

July 5, 1966

NOTES 7/5/66 BALCH

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S-II Test Stand A-2 Refurbishment and GSE Modification - Refurbishment assigned to Corps of Engineers is nearing completion with only some minor sealing of exterior test stand walls, painting, pressure checking, and cleanup left to be done. Other refurbishment activities, system and subsystem checkout and GSE modification to the S-II-1 configuration are proceeding satisfactorily, with expected completion dates in support of placement of S-II-1 stage in stand on the first of August. ✓

S-II GSE Study - A complete study has been made of all problems with GSE experienced during the S-II-T test program, and necessary corrective action is being taken. Presentation on results of study was made to the S-II-T Stage Office in Huntsville on 7/1/66. ✓

Preparations for S-II-1 Static Firings - Coordinated instrumentation requirement and red-line list with R-P&VE, R-TEST, and S&ID. Met with S&ID and GE on measuring program and recorder assignment list. Requested Rocketdyne support for engine performance evaluation. S&ID released end item test plan. All support facilities and systems are being made ready to support the S-II firings on schedule. ✓

Labor Relations - Issues in dispute between the IAM and the J. N. Travirca Company are again being considered by the President's Missile Sites Labor Commission. Decision is expected within two weeks. ✓

International union representatives of the Electricians (IBEW) and the Plumbers and Pipefitters (UA) met in Washington during the past week to consider the jurisdictional dispute involving installation of equipment having both pneumatic and electrical components. It is understood that agreement has been reached and that the local unions will be advised shortly. ✓

Space Service, International, one of the GE subcontractors that has a collective bargaining agreement with the IAM, has been selected by GE for FY 67. Selection of this incumbent subcontractor should tend to reduce the probability of labor difficulties. ✓

Manned Space Awareness Program - Astronaut Jack R. Lousma visited MTF on Monday, 6/27/66, in connection with this program. ✓

ATM: Dr. Mueller and Dr. Newell had a meeting on Thursday on the entire AAP program including Dr. Mueller's concept of mounting the ATM on the LEM. We understand that they agreed to disagree on this ATM concept. They presented their views to Dr. Seamans on Friday but no decision was made. There will be another meeting later this week with Dr. Seamans. Both Dr. Mueller and Dr. Newell have given their Project Approval Document to Dr. Seamans. We are preparing a development plan for the ATM. This will include the results of the inhouse study effort as well as the 8-week Grumman effort. We expect to be completed by the end of July and the plan will be available the end of August. ✓

PHASE "C" INTEGRATION CONTRACTS: Lockheed contract legal review started July 1, with Martin contract ready for review July 5. The contracts are scheduled to be signed this week. Meetings with each laboratory were held starting last week to review status of Integration Contracts and to discuss laboratory participation in the integration effort and the contracts. ✓

S-027 (X-RAY ASTRONOMY EXPERIMENT): An experiment development plan has been written and forwarded to Headquarters on July 5, 1966. This plan requests funding and authority to proceed by July 15, 1966 to meet the schedule for SA-210. This experiment will be located in the I. U. It is the first experiment to be funded through the Headquarters' AAP Program Office. ✓

ARMY - RADAR CALIBRATION SATELLITES: Donald Bauer, ARPA Division of R&D Army Missile Command, has requested that MSFC look into the possibility of conducting a feasibility study and subsequently to fabricate and launch two satellites for purposes of calibrating radar sites. Col. Hill (ARPA, Washington) talked with J. Disher's office and it was suggested that a more detail work statement be made available to NASA. ARPA would like for MSFC to generate this work statement through a funded feasibility study. The Army would like to launch between October 1967 and December 1968. Some of the characteristics they desire are:

- . Passive radar test target with attitude control
- . Operational life - 2 1/2 years minimum
- . Inclination - 50° or greater

The Army would like to know if NASA is interested in pursuing this matter by the middle of July. I would like to discuss this with you at your earliest convenience to arrive at a decision as to whether we pursue this.

GENERAL: The MSC pallet procurement action is forcing the decision to continue, drop, or postpone the pallet concept. Information from Headquarters indicates a high probability for not proceeding. ✓

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F-1 ENGINE F-1 Production Engine F-5036 was damaged during unloading at the Michoud Assembly Facility (MAF) on June 29, 1966. The exhaust manifold was dented in two places, the larger dent being approximately $1\frac{1}{2}$ inches in diameter. The security cover was also damaged. Final disposition of the engine will be determined upon completion of a detailed inspection, which is now in process.

F-1 Engine F-5038 undergoing single engine testing at MSFC has accumulated eleven tests for about 1400 seconds (including acceptance testing). One of the test objectives is to investigate the growth of injector baffle bulge which first appeared during acceptance testing. The bulge has increased during the test series and other slight bulges have appeared on the other inner radial baffles. Currently the condition is not severe enough to affect reliability or performance. ✓

H-1 ENGINE The H-1 engines performed satisfactorily in the long duration static test of S-IB-6, the first stage with 205K engines. Post test inspection of inboard engine 4071 revealed a split in one thrust chamber tube approximately $\frac{1}{2}$ inch long, 10 inches below the injector. The thrust chamber can be repaired; however, the engine must be removed. A spare engine will be installed, and engine 4071 will be repaired at Neosho. As a result of two previous incidents of this nature, corrective action is already in progress. Production support testing indicates that the incidence rate of tube splits of this nature can be reduced by the incorporation of a higher prefill in the chamber. This solution is being considered at this time pending completion of testing at 3° and 6° cant angles to simulate stage installation. It is theorized that hot spots on the tube wall reduce tube strength, resulting in a tube rupture. To learn more about the mechanics of the failure, a production support engine is currently being tested with a chamber containing approximately 100 thermocouples in the combustion zone. ✓

J-2 ENGINE The test cell at AEDC was "pumped down" to simulated altitude on June 28 for facility leak checks. The simulation did not reveal any major discrepancies. The cell will be "pumped down" next week with cryogenics aboard the S-IVB tank. ✓

The engine (2048) which experienced instability at MSFC on May 10, 1966, has been reassembled and installed on the test stand at MSFC. An attempt will be made to simulate the instability condition as soon as the engine is checked out. ✓

The S-II Battleship was tested at Santa Susana on Wednesday, June 29, for 382 seconds. A small intermittent fire was observed on an outboard engine during the firing. Post firing inspection revealed a broken oxidizer turbine by-pass valve inlet pressure sensing line. All test objectives were met.

The ECA replaced in AS-203 about 10 days ago checked out satisfactorily after a "summing" network in a stage telemetry circuit was changed to give the proper impedance match to the ECA. Extensive testing was conducted on the removed ECA, with S-IVB stage 207 at Douglas, Huntington Beach, and as a component at Rocketdyne, Canoga Park. Cut-offs at temperatures from 85° - 110° F were observed with the ECA in the stage and with the ECA in an environmental oven. This anomaly was traced to a poor quality solder bond on cut-off board No. 2. All ECA's are thermally cycled from -65° F to 140° F during factory buildup to verify fabrication quality. This particular solder joint was apparently marginal and the open circuit occurred only after it had been subjected to many thermal stress cycles. ✓

NOTES 7/5/66 CONSTAN

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Negative Report.

NOTES 7/5/66 FELLOWS

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R&D Operations Fiscal Status: All Saturn money allocated to R&D Operations as of June 30 was initiated. Our requirements at the beginning of the fiscal year were substantially higher, but were continually negotiated downward by IO to the annual plan shown below:

	<u>End of FY-66 Annual Plan</u>	<u>Initiations*</u>
Saturn IB	27,629,000	27,629,000
Saturn V	109,105,000	109,105,000
Engines	837,000	837,000
SRT and Advanced Studies	35,757,000**	33,819,000 ✓

*Official June 30 initiations may be slightly different when FMO books are adjusted to actual contractual obligations.

**"Annual plan" for SRT and Advanced Studies means "actual authorized to date." Of this total, the last \$1,070,000 was not authorized by NASA Headquarters until June 1966.

It is planned that remaining SRT and Advanced Studies tasks will be initiated during the next three months. ✓

A substantial amount of money has been initiated for FY-67 contractual action - \$2.270 million for Saturn IB and \$9.302 million for Saturn V. ✓

7/5/66
1. Hypersonic Transport (HST) Traffic, 1980 - 2000: Further results from the Ames' study of hydrogen-fueled, airbreathing hypersonic aircraft are now available. Using data from a previous Lockheed (MSFC) analysis, GD/Convair estimated that the world's total annual two-way air traffic in the period 1980 - 2000 would increase from 22 million to 52 million passengers (excluding Communist countries' population). Based on total traffic requirements, GD/C recommended an HST design range of 5500 n.mi. Selected cruise Mach number is 6.0. Busiest air terminal will be New York City, with 5,000 to 12,000 business and government passengers departing per day between 1980 and 2000. Depending on load factors and utilization, this would require from 10 to 30 Hypersonic Transports (300 passengers each) per day. If you desire further details on this study, we shall gladly furnish them. ✓

Not necessary
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2. Systems Engineering and Integration Support Contract: Effort is presently underway by R-AERO to formulate an acceptable incentive arrangement for the Boeing Company Systems Engineering and Integration Support contract (section 8.0 Flight Systems Analysis). The consolidated R&DO plan will be based upon inputs from P&VE, Astrionics, and AERO. A meeting, attended by representatives from AERO, P&VE, and Astrionics, was held July 1, 1966, to discuss the incentive philosophy and to tentatively select performance and schedule critical contract documents which should be incentivized. ✓

3. AS-204 Operational Trajectory: MSC requested in the last Guidance and Performance (G&P) Sub-Panel meeting that the AS-204 trajectory be reshaped to provide at least a 10 percent, and hopefully 20 percent, relief in aerodynamic heating for the spacecraft. Our latest estimates are that we should have about 3,000 pounds total reserve available which would leave about 1000 pounds available for lofting. If this 1000 pounds is used for reshaping the trajectory, we could obtain about a 15 percent heat reduction. However, this would essentially use up any possible engine-out capability. MSC also requested at this G&P meeting that the LES be jettisoned by the astronauts. This would be done from 30 sec to 35 sec, from the 65 percent level during J-2 buildup. Active guidance will be initiated 40 seconds after time base #3 (OECO), or about 3 - 8 seconds after tower jettison. The tower jettison time is delayed about 14 seconds relative to the sequencing on AS-202 which costs about 100 pounds of performance reserve. This proposal was accepted by MSFC. ✓

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1. S-IC-1 CHECKOUT: Post-static checkout of the S-IC-1 stage is approximately four days behind schedule, due primarily to late delivery of instrumentation calibration tapes and to checkout procedures which do not allow telemetry and instrumentation tests to be run concurrently. Boeing has now delivered tapes that are 90-95% correct, and it is expected that instrumentation checkout can be completed and lost time regained. There are some hardware problems developing which appear to be impossible to correct before the stage is shipped to KSC. The most significant is an engineering change which requires changeout of 85 transducers on the engines. Hardware will not be available before the stage arrives at the Cape; consequently, changeout of transducers will negate a large portion of the leak/pressure checks on the engines. ✓
2. RCA-110A COMPUTER: Revised manufacturing processes have been instituted at the RCA/Camden facility for all new printed circuit (PC) boards. This action is based upon the test results from both RCA and MSFC and should prevent the transistor solder cracking problem on all future new RCA-110A computer boards. All PC boards made prior to the incorporation of the above processes are being reworked using the copper tubelet approach at the RCA/Van Nuys facility. Rework was temporarily stopped during the first week of June due to the corning glass resistor cracking problem mentioned earlier. This condition has since been overcome by a redesign of the baby board separation device responsible for cracking the resistors. A survey of other Saturn component manufacturers employing similar transistor mounting configurations is in progress. All field personnel have been alerted to this potential failure mode and have been instructed to notify this Laboratory of any occurrences. To date, the survey indicates a similar condition exists on the Control Signal Processor (Martin Company) and the Flight Control Computer (Electronic Communications, Inc.). However, due to a manual PC board preparation and subsequent soldering operations used on the above two devices, as opposed to the automatic soldering process used in the manufacturing of the RCA-110A computer boards, the problem is much less in magnitude. ✓
3. S-IU-501 CONFIGURATION AUDIT: The first phase of the Configuration Audit of S-IU-501 was completed recently. The preliminary evaluation indicates that the same deficiencies existed on this audit as on the audit of S-IU-204. Most significant were: the lack of agreement between the engineering documentation and manufacturing documentation, and the lack of adequate pre-audit planning on the part of IBM evidenced by the nonavailability of documentation. ✓

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1. OPTICAL AZIMUTH LAYING: The potential problem of fog interfering with azimuth laying is still present. If the right combination wind direction and humidity occurs during a launch, the optical azimuth laying can be interrupted. Efforts to relocate the LOX vents were not successful.

A study to determine if the LOX fog could be optically penetrated has been made. It was determined that infrared energy was the best source for this application but the worst case conditions of fog densities cannot be penetrated. The theodolite has been designed to provide maximum energy source and the best quality optics available were used. The platform ESE has an additional provision to maintain a fixed azimuth by use of the vehicle reference roll phi signal. This mode is not automatic and must be entered into by decision of personnel in the blockhouse. The optical system can position and hold the azimuth coordinates to ± 20 arc seconds whereas a degradation in azimuth accuracy to ± 120 arc seconds can occur in the phi signal mode.

Some of the Apollo missions have assigned azimuths that are functions of standard time and are continuously changing. On these missions, final mission azimuth is computed on the basis of the predicted liftoff of the vehicle. If a launch hold is encountered after final azimuth laying, a correction of azimuth laying will be required after the countdown is resumed and a new predicted liftoff in standard time is known. This is automatically handled in the ground computer with no degradation in accuracy with the optical mode of alignment.

The phi signal mode of azimuth laying cannot update the azimuth laying to any acceptable degree of accuracy after a hold. ✓

Kalle

Has about a good compressed-air hose aimed at the vent outlet and triggered by blockhouse command if line of sight is obstructed by fog? B

NOTES 7/5/66 HEIMBURG

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S-IC-T

The S-IC-T is to be placed back in the test stand on Thursday, July 7, 1966. ✓

S-IB

The S-IB-6 was successfully fired for a full duration on June 29, 1966. Post-test inspection revealed split in thrust chamber which requires engine replacement. This is the second occurrence of this type failure in the last two stages to be static fired. (Engine in Position No. 4 on S-IB-5; No. 8 on S-IB-6.) ✓

205k rating

F-1

Tests FW-037 through FW-042 were conducted on the West Area F-1 Test Stand with F-1 engine S/N F-5038. Primary test objective was to evaluate a qualification configuration engine. Total engine mainstage time on this engine to date is 1,519 seconds. ✓

NOTES 7-5-66 HOELZER

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SUPPORT CONTRACTOR CHANGE: Computer Sciences Corporation is waging a vigorous recruiting campaign in an effort to staff the Computation Laboratory support contract on schedule. The present support contractor personnel (General Electric) are being contacted first in order to save as many of the experienced people as possible. The situation at present is quite confusing due to the fact that other segments of GE have also been recruiting among the GE support personnel in an attempt to place many of the professional people, who desire to remain with the company, elsewhere. CSC has named its top management and has recruited most of the non-professional support personnel and approximately twenty percent of the professionals. Although considerable confusion now exists, this situation was expected and it is anticipated that conditions will stabilize in the near future; meanwhile, the normal work of the laboratory is continuing as well as could be expected. ✓

AS-203: Launch was at 8:50 AM CST today. Flight evaluation reports will be submitted at T + 3 days and T + 10 days. The Mission Director will issue a report in 24 hours. ✓

LAUNCH VEHICLE TEST AND CHECKOUT: We have an effort underway in the CCSD Systems Engineering Contract aimed at optimizing the various stage test and checkout activities as well as the integrated launch vehicle checkout at KSC. The immediate objective of this effort is to determine the feasibility of reducing actual test operations and test time at factory sites, static test sites, and the launch site, by considering these operations as series operations complimentary to each other rather than independent operations. ✓ The effort is a continuation of an in-house activity initiated by R-Qual, who are participating in the direction of the effort by CCSD. We gave a presentation to General Bolender on the status and plans for this effort last week and plan a presentation to KSC and contractor management personnel in the near future. ✓

LB

! Good!
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AS-204 HARDWARE DELIVERY TO KSC: Current MSF controlled milestones for AS-204 hardware require deliveries to KSC by July 31, 1966. Based on the predicted AS-202 launch date, we are requesting that MSF revise the AS-204 deliveries requirements to August. ✓

IU ECS MANIFOLDS: You will recall that we had considerable difficulty with high porosity welds in the manifolds fabricated by Hayes for the early IU's. These first manifolds were procured by MSFC and provided as GFP to IBM. Beginning with IU-204 the procurement responsibility was transferred to IBM who placed a procurement with Solar (Hayes did not bid). Recently, leaks were detected in the manifolds installed in IU-204. Investigation revealed that the leaks were from cracks at the welded joints (not high porosity welds as on the Hayes manifolds) and further, that the cracks appear to be caused by the forming techniques after the joints are welded and inspected. The fabrication and inspection techniques are being changed at Solar and new manifolds will be installed in IU-204. No immediate schedule impact is anticipated on SA-204. ✓

CCSD SYSTEMS ENGINEERING CONTRACT: The responsibility for the administrative functions for the CCSD Systems Engineering Contract (Schedule II of 4016) is being transferred from Michoud to MSFC. These functions primarily involve contracts and funding activities. Although there will be some workload increase involved, we feel that this will benefit us in the control and management of the contract. ✓

7/5 JFS

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Water-Methanol Manifolds for Instrument Units:

IBM reported that under hydrostatic test, certain welded joints in the water-methanol manifolds seeped.

A metallurgical investigation showed inter-granular micro cracks extending from the bore of the tubes adjacent to the weld zone.

The 6061 Aluminum manifolds have been manufactured by Solar by a two or more pass welding technique; a flux was used as a molten metal backup and to improve the appearance of the weld. The cracks are a characteristic of the alloy and are certainly due to the welding technique. The most likely cause of the cracks is overheating of the metal adjacent to the weld. Stress corrosion due to the flux or other contaminants cannot yet be ruled out conclusively.

Source inspection was not able to detect the cracks. The inspection methods specified are X-ray and visual. Visually, the welds look fine (bore-scopes were not used). X-ray techniques do not have the resolution to reveal the cracks which are very minute at manufacture; the cracks grow subsequently and can only then be picked up by X-ray photography.

The original three sets of qualification plus flight hardware were made by Hayes using a single weld pass technique.

We are working with P&VE, Solar and IBM to help resolve the problem and minimize the schedule impact. ✓

Bill L.
Request
briefing
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1. 501 DAMPER SYSTEM - A design review was held with NASA Headquarters, MSC, and MSFC personnel on June 29, 1966. The design is proceeding satisfactorily, and the schedule for delivery of the damper system has been approved by I-V. ✓

2. S-IVB HIGH FORCE TESTS - The tests on the forward skirt were completed. No failures resulted from the tests. Next, the boattail will be installed and tested. ✓

3. S-IU-204 AND 501 MANIFOLD PROBLEMS - Leakage in the Water/Methanol manifold has been attributed by IBM to cracks introduced in the weld area during forming of the manifolds. Solar Co. is now required to x-ray after forming. P&VE and ME personnel have seen indications of a more serious problem. Failure analysis will be conducted to provide more information. ✓

4. LEM ALONE CONFIGURATION - The preliminary issue of the end item specification for the MSFC produced nose cones for SA-206, 208, and 210 was completed and submitted for comments. ✓

Lee Belew

Bill
Ferguson
FYI B

5. S-IVB WORKSHOP - Mr. Raffensberger of MSF suggested a presentation on the Workshop Program at MSF within two weeks to discuss status and focus on interface problems between MSC and MSFC. Authority to proceed with the RFQ on the Study of Spent Saturn S-IVB Stage Utilization for Support of Earth Orbital Missions has been received from NASA Headquarters. Instructions have been issued to the Working Group to cease activities on the SSESMS.

6. GENERAL MANAGEMENT PROGRAM REVIEW - Three current studies under supervision of our Vehicle Systems Division were among those highlighted by Dr. Walton Jones of OART at the June 22-23 Annual General Management Review for Biosciences at NASA Headquarters. They were: (a) NAS8-20095-Man-System Task Analysis for Lunar Surface Experiments, (b) NAS8-20015- Locomotion Control and Display Criteria for Lunar Surface Vehicles, (c) NAS8-20006-Man-System Design Criteria for Extraterrestrial Surface Vehicles. ✓

7. ZERO-G INDOCTRINATION PROGRAM - The MSFC design support team successfully completed the first phase of the Zero-g Indoctrination Program at Wright-Patterson AFB. Simulated manual tasks of representative maintenance operations were performed in the zero-g aircraft and on the AF 6-degree of freedom simulator. ✓

8. SA-5 DEBRIS - Recovered fragments of the SA-5 payload are being analyzed by our Materials Division. The fragments included a section of an expanded bellows, an attachment strap for the flexible heatshield, and 2 pieces of HRP honeycomb core apparently from the skirt areas. The section of expanded bellows shows numerous small holes through the skin. A very cursory examination of the holes suggests that they are not the results of hypervelocity impact, although micrometeoroid impact has not been eliminated. Since the payload included 11554 lbs. of sand, the possibility of the fragment flying through a dense cloud of sand as the payload broke up is being explored also. ✓

7/5

APOLLO COST REVIEW - We have attempted to learn the results of the completed assessment from the Apollo Program Office.

Their opinion is:

1. The MSC plan to cut back to meet the MSF POP guidelines is very optimistic and the Apollo Office is concerned about MSC's ability to accomplish this.
2. The KSC presentations left them confused on exactly how things stand, Dr. Mueller read the results as a \$40 million problem, however, program budget experts feel it is less.
3. That MSFC presented an honest, conservative assessment of the major contractors. It was felt that our approach seems reasonable and we are making an effort to reach the POP figures.

However, as a result of Dr. Mueller's comments there is a desire in the Apollo Program Office to gain additional insight into our R&DO laboratory area. Their impression and concern is that the overall laboratory costs were not significantly reduced in FY 67. They also desire a more detailed breakout of hardware, studies, GFE, special test requirements, etc. Also we shall have to do some more checking of possible uses of AO funds as suggested by Dr. Mueller. (Note: Congress so far has expressed an intention to cut AO funds in FY 67.) ✓

NOTES 7-5-66 RICHARD

B 7/8

Negative Report.

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1. S-II Stage:

Battleship - Test conducted on Thursday, 29 June 66, for 382 seconds. Major objective was to prove the new augmented spark igniter (ASI) lines. Propellant utilization "stepped" at approximately 160 seconds. No test preparation "holds" encountered. All test objectives obtained. ✓

Negotiations - CPIF cost negotiations began Monday, 27 June 66, recessed Wednesday, 29 June 66; and will reconvene on Wednesday, 6 July 66. Immediate efforts applied to shopping lists of cost reduction items. ✓

Structural Cracks - An investigation of the S-II-3 LH₂ tank has revealed cracks in the rib stiffeners adjoining the weld island. These cracks were revealed in two randomly picked stiffeners and may be occurring in many others. These cracks have been noted in forming, but this is the first time that they have been noted in an actual flight finalized unit. A further investigation is being conducted to determine cracks in, remnants of S-II-T, S-II-F, S-II-1, S-II-2 as well as S-II-3 and the solution to the problem. ✓

2. S-IVB Stage: "

501 Flight Stage - Shipment date from Sacramento has been changed from 2 August 66 to 15 August 66. Super Guppy transportation to be used. No schedule impact. Additional time at Sacramento permits closeout of open work prior to shipment. ✓

High Force Testing - Forward skirt testing was completed on Monday, 27 June 66. Preliminary data indicates test specimen successfully met vibration environment. Boat-tail testing is expected to start today, Tuesday, 5 July 66. ✓

3. Service Arm - Swing arm #7 (S-IVB/IU) testing revealed the following problems:

a. Debonding of that part of the IU structure that holds the vehicle umbilical plate. Temporary fix in order to continue testing was accomplished by using bolts. ✓

b. During the repeat (tracking) test, observers claimed to have seen occasional separation between the vehicle umbilical and the service arm umbilical plates. ✓

Both problems are under analysis by my office, P&VE, Test, KSC and IBM. We will keep you informed. ✓

4. LV GSE:

RCA 110A Computers - Printed board changeout for Launch Umbilical Tower (LUT) #1 and Launch Control Center #1 have been completed except for memory bank. The remaining boards (memory bank) can be changed out through routine maintenance and without program impact. ✓

NOTES 7/5/66 SPEER

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B-7/2

Negative Report

NOTES 7-5-66 Stuhlinger

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CD 7/5

1. PEGASUS: No substantial changes. Upon invitation by Dr. Lucas, RPL gave a presentation on meteoroid measurements and S-IVB puncture probabilities at a P&VE seminar. Puncture probabilities are essentially as I reported them in my preliminary note to you on 5/23. Would you be interested in a copy of the work paper? Yes B

2. LUNAR EXPLORATION: Phil Culbertson held a review of our lunar exploration studies at KSC on July 1 in preparation of the August 1 JAG presentation. Headquarters, MSC, KSC, and MSFC (ASO and RPL) were represented. Our presentations on three exploration phases (AAP, 1970-74; Molab, 1974-77; and Permanent Base, 1977 on) were well received. We were asked by Culbertson to prepare our inputs for the August 1 JAG presentations essentially along the lines of our previous studies. ✓

NOTES 7/5/66 WILLIAMS

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Negative report.

July 11, 1966

~~dir~~
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GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

TO Dr. von Braun, DIR

DATE July 20, 1966

FROM Director, Experiments Office
R-EO-DIR

SUBJECT X-ray Astronomy Experiment as discussed
in my Notes to Dr. von Braun, 7-11-66

File
NOTES

As a result of discussions with Messrs. Holtz and Mitchell of OSSA, and Dr. Annis of American Science and Engineering Corporation, I was provided voluminous information on the X-ray Explorer experiment as proposed by ASE and approved by the Space Science Steering Committee. A very careful review of this information indicated that with minor modification of the experimental package flight on a Saturn vehicle would be possible. Additionally, this experiment when conducted in conjunction with another experiment, also proposed by ASE, would probably result in one of the best sets of measurements of galactic X-ray sources possible. I suggested to Messrs Holtz and Mitchell that possibly such a combined experiment existed and that for such a combined experiment a carrier such as the ATM would prove almost ideal.

After due consideration OSSA decided to continue the development of the experiment as an Explorer X-ray experiment to be launched on the Scout. I indicated to Mr. Holtz that under these circumstances it was the consensus of Marshall management that we should not undertake management support of the project. My understanding is that the project will be assigned to Wallop's and that some other project in process up there will either be cancelled or delayed in order to make room to accommodate this one.

William G. Johnson
William G. Johnson

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



OFFICE OF DIRECTOR - MSFC

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M. 7-19

CODE	NAME	INIT.	<input type="checkbox"/>	<input type="checkbox"/>
DIR <i>Eberhard</i>	Dr. von Braun		A C T I O N	I N F O R M A T I O N
<i>As far as I know this issue is</i>				
<i>dead. Kalleps wants to do it.</i>				

REMARKS: *Please verify (Johnson)*
 SUBJECT: X-Ray Astronomical Experiment to be flown on SCOUT *7/16*

The Weekly Notes of 7/11/66 - Johnson indicate that MSFC has been requested by OSSA to take over project management of an X-Ray Astronomical experiment to be flown on a SCOUT vehicle. Although MSFC ought to be as cooperative as possible, especially with OSSA, I want to advise very much against taking over this project management. It would mean setting up another Manager who probably has to directly report to Ed O'Connor. It will take more management people, we would have to work ourselves into the SCOUT, etc.

I believe we ought to take on only projects which would give us some benefits as to interesting work for our R&DO Laboratories rather than mere management jobs which will cause us only trouble and do not help MSFC in any way.

Only if MSFC would really be assigned the field of astronomy as a mission would it be of some benefit to take over the management of this project.

CC:
 R-DIR, Mr. Weidner
 R-EO-DIR, Dr. Johnson

CODE DEP-T	NAME Rees <i>E. Rees</i>	DATE July 15, 66
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NOTES 7/11/66 JOHNSON

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Precision Optical Tracking Experiment (T-018; MSFC#15) This experiment has been approved by the Manned Space Flight Experiments Board and the Levels Three and Two Change Boards for Vehicles AS-503, 504, and 506. It was rejected for assignment on those vehicles by General Phillips at the Level One Change Board meeting on the basis of the policy decision made approximately a year and a half ago that no non-mission oriented experiments would be flown on the Apollo Mainstream Saturn V vehicles. We are currently requesting assignment of the experiment to Saturn V AAP vehicles (possibly as early as AS-507). We are also investigating the possibility of performing the experiment on the Saturn IB. However, this is dependent upon the feasibility of seeing appropriate portions of the launch vehicle from the site selected to house the ground tracker at the Cape, or upon the availability of a different mounting site for the ground equipment than that already chosen. ✓

X-Ray Astronomy Experiment to be flown on SCOUT MSFC has been requested by Mr. Holtz of OSSA, upon the advice of Ed Cortright to him, to take over project management of an X-Ray astronomy experiment proposed by the American Science and Engineering Corporation of Boston for flight on a SCOUT vehicle. Mr. Holtz reports that this particular project is fully funded for FY 67, but that the current workload at Wallup's will not permit normal assignment of the experiment to that Center. I have agreed to meet with Mr. Holtz on the afternoon of July 11 for further discussion of the experiment with him. It is not my intention in this meeting to make any binding commitments for the Center but only to gather sufficient background information to permit a decision. ✓

NOTES 7/11/66 BELEW

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NTS 7/11

ATM/LM INTEGRATION: Discussions were held with MSC on the continuation of Grumman effort on specific ATM integration problems past the present deadline of July 31. We are to discuss this with MSC during the coming week to determine what tasks need to be continued. If agreement can be reached, these tasks will incorporate the follow-on study contract that is presently under preparation at MSC. ✓

ATM: As an outcome of additional meetings between Dr. Mueller and Dr. Newell on ATM, Dr. Mueller has requested that additional information on MSFC's project concept be made available to him by July 15 for transmittal to Dr. Seamans on Monday, July 18. We are proceeding with the generation of such additional data in the form of a Preliminary Project Development Plan. We get the feeling from conversations with NASA Headquarters personnel that a decision on the ATM is nearing and may take place the week of July 18. ✓

INTEGRATION: In-house meeting with R-QUAL, R-ASTR, and R-P&VE was held July 6 to discuss systems checkout concepts and to identify areas that should be investigated by the Integration Contractors. Follow-up meetings with Lockheed and Martin are tentatively scheduled July 15 and 19.

Lockheed signed Phase "C" Contract July 7 and Martin signed July 8. Final MSFC review is pending. ✓

RACK: A final decision has not yet been made on the basic configuration of the Rack Structural Support System. A decision on whether the upper rack is included will be firmed up pending analysis of docking loads and torque applied to the payload module in the docked position. Five flight units and one test unit will be built by MSFC. Our specification and plan for building the units are scheduled to be completed by July 25. ✓

SSESM SEB: The SSESM SEB schedule is as follows: Final report to be wrapped up Monday and Tuesday; Report to Dr. Gilruth - Wednesday, July 13. Report to Dr. Mueller Friday morning and that afternoon report to Mr. Webb. MSFC attendance will cease with the Wednesday session per Mr. Newby's policy. ✓

WORKSHOP EXPERIMENT PROGRAM: The Workshop Experiment Program was reviewed with you on July 7, with the resulting decisions to place more emphasis on the MSFC focal point (Mr. W. Ferguson of the new Saturn/Apollo Applications Program Office) for these activities. A meeting is planned with NASA Headquarters at MSC for Tuesday, July 12 to make plans for "beefing up" the habitability portion of the workshop activity. This meeting was also called by John Disher of NASA Headquarters as a planning session for the July 27 Management Council Meeting. ✓

9/8 7/11

J-2 ENGINE

The AS-203 flight data received has revealed no engine performance anomalies. The spurious engine cutoff signals detected at KSC during stage checkout were traced to engine electrical control assembly (ECA) and stage networks. Impedance changes in the stage networks eliminated the false telemetry cutoff signals, and the erroneous cutoff command signals were traced to a temperature sensitive solder joint in the ECA. The block III ECA presently installed on AS-202 will be replaced with a block IV unit, which incorporates improved solder connections. All other flight engines are presently equipped with block IV ECA units. A general review of the electrical control assembly for Dr. Rees is scheduled for the morning of July 20. I hope you can attend part or all of it. ✓

The ignition system on engine J-2042 was found defective during checkout of S-IVB 502 at SACTO. System components are being replaced to isolate the problem and support acceptance test of the stage.

The J-2 Engine Contract (R&D and Production, converted to CPIF) has completed all reviews within I.O. and is in the Center Director's Office for signature of the contract and the transmittal letter to Headquarters.

We understand that Headquarters' approval of the Procurement Plan for J-2 engines to support Saturn IB S/AAP vehicles 213-228 is being deferred. It seems Headquarters would like to delay approval of this plan nine months by planning to use Apollo flight spare engines for 213-215. We do not feel that vehicle schedules should be based on the questionable availability of flight spare engines. ✓

F-1 ENGINE

Investigation of engine F-5036, damaged during unloading at Michoud (reported last week) has resulted in a tentative decision to cut out and field weld the area of primary damage.

Negotiations will begin July 12 on Production Support and Deliverable Hardware Contract to complete the 15 vehicle requirements. A review of the engine/cluster test history has resulted in a decision to procure three less engines (30 vs 33) and to reduce the thermal insulation sets by 10. However, an additional refurbishment program will be needed to provide for an adequate "spare" capability. ✓

H-1 ENGINE

All H-1 engines performed satisfactorily during the flight of SA-203. On S-IB-6, engine H-4071 was removed and replaced by spare engine H-4072 at MSFC subsequent to the second static test as a result of thrust chamber tube splits. ✓

On S-IB-7, engine H-7079 had an external fuel leak beneath the aspirator and is to be replaced by H-7076 at Michoud prior to shipment to MSFC for static firing. ✓

It is worthwhile to note that we are making good use of our spare engines to prevent schedule slippage and thereby effecting a considerable overall program savings. ✓

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QAB 7/11

B-7/14

S-IC VEHICLE STATUS

S-IC-3 - Checkout is proceeding in a satisfactory manner and ahead of contract schedule. Completion is scheduled for September 22. ✓

S-IC-4 - Component installation in final assembly is on schedule, with expected completion of August 5. ✓

S-IC-5 - Structural assembly in the Vertical Assembly Building has started. The thrust structure is in place and the tanks and other components are available for assembly. ✓

S-IC-6 - Structural components are estimated to be 70% complete and on schedule. ✓

S-IC-7 - Thrust structure and fuel and LOX tank assembly has started. ✓

S-IC-8 - Tank components (skins and domes) have been started. ✓

NOTES 7/11/66 FELLOWS

B 7/14

9/8 7/11

1. R&D Operations Technical Justification in Support of Program Operating Plan (POP) 66-3: As a result of the extremely tight budget for FY-67 emphasized by Dr. Mueller in his recent visit to MSFC, we are conducting a comprehensive review of the R&D Operations technical requirements in support of POP 66-3. As of June 30, IO agreed on these funding levels as the basis for issuance of the Resources Authority Plan for R&D Operations:

Saturn IB	\$10.6 Million (Includes \$.900 Million for Experiments)
Saturn V	\$88.1 Million
Engines	\$.430 Million

In the current review, the requested budget will be scrubbed down to hard core technical requirements. We expect to have completed this critical analysis of our FY-67 budget requirements, including discussions with IO, by the end of this month. ✓

2. S-IC Test Program: R-TEST moved the S-IC-T from R-ME to the test stand July 7, in preparation for additional testing. Refurbishment will continue by ME in the test stand, and will be completed in time for the stage to be made available for the system demonstration test of the B-2 position at MTF. The tests will also be completed and the stage moved from the stand in time for the acceptance test of S-IC-3 scheduled to begin October 28, 1966. At the request of IO, a comprehensive R&DO test plan for S-IC-T is being developed this week under the coordination of R-TEST. The plan will be submitted to IO July 15. ✓

NOTES 7/11/66 GEISSLER

B 7/15

Q/S 7/11

1. AS-204 Operational Trajectory: It was reported in NOTES 7/5/66 GEISSLER that MSC had requested some relief for aerodynamic heating during ascent. This request has now been withdrawn per telephone conversation between Mr. Perrine of MSC and Mr. McNair. ✓

2. AS-203 Flight Results: AS-203 was launched at 9:53 EST on July 5. The FEWG review meeting was held on July 6. Preliminary results, from looking at the data, indicate a very successful flight with no apparent significant problems. Preliminary information indicates insertion velocity was 1.4 m/s greater, perigee 2.8 km greater, and apogee 5.1 km greater than predicted. The orbital experiment was extremely successful with the one TV camera remaining (one failing in the countdown) providing excellent coverage of the LH₂ behavior in the tank. Cursory results indicate the liquid can be adequately controlled with the orbital thrust levels being considered for Saturn V. There was apparently less LH₂ sloshing during powered flight than on SA-201, probably due to the baffle in 203. ✓✓

Unexpectedly, the noise that showed up on the rate gyros on the AS-201 flight was not present on AS-203. Preliminary results indicate the acoustic level was probably only slightly higher at the IU on 203 compared to 201. ✓

The re-routed turbine exhaust through the flame shield did not cause any base heating problems. ✓ There were indications of burning in the base, but this was not as severe as had been expected. There also were no indications of any significant "blow torch" effects. ✓

9887/11

1. INSTRUMENT UNIT PROGRAM: The eleven water/methanol manifolds were removed from the IU-204 and the weldments X-ray inspected. X-ray revealed cracks in nine of the eleven manifolds. The present three pass welding procedure is considered to be the cause of these problems and solutions are being actively investigated by ME.
 - It is planned that IU-205 manifolds will be replaced by August 8, 1966, and checkout will be completed by September 21, 1966; a slip from August 23, 1966. ✓
 - IU-501 checkout will be completed prior to removal of manifolds. The target date for shipment of this unit is August 25, 1966. ✓
2. S-II PROGRAM: To date, all 31 tests have been completed on the S-II-1 stage, and the data on 25 of the tests has been accepted by NASA. The stage has 95 open squawks and 195 open EO's. Thirty-five components remain to be qualified of which 26 are in criticality categories I and II. ✓

NOTES 7/11/66 HAEUSSERMANN

B 7/15

9/8 7/11

1. APOLLO TELESCOPE MOUNT (ATM): An intensive effort has been undertaken within Astrionics to provide the technical portions of ATM design/development for a project development plan (PDP) requested by Dr. Mueller last Friday (7-8-66). I am emphasizing the technical content of the PDP since I believe this is what is most needed by Headquarters to reach a conclusion. The required submission to Headquarters is Friday (7-15-66). Our objective is a high quality PDP in the technical area. Because of the critically short time period it may be necessary to deemphasize or postpone submission of details concerning payload integration and/or management plans. ✓

B 7/15

9/8 7/11

S-1C-T

The S-1C-T stage was installed in the test stand on July 7, 1966. The stage will be updated to the S-1C-4 configuration for additional testing and will be removed from the test stand the latter part of September, to make ready for the S-1C-3 stage. The on dock date at MTF is January 3, 1967. ✓

F-1

Test FW-043 was conducted on the West Area F-1 Test Stand on July 6, 1966, with F-1 engine S/N F-5038 for a mainstage duration of 32 seconds. Cutoff was initiated by the thrust OK cutoff circuit at lox depletion as programmed. The high lox dome and GG lox injector purge pressure regulator was not run up for this test (it was omitted during the final countdown procedure by mistake); therefore, there was a possibility of contamination in the lox system. The lox main valves and the GG ball valve have been removed and checked for contamination. Visual inspection plus swab checks proved that the hydro-carbon level was within allowable limits. Next test on this engine will be on July 12, 1966. ✓

S-11-1 (Seal Beach)

An integrated checkout is scheduled for July 10, with data review on July 13. The stage will then be moved from station 8 to station 7 into a horizontal position for LH₂ tank entry to inspect for cracks as found on S-11-F and S-11-3. Pending this inspection, the shipment to MTF will be scheduled about July 23, or later. ✓

S-11 Battleship

A successful full duration firing was performed on June 29, 1966. ✓

S-1VB (Sacramento)

Vehicle 502 is in checkout on Beta I with firing scheduled for July 27. ✓

Vehicle 206 arrived at Sacramento on July 1, and was installed on test stand Beta III on July 6, 1966. There are presently no problems outstanding on the vehicle. The acceptance firing is scheduled for August 17, 1966. ✓

NOTES 7-11-66 HOELZER

988 7/11

B 7/15

NEGATIVE REPORT

NOTES 7/5/66 JAMES

R.F.
B-7/15

988
AS-203: Launch was at 8:50 AM CST today. Flight evaluation reports will be submitted at T + 3 days and T + 10 days. The Mission Director will issue a report in 24 hours.

LAUNCH VEHICLE TEST AND CHECKOUT: We have an effort underway in the CCSD Systems Engineering Contract aimed at optimizing the various stage test and checkout activities as well as the integrated launch vehicle checkout at KSC. The immediate objective of this effort is to determine the feasibility of reducing actual test operations and test time at factory sites, static test sites, and the launch site, by considering these operations as series operations complimentary to each other rather than independent operations. The effort is a continuation of an in-house activity initiated by R-Qual, who are participating in the direction of the effort by CCSD. We gave a presentation to General Bolender on the status and plans for this effort last week and plan a presentation to KSC and contractor management personnel in the near future.

AS-204 HARDWARE DELIVERY TO KSC: Current MSF controlled milestones for AS-204 hardware require deliveries to KSC by July 31, 1966. Based on the predicted AS-202 launch date, we are requesting that MSF revise the AS-204 deliveries requirements to August.

IU ECS MANIFOLDS: You will recall that we had considerable difficulty with high porosity welds in the manifolds fabricated by Hayes for the early IU's. These first manifolds were procured by MSFC and provided as GFP to IBM. Beginning with IU-204 the procurement responsibility was transferred to IBM who placed a procurement with Solar (Hayes did not bid). Recently, leaks were detected in the manifolds installed in IU-204. Investigation revealed that the leaks were from cracks at the welded joints (not high porosity welds as on the Hayes manifolds) and further, that the cracks appear to be caused by the forming techniques after the joints are welded and inspected. The fabrication and inspection techniques are being changed at Solar and new manifolds will be installed in IU-204. No immediate schedule impact is anticipated on SA-204.

CCSD SYSTEMS ENGINEERING CONTRACT: The responsibility for the administrative functions for the CCSD Systems Engineering Contract (Schedule II of 4016) is being transferred from Michoud to MSFC. These functions primarily involve contracts and funding activities. Although there will be some workload increase involved, we feel that this will benefit us in the control and management of the contract.

NOTES 7/11/66 JOHNSON

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9687/11
Precision Optical Tracking Experiment (T-018; MSFC#15) This experiment has been approved by the Manned Space Flight Experiments Board and the Levels Three and Two Change Boards for Vehicles AS-503, 504, and 506.

It was rejected for assignment on those vehicles by General Phillips at the Level One Change Board meeting on the basis of the policy decision made approximately a year and a half ago that no non-mission oriented experiments would be flown on the Apollo Mainstream Saturn V vehicles. We are currently requesting assignment of the experiment to Saturn V AAP vehicles (possibly as early as AS-507). We are also investigating the possibility of performing the experiment on the Saturn IB. However, this is dependent upon the feasibility of seeing appropriate portions of the launch vehicle from the site selected to house the ground tracker at the Cape, or upon the availability of a different mounting site for the ground equipment than that already chosen. ✓

X-Ray Astronomy Experiment to be flown on SCOUT MSFC has been requested by Mr. Holtz of OSSA, upon the advice of Ed Cortright to him, to take over project management of an X-Ray astronomy experiment proposed by the American Science and Engineering Corporation of Boston for flight on a SCOUT vehicle. Mr. Holtz reports that this particular project is fully funded for FY 67, but that the current workload at Wallup's will not permit normal assignment of the experiment to that Center. I have agreed to meet with Mr. Holtz on the afternoon of July 11 for further discussion of the experiment with him. It is not my intention in this meeting to make any binding commitments for the Center but only to gather sufficient background information to permit a decision. ✓

9/8 7/11

S-IVB Full-Scale Panel Flutter Test Program: In support of the wind tunnel test program at the Arnold Engineering Development Center (AEDC) for the S-IVB panel flutter problem, we are engaged in the manufacture of two wind tunnel models designed by P&VE. The first one is a pressure survey model where the pressure distribution on a rigid panel will be determined in the wind tunnel. The second model, the actual flutter test model, accommodates the actual S-IVB full-scale skin panel. This model also simulates structural load by a hydraulic system while the specimen is being tested in the wind tunnel. In order to avoid any damage to the wind tunnel, AEDC engineers have imposed rigid requirements for the design and structural test of the fixture to be carried out by P&VE prior to the wind tunnel tests. The whole program is on a very tight schedule with many problems in design and manufacture which were unforeseen at the start of the program in February 1966. Total effort in ME Laboratory will amount to approximately 30,000 man-hours, of which more than 10,000 hours are productive hours in the shop. With a relatively high overtime rate (10%), we will meet the desired schedule. This is only one typical example of the some 30 different manufacturing jobs we are presently engaged in. Some of the jobs are bigger (nose cones, LEM racks), some are smaller. All of them have in common very tight schedules and requirements for high skills in many manufacturing disciplines. ✓

B-7/15

1. AS-203 LAUNCH - All vehicle and engine systems performed satisfactorily. Inboard engine cut-off occurred 1.22 seconds earlier than predicted; S-IVB stage cut-off was approximately 3 seconds earlier than predicted. Propellant residuals were 6300 lbs. LOX and 20000 LH₂. At least one of 2 camera capsules covering separation was recovered. Orbital T.V. coverage of the LH₂ tank was excellent and indicated adequacy of the fluid control system and procedures. Orbital venting parameters appeared to be normal. The hydrogen chilldown for the simulated restart appeared to be normal. A briefing on this flight has been set up for you for Wednesday, July 13, at 2:00 p.m., under the auspices of the Flight Evaluation organization. ✓
2. STRUCTURAL INTEGRITY TEST OF S-IVB-203 - Preliminary indications are that the delta-pressure across the common bulkhead at Test Termination was approximately 37 psi. During the only destruct test of the common bulkhead at DAC, collapse occurred at 34.7 psi due to local instability. Theoretical value was approximately 42 psi. ✓
3. S-II-1 LH₂ TANK INSPECTION - S&ID entered the S-II-1 LH₂ tank July 10 to inspect approximately 1090 points for cracks. (Approximately 12 cracks were discovered at these points in S-II-2.) If cracks are found, there is a high probability that the stage will not be ready for shipment on July 19 as scheduled presently. Director, P&VE, and others from the laboratory will review this situation at Downey on July 12. ✓
4. S-IVB O₂/H₂ BURNER - The first successful 4½-hour burn of the oxygen-hydrogen burner was completed on July 1, 1966. Simulating mission profile, the burner operated in the thrusting mode for 270 minutes after which the LH₂ run tank pressure was ramped to simulate S-IVB/Saturn V fuel tank repressurization. ✓
5. S-II ULLAGE MOTORS - Thiokol is now developing S-II ullage motors and expects to complete PFRT by December 31, 1966. As requested by IO, P&VE expects to assign a representative at Thiokol on a full-time basis for the remainder of the year. ✓
6. CYLINDRICAL PAYLOAD MODULE - LEM-RACK - In support of the MSFC accepted design and manufacture of the structural support carrier for this payload, P&VE has been named as the R&DO lead laboratory. We have appointed Mr. W.A. Brooksbank to manage this effort. Several meetings with DOD and the payload contractor (Lockheed) and NASA personnel were held. Due to payload peculiar requirements, we are not designing the total RACK as we would have liked it, but only the lower half, equivalent to a LEM descent stage configuration. We are now studying the concept of separating the payload from the RACK directly while still connected to the SLA. This eliminates a second separation and eases attitude control problems. The docking mechanism will be connected directly to the forward end of the payload. ✓
7. PLUG MULTI-CHAMBER - No progress has been made in resolving the overrun on contract NAS8-11436, Evaluation of the Plug Multi-Chamber. Mr. Tischler of NASA Headquarters demanded that Pratt and Whitney accept a reduction in fee due to technical errors in performance of the contract. Pratt and Whitney will not agree to this reduction. This contract may have to be terminated. ✓

Bill Lucas

Who designs upper half?
Lockheed?

B

9/8 9/11

B 7/15

MSF GUIDELINES FOR POP 66-3 - We have received the official MSF guidelines for the R&D POP 66-3. These guidelines request a laboratory-by-laboratory break-out of R&DO funding. This depth has not previously been requested. ✓

KSC PAYLOAD INTEGRATION INTEREST - According to reliable sources at KSC, several groups are pushing Dr. Debus to become active in pushing for a strong role in payload integration due to the obvious benefits to the economy of the State of Florida, etc. Heretofore, Dr. Debus' position was that this work should not be performed physically at the Cape. Current MSF plans do include all alternate Apollo Payload Integration (equipment installation) work being performed at KSC. If KSC gets serious about taking up this role, it will increase the possibility of no payload integration ever being performed "physically" at MSFC.

H.M.

Debus has repeatedly stated that he is even short of spaces for his Apollo mainstream job.

I believe

Some physical integration work will wind up in KSC "by default" anyway, because of late deliveries, changes etc. But this ought to be minimized.

Note: All AAP missions need non-flight articles for the actual integration, therm.-vac. testing and similar jobs. These non-flight articles should never go to the Cape. B

NOTES 7/11/66 RICHARD

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90 7/11

AS-203 Experience: All ground computer programs were utilized as planned in the checkout and launch of AS-203. No significant computer hardware or software problems occurred after the computer cards were changed out and the system had stabilized. (The remote control of the computer system from the control center was available for the first time and operation was satisfactory.) This experience with the difficult portion of launch site automation means we can move ahead with the simpler and more direct task of converting manual operation to automatic procedures. We are working with the laboratories, IO, and KSC to plan this continuing development to make use of this automatic capability across all of the systems. ✓

The launch vehicle system and the vehicle-ground systems proved out practically all of our basic technical approaches. Our orbital techniques and systems appear to be sound. With a few additions, such as injection phase guidance, reignition computations, increased orbital checkout, data compression (for between ground station use in orbital operations), etc., the basic system will be ready. Our main problem in the future will be the necessary preflight verification to make sure we have properly integrated the entire system to the mission requirements. ✓

NOTES 7/11/66 RUDOLPH

9/18/71

B 7/15

Negative Report.

NOTES 7/11/66 SPEER

B 7/15

9/27/11

1. AS-203 BREAKUP IN ORBIT: According to the Mission Plan the continuous vent was closed at 4 hr 45 min after liftoff and the GOX ullage valve opened at the same time. This part of the experiment was the "pressure rise test" to obtain data on the pressure rate of a closed partially filled LH₂ tank. Although considered desirable, this test was not believed to lead to failure of the common bulkhead because of LH₂ tank relief valve setting at 39-42, slightly below the point where weld cracking would be expected to start; and also because of the low pressure rise expected (4 psi/hr). We have received sufficient evidence that the vehicle was destroyed in orbit in sight of both Texas and KSC during the end of the 4th orbit at 5:11:20 CST. The differential pressure across the common bulkhead was between 34 and 37 psi. The pressure rise was actually 16 psi/hr. There were 15,000 lb LH₂ and 200 to 300 lb GOX on board. It is not positively known if this was a true explosion or a pressure burst. 4 min after loss of signal NORAD's Trinidad Radar acquired a great number of pieces. This event, although somewhat unexpected, provides very valuable information; we are fortunate that telemetry was still being transmitted, and that 3 ground stations happened to be where we needed them. ✓

2. AS-203 ORBITAL OPERATIONS: The Digital Command System Tests performed in orbit at Carnarvon, Australia and KSC in the third revolution were completely successful. A time sequence update of minus 48 seconds was commanded from Bermuda in the third revolution to modify the orbital time base to insure the occurrence of critical events scheduled for Texas within the communications acquisition of the Texas site. All orbital check-out mission objectives were completed successfully. ✓ It was necessary to send a TV camera switch command from Carnarvon in the third revolution to return to TV Camera #1 as the mission sequence had, as planned, switched to the #2 Camera which had failed prior to liftoff. ✓

3. AS-203 LIEF OPERATION: The Huntsville Operations Support Center (HOSC) successfully supported the AS-203 Countdown Demonstration Test (CDDT) and Launch. The procedural and communications changes introduced as a result of the AS-201 experience resulted in a substantially improved operation. Approximately 12 support requests were received from KSC during the CDDT. 107 support engineers were assembled in the HOSC for the AS-203 launch, with about 35 of these personnel remaining during the orbital mission. Approximately 29 support requests were received from KSC, about one half the number received on AS-201, due to the smoothness of the AS-203 terminal countdown and launch. In addition, support was provided to the LH₂ experiment and S-IVB/IU flight controllers at MCC-H during orbit. Significant LIEF development milestones during the AS-203 mission included successful data and voice interface with the orbital Manned Space Flight Network and successful relay of the onboard TV from Texas and KSC ground stations to the HOSC. ✓

NOTES 7-11- 66 Stuhlinger

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9/27/11

1. PEGASUS: The recovery of thermal and meteoroid coupons from Pegasus C is being pursued as a joint ASTR-RPL project. Mr. Boehm & Mr. Pfaff are in charge of the recovery project (study contract with Emerson Electric). RPL is in charge of the two experiments: Solar spectroreflectometer measurements (Ed Miller) and Requirements for recovery and scientific evaluation of thermal and meteoroid coupons (Ed Miller and Mary Jo Smith). ✓

2. MANNED PLANETARY FLYBY STUDY: RPL is providing input to ASO on the scientific objectives of planetary flyby missions. This material will be used first in the current study under the auspices of the Joint Action Group. It will also be valuable for any later planetary mission studies. ✓

NOTES 7-11-66 WILLIAMS

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B 7/15

Negative report.

July 18, 1966

NOTES ⁷ 7/18/66 BALCH
7/18/66

B-7/22

S-II Test Stand A-2 Refurbishment and GSE Modification - Technical systems refurbishment assigned to GE has now been completed, leaving only the GSE modification to the S-II-1 configuration and minor refurbishment to be completed by S&ID. All work is expected to be complete before the arrival of the S-II-1 at MTF. ✓

Preparations for S-II-1 Static Firings - End Item Test Plan was received for review. Comments by NASA/MTF were scheduled for review on 7/15/66. Review of comments from R&DO elements is scheduled for 7/19/66 and 7/20/66. Letter recommending redline and sequence changes was released by R-TEST, and copy was furnished S&ID/MTF. Discrepancies between list of detailed operating procedures (DOP's) furnished by S&ID/MTF and End Item Test Plan were scheduled to be resolved on 7/15/66. S&ID is preparing a shortage list, by system, of GSE hardware items required to support S-II-1 checkout and testing, so that necessary procurement actions may be initiated. ✓

S-IC Activities - Preliminary requirements for a test program plan for the S-IC at MTF are being developed. End Item Test Plans for S-IC-1, S-IC-2, and S-IC-3 are being reviewed in this connection. Completed acceptance checkout of Special Power on the S-IC Test Stand. All four hold-down arms for the B-2 position of the S-IC Test Stand have been determined to be acceptable and moved to the stand for installation. ✓

Technical System, Phase II - Joint occupancy of the 7th through the 10th floors of the S-II Test Stand service core was obtained for technical systems installation. Acceleration of installation work continues, with a 5-day, 9-hour work week on both the S-IC and S-II complexes and an additional 5-day 8-hour shift on the S-II complex. ✓

NOTES 7/18/66 BELEW

B 7/22

7/18/66

ATM: An initial draft of the Apollo Telescope Mount Preliminary Project Development Plan was prepared during the week and forwarded to the SAA Program Office at Headquarters. The material in the draft was specifically requested by Headquarters for use in a comparison of alternate mounting concepts (i. e. Rack, LEM-D/S, SSESMS) that will lead to an early decision by Dr. Mueller and Dr. Seamans. A copy of the PDP draft is to be handed to Dr. Mueller either 7/18 or 7/19. ✓

I would like to note that preparation of the PDP draft required maximum effort on the part of R&DO, particularly Astrionics, and my office to meet the short deadline. ✓

As a follow up to the meeting with Dr. Mueller, Dr. Newell and Mr. Clark on Friday, July 15 we are preparing to set up a meeting between MSFC and GSFC as early as next week. ✓

INTEGRATION CONTRACTS: The Lockheed and Martin Phase "C" Integration Contracts were approved and released effective July 8.

A meeting was held with Scott Fellows of R&DO on July 14 to discuss the establishment of an Integration Ad Hoc Facilities Committee to provide information to contractors on MSFC facilities and their availability. Scott Fellows will chair the committee, which should be operational next week. ✓

S-IVB WORKSHOP: We have established with MSC a date (July 21, Thurs.) for Workshop Experiments meeting to be conducted at MSC with Headquarters and MSFC in attendance. MSFC is preparing a final cut of the Workshop Experiments Program.

Last week we found that MSC is developing a crew quarters experiment. If agreement is not reached at the above meeting on whose experiment to use, they will be forwarded to the Center Director level for resolution.

SEB results have been presented to Dr. Gilruth, Dr. Mueller, and Mr. Webb. It is not anticipated that a contract could be let before early August. However, the Headquarters manipulations will be expedited, if possible. Mr. Gorman and Mr. Schwinghamer are in the Headquarters presentations. ✓

RACK STRUCTURAL SUPPORT SYSTEM: A preliminary draft of a Project Development Plan for the "Rack" is being coordinated with MSC. A rack mock-up is scheduled to be completed by August 15. The first materials purchase is also scheduled for August. Preliminary Design is proceeding satisfactorily with meetings with MSC and Lockheed this week. ✓

B 2/22

7/18/66

C-1 ENGINE

A briefing on the status of the C-1 program will be given to Dr. Mueller on July 25, 1966. ✓

F-1 ENGINE

Production engine F-5038 has been tested 17 times at MSFC and has accumulated approximately 2050 seconds. One of the test objectives is to determine the effect of engine testing (to QUAL life 2250 seconds) on the known baffle bulge. To date the bulges have increased in size with no degradation of the performance. The last test developed a leak in the bulging area. ✓

J-2 ENGINE

The Block III ECA on AS-202 has been replaced with a Block IV configuration. Augmented spark igniter (ASI) LOX lines incorporating the additional weld and shot-peening to increase fatigue life have been installed on the S-II-1 stage.

The AS-203 flight data received to date indicate the J-2 engine performed satisfactorily in all respects. The LOX and LH₂ chilldown cycles performed in orbit indicated a satisfactory start could have been accomplished had Saturn V propellant loading been on board.

The ECA on S-IVB 502 (J-2042) was replaced at SACTO due to an erratic spark exciter. The exciter is undergoing failure analysis at Rocketdyne.

The J-2 Engine Combination Contract (NAS8-19) covering Production and R&D, as converted to CPIF, has completed Center review and has been signed and forwarded to NASA Headquarters for final approval.

The status of the Environmental Verification Test Program at AEDC is as follows: a. The LH₂ storage system has completed "checkout" satisfactorily with the exception of the vent burn-off stack which required some redesign. b. The fuel and LOX run tank are tanked with LN₂; both look good. c. All test discrepancies from the three air-on periods have been corrected with the exception of a Battleship prevalue joint seal leak. d. Electro mechanical and pressure checks on the engine are yet to be accomplished. e. AEDC is holding to a July 30, 1966, firing date. Our evaluation indicates the test will probably not occur before the first week in August. ✓

H-1 ENGINE

As a possible solution to the TOPS switch contamination problem, Southwestern has proposed a design modification using an electron beam welded cap. Eight switches are being modified for engineering evaluation, quality and reliability verification testing. This design improvement should virtually eliminate contamination of the switches. Proposed effectivity is SA-213 and subsequent.

Ten hot fire tests of engine H-156 have been conducted in support of the thrust chamber combustion zone tube burn study. The thrust chamber contains sufficient thermocouples to provide a complete temperature profile of the combustion zone. To date, prefill level, cutoff purge, and main fuel valve opening time have been varied in attempting to determine the cause for hot spots. These parameters have not produced any significant changes in wall temperature. Further tests are planned during which the effect of varying main LOX valve opening time, pump inlet pressures, and propellant temperatures will be investigated. ✓

NOTES 7/18/66 CONSTAN

7/19/66

B 7/22

Negative report.

NOTES 7/18/66 FELLOWS

B 7/22

7/18/66

1. Conversion of Saturn V Systems Engineering and Integration Support (SE&IS) Contract to CPIF: Last week, R&DO and IO met to formulate a position on incentive provisions for the Saturn V SE&IS contract with Boeing, which is presently being converted to CPIF from CPFF. Insofar as technical considerations are concerned, incentives will be centered around the Breadboard operation, the dynamic test vehicle program, interface documentation, and flight systems analysis. The latter subject will carry the heaviest performance and schedule incentives. Parallel evaluations are proceeding in R&D Operations, IO, and Executive Staff to determine trade-offs between weighting factors for cost incentive and for schedule and performance. R&D Operations has been assisting IO in the structuring of this incentive contract for about seven months, and the work should be completed in August. ✓

2. Saturn IB Systems Engineering Support: R&D Operations is reviewing Chrysler's proposal for Saturn IB Systems Engineering Support. The proposal is presently costed by Chrysler at \$46 million through runout; however, only about \$27 million is available for this support. The proposal is being thoroughly scrubbed down to determine mandatory items and to delete or reduce scope on such deliverable items as documentation, studies, and analyses which do not significantly affect vehicle performance. The revised work scope is to be submitted to IO later this month for recosting by Chrysler. ✓

B 7/22

7/18/66

Crossed-Beam Presentation to ESSA: On July 7, 1966, Mr. O. C. Jean, R-AERO-DIR and Dr. Fritz Krause, R-AERO-A, gave a presentation about crossed-beam technology to Dr. David S. Johnson, Director, and Dr. J. P. Kuettner, Chief Space Scientist, of the National Environment Satellite Center, ESSA. Both Dr. Johnson and Dr. Kuettner agree that the crossed-beam concept shows a great potential as future environmental monitoring system. Dr. Johnson, who had to leave early, asked later for a complete list of restrictive assumptions and practical limitations. Dr. Kuettner recommended to concentrate our feasibility studies on horizontal wind measurements at all altitudes over the entire globe. Instead of repeatedly scanning the same area he would prefer wind profiles from a single sweep, which may be averaged over path lengths up to 300 miles. Five copies of our preliminary report entitled "Phase A, Feasibility Study About AAP and Atmospheric Experiments With Crossed-Beam Methods" were handed out and will be technically evaluated by ESSA. Furthermore, the ESSA will write a letter to MSFC with specific recommendations on the scope of the immediate Phase B conceptual design program. ✓

E.F.

In view of the growing interest and acceptance of the cross-beam concept, I think it would be a fine thing if AERO's originators would write a paper to be published in one of the more prestigious trade journals on the subject.

B 7/22

7/18 983

B 7/22

1. S-IU-204 CHECKOUT: Since identification of the cracking problem in the solar methanol water coolant manifolds, eleven new manifolds have been received at IBM. Of the eleven, eight showed existing cracks when inspected by X-ray. The meeting to "turn-over" IU-204 to KSC is scheduled for July 26, 1966, and unless a significant improvement is made in manufacturing the coolant manifolds, it appears that IU-204 will have to be given to KSC less the manifolds or with manifolds containing cracks. ✓
2. CHRYSLER-MICHOUD QUALITY & RELIABILITY SURVEY: A quality and reliability survey was performed on the S-1B Program at Chrysler-Michoud during the period June 21 through July 1, 1966. This survey was the first in a series which are to be conducted along somewhat different lines than in the past. Since we knew that Chrysler Corporation had an organized and generally acceptable quality program, several pieces of hardware were selected and followed through the system from start to finish in order to determine just how well Chrysler was applying their system to the product. Composition of the survey teams has also been changed somewhat, for these surveys, to include predominantly high level individuals (Division and/or Branch Chiefs) from this Laboratory. In general, the discrepancies found in the contractor's quality and reliability programs were minimal. ✓ ✓ Chrysler has already initiated action in a number of areas which did need improvement. ✓
3. PRINTED CIRCUIT BOARDS: As a result of the difficulty experienced by RCA Van Nuys on printed circuit boards, we have investigated boards at Sanders Associates for cracked solder connections. Boards examined had undergone 180 temperature cycles; no cracked connections were disclosed. ✓ The same investigation was made on Brown Engineering Company built printed circuit boards and cracks were evident on a small scale, and could not be identified to specific part types. ✓

9/2 9/18

B 8/3

1. PRELIMINARY EVALUATION OF SA-203 MEASURING SYSTEM:

	<u>Scheduled Measurements</u>	<u>Failed</u>		<u>Not Yet Clear</u>
		<u>Fully</u>	<u>Partially</u>	
S-IB	502	6	2	3
S-IVB	208	9*	-	12
IU	367	1	4	4

*5 of these failed during checkout and countdown. ✓

2. APOLLO TELESCOPE MOUNT (ATM): The initial Project Development Plan (PDP) for ATM was completed on schedule and hand-carried to Mr. Bill Taylor in Washington on 7/17/66. The successful completion of this intensive effort was the result of a high degree of cooperation and coordination on the parts of the organizations and personnel concerned. We understand that Dr. Mueller will review the PDP while at the Cape today. Meanwhile, MSFC is proceeding to edit, complete the art work, and print the document in final form. Your successful trip to Washington on ATM experiments on 7/15/66 is highly appreciated by all of us. ✓

3. MANUAL GUIDANCE ON BLOCK II APOLLO: It has been brought to our attention that MSC is seriously interested in manual guidance as a backup system on Block II Apollo. According to our contacts at Ames, Warren North of MSC's Flight Crew Safety Division has approached that Center on the possibility of a "crash" study, to be funded by MSC, aimed towards having an operational concept within a year. Mr. North has informed Ames that these studies have been brought to the attention of Dr. von Braun, Dr. Mueller, and Dr. Shea. ✓

4. IU-500FS BATTERY FAILURE: A battery failure occurred on one of the 500FS IU batteries after installation but before power transfer. The failure is being investigated on the site and the battery will be shipped back to the manufacturer for a complete study.

The cause of the failure cannot be determined at this time. However, the data available indicates an internal short or a deterioration of the separator material in one of the cells.

There was extensive damage to the S-IU-500FS. Some IU equipment, based on a visual observation only, has been found to be damaged and must be replaced; such as, 20 wire cables, several flat cables, cold plates, and environmental flex hose. The repair will take 1 to 3 weeks and will correspondingly increase our operational cost.

As a result of the occurrence, we are also investigating redundant use of batteries to a greater extent as before; in addition, we will consider protection methods against battery overheating and fire hazards. ✓

F-1

Tests FW-044 through FW-046 were conducted on the West Area F-1 Test Stand with F-1 Engine S/N 5038 for a total mainstage duration of 474 seconds. Primary test objective was to evaluate a qual configuration engine. ✓

The injector developed a 1/16" diameter hole through the baffle bulge during test FW-046 (after a total mainstage time of 2025 seconds). This engine will be removed and preparations begun for testing engine S/N 4017 (flight engine from the 502 booster). This type failure is repairable in the engine and would be allowed in flight engines according to present specifications. ✓

S-IVB (Sacramento)

Pre-static checkout continues on schedule for the acceptance firings of both S-IVB-502 and S-IVB-206. Vehicle 502 is scheduled for a two burn acceptance firing on July 27, 1966. Acceptance firing of Vehicle 206 is scheduled for August 17, 1966. ✓

There are presently no problems outstanding on either vehicle. ✓

S-II

Reviewed the S-II-1 redlines and recommended to the S-II Stage Office methods of implementing the redlines so that only a truly out of limits parameter would terminate a test. In addition to the redlines, established other test requirements that would be used to determine a successful static firing. ✓

GROUND SUPPORT EQUIPMENT

A structural failure occurred on the LES tower simulator during tracking tests on the Saturn V Access Arm Environmental Chamber. At the time of failure the Environmental Chamber was being tracked at 0.7 c.p.s. with a major axis amplitude of $+19\frac{1}{2}$ ". Failure occurred at welded connections on each of the four LES tower legs in the area where the LES attaches to the Command Module Simulator.

The attaching hooks and the hood on the Environmental Chamber were damaged. EC for Arm 9, Set 3, has been installed to replace the damaged EC which will be repaired and used on Arm 9, Set 3.

This is the second structural failure of an LES tower/simulator. The first occurred at KSC on 500F.

KSC and P&VE Laboratory have been informed of the failure.

K.H. I hope this does not in any way reflect adversely on the adequacy of the design of flight articles! B

NOTES 7-18-66 HOELZER

B 8/3

7/18 95A

NEGATIVE REPORT.

NOTES 7/18/66 JAMES

B 8/3

REPLACEMENT OF PC BOARDS IN VLF 34 RCA COMPUTER: The changeout of PC boards from VLF 37B to VLF 34 RCA computer was completed last weekend and the computer is operational. Repaired boards to reinstall in VLF 37 should be available by July 24. ✓

IU MANIFOLD PROBLEM: The problem of cracked manifold welds has not yet been satisfactorily solved. Cracks are still showing up in recent welds. IBM is working the problem with the cooperation of the laboratories. We are hopeful that we can develop a satisfactory answer in about two weeks. ✓

IBM-OWEGO UNIT LOGIC DEVICE PRODUCTION: In six weeks IBM-Owego will deliver the last ULDs required by the current buy of 31 LVDC/LVDAs. They have advised us that immediate action is required on our part to prevent shutdown of their production line. We are requesting that they advise us of specific action they think is required to maintain the production line capable of supporting an eight system per year delivery. We must resolve this within two or three weeks to avoid having to pay startup costs later. We will keep you advised. ✓

APOLLO SUPPORT FUNDING: My understanding of the Friday budget meeting in Mr. Maus' office is as follows. Approximately \$6 M will be referred from Saturn IB to R&DO and will become a part of R&DO Apollo Support General Account (ASG). It will lose its identity to Saturn IB. All I. O. ASG funds will be furnished by Saturn V. For instance, if a Saturn IB S-IVB workshop change is required, Saturn V must fund it. General Phillips has reiterated he wants to approve ALL workshop changes. The time cycle for getting approval will probably be lengthy and may cause problems. ✓

7/18 952

B813

S-IVB Workshop The Experiments Office is conducting a review of all of the secondary experiments proposed by MSFC for incorporation in the S-IVB Workshop experiment program. It is currently planned that this office will support Mr. Ferguson in meetings at MSC later this week for the purpose of formulating an overall experiments program to demonstrate and test habitability and usefulness of the workshop. ✓

Pegasus C Rendezvous and Retrieval A coordinated effort is now underway among Astrionics, Research Projects, and Advanced Systems Office (with Mr. Belew of ASO spearheading the effort to establish mission and operational concepts) to develop the Pegasus C rendezvous and coupon retrieval experiments together with all required hardware. There is a possible conflict between the requirements for this experiment on Flight 209 and the workshop. These conflicts will be identified and reconciled. ✓

Space Manufacturing - Serpentuator

Manufacturing operations in space are needed for maintenance, repair, modification, assembly and for a possible production of special items.

Adjustment of suitable processes and tooling concepts depends to a large degree on the operational environment like operators mobility and tooling and materials logistics such as transportation, storage and handling.

Handling of man and material in space rests presently on reaction systems, like the Astronauts Maneuvering Unit (AMU). Within close range of a space craft, mobility can be also provided by mechanical systems. We are in the process of evaluation of such a system consisting of a number of links which are gimballed against each other within $\pm 15^\circ$ in two planes. Each link is visualized as being two to six feet in length. With 36 links of three-ft. length, one could cover a range of 100 feet and exert a force of two pounds at the end in either direction. Such a long serpentine actuator is called a Serpentuator. This concept has been studied jointly with R-Aero and Comp Laboratories and Astro-Space Labs as contractor for preliminary design. Electro-mechanical and hydraulical design is considered feasible for a range up to several hundred feet. Storage of the Serpentuator is provided by spiraling it inside or outside the cylindrical shrouds of a stage. The preliminary stability analysis by Aero and Comp shows only limited stability for constant torque drive at each joint, while the constant angular rate drive is much more promising and was selected for the design layouts.

It is planned to build a three-link test model of such a device and eventually a 36-link simulation model. ✓

1. INSTRUMENT UNIT AND NOSE CONE - A preliminary review of AS-203 flight data indicates that the maximum acoustic levels attained along the instrument unit during flight ranged from about 154 to 158 dB. It appears that the oscillating shock environment did occur as predicted and was present over microphone B6-601 for about $\frac{1}{2}$ second between 45 and 46 seconds of flight (referenced to range 0). However, the overall sound pressure level resulting from the oscillating shock was 6 to 10 dB below the predicted level. AS-203 acoustic data compared favorably with AS-201 acoustic data. Instrument unit vibration levels did not indicate a significant response and all composite Grms measurements were generally below 201 measurements.
2. LOX CHILLDOWN AS-203 - Preliminary evaluation of the AS-203 flight data indicates a successful LOX recirculation test was accomplished, although the LOX recirculation pump performance was low during the test. The low performance is attributed to the decaying ullage pressure from GOX ullaging and low LOX residuals which attributed to the pump inlet being only partially submerged during portions of the recirculation sequence. Even with the low performance, the data indicates a sufficient chill was obtained for a Saturn V engine restart. The LOX chilldown was added to the mission plan as a bonus experiment, and the possibility of not obtaining full data or any data was well known prior to the test due to the expected conditions in the LOX tank. ✓
3. SATURN V/S-IVB AUXILIARY PROPULSION SYSTEM IS FIRED IN VACUUM CELL - The Saturn V/S-IVB APS Module was successfully fired in the vacuum test cell at MSFC on Monday, July 11. The test marked the first time that the system has been fired at low ambient pressures. ✓
4. S-II STRUCTURAL CRACKING PROBLEM - Personnel from R-P&VE and R-ME reviewed the S-II stage structural cracking problem at S&ID last week with the result that S&ID was given explicit instructions relative to searching out the cause of the cracks and correcting the situation. Although S&ID had taken little initiative in investigating the problem, the MSFC review team was able to determine much about the history and origin of the problem from S&ID records. Furthermore, sufficient evidence was accumulated by and for the team to recommend a plan of action for inspection and repair of vehicles S-II-F, -1, -2, and -3. ✓
5. GENERAL - The Vibration and Acoustics Branch is providing vibro-acoustic support to the Center's Chief Council on matters of damage claims resulting from static firing of the S-IC stage and F-1 engines. A specific claim involves claimed damages to a family dwelling in Valhermosa Springs, Alabama, located approximately 11 kilometers from the S-IC test stand. This Branch will provide technical evaluation with regard to the validity of such claims. ✓
6. UMBILICALS - During testing of the S-IVB aft and S-IVB/IU umbilical service arms at the Saturn V GSE test facility, excessive vehicle skin panel deflection occurred. During maximum motion and frequency of the vehicle simulators, high loads are imposed on the umbilical carriers and vehicle skin by the KSC withdrawal mechanism cylinder. Since the tests were performed on an earlier IU version with weaker skin panels than present flight versions, tests will be repeated on new skin panels to be purchased from IBM. Modifications to the withdrawal mechanism have also been incorporated, lessening the loads. If IU beef-up is still required after these tests, a field fix at KSC can be incorporated. IBM is preparing a beef-up design for this case. ✓

NOTES 7/18/66 MAUS

7/18/66

B 8/3

House Space Committee Study of Apollo Program Progress-
Mr. Wilson of the House Space Committee Staff began the study of Apollo Program Progress (technical, costs and run-out problems) with a visit to NAA/Downey on July 14 and 15. NASA representatives were Captain Freitag, NASA headquarters, J. W. Prager, MSFC.

Further visits planned by Mr. Wilson are IBM and GE in Huntsville on July 27, Chrysler-Michoud on July 28 and Boeing-Michoud on July 29. ✓

NOTES 7-18-66 RICHARD

7/18 ND

B 8/3

Negative Report.

7/18/66

8/3

1. Saturn V FY 68 and Subsequent Year Funding Requirements - We are currently assessing our FY 68 and subsequent year funding requirements for the main-stream Saturn V/Apollo Program in an effort to reduce funding requirements and thus make available additional funds for Saturn V/AAP. Present rough assessment indicates a possible reduction in Saturn V/Apollo funding requirements of \$50 million for FY 68 & \$100-150 million for FY 69. ✓

2. S-IC and S-II Pre-negotiation Position - The S-IC and S-II Project Managers, presented to Dr. Mueller on July 12, 1966, their respective pre-negotiation positions for the S-II Stage conversion and the S-IC Stage follow-on buy of stages 511 through 515. Dr. Mueller approved both positions. ✓

3. S-II Stage:

Ullage Motor -

- o S&ID contracted with Thiokol on June 30, 1966 for backup Ullage Motor program.
- o Selection of one of the two motor configurations proposed by Rocketdyne to be made by September 15, 1966.
- o Selection between Thiokol and Rocketdyne motor to be made by December 31, 1966. ✓

Structural Cracks - (Reference Notes 7/5/66 Rudolph, Item 1 - attached)

- o Both vertical and horizontal stringer ends for all LH₂ tanks are being inspected and cracks repaired.
- o No schedule impact anticipated for S-II-F.
- o S-II-1 schedule impacted as follows:
 - On dock MTF now scheduled for August 12, 1966, (was July 30, 1966)
 - On dock KSC now scheduled for November 10, 1966, (was Oct 29, 1966). ✓

4. Service Arm - (Reference Notes 7/5/66 Rudolph, item 3, attached)
IBM was directed by contract mod to supply an IU segment by today, July 18, 1966 for additional umbilical testing. ✓

Attachment: DIR, I-DIR, & R-DIR's copy only.

7/18 953

1. AS-203 BREAKUP IN ORBIT: According to the Mission Plan the continuous vent was closed at 4 hr 45 min after liftoff and the GOX ullage valve opened at the same time. This part of the experiment was the "pressure rise test" to obtain data on the pressure rate of a closed partially filled LH₂ tank. Although considered desirable, this test was not believed to lead to failure of the common bulkhead because of LH₂ tank relief valve setting at 39-42, slightly below the point where weld cracking would be expected to start; and also because of the low pressure rise expected (4 psi/hr). We have received sufficient evidence that the vehicle was destroyed in orbit in sight of both Texas and KSC during the end of the 4th orbit at 5:11:20 CST. The differential pressure across the common bulkhead was between 34 and 37 psi. ✓ The pressure rise was actually 16 psi/hr. There were 15,000 lb LH₂ and 200 to 300 lb GOX on board. It is not positively known if this was a true explosion or a pressure burst. 4 min after loss of signal NORAD's Trinidad Radar acquired a great number of pieces. This event, although somewhat unexpected, provides very valuable information; we are fortunate that telemetry was still being transmitted, and that 3 ground stations happened to be where we needed them. ✓

2. AS-203 ORBITAL OPERATIONS: The Digital Command System Tests performed in orbit at Carnarvon, Australia and KSC in the third revolution were completely successful. A time sequence update of minus 48 seconds was commanded from Bermuda in the third revolution to modify the orbital time base to insure the occurrence of critical events scheduled for Texas within the communications acquisition of the Texas site. All orbital check-out mission objectives were completed successfully. It was necessary to send a TV camera switch command from Carnarvon in the third revolution to return to TV Camera #1 as the mission sequence had, as planned, switched to the #2 Camera which had failed prior to liftoff. ✓

3. AS-203 LIEF OPERATION: The Huntsville Operations Support Center (HOSC) successfully supported the AS-203 Countdown Demonstration Test (CDDT) and Launch. The procedural and communications changes introduced as a result of the AS-201 experience resulted in a substantially improved operation. Approximately 12 support requests were received from KSC during the CDDT. 107 support engineers were assembled in the HOSC for the AS-203 launch, with about 35 of these personnel remaining during the orbital mission. Approximately 29 support requests were received from KSC, about one half the number received on AS-201, due to the smoothness of the AS-203 terminal countdown and launch. In addition, support was provided to the LH₂ experiment and S-IVB/IU flight controllers at MCC-H during orbit. Significant LIEF development milestones during the AS-203 mission included successful data and voice interface with the orbital Manned Space Flight Network and successful relay of the onboard TV from Texas and KSC ground stations to the HOSC. ✓

7/18 9/18

1. ASTRONOMICAL OBSERVATIONS: In several of our past presentations on astronomy, the question has come up concerning the relative merits of making astronomical observations from low earth orbit, high earth orbit, or on the lunar surface. Dr. Bill Tift, the Principal Investigator for the optical UV experiment on the proposed X-ray, gamma-ray, and UV payload, is presently serving on the "Large Space Telescope Committee" of the National Academy of Sciences. Dr. Lyman Spitzer, Dr. Whipple, Dr. Code and several other well known astronomers comprise this Ad Hoc Committee of the NAS. Apparently this committee considers its main objective to "sell" and expedite the development of a large manned space astronomy facility. In this respect Dr. Tift has given considerable attention to low earth orbit vs. high orbit for astronomy observations. He also feels the lunar base astronomy observatory may be quite attractive. Dr. Tift would be quite willing to give you a presentation (or an informal discussion as you may desire) on the merits of various types of orbits and lunar surface for astronomical observations. If you desire, we will make the necessary arrangements. Dr. Tift now makes frequent trips to MSFC in connection with his UV camera contract.

→ E.S.

Please do, Ann Bonnie

B

NOTES 7-18-66 WILLIAMS

7/18 903

B 8/3

1. Project Able: After presentations to NASA Headquarters, the proceedings of the Project Able SEB were approved by OMSF on July 14, 1966, and by the NASA Administrator on July 15th. Official notification of authority to negotiate with the recommended contractors was received at MSFC Procurement this a.m. (July 18).

July 25, 1966

NOTES 7/25/66 BALCH

B 7/25

7/25/66
S-II Test Stand A-2 Refurbishment and GSE Modification - Additional difficulties have been encountered in the checkout of GSE, but all existing problems are being satisfactorily resolved, and both the GSE modification and checkout and all refurbishment is still expected to be complete by the time the S-II-1 arrives at MTF. ✓

S-II-1 End Item Test Plan - NASA/MTF comments were reviewed on 7/15/66. MTF representative met with representatives of R&DO elements on 7/19/66 and 7/20/66, and agreement was reached as to the NASA position on the test plan. S&ID presented their comments on 7/21/66 and 7/22/66. Target date for final NASA-approved test plan is 8/1/66. ✓

S-IC and S-II A-1 Test Stands - Because of slippages in brick and mortar construction and consequent delays in completion of technical systems and GSE installation and checkout, considerable difficulty is expected in meeting stage contractor need dates for stage testing, especially in the case of the S-IC B-2 position. Because of the urgency of meeting these need dates and the complexity of the problems involved, an Activation Task Group has been formed, effective 7/20/66, to exercise control over all activities affecting the activation of the S-IC and S-II A-1 test stands, at least through integrated subsystem and systems checkouts to insure their readiness for stage testing in accordance with program requirements. The primary attention of this Task Group at this time will be devoted to directing the Corps of Engineers efforts towards providing critically needed areas in the priority required for technical systems and GSE installation and insuring that maximum use is made of the areas that are provided on either a JOD or BOD basis. ✓

Technical Systems, Phase II - Additional acceleration of installation work will begin on 7/25/66, with a 5-day 10-hour first shift and a 5-day 9-hour second shift on both the S-IC and S-II complexes. ✓

Labor Relations - The President's Missile Sites Labor Commission met on 7/21/66, and adopted in its entirety the Industrial Subcommittee's recommendation on terms of settlement to be proposed in the disagreements between the IAM (Machinists' Union) and the J. N. Travirca Company, one of GE's subcontractors. Negotiations between the union and the company are scheduled to resume 7/26/66 on the basis of the proposed terms of settlement. Reliable information has been received that these terms are acceptable to both the union and the company. ✓

NOTES 7/25/66 BELEW

B 7/25

ATM: Bill Horton, Gene Cagle, Gerhard Heller, Rein Ise, and I visited GSFC on 7/22 for the purposes of establishing a working interface with GSFC and to initiate the transfer of experiment management responsibility to MSFC. The group was very well received. Dr. Clark personally took about 30 minutes to observe the discussions and put them in a spirit of cooperation. Mr. Bourdeau, Assistant Director for Projects at GSFC, expressed his willingness to cooperate as needed. Most of the time was spent with Mr. John Thole, the nominated ATM project manager from GSFC. He and his project people lead a very informative discussion about some of their experiences with the experiment developers, the funding and technical status of the experiments, and some overall tips based on their feelings about the ATM project. They furnished us copies of reports and specifications on the ATM which had been generated to date. It is planned that specific follow-up meetings with GSFC, technical and contracts personnel, will begin within a week. ✓✓

PAYLOAD INTEGRATION: First monthly reviews with Lockheed and Martin are tentatively scheduled for 8/3 and 8/4, respectively, pending resolution of travel arrangements.

Organizational meeting of the Ad Hoc Facilities Committee, chaired by Scott Fellows, was held 7/21. Lockheed and Martin will meet with the committee 7/28 for briefing on objectives and guidelines. ✓

Headquarters Saturn/Apollo Applications has requested MSFC, MSC, and KSC to make a comparative evaluation of the LEM Taxi/Shelter and the augmented LEM. This study is to be completed by 8/15. I have requested Advanced Systems Office to undertake the MSFC portion of the study. ✓

SPENT STAGE: On 7/25, Mr. Ferguson is presenting to the MSFEB (Manned Space Flight Experiments Board) the spent stage experiments (not the corollary experiments). ✓

JIS 7/25

B 7/25

F-1 ENGINE

Kenn County California has been charging North American Aviation Possessory Interest Tax in lieu of real property tax assessments for using the test stands and other facilities at the Rocket Engine Test Site, Edwards Air Force Base. There is reason to believe that these test stands are on "Exclusive Jurisdiction" property of the U. S. Government. Therefore, surveys are being made to specifically identify the precise location of these facilities on either "Joint or Exclusive Jurisdiction" property. It is believed that if the stands are on Exclusive Jurisdiction land they cannot be taxed by local authorities and a refund of up to \$300,000 already billed will be made. Additional savings will accrue in future years. The NASA share of the cost of the surveys is \$8,000.00 (F-1 Project funds).

to us,
I hope
B

F-1 engine 5038 has been removed from the MSFC test stand after developing a fuel leak in the bulged area of the injector baffle after 2050 seconds of run time. The injector will be repaired by approved repair procedures and returned to testing to further evaluate the repair technique and the effect on injector life and performance. ✓

H-1 ENGINE

A pre-negotiation meeting was held with Rocketdyne this week to discuss scope of work, and terms and conditions for the 60 engine buy.

The scope of work was reviewed and several refinements agreed upon including some to reduce contract costs such as listed below:

1. Delete the QAT engine teardown effort at Rocketdyne and have it done at MSFC.
2. Reduce the minimum acceptance firing tests (two instead of three).
3. Reduce the number of copies of some reports from ten to three.

This is the first FPI engine procurement at MSFC. Considerable progress has been made in the settlement of the general contract clauses; however, there are still several areas where contract clause negotiations are incomplete, such as the Hot Test Risk Clause. ✓

J-2 ENGINE

An S-II Battleship firing was terminated during transition by an erroneous gas generator over-temperature cutoff on Friday, July 22, 1966. Actually, the low temperature calibration was set too high. Post-test examination of data and hardware revealed the first stage turbine wheel on one LH₂ turbopump had been installed backwards while replacing the turbine honeycomb seal. Some damage to the turbine blades resulted and the turbopump is being replaced.

The erratic operation of the spark exciter on J-2 engine J-2042 (S-IVB 502) has been attributed to GN₂ leaking into the spark exciter case. The spark exciter is normally sealed with dry air. The exciter case is then enclosed in the ECA Package which is pressurized to 50 psi with GN₂. Investigation revealed a crack in an electron beam weld on the spark exciter case which allowed GN₂ to enter the package. Also, a failed transistor and diode were found in the spark exciter switching circuit. A test program is underway to determine if the GN₂ leakage caused the transistor and diode failure. This is the first failure of the spark exciter of this nature, and the second GLA (vendor) supplied ingiter failure. All previous checks at Rocketdyne and DAC of the spark exciter showed normal operation. ✓

NOTES 7/25/66 CONSTAN

9/25 7/25

B 7/25

FY 67 BUDGET PROBLEM

A comprehensive review of the total Michoud Assembly Facility operating costs is in progress. Presentations were made on July 21 by Mason-Rust, the Michoud Facilities Office, and Michoud Support and Management Services Office. On July 22 a presentation was made by LTV. After evaluation of these individual presentations a combined presentation is planned for the management of CCSD, Boeing, Mason-Rust, LTV and NASA. ✓

CONTRACT NAS8-5608, THE BOEING COMPANY

Pre-negotiation incentive arrangement approval of follow-on S-IC Stages, 5-11 through 5-15, was received July 12, 1966, and on July 18 negotiations commenced on work scope and contract terms and conditions. No major unforeseen difficulties encountered to date during negotiations. ✓

NOTES 7-25-66 FELLOWS

B 7/25

- 7/25 9/15
1. Performance Evaluation of Single Support Contractors: The second six-month cycle is nearing completion for evaluating the Single Support Contractors' performance to establish recommendation for award fee. Ten of the eleven contractors have been evaluated. There appears to be sincere accord with the methods of the PEB and with the depth of penetration into contractor performance factors rated to award fee. The remaining contractor in this review cycle is the GE Company which had its second six-month evaluation period (and its last one) extended two months because of the required phase-over with Computer Science Corporation, the new Comp Lab Single Support Contractor. ✓
 2. AAP Integration Contractors: An AAP Integration Ad Hoc Facilities Committee was organized per the I-S/AAP-MGR office instructions and operating ground rules were established in the first meeting of the Committee on 7-21-66. I am the Chairman and members have been designated from each of the Labs, the Facilities & Design Office and the I-S/AAP-MGR office. The Committee is scheduled to meet with Lockheed & Martin personnel on Thursday, July 28, 1966, as an initial step in providing MSFC answers to facilities questions which the contractors might raise. ✓

NOTES 7/25/66 GEISSLER

B 7/25

- 9/8/25
1. Space Flight Mechanics Specialist Conference: The American Astronautical Society (AAS) Space Flight Mechanics Specialist Conference was held at the University of Denver, July 6-8, 1966. MSFC participants were Mr. H. Horn and Mr. H. Ingram from R-AERO, and Dr. R. Arenstorf from R-COMP. Their papers were well received. Main topics covered were: (1) Satellite Orbit Prediction and Perturbations, (2) Determination of Orbits and Constants, (3) Trajectory Optimization, (4) Trajectory Shaping and Analysis, (5) Interplanetary Space Missions, and (6) Cislunar Space Missions. ✓
 2. The Boeing Company (TBC) Incentive Contract: The R&DO position on TBC incentive contract (Task 8.0, Flight Systems Analysis) has been coordinated and submitted to I.O. by our Projects Office. The proposal includes motivation for contractor submittal of critical schedule and performance documents, and an overall motivation to successfully integrate the vehicle system performance through analysis (called verification of analysis by flight). Major emphasis has been placed on the performance critical documents. ✓

NOTES 7-25-66 GRAU

Q18 7/25

B 7/25

Nothing of significance to report this week.

7/25 JES

1. APOLLO TELESCOPE MOUNT (ATM): A visit to Goddard Space Flight Center (GSFC) last Friday (7/22) for the purpose of discussing phase-over of ATM to MSFC was highly informative and beneficial. Messrs. Bill Horton and Gene Cagle of this Laboratory accompanied Messrs. L. Belew and Rain Ise of IO and Mr. Heller of RPL. The majority of time was spent with Mr. John Thole, GSFC ATM Project Chief, and his group. Dr. Clark participated in an initial, general discussion in the office of Mr. Robert Bourdeau, Asst. Director for Projects. The entire attitude of GSFC was one of cooperation and assistance in the transition of ATM to MSFC. ✓ GSFC had built up a group of 45 - 50 personnel assigned solely to the ATM project under Mr. Thole. In Mr. Thole's opinion, the experiments will be the pacing items in the ATM schedule. Additional meetings with GSFC will be scheduled in the immediate future for further detailed discussions. ✓
2. LOX FOG INTERFERING WITH PLATFORM ALIGNMENT: In anticipation that this condition will continue to cause a problem during launch preparations, we have requested through IO that until further notice a camera film observation be taken during each launch countdown. This data will enable us to determine the severity of the problem and affect on final alignment. ✓
3. RECIRCULATING GAS SUPPLY FOR GAS BEARING COMPONENTS: Two different systems are under development, one with a spring resonance gas lubricated piston (under contract with Mechanical Technology Inc.) and another more sophisticated one which evaporates freon from waste heat of the stabilizer and a heat exchanger to liquefy the freon again (under contract with Conduction Corporation). We have both systems as breadboard running in our laboratory; however, the first system is ahead with 1,400 hours constant running under full load. We have all the confidence that we will achieve our aim of 10,000 hours. The weight of this cooling system is always lower despite the use of electrical power from batteries than the present pressure bottle gas supply. The second system still requires considerable development time. ✓

7/25 JFB

S-IC-T

Three engines were installed this week. The lox suction line at engine position No. 4 was lowered for inspection of the tunnel to line roller bracket system. If you recall, these were a problem early in the program. This was accomplished to determine their status after all the firings that the -T has experienced. The hardware was in good condition. Boeing and R-P&VE both inspected this line. We will reluctantly remove the S-IC-T from the test stand on Friday, July 29, 1966, on the orders of General O'Connor. A meeting was held on Thursday, July 21, 1966, in Mr. Weidner's office. R&DO was unable to convince him of the need of this effort in support of the S-IC program. ✓

F-1

No tests were conducted this week due to removal of engine S/N 5038 (qualification type) and preparations for calibration verification of engine S/N 4017 (502 flight engine). This test (FW-047) is scheduled for July 25, 1966. ✓

S-IVB (MSFC)

Tests S-IVB-030 and S-IVB-031 were conducted at the S-IVB test stand (MSFC) utilizing engine J-2048 on Thursday, July 21, 1966, with durations of 6.0 and 200 seconds, respectively. The main test objective was to duplicate the operations, times, etc., that led to tests S-IVB-026 and S-IVB-027 (J-2 engine 2048 went rough on test S-IVB-027). All objectives were met and no rough combustion occurred on either test. We are coordinating with R-P&VE and Rocketdyne to determine where we go from here since this occurrence has not been explained to date. ✓

S-IVB (SACTO)

Vehicle 206 The acceptance firing for Vehicle 206 remains scheduled for August 17, 1966, with little likelihood of bettering this date. There are presently no outstanding problems on the stage. ✓

Vehicle 502 The acceptance firing of Vehicle 502 has been rescheduled for Thursday, July 28, 1966, to allow time for the simulated static firing and data review. There are no major outstanding problems on the vehicle which could delay the firing. ✓

GROUND SUPPORT EQUIPMENT

Removed test umbilicals and changed to the 501 flight umbilicals and propellant couplings on Arm No. 4 and No. 5 (S-II Intermediate and S-II Forward Arms) last week. Flight umbilical testing was scheduled for this week with liquid hydrogen in the hydrogen propellant lines. During the dry checkout tests on Arm No. 4, the lanyard withdrawal cable broke on the lox coupling allowing the coupling to hit the ground, causing coupling damage. This looks like a KSC design deficiency and could affect schedule due to shortage of flight hardware. ✓

NOTES 7-25-66 HOELZER

7/25 JS

B 7/25

TESTING OF PROGRAMS FOR AUTOMATIC CHECKOUT: It is undesirable to use the "breadboard" facility for the development and reliability testing of checkout programs because the "breadboard" is needed for hardware studies and a considerable amount of manpower is required for its operation. Astrionics and Computation Laboratories are studying the possibility of simulating those parts of the "breadboard" needed for the testing of the computer programs on a separate digital computer, thus freeing the "breadboard" for its intended purpose. ✓

~~CONFIDENTIAL~~

NOTES 7/25/66 JAMES

7/25 JJS

B 7/25

IU-204 ENVIRONMENTAL CONTROL MANIFOLDS: Reference is made to the first paragraph of Mr. Grau's notes dated July 18 (copy attached). I was quite concerned with Mr. Grau's comments as they apply to IU-204 environmental control manifolds. I have met with Quality Laboratory personnel, IBM personnel, and others, and I don't think we have an IU-204 problem. My understanding is that Quality Laboratory will update their position on this subject in this week's notes. ✓

SATURN IB REVIEWS: Reference your question on my notes of July 11 (copy attached) as to whether we should cut back on these Headquarters reviews that take up so much time. We have attempted to reduce the reviews from time to time without success. Obviously Headquarters does not want to give up their central role in them. We would have no chance of reduction before SA-204. ✓ I suggest after SA-204, when Saturn V reviews are beginning also, that the center reassess the problem. ✓

STATUS OF RCA 110A COMPUTERS AT KSC: Printer circuit boards (reworked to correct the cracked solder joint problem) have been installed in the RCA computers at KSC as follows:

a. VLF-34 has the PC boards installed from the VLF-37B computers used for SA-204. The VLF-34 computers are actively supporting SA-202 checkout. ✓

b. VLF-39-1 computers have reworked boards installed and are operating. ✓

c. VLF-37B replacement reworked boards have all been shipped to KSC and are being installed. ✓

d. VLF-39-2 computer boards are being reworked for delivery in October 1966. ✓

e. KSC laboratory computer reworked boards are to be delivered in November 1966. ✓

f. VLF-39-3 computers will be delivered with reworked boards and new boards fabricated with corrective techniques. We do not plan a mass changeout of boards at other locations. These boards will be updated on a replacement basis. ✓

~~CONFIDENTIAL~~

(2 attachments described above)

7/25 JD

B 7/25

ART/SRT and SD FY 1966 PROGRAM STATUS

	<u>ANNUAL PLAN</u>	<u>PROGRAM AUTHORITY</u>	<u>PROCESSED TO FMO</u>	<u>OBLIGATED</u>
OART	18,990,000	18,990,000	16,659,873*	14,174,695
MSF (904)	9,450,000	9,450,000	9,454,977	9,217,070
OSSA	1,138,000	923,000**	893,200	702,306
OTDA	<u>1,627,000</u>	<u>1,627,000</u>	<u>1,543,350</u>	<u>1,458,256***</u>
TOTALS	31,205,000	30,990,000	28,551,400	25,365,342

*Uninitiated balance includes \$2,076,000 program authority received week of July 11 for approved tasks in the Chemical Propulsion Programs and the Space Vehicle Systems Program. The residual funds include \$122,000 for liquid hydrogen studies to be utilized in connection with the nuclear vehicle technology program. ✓

**Annual Program Plan should probably be corrected to this figure since additional authority from OSSA does not appear likely at this point.

***Authority for reprogramming to permit immediate utilization and obligation of residual funds in the OTDA program has been requested from Headquarters.

POP 66-3 A revised Supporting Development Program (OMSF) has been prepared for inclusion in POP 66-3 which outlines \$13.755 M of 904, 905, and 908 work units. This includes the \$10.080 M minimum program submitted to Mr. Gray by Mr. Weidner in his letter of July 7, 1966. This is about 50% of the program total originally submitted to Headquarters for review. ✓

Inter-Center Research Coordination Copies of this Center's ART/SRT submission have been forwarded to each of the NASA Centers and where copies of their submissions have not been received, copies have been requested. Mr. T. A. Harris, Research Assistant to the Associate Director at the Langley Research Center, has advised that Mr. C. J. Donlan had directed that Langley not reciprocate with copies of their work units. It is noted that Langley is the only Center to date that has refused to cooperate in this exchange of research information. I plan to take this up with Mr. Donlan this week. ✓

1. CYLINDRICAL PAYLOAD MODULE-LEM-RACK - (Reference Notes 7-11-66) The MSFC RACK concept consists of an upper and lower half representing the LEM lab and LEM Descent Stage structure. For some applications, we only need the Descent stage portion. For the Cylindrical Payload, we had tried to design the total RACK with the docking mechanism incorporated into the RACK structure and the payload not connected at the forward end at all. The main reason for this was to establish this RACK as a payload carrier, available also for other applications. For the Cylindrical Payload, due to specific problems, no upper half of the RACK will be required. ✓

2. S-II STRUCTURAL CRACKING - Cracks have been found in the LH₂ tanks of all fabricated S-II stages and in some segments which have not been welded into the finished tank. S&ID is now repairing the LH₂ tank of S-II-3 but has not yet demonstrated the adequacy of the repair technique. The situation is becoming more alarming, and we are maintaining a representative of our Strength Analysis Branch in residence at S&ID now. We expect a report from S&ID by August 1 which should give insight into the origin of cracks.

Because this type of cracking may have been related to the S-II-T failure, a team of metallurgists was sent to MTF on July 20 for additional studies on the debris. Upon arrival of the team at MTF, it was discovered that S&ID has scrapped the reassembled debris and that any further evaluation of the debris was hopeless. Fortunately, nine relatively small pieces containing cracked stringers had been saved, and these pieces were under study by Materials Division. S&ID/Downey personnel were reluctant to release the pieces to MSFC. !!

3. EXPERIMENT #2 - Our Thermal Coating Experiment, as is probably the case with other non-interference in-flight experiments, is in constant jeopardy by changing mission requirements in the main-line program. The new SA-206 nose shape will experience temperatures such that thermolag coating was being considered. This would have negated our experiment. We changed the structural thickness somewhat to account for the higher temperature instead of using thermolag. This increases the weight of these nose cones by 25-30 lbs. ✓

4. PROJECT THERMO - The phase B study contract for this In-flight Experiments payload hopefully will be signed by the end of July. This phase B study involves significant efforts of several R&DO labs besides P&VE, as well as five different private companies. At this time, this experiment is still planned to be the alternate payload for 509 according to OMSF. ✓

5. HIGH PERFORMANCE INSULATION CONCEPTS - Use of a high performance insulation concept which requires prelaunch evacuation has been considered questionable for use on flight vehicles because of high susceptibility to mechanical damage and inability to repair the flexible outer jacket. An MSFC 105"-diameter, flight-configured tank, about to be thermally tested in a vacuum chamber, has been damaged on two different occasions. Repairs have been made and the insulation re-evacuated to acceptable levels within 48 hours. This represents a significant advance in technology in that a combination of two fundamental insulation concepts, evacuated and purged concepts (each having specific advantages), remains a contender for future stage considerations. ✓

1.0.
Had we released the debris for scrapping before the final report was in Hq.??
B

NOTES 7/25/66 MAUS

7/25/66

B-7/25

Negative Report.

NOTES 7/25/66 RICHARD

7/25/66

B 7/25

Negative Report.

NOTES 7/25/66 RUDOLPH

7/25 JRS

B 7/25

1. S-IC-1 Stage:

- Currently in R-QUAL undergoing post captive checkout.
- Completion of checkout expected by Saturday, 30 July 66.
- Stage on schedule with delivery to KSC anticipated for Monday, 29 August 66.

2. S-II-1 Stage:

- Moved into Station VII at 3:30 am, Saturday, 23 July 66.
- Internal inspection of the LH₂ tank completed at 6:00 pm, Sunday, 24 July 66.
- 15 cracks found. ← !
- Shipment date from Seal Beach is anticipated for Saturday, 30 July 66, with an on dock MTF date of Sunday, 14 August 66 (on dock MTF date, same as I reported in Notes 7/18/66 Rudolph). ← A.I.R. as is? Cracks and all?? B

3. S-II Battleship Firing:

- Conducted at 3:00 pm, Saturday, 23 July 66 for .5 seconds (full duration scheduled).
- Cutoff automatic due to gas generator overtemp (GGOT) indication.
- Quick look data indicates actual cause was fuel turbine pump stall which apparently resulted in GGOT. (See attached Flash Report) ✓

4. S-IU-500FS Unit:

- Experienced a fire on Thursday, 14 July 66, resulting in damage and a requirement for replacement of:
 - 4 water/methanol flex lines
 - 2 coldplates
 - 11 cables (2 of them large)
 - 1 section of purge duct
 - 1 battery bracket
 - 1 flowmeter
 - 2 flat cables

Replacement scheduled for completion by Monday, 1 August 66, and S-IU-500FS testing should resume at that time. ✓

Attachment: DIR, I-DIR, R-DIR's copy only.

Flash Report

FLASH REPORT

TO : Dr. Arthur Rudolph, I-V-MGR

DATE July 25, 1966

TIME 10 A.M.

PREPARED BY James Odom

OFFICE I-V-SII-T

PHONE NO. 876-5220

FROM : Manager, S-II Stage Office, I-V-SII

SUBJECT : S-II Battleship

The second full duration firing of this series was attempted on Thursday, July 21, 1966 (see Flash Report dated July 21, 1966).

This firing was rescheduled for Friday, July 22, 1966.

The first attempt on this day was aborted just prior to ignition due to low hydrogen tank ullage pressure.

The second attempt was started utilizing the facility gas supply to supplement the hydrogen tank ullage pressurization system. This attempt was stopped by the GSE free hydrogen burn off system indicating one burner was not operating. This was corrected and recycled.

The third attempt was aborted at approximately .5 seconds after ignition by a calibration shift of the gas generator over temperature drawer in the GSE for engine no. 1.

In this same attempt the gas generator for engine no. 3 indicated an over temperature condition as well as a very low turbine speed. The pump was entered on Saturday, July 23, 1966, and found the first stage turbine wheel was installed backward by the Rocketdyne field crew. This pump is currently being replaced by Rocketdyne. ! B

The next attempt is scheduled for Friday, July 29, 1966.

I.O. Suggest you prepare a personal letter to Sam Hoffman for my signature. cc: See Page 2

George D. Wallace, Jr.
Samuel Yarchin
Manager, S-II Stage

URGENT

Attachment

"How can we ever hope to go to the moon if something like this is still possible??"

NOTES 7/25/66 SPEER

B 7/25

9/1 7/25

1. AS-202 MISSION RULES: The AS-202 Launch and Flight Mission Rules are now being finalized. We have on this mission very few mandatory requirements for launch. The basic vehicle systems are covered by redlines and the wind restrictions which are mandatory. There is only one measurement (the guidance computer data stream) which is considered mandatory. Some ground instrumentation is mandatory; however, no single station would be cause for scrub. The Glotrac (Azusa) Beacon is highly desirable. The spacecraft C-band beacon is mandatory which satisfies MSFC requirements for tracking data. While the MSFC requirements are few, Range Safety and MSC will impose a number of additional mandatory requirements. ✓

2. HOSC ADDITION: The first two Saturn IB flights have shown the physical space in the Huntsville Operations Support Center (HOSC) to be grossly inadequate. We have acquired two 500 sq. ft. trailers as temporary relief. For Saturn V there is an urgent need to add 4,000 sq. ft. to the HOSC (present area: 10,200 plus trailers). As a result of a joint study (R-COMP, F&D, I-MO) I proposed to Mr. Newby a 100 ft one-story addition to the A-wing of COMP Lab, which can be held within MSFC approval limits (145 K) and stays within the general design of the building. Mr. Newby agreed to start inhouse design work immediately because of the extremely short time left for this project (7 months). However, final approval of the project was withheld pending your and Mr. Gorman's approvals. F&D was requested to explore potential cost savings of a shorter two-story addition, and Mr. Cook was requested to see if existing COMP space could be made available for HOSC on a time-sharing basis. ✓

3. OPERATIONS COST EFFECTIVENESS: The Mission Operations Office, in co-operation with other MSFC elements, has been performing a study on operations cost effectiveness in preparation for a review to be conducted by OMSF. The following conclusions were jointly reached with R&DO. The S-Band telemetry system on the Saturn V should be removed from the vehicle after the Command and Communication System's (CCS) reliability has been verified (approximately AS-504). ODOP tracking should be eliminated on the operational vehicles. The decision as to the future of the AZUSA/GLOTRAC should be delayed until the conclusion of an MSF study of a new tracking system based on existing S-Band equipment. This system, if implemented, could adequately and more efficiently replace the AZUSA. A memo is being prepared to both the IB and V Program Managers to investigate the cost and schedule impact of these proposed deletions. ✓

NOTES 7-25-66 Stuhlinger

B 7/25

1. AAP LUNAR SCIENCE: We finally received \$715 K from Dick Wilmarth of OSSA for the Lunar Science program. This is the money which Dr. Newell had held up pending clarification of MSFC's role in lunar science. The money is earmarked for specific tasks concerning scientific experiments. We will move fast to commit these much-needed funds. ✓

2. PEGASUS: Pegasus data reduction is continuing, although there may be minor delays due to the change of support contractors in Computation Laboratory. No significant changes in meteoroid impact data. ✓

NOTES 7-25-66 WILLIAMS

7/25/66

B 7/25

NEGATIVE REPORT.