGINE Of the three F-1 engines removed from S-IC-2, only engine F-4017 was found to require LOX system cleaning. However, engines F-4019 and F-4020, in positions four and five, will be removed from the stage to allow inspection of the main LOX valves. All engines are expected to be reinstalled in S-IC-2 by April 18. ✓

A premature test termination resulting from a sharp shift in performance recorded at 95 seconds into a run on F-1 engine 2010 (ground test type) at MSFC on March 28 triggered an investigation which revealed a screw lodged between the fuel pump inducer and the inlet wall. The screw, one of four retaining the fuel pump inlet fairing just upstream from the inducer, lost its torque and backed completely out. The screws are held in place by a friction type thread gripping insert. A complete investigation is underway covering all aspects. ✓

J-2 ENGINE The first 230K thrust engine has been accepted and shipped to MSFC for use on the S-IVB Battleship test stand.

The LOX turbine cracking problem is under extensive investigation at Rocketdyne and at all field locations where the J-2 engine is being utilized. Rocketdyne is conducting an intensive test program to determine the effects of running the LOX turbopump with the stator tabs removed. Also, inspection of all LOX turbines in the field is continuing on an expedited basis. The decision was made during the S-II-T pre-firing review at MTF last Friday to conduct the first firing without removing the turbine wheels for a detailed inspection. However, a decision was not reached on when the wheels should be pulled, so a meeting with S&ID, Rocketdyne and Marshall is scheduled for tomorrow, here at MSFC. We are planning a meeting for sometime next week to review this problem relative to the total Apollo program. Rocketdyne will have accumulated considerable more data on running without the stator tabs and should be through with the inspection of all engines in the field. We are arranging it around Dr. Rees' schedule and will inform you of the meeting date. ✓

H-1 ENGINE During static firing of Stage S-IB-5, engine H-7069 was found to have a small horizontal crack in the number one tube of the thrust chamber. The crack was approximately 1/16-inch long and located 10-1/2 inches below the injector. As a result of this discovery, the engine will be pulled and sent to Neosho for repair. Turn around time of ten to fourteen days is expected. No schedule impact is anticipated. ✓

NOTES 4/4/66 CONSTAN

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STATUS OF CURRENT BOEING-IAM NEGOTIATIONS

Negotiations are still in progress and there are no indications that they are any closer in reaching an agreement. It is our understanding that the union plans to call a meeting with its members throughout the country sometime after April 10, 1966. In all likelihood, if a strike occurs, it will occur during or shortly after this meeting. ✓

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NEGATIVE REPORT.

NOTES 4/4/66 FELLOWS

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1. Optical Experimental Facility: This facility was proposed by MSFC for the FY-68 C of F Program. At the request of Mr. F. J. Sullivan, OART, Dr. Randall of the Astrionics Laboratory attended a meeting in Washington, March 24 and 25, to discuss requirements of the Centers for an Optical Experimental Facility such as the one proposed by MSFC. All Centers were represented except Lewis. MSFC and Goddard had R&D requirements for an optical facility. Other Centers indicated that if such a facility were constructed, occasional experiments would be requested of the Center operating the facility. MSFC and Goddard envision different types of experiments, and it is not clear at this time whether a single dome and telescope configuration can satisfy both Centers' needs. Dr. Randall and Mr. Reinbolt will discuss the possibilities of common facilities with Dr. Henry Platking of Goddard. ✓

2. Incentive Contracting for Systems Engineering: Recently, my Vehicle Support Office held meetings with IO and the laboratories to discuss systems engineering responsibilities. Following these meetings, instructions were issued to the laboratories reaffirming the requirement to continue work to meet the established schedules for conversion of the Boeing and Chrysler contracts to CPIF basis. (Negotiations are scheduled for completion by June 30, 1966.) Concurrently with the conversion, R&DO will make a study of all systems engineering activities and identify organizational responsibilities. ✓

3. FY-66 Initiations: Status of R&DO initiations from FMO manual records as of March 31 is as follows (dollars in thousands):

	<u>Program Authority</u>	<u>Initiations</u>	<u>Obligations</u>
OMSF			
Saturn I	\$ 53	\$ 53	\$ 53
Saturn IB	28,560	26,814	20,611
Saturn V	109,598	103,849	69,311
Engine Development	842	821	699
Supporting Development	10,450	10,185	3,590
Total OMSF	<u>\$149,503</u>	<u>\$141,722</u>	<u>\$94,264</u>
OTDA	1,500	1,493	207
OART	16,264	13,221	4,261
OSSA	<u>608</u>	<u>533</u>	<u>210</u>
Total R&DO	\$167,875	\$156,969	\$98,942

Uninitiated Saturn balances are mainly for supplies, materials, etc. properly planned for fourth quarter initiations. ✓

1. Saturn V Direct Ascent Mode: A presentation on this subject was made to Dr. Mueller while he was visiting at MSFC on April 1, 1966. The presentation covered the flight mechanical and launch vehicle considerations required to incorporate the direct ascent mode into the Saturn V program. There is only one major draw back to the direct ascent mode, and that is the launch window availability. Restricting ourselves to the presently defined Apollo constraints, there are only 5 months (June thru Oct) out of the year that a mission to the moon can be accomplished with direct ascent. It was pointed out, however, that if the lunar lighting constraint could be relaxed then it would be possible to have an opportunity each month. R-AERO is presently engaged in a study to evaluate the possible trade-offs of direct ascent launch windows vs all the Apollo operational constraints. It is felt that the results of this study will show that a significant increase in direct ascent launch windows can be obtained without degrading mission success probability. The following plan was presented and agreed upon for implementing the direct ascent mode into the Saturn V launch vehicle program: (1) AS-501 will be flown with the earth orbital mode. (2) Effort will be continued to provide the earth orbital mode capability for AS-502. Limited effort will be initiated now to also make provisions for direct ascent capability for AS-502; however, the final mode decision for AS-502 will be based on the results of SA-203. If the decision, based on timely SA-203 results, is to provide direct ascent capability on AS-502, it can be provided without a major schedule slip. (3) If the SA-203 LH₂ experiment provides favorable results for restart then the direct ascent mode capability effort will be continued at a lesser pace, for application to future mission requirements. (4) If AS-501 mission is successful, then direct ascent effort will be continued as described in 3 above.

Dr. Mueller requested that an assessment of the program cost be made for implementing the dual capability (earth orbital and direct ascent mode) into the Saturn Program. R&DO and IO will look into this. ✓

2. Crew Safety Panel: A representative of our Flight Evaluation and Operation Studies Division attended a meeting of the Crew Safety Panel on March 30. He presented study results which showed that if wind probabilities were considered, and assuming a biased tilt program, that the "effective criticalities" could be reduced. The Panel took the position that filters in the EDS loop for the angular rates should be considered mandatory for SA-203 and AS-202. They also went on record again that the over rates should be an automatic abort parameter. ✓

3. Saturn IB/203 Static Stability Test: Recent scale model tests in the MSFC 14-inch Tunnel to investigate questionable center of pressure variations on the Saturn IB/203 launch vehicle have been completed. The protuberance effects on center of pressure noted on Saturn IB/203 in these tests were consistent with those experienced on Saturn I, Block II and Apollo-Saturn IB. However, the removal of engine shrouds and turbine exhaust ducts from the Saturn IB/203 tail barrel resulted in an additional 0.15 caliber forward center of pressure movement. The combined effect of protuberances and tail barrel geometry changes resulted in the approximately 0.4 caliber CP/D shift noted on Saturn IB/203 in the above mentioned scale model tests. ✓

4/4 JTD

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1. IMPROVEMENTS IN THE UNSATISFACTORY CONDITION REPORT (UCR) SYSTEM: We are in the process of finalizing the improved reporting systems with each of the Saturn stage contractors. UCR information (with the exception of CCSD data) is transmitted to Q&RA Laboratory on an automatic basis, either by direct ADP magnetic type transmission or through submittal of punched cards. Information submitted includes complete failure and discrepancy data, related failure analysis information, and final corrective action to prevent recurrence of the condition. This Laboratory evaluates each UCR from the standpoint of criticality, previous occurrence, and adequacy of corrective action. Reports are prepared from these evaluations and submitted to the various stage offices for program assessment and initiation of overall corrective action. All Saturn UCR information is maintained, in uniform format, in the MSFC centralized ADP system where it may be extracted by various elements of MSFC for use in such efforts as reliability studies, evaluation of checkout requirements, logistics planning and assessment of corrective action status. Status of stage contractor reporting systems is as follows:

- o The Boeing automated computer program for data transmitted has been prepared and a test program submitted and satisfactorily interfaced with the MSFC ADP system. Data transmission on S-IC-3 is to begin about the middle of April.
- o Implementation of the NAA system is complete with transmission of S-II-1 data due April 8, 1966.
- o The DAC system has been operational since December 1965.
- o The IBM system has been operational since March 1, 1966.
- o CCSD data is not transmitted on an automated basis; however, copies of the CCSD failure reports are received and entered manually by Q&RA Laboratory into the MSFC ADP system. ✓

2. CALIBRATION ACTIVITIES: With the assumption of calibration efforts previously performed by Astrionics Laboratory, the last significant calibration effort for the Center has been centralized in this Laboratory. Astrionics has been most helpful in accomplishing this last move, transferring four Civil Service personnel and nine contractor spaces with the function, and providing calibration facilities in building 4487. It is our intent to give the best possible service to our customers and every effort will be made to satisfy them. ✓

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1. IN-FLIGHT EXPERIMENTS: Activities in the in-flight experiments area have been rapidly increasing. Final approval was obtained from NASA Headquarters on the Optical Tracking Experiment #15; the AAP office of OMSF (Dr. Lundholm) is reviewing the Gas Bearing (#11), Antenna Patterning (#13), and AROD (#14) experiments; a total of \$646K has been recently received from Dr. Johnson's office for various phases of ASTR activities of in-flight experiments; action has been initiated to introduce the Thermal Radiation (#2) experiment on AS-206. P&VE experiments 3 through 7 are planned for the LEM. The question of MSFC/ MSC/Grumman roles again comes up and what is the interface definition and its level of detail insofar as MSFC providing the housekeeping functions (power, telemetry, sequencing, etc.). Our efforts are stalemated insofar as support of P&VE until this area is clarified.

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It is anticipated that the delivery of the S-1C-2 stage to Test Laboratory may slip several days beyond May 2. This is based on present time estimates for stage changes and the 15 day post-manufacturing checkout required by R-QUAL. ✓

F-1

Test FW-021 was conducted on the West Area F-1 Test Stand with F-1 engine S/N F-2010 on March 29, for a mainstage duration of 97 seconds. The test was terminated early due to the fuel pump balance cavity exceeding the maximum redline. Most engine parameters experienced a sharp increase in value at approximately five seconds before cutoff was initiated. Upon removal of the fuel inlets, it was discovered that a bolt which retains the fuel inlet fairing in place had backed out and was lodged in the fuel inducer. There are four of these bolts and they rely on a locking feature built into the threaded insert. This will impact 501 and 502 schedules due to a torque check of these bolts which will be required as a minimum approach. It is our understanding that a fix for this problem is in the production "pipe line", but far upstream. ✓

S-1B-5

The full duration test, SA-35 was performed on March 31, at 4:40 p.m., for a duration of 145 seconds from ignition to outboard engine cutoff. All systems performed satisfactorily. After the test, a leak was detected inside the thrust chamber of engine No. 4. Investigation revealed a crack in a tube, 10½ inches below the injector. The engine will be removed and shipped to Neosho for repair. The stage will be shipped to Michoud on April 7, without engine No. 4. After repair and penalty firing, the engine will be reinstalled at Michoud. ✓

S-11-T (MTF)

LN₂ tanking was initiated Tuesday, March 29. Lox tank was filled from 5% to the 98% level at the fast fill rate with no delay. The lox tank was filled to the 100% level through the topping system. The lox fill rates were lower than expected (1600 to 2000 g.p.m.). The LH₂ tank was unloaded through the slow fill and topping to the 20% level; from the 20% level to empty was detanked through the facility F&D valve to the pit. Lox was detanked through the lox dump system and the lox F&D system with the flows being 2,700 and 3,100 g.p.m., respectively. The 15 minutes detanking requirement was not obtainable through either system. Detanking of both tanks was completed at 7 a.m., March 30. Frost was accumulated to ¼ inch on the exterior skin during the 8 hour hold period. Preliminary examination of the insulation revealed one large crack in the "J" ring area. ✓

S-1VB (SACTO)

The NASA/DAC buyoff meeting for vehicle 204 was held Friday, April 1. The possible leak from the fuel tank is still unresolved. DAC pressurized the cavity and conducted a decay check, but the results indicated there is not a leak. However, these results are not conclusive. Vehicle 203 is scheduled to be shipped to KSC today via the Super Guppy, arriving Wednesday, April 6. Power was applied to vehicle 501 on Wednesday, March 30, in preparation for a firing about the second week of May. ✓

4/4/66

1. IBM COMPUTER REQUIREMENTS: The IBM Federal Systems Division has transferred their computer programs from the Computation Laboratory 7094's to their own Model 360 computer, except in critical areas involving AS-203. This workload transfer is some relief to the Computation Laboratory as IBM, at one time, was using in excess of 100 hours per month of our 7094 time. This move was coordinated with Industrial Operations. ✓

2. APOLLO PROGRAM OFFICE-MSFC DATA LINK:

Mr. Tuey of the Headquarters Apollo Program Office has requested that Computation Laboratory, Data Center Division, review and determine technical feasibility of providing the Apollo Program Office in Washington, D. C., with a data base of information in the on-line 7010 computer system at MSFC, with a remote terminal located in Washington to be used as an inquiry device. The request was made during a meeting on March 23, 1966, with Executive Staff personnel and Computation Laboratory representatives.

A preliminary review was conducted and showed that it was technically feasible and that there was sufficient capacity in present hardware to handle their initial requirements.

Mr. Tuey was requested to submit a coordinated request in writing to cover their requirement. ✓

H. Maus, Exec. Staff

Looks like another effort to syphon raw data out of the Center, thus depriving us of an effective way to establish a Center position first. Shall we support this? B

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STATUS OF THE S-IB STAGE PROJECT: (THIS ITEM WAS REQUESTED BY DR. REES) Essentially 100% of the engineering drawings has been released for stages 1 through 9 and 85% has been released for each of the remaining three stages of the twelve stage S-IB project. The remaining 15% required for each stage are predominantly drawings which describe the instrumentation program. Both the short and the long duration static tests for S-IB-5 have been completed and manufacturing of S-IB-10 will begin this week. All long lead time hardware has been procured and essentially all remaining hardware is under order. A procurement plan is being processed for a follow-on buy.

SATURN IB NOMENCLATURE: In reviewing the draft script for the January-March 1966 OMSF Quarterly Film Report we noted that throughout the script the Saturn IB launch vehicle was called the "Uprated Saturn I." Since we have received no written notification of a nomenclature change, we objected to the use of this unofficial nomenclature. It appears, however, that this terminology will become standard for NASA Headquarters publicity releases unless more strenuous objections are raised.

(B)
See my remarks on attached slip B

CHRYSLER SOLDERING PROBLEMS: During the week of March 7 ten distributors were inspected and 363 complaints were written, 117 of which required rework. This continues to be a real problem and effective two weeks ago 100% inspection was started on all solder joints. KSC people tell us that, based on their inspection of both Chrysler and Douglas soldering work, Douglas is well ahead in this area. We are attempting to get better definition of the requirements for vibration bends and the quantity of solder on joints. ✓

IBM SUB-VENDOR STRIKE: The strike at Potter and Brumfield is continuing and indications are that the strike could get to be a serious one. The company produces relays which are used in the power distributors, switch selectors, and the LVDC's. Unless the strike is settled this week, we can expect delayed deliveries of switch selectors starting with 141 which would impact about 206 and 503. ✓

EMERGENCY DETECTION SYSTEM CLOSED/OPEN-LOOP FLIGHTS:

The crew safety panel has established a firm requirement to install a filter in the emergency detection system control rate gyro package for AS-202 and subsequent. It is hoped that this change will eliminate the noise problems encountered on AS-201. It is planned to fly the EDS with the filter open-loop on AS-203 for verification and to fly the EDS closed-loop on AS-202. ✓

I see nothing wrong with use of "Saturn IB" in all doc - George Mueller specifically directed this change in the Saturn IB launch vehicle nomenclature for press purposes only. All of our official documents and in dealing with Headquarters refer to Saturn IB. still However, Mueller feels that we will have a better use story of success with 11-out-of-11 or 12-out-of-12. the Conversely, if we had a failure, we would be in a looser better light with 11 successes out of 12 launches. term "Saturn I" whenever it helps the image.

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has
convinced
me that
welding is
one of the
most critical
aspects of
our whole
job!!

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1. S-II Welding Meeting: You might get tired hearing so often about welding problems. But all of the welding techniques are compromises for the many overlapping aspects in the areas of metallurgy, weld equipment, tooling, quality control, and last but not least, management. In February of this year, a meeting was held to discuss NAA's management organization relative to welding. It was evident that changes were necessary to provide a more decisive welding program. As a result of that meeting, NAA reviewed their organization structure and at a meeting held on March 29-30, they presented, to ME Laboratory personnel, their new organizational plan. S&ID has promoted Mr. Cole to a responsible position for coordination and implementation of welding fabrication practices for the S-II vehicle. NAA has accepted Marshall's recommendation that additional research and more importance be given weld energy joules per inch (time-temperature) in the welding of 2014 material. The ME Laboratory has, through its research work, been aware that an important consideration in producing strong welds in 2014 material is the time-temperature phenomenon. It is interesting to note that Dr. Adams of M.I.T. is now performing studies relating weld energy nugget size and weld properties in aluminum weldments, and realizes the importance of the time-temperature relationship. We believe that in the future, time-temperature controls will be integrated into the welding specification to insure reliability. ✓✓

2. S-IC-501 and -502: Considerable modification work is still required for these stages on electrical distributors and cables. There exist today 16 ECP's (Engineering Change Proposals, negotiable), 5 PRR's (Production Revision Record, non-negotiable) and 4 CAM's amounting to more than 900 manhours modification work for -501, and 1350 manhours for -502. Some ECP's have not yet been approved by Level III Change Board. To meet the April 18 delivery date to Test Laboratory for -502 we will have to work 7 days a week in this area. ✓

Removal of engines for -502 for contamination check is on schedule. Except on the first engine no contamination has been found. Re-installation will be completed prior to April 18, 1966. Status of undelivered hardware from Boeing for -501 is 104 line items (of which 10 are overdue), and for -502 is 275 line items with 32 overdue items. ✓

1. LOCAL SCIENTIFIC SURVEY MODULE - A mobility test program of the BECO built LSSM mock-up was begun this week on Test Range 3 near Gate 9. The mock-up was instrumented with accelerometers and power-measuring meters. The Army provided a M-274 "Mule" vehicle for comparison testing. The M-274 vehicle (a 4 x 4 wheeled vehicle without suspension) is very similar to a LSSM. Movies are being taken and will be available within two weeks. ✓

2. J-2 ENGINE LOX TURBINE WHEEL - Cracking has occurred on the original thin wheel design only and not on the new thick wheel design scheduled for S-IB/208 and S-V/504 and subsequent (engines 2060 and subsequent). An inspection of all thin turbine wheels on engines J-2012 through J-2059 will be made before stage acceptance and prior to flight with the exception of engines on vehicle S-II-T. The engines on S-II-T (2014, 2017, 2018, 2021, 2024) will be swab checked before first firing; J-2014 will be inspected after first firing, and all engines will be inspected after first 350 sec. firing. ✓

3. HAZARDOUS GAS ANALYZER - Procurement hurdles seem to have been cleared, and all equipment for the hazardous gas analyzers for the AS-500F and Complexes 34 and 37 is to be delivered on or before 5-1-66. The AS-501 system is being implemented also. ✓

4. S-II - Vibration tests on the LH₂ inboard feed line (ME 271-0011) were satisfactorily completed on 3-29-66 at Wyle Laboratories.

Component Qualification Status -

131 Propulsion System Components ✓

116 Qualified

15 Unqualified (being tested)

5. IN-FLIGHT STERILIZATION OF MARS PROBES - A paper was presented by Dr. Fisher (Human Factors Section) at the AIAA/AAS Stepping Stones to Mars Meeting in Baltimore. The paper gave some engineering concepts for in-flight sterilization which would relieve the stringent and expensive requirements for terminal sterilization of space probes within the contaminated earth environment. ✓

6. S-IC IMPEDANCE TEST - The S-IC fuel line impedance study by the Vibration and Acoustics Branch (R-P&VE-SV) and The Boeing Company was completed. The significant results are that impedance techniques can be applied to determine environmental loads, and that impedance techniques would be useful in establishing environmental design and test criteria. ✓

7. S-IC STAGE 1/4-SCALE INTERTANK - The 1/4-scale intertank was successfully tested to failure on 3-10-66. The specimen failed at 150% of combined axial load, bending moment, and shear in a cryogenic environment. ✓
This concludes all of the intertank scale testing in the S-IC program. ✓
These subscale tests yielded results within 95% of the full scale tests. ✓

4/4/66

BUREAU OF THE BUDGET VISIT - Mr. Franz Kretzmann, who replaced Don Crabill as BOB coordinator for NASA budget activities, and Mr. H. T. Heintz visited MSFC on March 31 and April 1. They were accompanied by Bernie Johnson, MSF Programming Operations, and Al Crobaugh of D. Wyatt's office.

The purpose of the visit was to acquaint the new BOB team with MSFC activities, current MSFC budget requirements and to clarify information relative to incentive contracting and sustaining engineering that BOB had received as a result of last fall's visit.

Mr. Kretzmann expressed satisfaction over his visit here and we feel sure that he was satisfied with the clarifications that he received concerning the incentive contracting and sustaining engineering. He further indicated his favorable impression of the Center, its management and its activities. ✓

ANALYSIS OF FY-67 AUTHORIZATION HEARINGS - This analysis, which Ray Kline presented to you on March 31, will be repeated at the IO staff meeting on April 4 and to the R&D Council meeting on April 8. ✓

NOTES 4/4/66 RICHARD

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Interlock Philosophy:

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We have been working with Bellcomm to establish a tri-center and Headquarters coordinated philosophy on hardware interlock criteria. As we have mentioned in our earlier notes, this approach is badly needed to avoid a continuing review before each launch by Headquarters and others to assure everyone we have not jeopardized the launch with the interlock system.

The resulting criteria is, for all practical purposes, the one we have been using and should cause a minimum impact on our designs. However, it reconfirms the requirement for (a) parallel monitoring in the LCC of parameters which are interlocked, (b) the ability to recover from an interlock circuit failure and still make the mission, and (c) a minimum number of interlocks, consistent with operator response time and system reliability.

Another point the criteria makes is that the mission starts with ignition command, and not with liftoff. This is made necessary by the long recycle needed if the engines are shutdown and the resulting disasterous effect on launch windows. Hardware operating after ignition command should get the same mission critical emphasis, regardless of whether it flies or not. ✓

General Phillips has asked to be given a review of this subject by Bellcomm in the near future. ✓

NOTES 4/4/66 RUDOLPH

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1. SA-500F - Launch Vehicle erection completed with stacking of IU on Wednesday, March 30, 1966, on schedule. Dummy spacecraft will not be erected until Monday, May 2, 1966. GETS checkout will be initiated on Tuesday, April 5, 1966. ✓
2. S-IC-1 Stage Pre-Delivery Review at KSC - Scheduled for Thursday, April 21, 1966 at KSC. MSFC Dry Run is scheduled for Wednesday, April 13, 1966, at 9:00 am, in Room 223, Bldg. 4200. ✓
3. S-II Stage:
S-II-T Stage -
 - o LN₂ tanking was completed on Tuesday, March 29, 1966, with de-tanking (regular and emergency) finished on Wednesday, March 30, 1966. ✓
 - o Firing readiness review conducted on Friday, April 1, 1966.
 - o LH₂ tanking scheduled for Friday, April 8, 1966.
 - o 1st firing currently scheduled for Tuesday, April 12, 1966. ✓
- First Article Configuration Inspection (FACI) - begins today, April 4, 1966, on S-II-3 with configuration audit of Engine System. FACI will be conducted on an incremented basis by configuration audits of selected sub-systems as they are completed and ready for inspection. ✓
4. S-IVB Stage Simulator (500ST) for SDF (Breadboard) - arrived at MSFC via Super Guppy on Thursday, March 31, 1966. ✓
5. Saturn V - IU Checkout Station Verification Tests - started on Wednesday, March 30, 1966 (5 days behind schedule). It is anticipated that lost time can be made up during station verification test, resulting in no schedule impact. ✓

NOTES 4/4/66 SPEER

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B 4/9

1. FLIGHT OPERATIONS REVIEW AT MSC: A Flight Operations Review was held with J. Hodge at MSC on March 29 and 30. A Flight Directors (Hodge) Status of the AS-203 mission was conducted and it appears that there are no major problems in the operations area for the experiment. Other subjects covered during the visit were: (a) Integrating MSFC experiment flight controllers into the overall flight controller team, and (b) methods for handling generation of data for determining FIDO limits and guidance switchover criteria. The MSFC experiment controllers will report to MSC on April 18 to start training and simulations. Recommendations concerning the display data generation have been referred to L. Richard and A. Cohen (MSC) with a request to make appropriate panel assignments. Of special interest to MSFC was a remark made by A. Cohen, which appears to reflect the MSC position in general, that the design panels have now fulfilled their mission and should be abolished in the near future.

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2. BOD BRIEFINGS: Presentations were given to the BOB field team on April 1, 1966 covering the subject of Flight Data Requirements and LIEF Communications. The presentations were generally well received and it is felt that the questions of the team on these subjects were covered in our material. ✓

→ Eberhard Kees

Has this ever been suggested during one of the Panel Review Board Meetings?

Has do you see this?

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1. PEGASUS: No significant changes. RPL will participate in a meeting at MSC this week for the purpose of rewriting the Apollo Meteoroid Criteria.

2. AAP: - Earth Orbit- Our in-house laboratory equipment for bi-directional reflectance and transmittance measurements has arrived and is being checked out. A special feature is a mirror attachment which allows measurement of the reflected beam at zero angle to the incident beam. This laboratory work will allow the study of the angular dependence of reflected light in any direction of a hemisphere; it will be used in connection with simulated lunar surface material, and later in experiments on the lunar surface. ✓

Lunar Surface - MSF (Beattie) and OSSA (Wilmarth) are presently in the process of identifying potential Principal Investigators for experiments on the Emplaced Scientific Station (ESS) and for the lunar surface traverse experiments. The present OSSA planning figures associated with RPL's FY-67 AA Program is 6.2M, most of which will be earmarked to get the Principal Investigators started (similar to Badgley's FY-65 operation). ✓

The current figure being quoted at Headquarters for the overall development costs of the experiments for the first two AAP lunar surface missions (519-520 and 524-525) is 140M. ✓

3. MUELLER VISIT: Dr. G.E. Mueller and his associates spent an hour in some of RPL's laboratories last Friday. Due to the shortness of time, we could show him only some of our experimental work in the Thermal Space Environment Laboratory (interactions of solar radiation with surface coatings; emissivity, absorptivity, and reflectivity studies in the laboratory and in orbit; basic research in radiation effects on solids) and the Aeronomy Laboratory (physico-chemical reactions in the high atmosphere). Dr. Mueller was particularly interested in the close relationship of our work with in-flight experiments on Saturn I payloads, and also with potential AAP experiments on Saturn IB and Saturn V. ✓

4. ART/SRT AND SUPPORTING DEVELOPMENT FY-1966 PROGRAM STATUS:

	<u>Annual</u> <u>Plan</u>	<u>Program</u> <u>Authority</u>	<u>Processed</u> <u>To FMO</u>	<u>Obligated</u>
OART	16,639,000	16,139,000	15,573,596	5,357,033
MSF (904)	9,450,000	9,450,000	9,368,627	3,644,355
OSSA	5,903,000	608,000	535,458	264,330
OTDA	1,500,000	1,500,000	1,493,242	217,536
TOTALS	33,492,000	27,697,000	26,970,923	9,483,254

As of close of business 3-31-66

Action is currently being taken to withdraw the uncommitted funds in accordance with our memorandum, subject, "ART/SRT and Supporting Development FY-1966 Program," dated March 25, 1966. ✓

NOTES 4/4/66 WILLIAMS

B 4/9

4/4 9/8

1. S-IVB Workshop: Bill Ferguson spent Friday at MSC finalizing the statement of work for the three study contracts on the "Support Module" (formally the "airlock slice") which will go to Douglas, McDonnell and Grumman. He also reviewed the latest draft of the Procurement Plan and EDP which are now in relatively good shape. The only real problem is keeping MSC from making the Support Module "specs" so tight that only McDonnell can get the job and only Gemini equipment can be used. Bill is also in Washington today (4/4/66) with Gray and MSC trying to get the paperwork through MSF so that the RFQ can go out the end of this week. It is planned that only a matter of days (3 to 10) will be allowed for the contractors to respond. ✓

Term. Weidner and F.W.

2. Impressions from Gray and Mueller Visits to MSFC: In several instances over the past few months, and again during the Gray and Mueller visits last week, a "message" seems to weave its way through the discussions and meetings. That message is:

I couldn't agree!! more!!

- (1) We don't have much money to go out for new activities.
- (2) With no (or very little) money, we (Headquarters) can't make decisions to start or approve new activities.
- (3) New activities must be started - but don't ask us for approval because we can't say yes in this climate. Just go ahead and do things. ✓

This is precisely the situation. Where can I help more? B

In general, I feel Headquarters feels we understand the situation and knows what needs to be done, but that we wait until someone tells us to move before we get started. I think that we would do MSFC and MSF credit if we "decided among ourselves at MSFC what needed to be done and "just moved out on our own" (within our own recourses, that is) without any approval. We have considerable resources, including inhouse CS and support contractors, etc., and what little money is around to be divided up throughout NASA for the next 1 1/2 years is so small that it will not add appreciably to what we currently have, so why spend so much of our time debating over that "small pot" when we could get much further by properly expending what we already have.

There are (1) hazards, and (2) responsibilities, of course, associated with this approach; i. e., (1) we may bet on the wrong things and (2) once we select an item to go on, it must have complete and wholehearted support through the Center. ✓

Add to this the 4% practically un-tapped R&D money many companies are eager to spend on AAP - and you have a package B

April 11, 1966

4/11/66

B 9/19

F-1 ENGINE

Inspection of S-IC-1 engine 3013 revealed that three of the four pump inlet fairing screws were below the recommended torque. Rocketdyne is investigating a fix for all engines in the field, and expects to have their recommendation by the end of the month. S-IC-1 engines will be modified prior to shipment to KSC.

The viton A "O" ring seal in the gas generator post-tee block joint exhibits sporadic leaks. These seals are being changed-out for Buna N seals which retain resiliency at lower temperatures. No schedule impact is anticipated.

RL10 ENGINE

Atlas/Centaur AC-8 was launched at 8:00 p.m., Thursday, April 7, 1966. Centaur first burn was successful, and was followed by a 25-minute coast period.

During the boost pump "dead head" run period before opening the engine valves, the boost pump pressure and speed dropped. One RL10 engine reached full thrust, but shut down in 17 seconds while the other engine reached approximately 12 percent thrust and shut down in four seconds. No RL10 engine malfunction was indicated.

J-2 ENGINE

A meeting was held last Tuesday among P&VE, TEST, S-II Office, Rocketdyne, S&ID, and our office to review the J-2 LOX turbine wheel cracking problem. As a result of the meeting, the following requirements are being transmitted to the S-II and S-IVB stage managers: (a) Swab tests should be made on oxygen turbine exhaust hoods after each test of at least five seconds of mainstage operation, for sign of metal chips indicative of turbine wheel rubbing. Presence of such chips will require removal and inspection of the turbine wheels. (b) Inspect oxygen turbine wheels at intervals of not more than 1500 seconds of total engine operation including engine acceptance. The period of total operation between inspections should be reduced one second for each second of engine operation at maximum mixture ratio. However, the accumulated run time at maximum mixture ratio between inspections should not exceed 500 seconds. Maximum mixture ratio operation is defined as operation with the propellant utilization valve in the fully closed position. (c) Inspect all flight engines prior to stage acceptance firing and again prior to flight regardless of time accumulated in the stage acceptance.

An R&D engine with the stator seal removed from the LOX pump has accumulated 11 tests and 2014 seconds. The turbine wheel has been inspected after each 1000 seconds and it looks good. Evaluation will continue to verify this change as a possible method of redesigning or eliminating turbine wheel inspections. After we accumulate 3750 seconds of operation on this engine without wheel cracks, we will initiate a test program with thick LOX turbine wheels to determine the effect on engine start and performance. This is also a possible method of eliminating turbine wheel inspections.

CONSTAN

RS 4/11

B 4/19

S-I/IB Program

S-IB-3 departed from Michoud for KSC on April 7, 1966.

S-IB-5 departed from Huntsville, following Static Test, for Michoud on April 7, 1966. ✓

Computer Support

With Computation Laboratory assistance, the Slidell Computer Office has essentially completed the planning necessary to support MTO-S-II-T static test data reduction. ✓

S-IC Program

S-IC-3 checkout is continuing with no significant problems or delays developing.

S-IC-4 is undergoing structural assembly in the Vertical Assembly Building. ✓

Briefing on F-1 Engine Damage

A verbal briefing was given by Boeing on their investigation of why an F-1 engine was damaged during handling. The major contributing factor was lack of training of the handling crew, with some deficiencies in procedures and in the handling fixture. We have been able to get a mockup engine from Huntsville, to be delivered April 12, which will be a major help in the training of handling crews. ✓

Boeing - IAM labor negotiations are to be continued in Washington, starting next Wednesday. This is thought to be a hopeful sign that no immediate walkout will occur, although it is still possible. Boeing has indicated that they could recover from a strike of 30-days duration with no appreciable impact on the program. ✓

NOTES 4-11-66 DANNENBERG

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B 4/19

1. Interface Control Documentation (ICD's) - The weekly Notes of 3-21-66 reported that the identification phase for Saturn IB & V ICD's had been essentially completed. It can now be reported that the implementation is also well under way. A target date of June 1, 1966, has been established to complete the implementation phase, which will include contractually required action. R-S is working closely with both Systems Engineering Offices in IO to insure that those ICD's not yet released for early flight vehicles will be available in time to meet the established 6-1-66 date. After that date, only the mission peculiar ICD's will be required on short delivery deadlines (presently less than 20 peculiar ICD's per vehicle). ✓

2. ICD Repository - In connection with the implementation effort described above, the ICD Repository operations were reviewed in regard to efficiency and quickness of response. It became apparent that certain improvements can be introduced to better meet future needs after complete implementation of ICD controls. Forthcoming meetings will finalize improved procedures for future repository operations. A physical inventory of all ICD's in the Repository is simultaneously being conducted to purge the inventory and to assure completeness of Change Board action in all instances. ✓

3. Data Management - The ESE Program Office has accepted GE's proposal to submit microfilm for drawings and associated lists, excluding EO's. Effective 7-1-66, the MSFC Repository will receive microfilm in lieu of "hard copies." Microfilm will also be furnished KSC plus a limited number of hard copies. This measure should result in a sizable reduction of copy requirements imposed on GE by the Government. ✓

NOTES 4/11/66 FELLOWS

B 4/12

4/11/66

1. Repair and Alteration Program: With the decline of construction of facilities approvals, local plant engineering continues to increase in importance. In addition to repairs and minor improvements, the FY-66 local effort will be approximately 1,200 major maintenance jobs in R&D Operations plus 61 repair and alteration projects in the amount of \$4.5 million. Senior management attention will continue to be given these activities in applying money and effort to those requirements representing maximum long-range benefits. ✓

2. Early FY-67 Initiation Authority: In support of the Financial Management Office in their compilation of the initial FY-67 Resources Authority Plan, we have revised the R&D Operations Saturn Program Plan to reflect the reduced levels for Saturn IB of \$10,228,000 and for Saturn V of \$92,900,000. (Former annual plan was \$16,775,000 for Saturn IB and \$99,000,000 for Saturn V.) We still plan to initiate substantial amounts of FY-67 authority in time for obligation in July. ✓

NOTES 4/11/66 GEISSLER

B4/L9

4/11/66

1. Conference on Aerospace Meteorology: Members of our Aerospace Environment Division presented technical papers at the AIAA/AMS Conference on Aerospace Meteorology held at Los Angeles during the week of March 27, 1966. The papers were: (1) "The Analysis of Detailed Wind Profiles for the Launch of Saturn AS-201" by Mr. C. K. Hill, and (2) "Missile Range Reference Atmospheres - Their Origin and Use," by Mr. O. E. Smith. Approximately 300 people attended the conference. Personnel of Aero-Astrodynamic Laboratory are active in both sponsoring committees. ✓
2. Serpentuator: Our Dynamics and Flight Mechanics Division is cooperating with ME Laboratory in the study of the "Serpentuator." This is a mechanical linkage device to be used for extra-vehicular manned mobility. We will be responsible for the dynamic analysis of the system. ✓
3. Visit of Johns Hopkins University Representatives: Dr. Alan Brandt and Mr. Perini of the Applied Physics Laboratory of Johns Hopkins University visited our laboratory on April 1, 1966, to become better informed on the current state-of-the-art of optimization theory in general, and application of optimization techniques to trajectory computation, especially pertaining to air-augmented propulsion. The two researchers are heading a team under contract to the Department of the Navy, Bureau of Naval Weapons, interested in systems optimization of a two-stage rocket system employing air-augmented boost phase for the "Advanced Polaris" concept. We provided them with the desired information in the form of six informal briefings by laboratory personnel. We considered this effort worthwhile, since we may get valuable feedback from their future work. ✓
4. AS-201 Flight Results Presentation: Mr. Lindberg will make a presentation to the PRB on April 18th on the AS-201 launch vehicle flight results. The Crew Safety Panel will report on results of the EDS performance on AS-201. Another presentation has been requested by I/I-IB Program Office on April 15th on AS-201 flight results for MSFC management. This is to fulfill your desire that the original presentation on March 4th be repeated. ✓
5. SA-203 Pre-Flight Trajectory: The predicted J-2 start sequence will be revised as a result of the AS-201 flight results. A 0.41 second time lag will be assumed for the time from launch vehicle digital computer command to actual thrust buildup as a consequence of the lower than expected temperatures on AS-201. This will be incorporated in the operational trajectory. ✓
6. Bellcom/OMSF Apollo Criteria Document: Aero. Lab. representative, Mr. C. Dalton met April 7, 1966 at MSC with NASA Headquarters personnel regarding proposed Headquarters revision of the meteoroid criteria. ✓

4/11/66

1. IU SYSTEM'S CHECKOUT: Problems associated with IU Systems Checkout are increasing at an alarming rate. The following is the problem status for IU-203 due to ship to KSC on April 13, 1966.
- Major components have been rejected for malfunctions, but not replaced and/or repaired prior to completion of checkout. A UCR has been prepared for the following:
 - o Flight LVDC (Launch Vehicle Digital Computer) Serial No. P-5
 - o Flight LVDA (Launch Vehicle Data Adapter) Serial No. P-4
 - o EDS Control Rate Gyro and Control Signal Processor Coolant Pump
 - o ST-124M Yaw Gyro and possibly one Accelerometer
 - o Fifty guidance and control measurements of the DDAS exhibited noise over specified limits. KSC is very concerned about the noise problem.
 - The following major nonflight components were used during the entire checkout and will require replacement prior to launch:
 - o Flight Control Computer
 - o Switch Selector
 - o S-Band TV Transmitter

Removal of these nonflight components and rework noted above will invalidate a large portion of the checkout; therefore, we cannot attest to the flightworthiness of this IU at the time of shipment to KSC. We are concerned that this situation is not improving and that we will be faced with the same compromises on the first manned bird.
2. S-II PROGRAM: It is apparent that S&ID is taking the initiative in many cases to "clean up" troublesome areas. For instance, they have reduced the number of Fabrication and Inspection Records (FAIR) books for the S-II stage by 50%, thus reducing the workload of S&ID quality assurance people and the NASA-O people. The reduction will also simplify the manufacturing records. A plan is being developed for control of hardware which is moved out of station with open work. A plan outlining the quality assurance role in checkout is being developed. A plan is being developed to define quality assurance shakedown inspection of the stages. Finally, PERT charts have been revised to reflect inspection time which was not previously identified or allocated on schedules.
3. S-IVB PROGRAM: DAC's revised schedules for the qualification test program were approved by MSFC. The entire program is now scheduled for completion by December 1966. All testing applicable to 202 through 204 is to be completed no later than August 30, 1966, and all testing applicable to 501 no later than September 30, 1966. The appointment of Mr. Thomas of this Laboratory as MSFC's central contact for qualification testing, and DAC's appointment of Mr. Goldstein, as Qualification Test Director, has proven quite successful. Approximately 75 change requests (many of long standing) relating to the test program have been resolved and incorporated into the test program within the past month.

Request comment on actions taken

How Serious

B 4/19

4/11/95

1. UNIFIED S-BAND: A compatibility review of the Unified S-Band Vehicle and ground systems was held in Dr. Mueller's office on 3/31. Mr. T. A. Barr of the RF Systems Branch presented the MSFC contribution to the review. Dr. Mueller and General Phillips were present and expressed satisfaction with the development status. Presentations were also made by representatives from MSC and GSFC. ✓
2. AROD: A presentation on AROD was given to Mr. Christensen of OMSF during his recent visit to MSFC. His interest in AROD was to determine possible uses for the system in the Manned Space Flight Program and specifically in the possibility of using it in place of the Manned Space Flight Network. This particular interest is generated, apparently, by the need to economize. The direct yearly operating cost of the network was quoted to be 70 million. Mr. Christensen requested that we take a preliminary look at the feasibility of using AROD in place of, or to supplement the network, on a noninterference basis. ✓ He was informed that the preliminary look could only be made under the condition of noninterference, and that future action could be agreed upon after his evaluation of the results. ✓
3. APOLLO STANDARD COORDINATE SYSTEM: The use of the Apollo Standard Coordinate System has been resolved with IO and our contractors. Our original approach was to make its use across the board with all contractors and effective with SA-205 and 501. However, IBM-Huntsville was not advised soon enough and because of timing problems of implementation the effectivity will be with SA-206 and 502. Although this split effectivity with stage contractors (205/501) and IBM (206/502) is not the best solution, we feel it is acceptable and IO will accordingly proceed. ✓

4/11/66

B 4/11/66

S-1C

The schedule for S-1C-2 stage delivery to R-TEST has slipped from May 2 to May 12. The stage will be updated to as near flight configuration as hardware and documentation permits prior to post-manufacturing checkout during April 25 through May 10 by R-QUAL. ✓

F-1

Test FW-022 was conducted on the West Area F-1 Test Stand with F-1 engine, S/N F-3013, on April 7, for a mainstage duration of approximately 41 seconds. Rocketdyne has decided on a "fix" for securing the bolts which hold the fuel inlet fairing in place (these are the bolts which were responsible for the damage on engine F-2010). This fix utilizes a higher strength bolt and washer and an increase of torque from 70±10 in./lb. to 110±10 in./lb. A mixture of Epon 828 and Versamid 125 is also used to glue the bolt in place. Preliminary data indicate an increase of 3 to 4 times the initial torque using this mixture. Engine test at ERS will begin next week with this fix installed. We will use this fix on engine F-4T2 when it is installed in the F-1 Test Stand next week. ✓

S-1VB

Test S-1VB-019 was conducted on April 7, at the S-1VB Test Stand (MSFC) for a duration of 200 seconds. The primary test objectives were met satisfactorily. No fuel tank ullage pressure collapse was experienced as happened during acceptance test of 203. The pressurization system, orifice sizes, ullage volume, and sequence was duplicated on the S-1VB battleship for the above test, as was planned for 203 flight. ✓

Vehicle 203 was shipped from Sacramento to KSC on April 4, via the "Super Guppy", arriving at KSC on April 6. Checkout is continuing on vehicle 501, progressing toward a firing on May 11. DAC is experiencing some propulsion system problems, such as line which does not fit, brackets which are short, etc. The bracket problem is especially severe in the area of the calips pressure switches, which require a special, shock-mounted bracket. Twelve of the brackets are short. ✓

S-11-T (MTF)

The major portion of the week was devoted to completing various work items such as incorporating engineering changes to the SLAM and free hydrogen burnoff systems.

Trouble was experienced with the P.U. computer. Douglas A/C representatives were called in to assist. ✓ The P.U. computer amplifiers were replaced with Douglas off-shelf units. ✓ S&ID caused some delay in installation of these units because the amplifiers were not documented to NAA specifications. The P.U. computer had not completed calibration April 8. ✓

S-11 BATTLESHIP (SSFL) The major portion of the week was devoted to getting instrumentation ready for a special lox recirculation test scheduled for April 12. A Rocketdyne team was sent to battleship to inspect the J-2 turbine wheels. As of Friday, only J-2036 had been inspected. No apparent damage was located. The team recommended that primary seal be replaced. J-2 engine J-2036 had 12 starts and 2210 seconds of run time with this honeycomb seal. ✓

NOTES 4-11-66 HOELZER

4/11/66

B4(12)

Negative Report.

S-IB-3 AND S-IVB-203: The S-IB-3 ^{4/11 JTS} Stage left Michoud for KSC on April 7. S-IVB-203 arrived by Super Guppy at KSC on April 6. ✓

IU-203: As you will recall, in December of last year we identified a serious schedule problem with IU-203 in supporting the SA-203 launch schedule. Considerable attention was applied by both MSFC and IBM and checkout was completed last week. The IU will be shipped by Super Guppy 4/13. This delivery fully supports the KSC stack date. ✓

As we all know, when we exert major pressure in any one area of the program (such as schedules) other areas may, to some degree, be "compromised" from the optimum. Such is the case with IU-203 checkout. Since we could not effect the desired improvement in all flight hardware items, it was necessary to go through checkout with some non-flight (prototype) hardware. Further, some discrepancies experienced during checkout were "fixed" or waived for later "fixes" with little or no time for systems retest. These types of tradeoffs have reluctantly been made in the past and we are pushing to achieve program stability which will minimize the necessity for such tradeoffs in the future. This stability can only be achieved with timely hardware deliveries and early engineering definition. The hours we would transfer to KSC are relatively small. The problem from a quality point of view as well as ours is that the GFE situation is not improving as it should. We are still relatively late on deliveries and we still have bugs in the hardware. All elements of MSFC must give attention to this problem. ✓

The Qual Lab has recommended that we take two more weeks to checkout IU-203 at IBM, Huntsville, with all flight hardware installed. Considering the delivery status of remaining items, this would mean delaying shipment by at least 1 month (probably more) plus additional time for retest. In full consideration of the Qual Lab position, I am shipping IU-203 and taking the following actions: 1. Review (with Qual Lab) the KSC test procedures currently planned for SA-203 launch prep and insure that an adequate systems test will be conducted at KSC in all areas where we may have "compromised," to some degree, the systems test during factory checkout; 2. Insure that adequate bench tests are conducted (with Qual Lab participation) on all flight items installed in the IU-203 after shipment. ✓

I believe that this course of action will allow us to meet our schedule commitment as well as provide an acceptable level of confidence prior to launch.

SWITCH SELECTOR PROGRAM: This program which provides switch selectors to all Saturn stages has experienced certain technical and manufacturing problems which are beginning to "hurt" schedulewise. Switch selectors both in the assembly line and in the field are being recycled to Owego for rework. Now, in addition to these problems, a serious strike has developed with Potter-Brumfield, the single source supplier for a particular relay used in the S.S. The assets in hand will support us thru SA-206 and SA-503, however, we are in a day-for-day slip for deliveries to subsequent vehicles. Since these items are used in the stages for factory checkout and static firing, the delivery requirements are current needs. Alternate solutions are being pursued but none offer much hope for the immediate future. We are tracking closely with IBM and have advised Mr. Paul Styles' office. ✓

Hen
Seider

B

Highly undesirable situation!

B 4/13

4/11 JRS

B 4/18

Manufacturing Problems on S-II Structures at Tulsa: The material for the hat-shaped stringers for the aft interstage, aft skirt, thrust structure, and forward skirt for the S-II had recently been changed from Al 7075 to Al 2020. This change had been introduced for weight saving and is effective for S-II-504. These stringers are extrusions (in a hard condition), are riveted to the skin, and have caused a manufacturing and schedule problem. These structures are presently in final assembly for 504 at Tulsa and show many cracks in the material around rivet holes and also between the hat section sidewall and flange of the stringers. Most cracks are detected after riveting, but some have been found also after machining of stringers prior to an assembly effort. Of 1200 stringers inspected last week, 520 have been rejected. The course of action decided upon is: (1) disassemble all stringers from these structures and reinspect using the caustic etching and Zy-Glo method; (2) use non-impact fasteners instead of rivets for assembly (whereby the total weight advantage will probably be lost); (3) use shims as required to eliminate mismatch; (4) establish detail manufacturing control and assembly sequencing; (5) educate personnel on the sensitivity of the material; and (6) establish a comprehensive quality control procedure. In order to minimize schedule impact, it is mandatory that all manufacturing and support departments work in a three-shift, seven days a week operation. A delay of approximately four weeks for delivery of these structures to Seal Beach is anticipated.

Bill Lucas

Looks like
we took
some rash
action
switching
to this
harder
material.

Are you
satisfied
with actions

taken under
(1) through (6)?

B

B 4/10

4/11/66

1. EXPERIMENTS - OMSF called an informal planning meeting in an effort to assign our Experiments 3 - 7 (Project Thermo) to flight vehicles. For planning and budgetary purposes, our experiments were assigned to AS-509 and a second flight to 513. Recent obstacles to the continuation of this effort apparently have been eliminated, and our Phase B effort is now underway, including a small LEM integration study with Grumman. The alternate proposal to substitute the LEM descent stage or even the complete LEM with a rack was favorably received and will be pursued as an inhouse effort. Officially we are still looking toward the LEM. ✓
2. DC MOTOR BRUSH MATERIAL - A significant breakthrough has been made in the development of a DC motor brush made of 80% (wt) niobium diselenide and 20% (wt) molybdenum disulfide. The $NbSe_2$ provides high electrical conductivity and the MoS_2 has good lubricity. The crystalline structures and thermal properties of the two materials are so closely matched that a very compatible matrix results. Tests in vacuum at high temperatures indicate that the brushes do not arc and have very low wear rates. ✓✓
3. NUCLEAR - A request for development of environmental design and test criteria for the Nerva II engine was received from SNPO, Cleveland. Preliminary work has been started. ✓
4. S-IVB STAGE - The S-IVB SA-503 stage was hydrostatically tested to 105% of design limit loads. The double fix on the aft LOX bulkhead performed satisfactorily, but dye check on weldments in the LH_2 tank forward bulkhead revealed numerous previously undetected weld defects. Disposition has not been determined yet. ✓
5. S-IC PRESSURE SWITCHES - Solder balls have been found in some S-IC switches as well as on the J-2 Engine. All switches on 501 and 502 will be X-rayed. ✓
6. RETROCKET CONTAMINATION - The second subscale motor in the retrorocket exhaust contamination program was successfully fired in a vacuum chamber 4-6-66 by Test Laboratory. ✓
7. CENTAUR - Very preliminary information received on the Atlas/Centaur flight on 4-7-66 shows that all systems worked satisfactorily until begin of second burn. First indication is that hydrogen peroxide was exhausted at start of second burn. It is required to run the boost pumps. It started the pumps and one engine fired up and operated for approximately 15 sec. and then shut off. The cause of possible excessive hydrogen peroxide use during attitude control and propellant ullaging has not been determined. There should have been a 40 lb. reserve left even after the end of the second burn. ✓
8. FILM RETURN CAPSULE - (Reference NOTES 3-28-66 LUCAS) - This study will concentrate on return of photographic film, small scientific instruments, etc., from earth orbit. Return from lunar orbit design requirements will also be considered for commonality of design. The study is conducted by the P&VE Advanced Studies Office on its own initiative. At this time, insufficient detail is available for an informative presentation. We will keep you advised on progress. ✓

B.L.

Request briefing. Please arrange w/ Bonnie

B

ASO

Do we have info on Discoverer capsule?

Let's not "re-invent the wheel"! B

NOTES 4/11/66 MAUS

B 4/19

A/11/95B

1. POP 66-2 R&D - MSF R&D guidelines for POP 66-2 have been distributed. These guidelines request information in greater detail than previously submitted. The submission date has been advanced to April 22 in lieu of the May 2 anticipated submission date. The submission will contain an AAP estimate as well as Apollo requirements. The review of this submission is scheduled for April 21. ✓

2. APOLLO COST STUDY UPDATE - The computer input data which will yield the unit cost and corresponding annual costs, which you approved on March 28 (Hueter presentation) have been forwarded to MSF together with a letter stating the basic qualifications and limitations. The consolidated data from the three Centers is now pending review by Dr. Mueller. ✓

3. AAP FLIGHT MISSION ASSIGNMENTS DOCUMENT - Dr. Seamans has reviewed this document and decided not to release it until after MSF has made available for his review the data on "Rate Options" now being prepared for submission to BOB for the FY 68 Preliminary Budget. ✓

4. CONSULTING ASSISTANCE TO ELECTRONICS RESEARCH CENTER - At the request of ERC Mr. E. L. McInnis consulted with Mr. J. A. Vitale, Assistant Director, Facilities and Engineering, ERC to provide visibility of the NASA approach to facilities program formulation and execution, utilizing the experience gained by MSFC in its facilities program, organization and management evolution from the early stages of the Saturn I program to its present state. ✓

NOTES 4/11/66 RICHARD

B 4/19

Specification Program:

We are on schedule to produce an SA-213 block specification by April 28. ✓

In our other areas, we have gone to a "basic specification" defining general design and performance requirements for a block of operational vehicles. (In this case our blocks are SA-204-212 and SA-504-515.) We will then add addenda for each vehicle as needed to cover specific requirements. This should clear up some of the confusion which has existed in our documents in the past, and lead to a more efficient set of documentation. ✓

4/11/66

1. S-IC Stage Acceptance Captive Firings:

- Incentive contract currently provides for two captive firings (35 and 85 seconds) for S-IC-3 and subsequent stages. ✓
- Only one captive firing planned for S-IC-2. ✓
- Decision has been made that one captive firing (approximately 125 seconds) is sufficient for S-IC-3 and subsequent stages. ✓
- Incentive contract will be amended accordingly. ✓

2. S-II Stage:

S-II Battleship Program - will be continued on a limited operational basis for an indefinite period of time and periodic reviews will be made to assess need for continuation. ✓

S-II-T -

- LH₂ tanking - dry countdown - scheduled for today, Monday, 11 April 66. ✓
- LH₂ tanking; previously scheduled for Friday, 8 April 66, is now scheduled for tomorrow, Tuesday, 12 April 66. ✓
- The Captive Firing Test, previously scheduled for tomorrow, Tuesday, 12 April 66, is now scheduled for Friday, 15 April 66. ✓
- Above delays are the results of difficulties in making the Ground Instrumentation System operational. ✓

3. Strike at NAA (S&ID) - All welders walked out on strike at 1:00 pm, PST, on Thursday, 7 April 66. NAA stated that the strike will not have an immediate impact on the S-II Stage Project. ✓

B 4/10

4/11/66

F.S.
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was
very
little
interest
in
AROD!
B

1. CHRISTENSEN VISIT: Mr. Christensen spent a whole day at MSFC to review our mission operations activities and other items arranged per his request. ASTR-I presented development status of the AROD tracking system. There is great interest in this system since MSF is planning to eventually eliminate all remote sites transmitting telemetry, voice and command via synchronous satellites (LEM) and possibly using AROD for orbital tracking. We can expect strong support from MSF (not necessarily from OTDA) for experiment proposals along this line. AERO gave an excellent and well received briefing on MSFC meteorological activities. Extensive discussions were held on mission operations problems such as experiment flight control; the role of LIEF in AAP; and OSRO (Operations Support Requirements Office, D. C.). It appears that MSC is about to launch the second attack against OSRO and is now expected to succeed in forcing a discussion in one of the next Management Council Meetings. If and when this subject should be on the agenda I would like to brief you on this matter. *→ Please do. B*

2. AS-201 LIEF OPERATIONS CRITIQUE: Re your note concerning LIEF Operations Critique (copy attached for Dr. von Braun): we have now developed three alternate ways of improving our response time to urgent requests from KSC through LIEF. Briefly they are: (1) permanent grouping around tables in the Main Conference Room by vehicle stages; (2) permanent grouping as in (1), however by major vehicle systems; (3) call out of pre-selected systems groups (specific for each problem) into our separate Teleconference Room. A review of these principal alternatives and their respective advantages and facility impact is planned with Gen. O'Connor, Col. James, and Dr. Rudolph within the next two weeks. At that time our plans will be finalized and can be presented to you if you so desire. A compilation of all recommendations received from 18 separate sources is about to be published.

NOTES 4-11-66 Stuhlinger

4/11/66

Bals

NEGATIVE REPORT

NOTES 4-11-66 WILLIAMS

B 4/19

4/11 JWS

S-IVB WORKSHOP: The statement of work for the GAC/DAC/MAC 60-day contracts has been finalized and forwarded to NASA Headquarters (Gray) for approval. MSFC has been requested to provide two men for the SEB and one man to act as co-chairman of the Technical Evaluation Committee for the "follow-on" of the workshop contract, i.e., select one of the three companies at the end of the 60-day study to accomplish the "Phase D" support module job. Our nominations were furnished MSC last week and are:

SEB	Leroy Roberts	I-IB
SEB	Willy Prasthofer	R-P&VE
TEC	Robert Schwinghamer	R-ME ✓

April 18, 1966

NOTES 4/18/66 BALCH

4/18 JTB

B4/24

S-II-T Stage - Dry countdown for LH₂ tanking was completed on 4/14/66. Complete LH₂ tanking was accomplished Saturday and Saturday night, 4/16/66, and detanking was completed about 5 a. m. Sunday. Visual inspection and review data to date indicate only minor problems, and no obstacles are foreseen that will prevent static firing this week. ✓

S-II Test Stand A-1 - Completed erection of structural steel to the 10th floor on the service core. Erected No. 7 and No. 8 flame deflector manifolds. Negotiations on GSE installation are in progress, and award of contract is expected shortly. ✓

S-IC Test Stand - Progress of work in all areas was approximately as expected. Current work planning is based on expected Brick and Mortar schedule slippages of 60 to 90 days. ✓

Technical Systems, Phase II - Negotiations on GE proposal covering costs to complete Phase II Technical Systems began on 4/11/66 and are still in progress. Analysis to determine technical systems completion dates required to support the S-IC-T in Test Stand Position B-2 on 11/1/66 was completed, and refined JOD requirements were established. ✓

Video Tape Recording System in DAF has been checked out and was accepted on 4/12/66. It is to be operational in time to support S-II-T static firing. ✓

Four Television Pan and Tilt Units were received from Huntsville and installed in support of LH₂ tanking and static firing of S-II-T stage. ✓

Proposed Navy Bombing Range in Buffer Zone - In a letter to the Corps of Engineers, the Navy officially withdrew its proposal for a target area in the MTF Buffer Zone. ✓

A Procedure for Handling Claims that may arise as a result of the static firing of the S-II-T has been set up. A claims investigation team has been formed and is being trained to expeditiously review each such claim that may be presented. No problems are anticipated. ✓

4/18

B 4/24

J-2 ENGINE

Effort was initiated to install the S-IVB Battleship in the test cell at AEDC this week. This is two weeks ahead of the original schedule and represents expedited effort on the part of AEDC. A potential activation schedule delay exists due to late delivery of critical facility propellant valves. Work arounds have been initiated while our people and AEDC personnel investigate all sources for these valves. We have looked at MSFC, EAFB, and the M-1 project without any results. AEDC has a representative at the vendor plant to see if delivery can be expedited. We have approximately 30 days to obtain the valves before the activation schedule is affected.

Testing of an R&D engine with the stator seal removed from the LOX turbine has been temporarily interrupted to initiate an engine test program with the combination thick turbine wheel LOX pump and the thin turbine wheel fuel pump to determine the effect on engine start. ✓

RL10 ENGINE

The Atlas/Centaur AC-8 two-burn R&D vehicle was launched on April 7, 1966. The Centaur stage utilized two improved performance Pratt & Whitney RL10A-3-3 engines, which functioned nominally during first burn. The engines failed to restart, however, due to a malfunction in the vehicle peroxide system used for boost pump drive and ullage thrust. ✓ LH₂ tank skin temperatures and liquid vapor sensors indicate that propellants were settled throughout the coast period and at restart. ✓

F-1 ENGINE

The Rocketdyne recommended fix for the fuel inlet fairing screw problem, reported last week, has been incorporated into S-IC-1. The approved procedure for engines in the field is:

- a. Replace the screw with a higher strength bolt;
- b. To apply a coating of epoxy to the threads;
- c. To increase the bolt installation torque from 80 to 110 lbs/in.

The remaining S-IC-1 engines will be modified prior to delivery of the stage to Qual Laboratory for post-test checkout. This modification will be accomplished on S-IC-2 and S-IC-3 on the test stand prior to static tests. It is expected that this effort can be accomplished without stage schedule impact. ✓

4/18 958

1. IAM - BOEING NEGOTIATIONS

"Negotiations reconvene in Washington, D. C. on Wednesday, April 13, 1966. The movement of employees by lateral transfer as well as by promotion was the main topic of conversation. It is my understanding the Union has announced that Tuesday, April 19, as a deadline for agreement on a new seniority-ability control system. There still is every indication that the Union members will be given an opportunity to vote on a company proposal before any action is taken by the Union."

2. CONTRACT NOTICES

Contract NAS8-4016, Chrysler Corporation Space Division
Modification 292 for conversion of S-IB Schedule I from CPFF to CPIF was forwarded to MSFC for review March 24, 1966. Unless unforeseen difficulties are experienced, this file should be forwarded to Headquarters by April 15, 1966. ✓

Contract NAS8-5608, The Boeing Company

A letter was received from The Boeing Company informing I-MICH-C that their proposal submittal date covering stages S-IC-11 through S-IC-15 would be delayed approximately two weeks and the new anticipated submittal date is April 29, 1966. ✓

3. VIP TOURS CONDUCTED

This week the following VIP Tours were conducted at Michoud Assembly Facility:

- April 12 - Urban Land Institute Meeting in New Orleans
(approximately 100 persons)
- April 14 - Office, Assistant Secretary of Defense (one person)
Business Defense Supply Agency (four persons)
- April 14 - Southern Interstate Nuclear Board Meeting in New Orleans
(approximately 60 persons)
- April 15 - "Committee of 50" New Orleans Chamber of Commerce
visited by 24 industrial leaders in the nation to New Orleans to encourage industry to the area. ✓

NOTES 4-18-66 DANNENBERG

9/24/18

B
4/24

NEGATIVE REPORT.

B 4/24

4/18

1. MSFC/KSC Subagreement on Prelaunch Checkout and Launch Operations: Difficulties have been encountered in supplying necessary documents to KSC under terms of this agreement because of late receipt of input from the contractors and the inadequate condition of the contractor information based on first analysis by the laboratories. There was also a small problem from the stand-point of R&D Operations' review, in that Saturn V and Saturn IB offices had slightly different procedures to follow. In a meeting last week with IO, a draft of a common procedure for the two vehicle systems was agreed to. It was also agreed that IO would invite the stage contractors to meet with the labs to establish base-line documents and common guidelines for any additional information required from the contractors. This procedure should provide KSC with clear technical guidance and information sufficient for Cape operations.

2. Ground Wind Loads Test Program: R&DO transmitted a memo to Dr. Rudolph emphasizing that a mandatory damping test is to be performed on the Facility Checkout Vehicle at KSC before it is committed on May 26, 1966 to wind exposure. The Marshall proposed damping test plan was imposed on KSC to serve as a workable backup to the "Cox Test" (excitation of the vehicle by Cox pushing with his feet) to insure that there will be no slip at KSC should this limited test fail.

In an effort to circumvent those problems associated with the current eight-week forecast to accomplish the design, fabrication, and delivery of a sophisticated Mobile Service Structure (MSS) Model after contract go ahead, R&D Operations is having Hayes International, through the ME Laboratory, to fabricate a simplified or crude steel weldment model of the MSS to be delivered to the Langley Transonic Wind Tunnel on May 15. The MSS model will be used with the 3% Saturn V-LUT combination to determine what protection MSS affords the Saturn V vehicle as pertains to the von Karmen phenomenon. The current AS 500F approach to alleviate the problem of the von Karmen effect is to attach a hydraulic damper truss system to the aft S-IVB interstage to control the vehicle response. P&VE Laboratory and ME Laboratory have this problem under control with testing to be performed at KSC prior to May 26 date.

S.F.
What's that?
B

P&VE
Can occasionally see this design?
B

AS 501 will incorporate the same principal of the damper truss but will be more complicated in that the system will require reconnect capability as well as disconnect and retract. On May 17, R-P&VE will submit a preliminary design of the AS 501 Hydraulic Damper concept.

4/18

B
4/24

1. SA-10 Pegasus C Orbital Lifetime: Dr. Tweedie of Bellcomm called our Flight Test Analysis Division regarding the predicted orbital lifetime of Pegasus C. He had been requested by Headquarters to look at this with respect to a possible rendezvous on an AAP mission. His analysis indicated a reentry in January 1968 which was too early for the mission. Our current lifetime prediction is early 1969. Discussions with us disclosed that he was using the 1959 ARDC atmospheric density profile which was during a period of very high solar activity. This accounted for the differences. He agreed with our predictions and indicated he would report back to Headquarters that Pegasus C could be considered for such a rendezvous mission. ✓

2. Scramjet Undesirable for Commercial Transports: GD/Convair is studying "Hydrogen-fueled Airbreathing Hypersonic Aircraft" for the Mission Analysis Division of OART, located at Ames. A recent mid-point review was attended by Mr. von Puttkamer of Aero-Astroynamics. Five different vehicle configurations were investigated for their use as a commercial hypersonic transport (range 5000 n.mi., 200 passengers, Mach 6.0 cruise).

Best bet at present seems to be a double delta configuration with blended body and four wrap-around turboramjets (P&W SWAT 201's). It may be of special interest to you that Scramjet has been eliminated from further consideration in this study, due to its weight disadvantage in commercial application. While the mentioned double-delta aircraft has a take-off gross weight of about 544,000 pounds, the Scramjet vehicle (cruise between Mach 8 and 12) weighs 847,000 pounds (take-off gross weight). ✓

E.F.
Can you send me a sketch or some other brief description?
B

3. Remote Sensing through Cross Correlation of Optical Signals: The Fluid Mechanics Research Office of Aero-Astroynamics Lab. and the IIT Research Institute are developing a new test arrangement and statistical data reduction procedure which can be applied to all remote sensing methods, such as optical and microwave spectroscopy of combustion phenomena and plasmas, or photographic surveys of planetary atmospheres. This test arrangement will enable us to measure the local generation, convection, and decay of local instabilities and turbulence, the remote sensing of which could not be done before, since the dynamic information was lost when averaging over long optical paths. Recent experiments in supersonic air jets showed that this "crossed-beam correlation" arrangement works with and without tracers, such that investigations about contaminants, pollutants and trace constituents become feasible. Conceptual "Phase B" design studies have been authorized by the MSFC Experiments Review Board.

E.F.
Request an occasional briefing. Please arrange through Ronnie.
B

NOTES 4-18-66 GRAU

QEB 4/18

B 4/24

Nothing of significance to report this week.

1. CALIPS/SWITCH PROBLEMS: Calibration Pressure Switch. Q12 4/18. Further discussions have been carried out with P&VE to resolve problems associated with use of pneumatic Calips switches in overall test. It appears that Calips simulation for thrust OK on S-IC and mainstage OK on S-II and S-IC is impossible. Tank pressures appear feasible with precharging of the Calips line. A system study of Calips to identify the areas where measurement inaccuracies can occur and to propose methods of improvement has been initiated with Sperry. ✓
2. LC 37B GETS: The integrated GETS at LC-37B has been successfully completed. No problem areas are presently apparent. ✓
3. EBW FIRING UNIT DELIVERY: The GFP delivery of EBW Firing Units to stage contractors for the Saturn program recovered from a schedule slippage that has existed since 12/1/65. Fourteen firing units were shipped from General Laboratory Associated to Douglas Aircraft Company. ✓
4. MOD II SWITCH SELECTORS: These Switch Selectors have been retrofitted to include the dash five (-5) change and units are being returned to the stage contractors on schedule. No vehicle delay is anticipated due to this revision. Potter-Brumfield, the relay vendor for the Switch Selector, is presently on strike and IBM is no longer receiving relays for future units. IBM has relays in house which will enable them to produce 44 Switch Selectors which should be delivered through the middle of May. IBM is presently looking into a second source. ✓ If this strike continues for a long period of time, it could be detrimental to the Switch Selector program. ✓
5. SA-202 NOISE TESTS: Tests at KSC have been completed and a preliminary look at the records indicates that the noise suppression was compatible to results of tests run at IBM on the IU and at Astrionics Breadboard. ✓
6. GROUND SUPPORT SITE AT KSC FOR EXPERIMENT #15: Preliminary steps have been taken in establishing necessary KSC support and the location of a ground support site for MSFC experiment No. 15, the precision optical tracker. A site and an existing facility have been tentatively chosen. The facility is an obsolete IGOR camera facility which is being abandoned by the Air Force. Arrangements are being made to transfer the facility to KSC for our use and modification. ✓

B
4/22

4/18/66

S-1C

R-ME is proceeding on the May 12, 1966, delivery schedule with the latest approved changes to the S-1C-2 stage. The areas presenting the primary problems are the cables and distributors. The prevalve timers and the electrical circuit for the LOX flowmeters will be removed prior to delivery. ✓

F-1

The next test on the F-1 Test Stand is scheduled for April 19, 1966. ✓

S-IVB (MSFC)

Test S-IVB-020 was conducted at the S-IVB Test Stand on April 13, 1966, for a duration of 200 seconds. The fuel tank pressurization and fuel tank ullage was adjusted to simulate S-IVB-203 acceptance conditions. There was no fuel tank ullage pressure decay as indicated during acceptance test on S-IVB-203. All other test objectives were met satisfactorily. ✓

S-IVB (SACTO)

Stage 204 is presently undergoing post-static checkout in the VCL. Stage 205 has been installed on Beta III and is undergoing pre-static checkout. Stage 501 is on schedule for May 11, 1966, acceptance firing. ✓

S-11-T (MTF)

LH₂/LN₂ loading was started at 1:30 p.m., Saturday, April 16, 1966, and lasted through until 5 a.m., Sunday, April 17, 1966. The sequence was performed with no problems. The insulation held up satisfactorily with one long tear failure observed. The purge pressure at exit ports was approximately 0 p.s.i. An auxiliary purge was added to prevent back pumping air into the system. No leaks were observed in stage systems, no H₂ detection was noted. The main fuel fill and drain valve froze in the closed position and required several command open cycles from both regular and emergency controls to open. The LOX debris valve did not close on first command but was later closed. The LH₂ facility vent valve was very slow. ✓

The chamber chiller performed satisfactorily, chilling the chambers in approximately 4 minutes. One of the recirculation pumps (LH₂) did not operate. The other four performed getting the pump inlet into the start limits in 10 seconds. The P.U. system failed and was not used at all. The point sensors were used exclusively for tanking. ✓

NOTES 4-18-66 HOELZER

3 4/29

418 NB

Negative report.

NOTES 4/18/66 JAMES

3/24

9/8/19

AS-201 CRITIQUE: The AS-201 critique which you attended recently was repeated last Friday. Attendance was excellent. ✓

S-IVB LH₂ ULLAGE COLLAPSE: Evaluation of S-IVB-201 flight and S-IVB-203 acceptance firing data indicate the occurrence of an unpredicted ullage collapse phenomenon. The condition appears to result from combined effects of slosh, LH₂ load level, tank pressurant flow rate, and pressurant diffuser exhaust velocity. A test program has been initiated using the S-IVB and S-IV battleship for analysis.

→ Request a short briefing, soon B 4/24

S-IV COMMON BULKHEAD TEST FAILURE: An S-IV propellant tank being used for S-IVB structural tests failed during the second cycle of a planned ten cycle pressure cycling test with approximately 50 psia in the LOX tank and ambient pressure in the LH₂ tank. The S-IVB common bulkhead test tank and the S-IVB-503 LOX tank both failed under similar conditions and locations. We are expediting additional tests.

→ Serious? B

SA-203: (a) IU-203 was delivered to KSC on April 14 via Super Guppy on schedule. ✓
(b) Because of difficulties in delivery of mod kits and in checkout the breadboard was 2 1/2 days late in becoming operational in the SA-203 configuration. Because of this and KSC's firm requirement for accurate documentation with programs, we estimate that the scheduled May 1 delivery of SA-203 software will slip to May 7. We advised KSC of this by datafax Friday. (c) Because of the noisy rate signal in the EDS on AS-201 we must install a filter in the control signal processor. The current launch schedule requires that necessary hardware be available no later than June 5. This will be an extremely tight schedule. I have called the importance of this requirement to the attention of Martin management and IBM has agreed to supply high-rel parts to Martin for the early units. ✓

203?
B

AS-208 LEM SHROUD: Last week MSC suggested that instead of using BP-31 on AS-208, they provide a LEM adapter and we fabricate a nose cap (25 degree cone portion of the 203 double angle nose cone) which would be separated from the LEM adapter after orbital insertion by a cold gas sphere located in the top of the nose cap. We agreed to investigate this configuration and respond within two weeks. It appears that this approach would be competitive with our LEM shroud configuration. We have also re-evaluated our LEM shroud proposal and have decided not to split the double angle nose cone and separate it sub-orbitally, but to inject it into orbit and separate it by a "Pegasus type" spring system without guiderails. This would reduce R&DO's testing required, permit us to meet the AS-208 delivery of May 1967 to KSC, and allow a total program cost reduction exceeding \$300,000. ✓

4/18/66

Saturn/Apollo Contractor Manufacturing Technology Information Program:
In connection with this program and the support we are giving to MSF in the area of manufacturing, a visit of Messrs. Walter Burke and W. Dubusker from McDonnell Aircraft Company to the West Coast was arranged by our group last week. Manufacturing management from S&ID and DAC conducted the visitors through the main shops at Santa Monica, Huntington Beach, Seal Beach, L.A. Division of NAA, and the Apollo Spacecraft shops at Downey. The informal discussions during the tours brought to light many differences in techniques, organization, and design. Many topics such as bonding, tube brazing, accessibility of components, shortage control, repair techniques, control of debris in the astronaut compartment, management of support at KSC, etc., were discussed whereby from both parties many questions were asked and answers and opinions were freely exchanged. This was the first visit of Messrs. Burke and Dubusker to our Saturn/Apollo prime contractors at Los Angeles who will soon repay this visit to the McDonnell Company in St. Louis.

W.K. Very useful exchange!
B

B 4/24

1. CENTAUR AC-8 DATA EVALUATION - Liquid vapor sensors and LH₂ tank skin temperatures indicate that propellants were settled after orbital injection and prior to restart. To date nothing from the AC-8 flight indicates a problem relative to restart of the S-IVB stage. ✓
2. S-IU-203 COOLANT PUMP - The S-IU-203 pump has been retested and appears to be acceptable. ✓ It was ascertained that IBM did the ECS Acceptance Test for flow incorrectly, which indicated insufficient system flow and incorrect flow distribution. The method of testing would give insufficient flow. A proper test at Cape Kennedy is required to determine if there is a flow problem. ✓
3. S-IC STAGE - TBC has determined that the LOX and fuel prevalves for the S-IC require requalification for SA-504 because of lack of random testing. These valves were qualified to initial MSFC vibration requirements that did not require random testing. The test reports were reviewed at the time of incorporation of the MSFC random requirements, and the valves were determined to be qualified for S-IC flight and static firing. Many other components for the S-IC stage were developed under the original criteria and did not have random vibration applied. If this requalification philosophy is continued, a costly and unjustified program could result. I-V-S-IC was requested to rescind their approval for requalification.
4. S-II-T - IO was informed by memorandum that S-II-T cycle logs indicate current specification life cycle requirements will be exceeded for some components prior to the first static firing. It was strongly recommended to IO that the contractor provide spare parts to support a continuous static firing schedule and upgrade life cycle requirements to realistic levels. ✓
5. PROJECT REFLECTOR - Plans are being finalized for three systems contracts and two design contracts to establish feasibility for Project Reflector. All contracts will be under the technical direction of P&VE personnel. If the feasibility is established, DOD will attempt to justify funding the hardware. NASA is funding the five study contracts. ✓
6. SPACE APPLICATION MISSIONS (METEOROLOGY PROGRAM) - P&VE is presently participating in the evaluation of experiments and study contracts for OSSA in the application of manned meteorological missions. Our participation is in the systems engineering and integration of these payloads. ✓
7. LARGE SHOCK ABSORBER - The first impact test of the full-scale Lunar Logistics Vehicle Strut was completed. Simulating a low-velocity landing, the test produced a much shorter crushing stroke than had been predicted. ✓

Arthur Rudolph
222
B

Bill Lucas
Request Briefing on study scopes to the two competitively selected study contractors
B

B 4/29

NOTES 4/18/66 RICHARD

418

Complex 39 Operations: We have arranged to take part in the overall Complex 39 analysis being done by KSC and their contractor. Through this means we intend to accomplish the review of the use of our hardware and the contingency planning that goes with it. Our goal will be an operation-oriented "handbook" in three to four months, depending on 500F data, study results and other factors we may run into. ✓

4/18/66

B 4124

1. Strikes:

- Boeing - The Union and Boeing Company are still in negotiations. A strike/No strike decision is not expected prior to 27 April 66. ✓
- S&ID - Eighty-nine (89) welders are out on strike. Thirty-eight (38) supervisors certified for welding. S&ID states the strike, unless it is a prolonged strike, will not impact the S-II Stage Project. ✓
- Potter-Brumfield - (Producer of Relays for IBM) - has been on strike since 21 March 66. No early settlement anticipated. Most serious impact is production and delivery of Mod II switch selectors.

2. S-II-T Status:

- LH₂ tanking successfully completed on Saturday, 16 April 66.
- Preparations underway today, Monday, 18 April 66, for a captive firing tomorrow, Tuesday, 19 April 66. ✓

3. S-II First Article Configuration Inspection (FACI):

- First segment S-II FACI (S-II-1 Engine System) accomplished on schedule 4 April - 7 April 66. ✓
- Only minor discrepancies were noted and resolved. ✓
- Second segment (Propellant Management System) is scheduled for 18 April - 22 April 66. ✓

4. Saturn V Breadboard Activity - No progress was made on 500F Program tape debugging from Friday, 8 April 66 until Thursday, 14 April 66, due to a hardware failure in Sanders Display Equipment. IBM resumed 500F debugging at 10:00 pm, Thursday, 14 April 66 and still plan to make the 26 April 66, promised delivery date to KSC. (Originally scheduled for 16 April 66). ✓

A.R.
 They have even welding problems with their professional welders. If they let their managers do the welding, there we are in for real trouble! (I say this with all due respect for managers)

A.R.

Did we bring all of NASA's labor trouble shooters in on this problem??

B

NOTES 4/18/66 SPEER

4/18/66

B
4/24

1. AS-201 OPERATIONS CRITIQUE: Gen. Bolender chaired a KSC-MSFC critique of AS-201 operations problems on 4/11 at MSFC. It was agreed that the L/V Representative (Lee James) should be colocated with Dr. Gruene; in the Launch Control Center. James will have a direct phone line to the LIEF Manager. A new "problem voice loop" will be established in the Blockhouse and also tied in with LIEF. Our datafax requirement will be implemented on complexes 37 and 39, not on 34, however. KSC is taking active steps to effect additional balloon releases in critical wind situations such as experienced with 201. It was agreed that MSFC will send technical personnel to KSC only if their operational function cannot be performed through LIEF. KSC agreed to the new procedures for generating and changing L/V redlines. These procedures were jointly worked out between Lee James and myself. ✓

2. OPERATIONS MANAGEMENT GROUP MEETING: The meeting was cochaired by Mr. Christensen and Gen. Davis and was held on 4/14 at Andrews AFB. DOD made a pitch for increasing use of land based helicopters (eventually with refueling) instead of using carriers for spacecraft recovery operations. Agreement was reached on the future need for night launches (not earlier than 503). Compatibility of ship support for Apollo and MOL is still a problem. Gen. Houston (ETR) considers overflying Florida to achieve polar orbits unacceptable. Dogleg maneuvers may be acceptable if the actual need for these missions is proven. MSF made an interesting comparison with risks due to reentering orbital fragments (average casualty per flight 1/26, 320); the kill probability for a 140 deg dogleg Saturn IB flight is 1/38, 000 according to ETR. It was apparent that the protective goals of range safety are somewhat inconsistent with the actual hazards of present living. ✓

3. PRECISION S-BAND TRACKING SYSTEM: KSC, based on a TRW study, has proposed to utilize existing S-band stations to replace the presently used high precision tracking systems (Azusa and MISTRAM). MSFC was not given an opportunity to review the TRW results and it may not be possible for us to comment on the technical merits of the proposed approach. MSF is turning over responsibility for further study to OTDA. We (MSFC) will have to justify again our need for a high precision tracking system on operational vehicles. ✓

F.S.
Suggested
B

4. AS-203 MISSION RULES: The MSFC inputs to KSC Launch Mission Rules were completed on schedule and transmitted on 4/15. A draft of the MSC Flight Mission Rules is being reviewed. ✓

NOTES 4-18-66 Stuhlinger

418918

Ba/24

1. APOLLO APPLICATIONS PROGRAM: RPL has been requested by Mr. Reinartz' Office to review the AAP integration scope of work to provide better definition/clarification to those tasks related to the RPL mission. ✓

As a result of a suggestion by NASA Headquarters, MSC requested Mr. Bensko, RPL, to assist in the evaluation of the Apollo 10-foot drill proposals. The evaluation was conducted last week and Mr. Bensko participated, but not as a voting member. The 10-foot drill development is being handled by Mr. Piland's Office. ✓

At the request of Mr. Magliato, RPL prepared a description of four experiments for the potential 509 experiment package which you endorsed during Mr. Downey's presentation on April 7. ✓

NOTES 4-18-66 WILLIAMS

4/18 903

B
4/21

1. Workshop Presentation to DOD/AF: On Wednesday, April 13, 1966, MSFC and Headquarters personnel met at the Pentagon to present plans, technical description and the experiment program for the S-IVB Spent Stage Experiment to the Air Force. A high degree of interest was noted -- in particular the desire that NASA fly as early as possible, and with several flights rather than just one. This feeling may be expressed to higher NASA elements so that present planning can be changed to accommodate such a requirement.

2. Mr. William Ferguson's Recall to IO: Paper work is being processed to terminate Mr. Ferguson's detail to ASO and return him to IO as soon as possible, probably today, April 18, 1966.

April 25, 1966

NOTES 4-25-66 BALCH

A/25/66

B 5/11

S-II-T Stage - A successful first firing of the S-II-T was accomplished at 7:27 a. m. , Saturday, 4/23/66. Review of test data and assessments of results are underway. Meanwhile, recycle efforts have begun in preparation for the second firing, 150 seconds, projected for 5/11/66. ✓

S-II Test Stand A-1 - Most critical requirement at this time is completion of work platform with associated high pressure gas system installed and cleaned, which is expected to slip from early July to late September 1966. This and other expected slippages of 60 to 90 days have already been taken into account in current planning. No further slippage in critical brick and mortar completion dates is anticipated. ✓

Technical Systems Phase II - Negotiations on G. E. proposal to complete Phase II, Technical Systems are expected to be completed about 4/25/66. A second shift was added on 4/18/66 to expedite S-IC Technical Systems installation. Present plans are to use contingency funds to accelerate selected areas of S-II Test Stand A-1 Technical Systems to prevent further schedule slippage pending approval or disapproval of request for accelerated funds. ✓

Technical Systems, Phase III - Proposals on installation of technical systems in Components Service Facility have been received and are being evaluated by GE. Took beneficial occupancy of Rooms, 306, 307, 308, 309 and 310, and of Test Cells 120, 121 and 122 of the Components Service Facility. ✓

S-IC-T Firing at MTF - To regain time lost by construction schedule slippage, GE is accelerating technical systems installation, and Boeing plans to accelerate GSE installation and checkout and facility tests. These efforts will result in zero slack in schedule providing for first firing of S-IC-T on 12/7/66. However, meeting schedule depends heavily upon cooperation of Corps of Engineers and construction contractor in granting access to lesser areas at different times than originally requested. ✓

Visit by Members of Mississippi Legislature - Ten members of the Mississippi House of Representatives visited MTF and were briefed by the MTF Manager and given an extensive tour of the site. ✓

9/25
4/25

B5/1

J-2 ENGINE

An S-II-T test was conducted at MTF on Saturday morning, April 23, for approximately 15 seconds of mainstage operation. Preliminary evaluation of the data indicates all five J-2 engines operated satisfactorily. The center engine LOX turbine wheels were inspected yesterday for cracks and wear; everything was within tolerance and the turbine has been reassembled. All outboard engines were inspected for metal chips which might indicate stator seal wear and none were found. ✓

Rocketdyne accumulated 21 starts for 2090 seconds this week on an R&D engine with the combination thick turbine wheel LOX pump and thin turbine wheel fuel pump. The data indicate there is no significant engine start or performance change. We will continue the test program on this engine for 3750 seconds. ✓

The S-IVB Battleship stage and J-2 engine were installed in the J-4 test cell at AEDC this week. ✓

F-1 ENGINE

Engine F-5034 (S-IC-4/5 spare) was accepted at Canoga Park, California on April 19, 1966.

R&D engine 031 was bombed into instability and damped in about 14ms which is well within the mod spec. This is part of a continuing program to assure that Qual II injectors retain their design capability in stability. ✓

We are awaiting OMSF approval of our proposed incentive structure for the F-1 engine follow-on Apollo procurement and decision as to whether a prenegotiation presentation will be required. ✓

GENERAL

Members of the Fitters and Plumbers Union working on the J-4 cell modification at AEDC walked off the job April 21, 1966, in a jurisdictional dispute. It appears that the other union members will not walk off in sympathy. Labor relations people from NASA Headquarters, AEDC, MSFC, and Air Force Headquarters are working with the NLRB representatives from Memphis to resolve this situation.

The welders strike continues at Rocketdyne with critical welding being accomplished mainly by certified supervisors. A welding backlog is being generated and, if the strike continues, F-1 engine delivery schedules may be affected about August 1966. ✓

4/26 JES

B.5/1

1. CONGRESSIONAL VISIT

On Friday, April 22, 1966, Congressman George P. Miller (D-Cal.), chairman of the Committee on Science and Astronautics, U. S. House of Representatives, and a party of 12 visited the Michoud Assembly Facility. Included in the group were Congressmen Joseph E. Karth (D-Minn.), Joe D. Waggoner, Jr. (D-La.), Donald Rumsfeld (R-Ill.), Edward J. Gurney (R-Fla.), George E. Brown, Jr. (D-Cal.), and Earle Cabell (D-Tex.). The group was given a briefing by Dr. Constan, Mr. Nelson of Boeing, and Mr. Lowrey of Chrysler followed by a tour of the facilities. ✓

2. CONTRACT NAS8-4016, CHRYSLER CORPORATION SPACE DIVISION

Modification 292, conversion of Contract NAS8-4016 (S-IB Schedule I portion) from CPFF to CPIF, was forwarded to NASA Headquarters on April 19 for review and approval. ✓

3. IAM-BOEING NEGOTIATIONS

The union and company negotiation committees agreed to accept the recommendation of the Federal Mediation Service to settle this dispute. The union is to present results in mass meetings April 27. Indications are that union will accept the Federal Mediation Board's recommendation. ✓

4. POTENTIAL STRIKE BY THE NEW ORLEANS CONSTRUCTION CRAFTS UNIONS

Union agreements with the Construction Industry Association (CIA) expire April 30, 1966. Indications are that negotiations will break down between CIA and unions. An assessment is currently being made of our construction jobs and Marshall management will be advised. However, no vehicle schedule impact is anticipated. ✓

JB 4/25

35/1

1. Interface Management -

a. All Apollo (inter-center) Interface Control Documents (ICD's) for AS-202 through AS-207 and AS-501 through AS-504 are on schedule as reflected in the report to the PRB. ✓ Changes are being processed by Interface Revision Notices (IRN's), and will be implemented through Level II Change Boards. Recent experience indicates the desirability for certain improvements; the Inter-Center procedures are under review for that purpose. ✓

b. The Repository operations encountered some difficulties, thus causing delivery delays for 54 ICD's needed by IO for SA-501. Expediting action is underway and should solve these problems within a week. ✓

c. Receiving, processing and distribution of Saturn ICD's is documented in Annex J to the Interface Management instructions. ✓

2. Data Management - The first "Operation Papermill" suggestion has been approved for a \$115.00 award. ✓ A cost reduction report will be prepared on the \$2,258.00 savings involved. This suggestion No. 77 was made by Mr. Wallace J. Jordan, R-QUAL-AV, on the Initiation and Maintenance of a qualified products list (QPL) to MSFC-SPEC-143. ✓

3. Future reports on Interface Management, Data Management, and Configuration Management will be included in Scott Fellows' reports. ✓

NOTES 4/25/66 FELLOWS

4/25/66

B5/1

1. Systems Engineering and Launch Vehicle GSE Contract with Boeing: R&D Operations participated in meetings last week with IO in reviewing the Boeing contractual scope for Systems Engineering and Launch Vehicle GSE. The purpose was to reduce the scope and delivery requirements so that costs can be held within available funds. Principles being followed in reviewing the Systems Engineering and Launch Vehicle GSE contractual coverage are: (a) reduce the scope of work to the bare essentials; (b) reduce the delivery requirements whenever possible; and (c) do not contract for sustaining effort (maintenance of documentation) through the life of the program. R&D Operations will continue its efforts in reducing requirements in accordance with the three foregoing principles. It is expected at this time, however, that reduction in scope will achieve only a part of the total IO required reduction in cost. Other cost reductions will have to be negotiated with the Boeing Company. ✓

2. RCA 110A Computer Logistics and Maintenance: Continued difficulties in maintaining the RCA 110A Computer and its associated peripheral equipment have caused R&D Operations to reexamine the logistics and maintenance program. Cannibalization of equipment has been necessary to keep some computer systems working. Typical of the spares situation is that KSC has on hand only 15 percent of the line items established for their RCA 110A Computer system. To offer every possible assistance in arriving at a workable logistics and maintenance program for this equipment, I have appointed Mr. Dennis and Mr. Hunter as central points of contact in R&D Operations to work with Industrial Operations. ✓

NOTES 4/25/66, GEISSLER

B-71

1. Remote Sensing through Cross Correlation of Optical Signals: The MSFC - IITRI team presented experimental and analytical results about the crossed-beam method, which was described to you in Notes 4/18/66 Geissler. Remote sensing of local turbulence parameters has been successfully demonstrated in supersonic jets with and without tracers. Prof. M.J. Lighthill, the world's leading theoretician in aerodynamic noise, requested last fall that we provide him with jet flow results as soon as possible, since these data would allow the checking of the unresolved theories about supersonic noise generation and suppression. Remote sensing of aurora and airglow in the upper atmosphere with crosswise viewing ground telescopes has been partially successful. A new computer program has been developed for crossed-beam analysis, which could also be used for acoustical and/or random vibration analysis.

Dr. Strohmeier, VP of IIT Research Institute offered to point out the crossed-beam method and its AAP implications to the scientific community as well as influential NASA Hq officials. Dr. McCormac, director of Geophysics Division of IITRI offered to conduct a seminar here on problems, the analytical and instrumentation difficulties of which have previously prohibited systematic studies of radiation belts, trapped radiation and other geophysical phenomena, but which may be overcome by AAP or other manned experiments. An independent opinion of atmospheric and AAP objectives of crossed-beam experiments will be obtained by a new contract, the scope of which is being finalized for release for competitive bids.

2. Radiation Environment at Synchronous Orbit: Mr. Roberts of our Aerospace Environment Office, attended a meeting at NASA Headquarters with Dr. James Vette of Aerospace Corporation to discuss the radiation environment at synchronous orbit. The main radiation hazard will be from solar flares, but the trapped radiation environment (electrons) may exhibit a diurnal variation of about a factor of 50 in flux. The energy spectrum will also exhibit variations, but more data is required to establish the true radiation model at this altitude. The dose rate calculations which have been made using Vette's data range from 28 to 1,000 rads per year for a manned Apollo-type spacecraft at synchronous orbit.

3. Flight Mechanics Panel Meeting: The 16th Flight Mechanics Panel meeting was held at MSC on April 12-13. Two significant meeting items are: (1) MSC probably is going to accept (perhaps with some minor modifications) the MSFC proposed rendezvous technique rather than the Gemini approach. The "MSFC method for rendezvous" represents a noticeable payload gain over the Gemini technique. However, no formal commitment has been made to date. The Gemini procedure utilizes about 5 Service Propulsion Burns and phasing via elliptical orbits to achieve rendezvous and the MSFC proposal consists of putting the CSM into an elliptical orbit and the LEM into a circular orbit utilizing ground phasing and the iterative guidance capability in the yaw plane. (2) MSC apparently is having rather severe weight growth problems, particularly in the CSM at this time. It is anticipated that MSC may have to request a payload commitment increase for Saturn V. MSFC position was that we would support analysis of the S/C requirements and L/V capabilities; however, any commitment change is a Program Office (Dr. Shea & Dr. Rudolph) function to initiate. We are also initiating studies to determine a procedure for distributing the excess payload that may result for a given launch day due to reduced flight geometry reserve requirements.

Arthur
Rudolph
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9/12/25

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1. S-IC CHECKOUT: Post-manufacturing checkout of the S-IC-2 stage will resume April 25, 1966, with a scheduled completion date of May 12, 1966. Post-static checkout of S-IC-1 is scheduled to begin May 12, 1966, and to be completed by July 28, 1966. There are 38 outstanding changes to date on the S-IC-1 stage which should be incorporated prior to start of post-static checkout. ✓
2. S-II PROGRAM: The S-II-1 stage was moved to Station VIII at Seal Beach April 18 for post-manufacturing checkout. Approximately 3700 manhours of open work remains on the stage. Of this, approximately 1600 manhours is to perform leak testing on the insulation. ✓
3. RELIABILITY ENGINEERING SUPPORT SERVICES: The Source Evaluation Board for the Reliability Engineering Support Services has completed its evaluations and will present its findings to MSFC management this week followed up with a presentation of the findings to Mr. Webb on May 3, 1966. ✓
4. DCASD HUNTSVILLE SUPPORT: Huntsville Field Branch, Birmingham DCASD has added 46 new personnel in the past few months bringing the total branch strength to 117 personnel. There are approximately 17 persons at GE, 38 at IBM and the balance distributed between some 18 other locations. ✓

The S-II-1 stage is scheduled to arrive at MTF on June 6, 1966. ✓

NOTES 4/25/66 HAEUSSERMANN

4/25 JH

B5/1

1. VEHICLE SYSTEMS RELIABILITY: Personnel from G. Lemke's office (MAR) will visit MSFC 4/26 to discuss single point failures for AS-203. With AS-201 a "flap" occurred during the Flight Readiness Review at the Cape when Lemke presented a list of critical items which created a stir amongst MSFC personnel who questioned the validity of the list. The visit by Lemke personnel will ensure an official MSFC position for the AS-203 list. The list is based on the predicted failure rates of a component (black box) and modified by environmental factors and the criticality of the effect of failure on the mission success. It is expected that of the 10 to 15 most critical items the following Astrionics components will appear: Actuators (both stages), ST-124 Inertial Platform and Electronics, and IU Batteries (D10 and D20). Earl Hoard will represent Astrionics Laboratory at these meetings. With subsequent vehicles the platform will be less critical when the "backup" spacecraft platform becomes effective. Concerning the batteries, IBM has been studying a means of utilizing our existing battery configuration in a more redundant fashion which would make them less critical. A proposed change on this is due from IBM. With the present design configuration, the actuators will always be critical and thorough qualification testing will provide the best assurance of high reliability. A redundant servo valve has been developed for the S-IVB actuator which might also be considered for later procured vehicles (AS-213 and subsequent).

4/25 9/8

B 5/1

S-1C

The S-1C-2 stage changes scheduled for incorporation prior to post-manufacturing checkout (PMC) are complete except for one cable assembly and two printed circuits. PMC is scheduled to start today and will be completed in time for the May 12 delivery to R-TEST. ✓

F-1

Test FW-023 was conducted on April 19, 1966, with F-1 engine S/N F-4T2 at the West Area F-1 Test Stand for a mainstage duration of 65 seconds. ✓

S-IVB (SACTO)

Vehicle 501 The S-IVB-501 vehicle is approximately seven days behind the May 11, 1966, firing date, due to parts shortages. These shortages have delayed the pre-static checkout and consequently have slipped the firing. ✓

Vehicle 205 Checkout of vehicle 205 is continuing on schedule with the acceptance firing scheduled near the end of May 1966. ✓

Common Bulkhead Test DAC estimates that it will cost \$8,000 to repair the common bulkhead facility at Alpha. ✓

S-11 (MTF)

The first S-11-T static test (15 seconds) was scheduled for Friday, April 22, 1966. The countdown which was scheduled to start at 7 a.m. Friday was delayed due to GG and ASI spark interference on No. 1 and No. 3 engines. After trouble-shooting the spark system and instrumentation all day, an auto-sequence test was made at about 6 p.m. Friday. The countdown started at 7:50 p.m. Tanking of propellant and leak check were made without any major problems. The first auto-sequence count started at 1:42 a.m. Saturday, April 23, 1966. The count was stopped 4 minutes later when GN₂ chamber purge valve did not close. The countdown was re-started at 2:55 a.m. and was stopped at 3:16 a.m. when start tanks were out of "start box" because LH₂ was not being transferred to the test stand from the barge. The third re-cycle started at 5:05 a.m. and was stopped at 5:50 a.m. when free hydrogen burn-off system was not detected to be burning, a GSE problem. The fourth re-cycle started at 7:09 a.m., (the high pressure GHe below 2600 p.s.i.g. at the start of the fourth re-cycle and at the end of pre-conditioning was just above 1500 p.s.i.g.), and engine ignition was successfully accomplished at 7:28 a.m. The 15 second test was successfully terminated after slam was released. All major objectives were accomplished except auto propellant management (PU system again not functioning) and LH₂ recirculation. ✓

NOTES 4-25-66 HOELZER

B5/1

4/25/66

1. EXPANSION OF TMB ON-LINE SYSTEM TO SUPPORT MTF:

In response to a request from Mr. G. Keith, Mississippi Test Facility, the Computation Laboratory is in the process of obtaining and installing a terminal (IBM 1052) at the Mississippi Test Facility. This terminal will be on-line to the Inventory Control System and will be used to process inquiries and material requests to support material requirements of MTF, including their in-house contractors' requirements. ✓

This request has been coordinated with personnel from the Technical Materials Branch of TSO, and they are developing the requirements to modify the operational computer programs to support the new application. ✓

2. THIRD NASA INTER-CENTER HYBRID SIMULATION MEETING:

Simulation Branch just completed the third NASA Inter-Center Work Shop on Analog and Hybrid computing, sponsored by the Office of Advanced Research Technology (OART) and hosted by the Simulation Branch, Computation Laboratory. The work shop was well attended with representatives from some eleven centers or NASA activities. ✓

B5/11

NOTES 4/25/66 JAMES

4/25/66

AS-203 LAUNCH DATE: KSC is negotiating a new launch date with General Phillips. Colonel Petrone believes that they can accelerate the launch date as much as two weeks. If they succeed in doing this, this will make our already tight schedule even tighter. We are particularly close on our software on the modification for the control signal processor and on preparation for the Flight Readiness Review. ✓

AS-204 ALTERNATE MISSION ASSIGNMENT: We received a call from Bellcomm (T. Thompson) stating that Dr. Shea had proposed to General Phillips the AS-204 backup mission be changed from an un-manned orbital shot to a suborbital shot similar to AS-202. The stated reason for this request was that MIT is having problems providing two computer programs within the same time frame - prime and backup. Additionally, this supposedly would save MSC \$1.8M. We repeated the MSFC position that we want orbital mission with full R&D instrumentation. We cannot identify any specific launch vehicle objectives for another suborbital mission. Since this is our last vehicle with R&D instrumentation, we suggested delaying the alternate flight until MIT could provide the necessary computer program. ✓ Based on this information, T. Thompson recommended to General Phillips that the alternate mission not be changed. We can expect further flaps on this subject. ✓

REWORK OF RCA COMPUTER PC BOARDS: The rework of PC boards for the RCA 110A computers is lagging. RCA, van Nuys, is having difficulty installing the copper tubelet which is the recommended method of solving the cracked solder joint problem. The solder does not flow solidly into the tubelet but small pinholes form instead. This causes rejects. The latest projected date to begin the testing is April 26. The testing was scheduled to begin April 18. We have obtained management assistance in increasing the size of the work force to prevent further delays but, so far, an acceptable solution to the pinhole problem has not been found. ✓

4/25/68

B-5/1

Final Presentations for Supporting Structural Development Contracts - FY 65:

Last week, on April 21, the final presentations of Supporting Structural Development Contracts funded during FY 65 were held. This was a joint presentation of P&VE and ME contracts with industry personnel giving the individual papers. All contracts were funded by OMSF and concerned improvement in "the-state-of-the-art" in honeycomb, titanium, beryllium, and heat shielding structures. Thirteen contracts were reported on by eight companies: NAA/LAD, Boeing-Seattle, Lockheed-Sunnyvale, Fairchild-Hiller/Republic, Avco-Nashville, Aeronca, General Dynamics/Convair, General Dynamics/Ft. Worth, and Good-year. Represented at the meeting were 17 companies, among them all Prime Contractors, OMSF, OART, OSSA, MSC, Langley, Wright-Patterson Air Force, and IO and the Laboratories. Total attendance was approximately 180 with 110 from industry. Three vice-presidents of industry, approximately 15 directors in R&D, design, manufacturing and marketing were among attendance. ✓

The studies showed that titanium promises a structural weight saving (25 to 35%) and elevated temperature capability in high compression loaded structures or the tail end of a Saturn type vehicle. Beryllium offers similar savings in lower loaded areas, like the instrument unit and cold plates.

The optimum type of structure varies from skin and open stringer type "unitized panels" and "other than honeycomb" double wall arrangements at the tail end to honeycomb sandwich configurations at the medium and lower loaded tanks and shrouds.

The cost effectiveness for titanium is promising by utilization of burn-through welding and roll diffusion bonding and on the basis of consequent designing to the requirements of these new processes. The cost effectiveness of beryllium structures remains undefined.

Experimental hardware projects in most of the studies were carried to large or full scale. That way, the shortcomings of study assumptions and problem areas were demonstrated, and requirements for future development work needed were defined.

The results of these studies could be utilized for extended Saturn Apollo programs and advanced launch and space vehicles. ✓

NOTES 4-25-66 LUCAS

B 5/1

1. S-IVB 203 ULLAGE PRESSURE COLLAPSE - The problem of collapsing ullage pressure (observed during acceptance firing) has not been solved yet. Inspection of the vehicle showed that the LH₂ pressurizing module was improperly wired so as to give a flow rate of pressurizing gases higher than normal during the burn. The tank pressure should have been correspondingly higher rather than lower. The phenomenon is being investigated, and a test program has been outlined for the MSFC battleship to verify fix proposed by DAC. ✓

2. S-IVB WORKSHOP - In the absence of other arrangements, we have re-activated the S-IVB Workshop Working Group under chairmanship of Mr. W. Thompson, R-P&VE-A, and assumed the coordination required to keep the two-month's design effort on schedule. ✓

3. MAN-SYSTEM DESIGN CRITERIA - A paper titled "NASA Lunar Surface Operation Simulators" was given at the 37th Annual Scientific Meeting of the Aerospace Medical Association in Las Vegas, Nevada, by the two P&VE engineers who participated in the 18-day simulated lunar mission in a minimum volume shelter. ✓

4. SATURN V VOYAGER SHROUD - Final results of the Saturn V/Voyager shroud size study were presented to R&DO personnel on 4-19-66. As a result of the study, a 48-ft. cylindrical section above the IU topped with a standard MSFC double angle nose cone is recommended. This allows a launch probability greater than 95% in 1973, between 75% and 90% in 1975, and a 75% launch probability in 1977 based on no modifications to the present Saturn V launch vehicle. The study results and MSFC's recommendations were presented to JPL on 4-22-66. ✓

5. AM-355 PROBLEM - Allegheny Steel Company has refused to sell AM-355 to Teledyne for the manufacture of MC fittings. We have been unable to ascertain the reason from Allegheny but are pressing the issue. Production at Teledyne has been stopped by the material shortage which could impact assembly schedules of the S-IC, S-IVB, and IU.

6. MTF GASEOUS HYDROGEN STORAGE - In addition to the T-1 steel storage tank problem at MTF, the underground transfer lines, also T-1 steel, have been of concern. Recently, a leak in these lines was discovered. The defective line was replaced and the replaced section has been examined. The weld is of extremely poor quality but may be representative of the quality of welds throughout the piping system. We, with R-TEST, are considering the installation of a back-up piping system for MTF. Although costly, such a system could be necessary if weld problems continue to develop in the underground piping.

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958 4/25

1. FY 68 MANPOWER REQUIREMENTS - Manned Space Flight guidelines, signed by Paul Cotton, have asked KSC, MSC, and MSFC to submit detailed justification of the FY 1968 manpower estimates shown in POP 66-1. These estimates are as follows:

<u>CENTER</u>	<u>FY 67 CEILING*</u>	<u>FY 68 AVAILABILITY</u>
KSC	2794	-138
MSC	4854	-538
MSFC	7349	+494

* Permanent ceiling + co-ops - excludes all summer students, YOC's, summer temporaries, other temporaries, etc.

POP 66-2 will show that MSF's long range program established April 20 more than wipes out any availability previously reported. ✓
More detailed requirements will be submitted when available.

2. MSF REVIEW OF THE R&D POP 66-2 - The Headquarters review of the MSF R&D portion of POP 66-2 will be held at MSFC on May 2 and 3. Omitted from the review will be Advanced Missions, Supporting Development and Saturn Apollo Applications. The review will follow the same general format as previous reviews. ✓

3. MSF REVIEW OF AO POP 66-2 - The Headquarters team will be at MSFC to review the AO POP 66-2 on May 4. The team will include Mr. Paul Cotton, Capt Barkdull Kahao, and Mr. Gerald Heater. ✓

4. RECLAMA OF SALARY FUND SHORTAGE - Mr. Gorman sent a letter last Friday, (April 22) reclamaing the total salary ceiling and pointed out that MSFC was \$670,800-thousand-short. Informal discussion by telephone this morning (April 25) with Bernie Johnson indicates that MSF will be able to cover this reported shortage. ✓

B5/1

NOTES 4/25/66 RICHARD

4/25/66

Common Coordinate System: Until recently, MSFC had committed itself to use the Apollo Coordinate System Standards (OMSF document) on SA-501 and SA-205. However, the system required more time and effort for complete implementation than was originally anticipated. As a result, implementation is now committed effective on SA-502 and SA-206. We must fulfill this commitment, but at the same time we have to be cautious in the process to avoid mistakes which can accompany such changes.

NOTES 4/25/66 RUDOLPH

4/25 JCS

B5/1

S-II-T Stage Captive Firing - A successful test (15 second firing as scheduled) was accomplished on the S-II-T stage at 7:30 am, on Saturday, April 23, 1966, at MTF.

Propellants were tanked to the 100% unpressurized level in both tanks. Manual replenish was used on both the LOX and LH₂ tanks to maintain the 100% unpressurized level.

- The Propellant Utilization (PU) system was not activated due to a stage PU computer problem occurring the day before the test. Astrionics (Mr. A. Spears), DAC and S&ID are working the problem.
- Overboard bleed was utilized to precondition the hydrogen inlets. This was necessary because of a failure of one recirculation pump. All five (5) recirculation pumps will be replaced prior to the next test.
- Indications are, a positive pressure was maintained in the insulation. (Preliminary: inlet 3 psi, outlet 1.7 psi).
- Special tests were conducted on tank boil-off and recirculation helium injection.

Post test inspection of center engine turbine wheel revealed "no cracks." Swab check of four out-board engines indicated no difficulties.

The second S-II-T test is now planned for Wednesday, May 11, 1966, (18 days from 1st firing). ✓

NOTES 4/25/66 SPEER

B 5/11

RS 4/25

1. LIEF REVIEW WITH I-DIR: A review of the proposed improvements and modifications to LIEF was held on April 21 with Gen. O'Connor. The following decisions were made and implementation will be started at once: (a) Establish subsystem problem groups (approximately 36) consisting of R&DO, Program Office and Contractor personnel; (b) Improve Huntsville Operations Support Center (HOSC) communications system to provide support coordination, L/V representative "hot line" and alleviate other minor deficiencies; (c) Define details and monitor implementation at KSC; (d) Prepare detail HOSC operating procedures, provide earlier dissemination and improve personnel training; (e) Obtain adequate R-COMP support for HOSC preparation and operation (physical space and additional personnel); (f) Establish MSFC Mission Status Room for final launch preparations; and (g) Obtain adequate R&DO support for console preparation and use. - Both Program Offices participated in this review and concurred with the LIEF modifications. ✓

2. AAP EXPERIMENT DATA HANDLING: In a written comment to the draft of AAP Experiment Data Handling Program Mr. Christensen pointed out that while MSC will normally handle real-time control of experiments "there may be exceptions when MSFC has primary interest in certain experiments and properly should control certain aspects in real-time". Christensen also noted that facilities for and communication with NASA-designated principal investigators and NASA cognizant engineers will be provided by MSC and, in the exceptions noted, provided by MSFC. This is a direct result of my recent discussion with Christensen here and appears to give us a satisfactory starting position in this area. ✓

3. AS-203 EXPERIMENT CONTROLLERS: The six MSFC and two DAC Experiment Controllers for AS-203 reported to MSC on April 19 to begin training with the Flight Control Team. ✓

4. LIEF: A presentation on LIEF was given to the Third NASA Inter-Center Workshop on Analog and Hybrid Computation held at MSFC (4/19). ✓

ND 4/25

B 5/11

1. AAP:

Lunar Surface - For a considerable time, MSFC has been identified as the responsible Center for lunar surface payloads beyond the currently approved Apollo program. MSFC may lose this identification as a consequence of rapidly increasing interest at other centers (primarily MSC and GSFC) in the AAP lunar surface program. These other centers have followed MSFC's activities in the lunar surface program very carefully; in fact, their evolving activities are based largely on MSFC's past accomplishments. All of this is happening at the very time that OMSF seems to be placing more emphasis on lunar missions and less on earth orbital missions in their planning. Unfortunately, AAP funds for our FY 66 program have not yet become available to MSFC (except very small amounts); MSC will have the possibility of using Apollo funds for its program. In order to enable MSFC to retain its part in the lunar surface program (which I would strongly recommend), it is suggested that Apollo Support, General funds be made available for at least some of the lunar surface program tasks. ✓

Emplaced Scientific Station - We have had a \$162K contract with Westinghouse for studies on a lunar surface Emplaced Scientific Station. Westinghouse has completed their work; they made a final presentation at MSFC last week and delivered some impressive models. Their work has been very good. There may be \$100K available shortly for a continuation. ✓

Lunar Drill - Northrop and Westinghouse gave progress reports last week on their contract work for development of lunar drills. The reports covered a three-day period. Personnel from the Bureau of Mines, Corps of Engineers, and JPL, who are participating with MSFC in the technical direction of these contracts, were in attendance. The contracts call for delivery of engineering models of the drills in mid-summer. Thereafter, RPL will field-test the drills. ✓

2. PEGASUS: No significant changes. The three satellites still give significant data and evaluation is continuing. ✓

NOTES 4-25-66 WILLIAMS

B 5/1

958 4/25

Nuclear Propulsion Activity: We had a very productive series of meetings with the SNPO, Lewis, Westinghouse and Aerojet in Cleveland on Wednesday and Thursday of last week. With some prodding on our part, the SNPO people (Schwenk) agreed to enter into a joint schedule acceleration "paper exercise" to come up with a reasonable program which would be in line with some of our revised thinking. I feel it is to MSFC's advantage to devote more resources in this overall area. ✓ We plan to present our status and recommendations in mid-to-late May. ✓