

NOVEMBER 1 1965

INDUSTRIAL OPERATIONS - MSFC

1412

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DIR	Dr. von Braun		A	I N F O R M A T I O N
	<i>11/1/65</i>		C	
	<i>11/1/65 \$11/17</i>		T	
			I	
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REMARKS

Re your note on NOTES 11/1/65 Reinartz - Larger manhole in S-IVB.

file

The \$300,000 additional cost for the larger manhole in S-IVB will be covered by Saturn V and, hopefully, recovered out of the \$6.5 remainder of Saturn IB/Centaur. The change will apply to all S-IVB's starting with Saturn IB-211 and Saturn V-507. An ECP for a necessary structural change on the present manhole design (24" dia.) has been received. The proposal amounts to \$300,000. The increase to 40" dia. as desired for the "orbital" workshop will cost an additional \$300,000 and we will go ahead with it as described above. ✓

The quick-opening cover and adapter has been costed by DAC with \$400,000. Since it should require less time, we should try to get the money out of AAP funds. ✓

- cc: Mr. Williams, R-AS
- Gen. O'Connor, I-DIR
- Dr. Mrazek, I-DIR
- Dr. Rudolph, I-V-MGR
- Mr. Godfrey, I-V-SIVB
- Mr. James, I-I/IB-MGR



CODE I-DIR	NAME Hans Hueter	DATE 11-4-65
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Memorandum

TO DIR, Dr. von Braun

DATE November 10, 1965

FROM *Office of the Director*

SUBJECT a. Saturn IB and Saturn V Panel Flutter (see Weekly Notes - Geissler - 11/1/65 and 11/8/65)
b. Unsteady Aerodynamic Environment in the area of S-II upper skirt and S-IVB lower skirt

1. The meeting we had originally set for November 10 (see Weekly Notes - Geissler - 11/8/65) is now definitely going to be November 15 at 1:30 P.M.

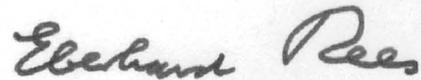
2. Problems to be discussed:

- a. Do we have to do something immediately on 201?
- b. Long range measures on Saturn IB and Saturn V as to the S-IVB stage.
- c. Reinforcement of the upper skirt of S-II (this is well on the way but status will be checked again).
- d. Measuring program on early Saturn V flights as to unsteady aerodynamic flow. Originally we had agreed to make measurements on the transition area between S-II stage and S-IVB stage on 501 or 502. Arthur Rudolph objects and wants to have this done only on 504. His objections are money and time schedules.
- e. Wind tunnel program for more information on the seriousness of above mentioned unsteady aerodynamic flow conditions.
- f. Possible Redstone missile flight program replacing wind tunnel tests under e, or in addition to e. Chrysler Corporation, who has proposed this, is invited for this issue.

3. As you know, we had originally abolished the idea of having tests made with the Little Joe. We had also rejected a Redstone missile program proposed by the Chrysler Corporation. Recently, however, Chrysler came back and said that the Navy is doing a flight program on three Redstone missiles for research anyhow and we could be a passenger for our aerodynamic measurements on the flights. This has opened the issue again.

4. As a result of the Monday, November 15, meeting, we want to establish a clear program of what we want to do on all issues a through f. We have to prize it out and then we want to be ready for a presentation and clear-cut proposal to General Phillips.

5. Unfortunately, I cannot attend the meeting because Sam Phillips wants me in Washington on Monday for a discussion with the S&ID Investigation Committee which I cannot decline. Therefore, I have asked Hermann Weidner to chair the meeting. Everybody you see on attached program is invited and will attend. Since you have asked quite some questions in this particular area, I wanted to let you know of this meeting and the issues involved, and suggest you attend if you can.



Eberhard Rees
Deputy Director, Technical

3 Enc:

Geissler Notes 11/1/65

Geissler Notes 11/8/65

Geissler Memo 11/8/65

cc

R-DIR, Mr. Weidner

R-AERO-DIR, Dr. Geissler

OFFICE OF DIRECTOR - MSFC

1420

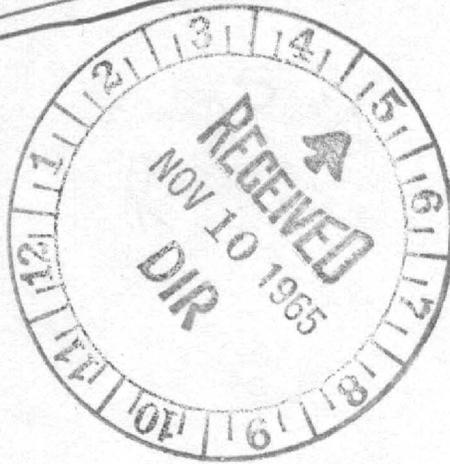
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	<i>Werner B</i>			

REMARKS

Accomplished
H

dir
11/12
B 11/13

11-1-65 NOTES file



CODE <i>DEP-A</i>	NAME	DATE <i>10-11-65</i>
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cc Mr Newg.

NOTES 11-1-65 CLINE

B11/2

QTS 11/1

1. S-IC: This Laboratory has been unable to obtain contractual coverage for certain GSE and hardware items needed by MILA. The original requests were submitted from July through October 1964; however, they have not been implemented because the contracting officer has requested sole source justification. Boeing is the most logical vendor since they have supplied the same or similar equipment and could meet schedules. The subject hardware, unless delivery is made, will cause S-IC-F and S-IC-1 schedule slippage

Harry S.

Please look into this and expedite things.

B11/2

Dr. Hueter:

Attached is solution to above stated problem, as you discussed with me.
J G Bradford
11/5/65

Mr. Gorman:

The original requests mentioned above were delayed in processing in IO. Adequate sole source justification was processed to completion on November 5. The responsible office in IO and the Contracts Office at Michoud are committed to providing immediate contractual coverage to Boeing so that the work may be undertaken promptly. I will follow through with this action to prevent any further delay.

VB

W. Davis
11/8/65



NOTES 11/1/65 BALCH

B 11/2

S-IC Test Stand Position B-2 concrete placement was completed on October 26. Joint occupancy of the Test Control Center first floor, cable galleries, and special power room is scheduled for today. ✓

Beneficial occupancy of Phase I Technical Systems from Aetron is scheduled as follows:

- | | |
|--|-------------------|
| a. Data Acquisition Facility | November 1, 1965 |
| b. Test Stand A-2 Instrumentation | November 6, 1965 |
| c. Test Control Center Instrumentation | November 6, 1965 |
| d. Test Stand A-2 Controls | November 29, 1965 |
| e. Test Control Center Controls | November 19, 1965 |
| f. Site-wide Systems | November 29, 1965 |
| g. Support Systems | December 7, 1965 |

With the exception of the Consolidated Systems data handling system, scheduled completion of Phase I job looks promising. ✓

S-II Test Stand A-1 concrete work is progressing with only the three foot roof slab yet to be poured. Steel erection above seventh floor will begin shortly. ✓

General Electric has completed new contract arrangements with Allied-Webb to provide the two NOWSCO 160K nitrogen rechargers which had been the base of labor wrangles in the past few weeks. ✓

Dr. Seamans paid a short visit to the site on Monday, October 25, and was accompanied by Gen. Jones, and Mr. Hueter. Memo for Record of their visit is being furnished under separate cover. ✓

B 11/2

978 11/1

H-1 ENGINE

Preliminary analysis of data indicates that all engines operated satisfactorily during the duration test of S-IB-3. ✓

The first two 205K H-1 engines were delivered to CCSD at Michoud on October 28, 1965. ✓

F-1 ENGINE

The first test of the Part II of the Engine Stability Demonstration was successfully performed with a bomb induced instability damping within 25 milliseconds. ✓

Engine F-4024 (second S-IC-3 engine) was accepted on October 29, 1965, and is scheduled for immediate delivery to Michoud via Guppy I aircraft. ✓

Negotiations to convert the NAS 8-5604 contract from CPFF to CPIF are still in process. So far, negotiations have been limited to schedule, scope and costs. Incentive provisions will not be taken up until several pricing differences are reconciled. ✓

J-2 ENGINE

The J-2 Production Contract for the acquisition of 103 J-2 engines and supporting services (as recently converted to CPIF) has been approved by NASA Headquarters. ✓

The Procurement Plan for combining the J-2 engine contracts plus the addition of sustaining engineering through April 1970, has been approved by NASA Headquarters contingent upon completion of negotiations by January 15, 1966. We feel the task can be accomplished by the stated deadline; however, expedient means must be taken throughout especially in areas of legal, pricing, and contracts office review. ✓

The QUAL I Demonstration will begin upon satisfactory completion of the FRT deficiency correction demonstration. The present estimate for the beginning of the QUAL I Demonstration is November 15, 1965. QUAL I should be completed by December 31, 1965. ✓

RL10 ENGINE

Prototype RL10A-3-3 engines have been installed on the Centaur Battle-ship Propulsion Test Vehicle at Sycamore. Hot firings are scheduled for mid-November. ✓

Atlas/Centaur vehicle AC-8 (the first vehicle with prototype RL10A-3-3 engines) is scheduled for composite systems test in January, 1966. Space-craft problems may delay the launch of AC-7 (at AMR) and AC-8 until the second quarter 1966. ✓

Preliminary analysis indicates that the average specific impulse for the AC-9 engines will exceed 442 (439 minimum specification requirement). ✓

9/28/11/1

1. VISIT OF DR. SEAMANS

Dr. Robert Seamans made an unexpected visit to Michoud on Monday, October 25. Dr. Seamans arrived at the Picayune Airport at 12 noon and after visiting MTF was transported by helicopter to Michoud where he met with management of Boeing and Chrysler and was given a tour of the Michoud Assembly Facility. Dr. Seamans appeared satisfied with the briefings and tour. ✓

2. S-IC QUARTERLY REVIEW

The twelfth quarterly review of the S-IC Program was conducted at Michoud on Wednesday, October 27, 1965. ✓

NOTES 11-1-65 DANNENBERG

B_{11/2}

9/18/11

1. Experiment Coordination - The Experiment Division (MT-X, Mr. Lord) has approximately \$500,000 available for feasibility studies of MSFEB approved experiments. After coordinating with the laboratories, R-S has requested \$345,000 to cover eight feasibility studies of MSFC experiments already approved by the MSFEB. To cover Breadboard and Design for these experiments would require additional \$615,000 in FY-66. ✓

The MSFC Experiment Review Board meeting on 10-25-65 approved the following R-RP proposed experiments for incorporation into the agenda of the next MSFEB meeting on 11-22-65:

MSFC #18 - Extended Plasma Probe

MSFC #19 - Plasma Electrostatic Potential. ✓

2. Configuration Management - "Procedure, Configuration Management Accounting Report," dated 10-1-65, represents the full instructions for preparing inputs to the MSFC Configuration Management Accounting Reports. The contractors will be invited to attend a briefing on the entire accounting system to be held on 12-2-65 by the IO Configuration Management Office.

The R-S Change Coordination Office has processed 111 ECP's (Engineering Change Proposals) during the month of October. A breakdown by stages is as follows:

<u>Stage</u>	<u>No. of ECP's</u>
S-IB	11
S-IC	43
S-II	6
Sat V GSE	12
H-1	2
F-1	19
J-2	18
	<u>111</u> ✓

3. Interface Management - The proposed R&DO Management Directive, "Interface Management," will be baselined and published per the agreements reached at the ICD meeting 10-27-65. All concerned agreed that an MSFC document should be issued after this R&DO Management Directive and the IO Configuration Management plans have been exercised. ✓

NOTES 11/1/65 FELLOWS

B11/2

JBH

1. KSC Test and Procedures Catalogs: Per your request on my notes 10/18/65, a reply for you has been prepared and is submitted separately. ✓
2. Saturn Funding Reductions: (Ref. my notes 10/25/65 which indicated a potential cut of about \$12M) In addition to the actual \$10,773,000 Saturn V reduction, R&D Operations has just been requested to place stop orders on \$4,423,800 of planned Saturn IB vehicle support work in the following areas: System analysis, Wind tunnel tests, Tooling & STE, Component testing, Electrical Systems, and LH₂ Technology. Schedule and performance impact are being assessed for the IB stop orders. *Have Weidner let's discuss this B*
3. Hazardous Gas Detection System, Saturn V: On November 1, P&VE will supply preliminary drawings to IO of the common manifold hazardous gas detection system. IO and KSC will decide the implementation schedule. The Saturn V system is based on the Saturn IB system now being installed. ✓
4. S-IC-1 - Parts Shortage: The remaining two F-1 engines will be reinstalled on S-IC-1 by today. Based on that installation and the scheduled delivery of remaining parts, it is expected that checkout will proceed by the middle of next week. Checkout is expected to be complete by the middle of January if no further problems are encountered. ✓
5. Saturn V Vibration Damping: At the request of Dr. Rees, R&D Operations has issued a work assignment to the Boeing Company to study methods of damping wind-induced vibrations on the Saturn V while the vehicle is on the pad. ✓
6. Saturn V Mechanical Automation Breadboard (MAB): Boeing has proposed rescheduling delivery of MAB hardware from the 1-19-66 contractual delivery date to 4-15-66. The delay is due to late delivery of hardware items, primarily the F-1 engine. P&VE, the lead laboratory, in consultation with Astrionics, is preparing a position statement for R-DIR which will be submitted to IO by November 12. IO will evaluate that position to determine program impact and feasibility of the Boeing-proposed schedule slip.
7. Support Contract Reviews: R&D Operations, with representatives from DEP-A, Financial Management Office, and the Purchasing Office, has completed a series of reviews of laboratory management operations under single support contracts. From these reviews, a policy memorandum for Mr. Gorman's signature has been prepared which amplifies present instructions for management of the support contractors. ✓
8. Saturn IB Pre-Flight Review: R-OM arranged for IO to make a series of presentations on IB Pre-Flight Review plans to those laboratories (QUAL, P&VE, AERO, ASTR) having the greatest involvement in the assessment. Presentations were completed last week. ✓

Arthur Rudolph

↓

?

We have 10 F-1's in SIC-T and SIC-501. But we can static-fire only one, because we have only one active test position.

Can't we pull one F-1 for the breadboard?
B

B 11/2

1. Saturn IB and V Panel Flutter: Ref: Notes 10/11/65 Geissler, item 4, copy attached. Flutter tests were conducted at Langley on panels similar to S-IVB forward skirt panels at Mach 1.9 using existing test equipment. Flutter did start at dynamic pressures as low as about 25% of expected flight values at critical buckling loads and zero differential pressure on the panels. Raising the differential pressure above 0.40 psi increased the minimum dynamic pressure for flutter, just slightly above flight values, but available test equipment did not allow to combine this with critical buckling loads - which are expected to occur in all flights for various time durations. Application of a visco-elastic spray raised the flutter boundary only moderately. Exact determination of the flutter boundary at critical buckling loads and with higher bursting pressures appears desirable, but there is a good probability that the present panels would flutter at some portion of the flight where many combinations of pressure differential and longitudinal loads can occur depending on the angle of attack history. A design modification will be necessary and the modified version will be subjected to a more accurate qualification test program possibly at Langley. The question of whether a modification should be provided for 201 or only later has not been finalized.

E.G.
 This worries me.
 How about AS-201?
 B

2. Frank J. Sullivan Visit: Mr. Frank J. Sullivan, Director, Electronics and Control Division, OART, visited MSFC to attend the Eighth Research Achievements Review. In discussions following the review meeting we determined that one of the reasons MSFC received no funds for guidance studies from OART was because personnel in Mr. Sullivan's division believed that all the competent researchers in Huntsville, that had been involved in guidance studies, had been transferred to ERC. I told Mr. Sullivan that this is not true. Further, I reminded him of our cooperation in freely allowing certain people to transfer to ERC and that we had been assured that the establishment of ERC would in no way decrease the funds available for research studies at MSFC. He confirmed this. Mr. Sullivan is reluctant to make research funds available to MSF Centers in view of the large difference in the MSF and OART budgets. However, it was my impression that Mr. Sullivan agreed that OART should fund both basic research tasks with no immediate application of results planned and tasks which are basic in nature even if the results could be of potential use in the near future.

That's of course the real reason OART has to feed their own hungry Centers first.
 B

3. Incentive Contracts: Revision to S-IVB Payload Capability Document (pre-flight computed capability) is currently undergoing final review. Review of S-IVB Mission Accomplishment Document will be completed by November 2 instead of October 29 as originally planned. This delay will cause added pressure to have the document ready for negotiations with Douglas, however, we anticipate that an acceptable schedule will still be met. Adequate subsystem performance assurance for the S-IVB stage is expected to result from this document. ✓

Suggest any action on part?
 B

NOTES 11-1-65 GRAU

9/5/11

1. S-IC-1 CHECKOUT: The concentrated efforts of this Laboratory, Manufacturing Engineering Laboratory and Boeing to obtain and install stage hardware shortages have had sufficient results to enable us to continue checkout operations of some systems starting later this week. ✓
2. GSE/ESE ACTIVITY: On October 22-23 General Electric Company completed occupation of new facilities at Madison. This facility replaces the present depot facilities in Building 4481 (MSFC) which are being refurbished and enlarged for subsystem testing. First Article Configuration Inspection (FACI) was completed on ESE for 500 FS installation in Building 4708. This equipment now awaits additional testing with an Instrument Unit before shipment to the west coast. Unsatisfactory Condition Reports (UCR's) are beginning to return from KSC on ESE for VLF-34. These UCR's are being recorded by this Laboratory, and passed to GE for investigation and corrective action. ✓
3. RECEIVING INSPECTION ACTIVITY: Our inspection reporting system shows that approximately 76,500 Inspection Reports (IR,s) were processed between January 1, 1964 and October 25, 1965. There were 4,194,479 items inspected and 402,453 items rejected for a rejection rate of 9.6%. The monthly average for this period is 3,643 IR's; however, due primarily to the heavy influx of General Electric ESE, the current monthly rate is approximately 12,000 IR's processed. ✓

9/18/11

1. FINALIZATION OF CONTROL SYSTEM DESIGN RELEASE FOR SA-204:

Control sensor locations, control gains, and shaping networks for SA-204, S-IB and S-IVB burns, have been released for implementation. The released control system, the result of vehicle stability and response analyses, provides satisfactory response characteristics and stability margins for the SA-204 flight vehicle. ✓

2. NONDESTRUCTIVE TEST TECHNIQUE: This technique has been developed for the inspection of multilayer printed circuit boards. By applying axial transverse laminography it is possible to obtain informative cross sections of the board parallel to the layer direction of the latter. Originally the method of axial transverse laminography was devised for medical purposes to take roentgenograms of the cross section of the human body perpendicular to the body axis. The technique lends itself to mass testing and we now have to develop the actual test and inspection tools. ✓

F-1 ENGINE

Preparations are being made for a series of tests with F-1 Engine S/N 1002-3 at the Static Test Tower West Facility. There will be no testing on the West Area F-1 Test Stand until December 1965, due to installation of lateral load cells to be used to determine dynamic thrust vector. ✓

S-1C-T

Test No. S-1C-12 has been rescheduled for November 2, 1965, due to problems associated with the pre-test checkout. This test is scheduled for approximately 150 seconds, Lox depletion. ✓

S-11

Battleship (Santa Susana) - Stress cracks were discovered in four high pressure bottle batteries after an inspection by a Rocketdyne team. A plan is being implemented November 1, 1965, to repair these bottles in time for a November 19, 1965, first firing. Welding problems have delayed installation of the suction line bellows. ✓

S-IVB- DAC

The acceptance firing of stage 202 has been rescheduled for Tuesday November 2, 1965, due to problems with the primary flight batteries in the electrical system. DAC had determined to test with the secondary batteries, but the decision was then made to correct the problem and use the primary batteries, thus slipping the schedule. ✓

S-IVB - MSFC

Test No. S-IVB-007 was conducted on October 29, 1965, for 250 seconds duration. Primary objectives were checking the S-11 hydraulic systems and S-IVB flight lox pressurization modules. The S-IVB and engine systems operated satisfactorily, however, the facility, engine restraint system failed to release, therefore, no hot gimbaling was accomplished on the S-11 hydraulic system. ✓

SATURN 1B - COMMAND MODULE ACCESS ARM TESTING

In reply to your question in the 10/18/65 Notes, there will be no adverse effect on the launch schedule for SA-201. ✓ The arm will probably satisfy minimum requirements for SA-201. ✓ However, since we could not run a complete test program because the arm had to be shipped to KSC, we do not have the confidence that the modifications required as a result of our limited testing, and to be made at KSC, will be completely satisfactory. ✓

(Copy of 10/18/65 Notes attached to Dr von Braun and Mr Weidner's copy)

958 11/1

B 11/2

KH

I hope
KSC
knows
this
B

NOTES 11/1/65 JAMES

B 11/2

9/8/11/1

AS-201: The S-IB Stage pre-launch preparation is proceeding normally. The power on the I. U. and S-IVB black boxes had been delayed pending verification of the cooling system operation. This verification was accomplished today and power will be applied to the I. U. and S-IVB black boxes and checkout will proceed. ✓

S-IB-3: A successful long-duration static firing was conducted October 26. Booster scheduled for shipment to Michoud tomorrow. ✓

S-IVB: S-IVB-202 static firing, which was scheduled for October 29, was postponed until November 2 due to difficulties with the stage battery circuitry. ✓

S-IVB-203 was shipped from Huntington Beach to SACTO by barge on the 29th of October. ✓

Performance characteristics of the S-IVB PU System: We are continuing to work actively with DAC and R&DO on the problem of S-IVB propulsion performance characteristics and the related effect on the guidance system. Proposed modifications to the LOX tank probe are being incorporated on the test probe at Minneapolis-Honeywell and a test program will be initiated. We hope to have a modified production probe with a fix applied by January 1. ✓

I. U. CHECKOUT RESPONSIBILITY: We have been discussing with R&DO and IBM the early transfer of I. U. checkout responsibility to IBM. Current plan is to transfer this responsibility as soon as possible for I. U.-202. The contract modification to this effect is being processed. ✓

TEST REQUIREMENTS, SPECIFICATIONS AND CRITERIA FOR VEHICLES AT KSC: Reference Col. Fellows' Notes, October 18, 1965, (copy attached). The test requirements, specifications and criteria are provided to KSC by the Program Manager in accordance with the MSFC/KSC Sub-Agreement on Pre-Launch Checkout and Launch Operations. From these data KSC generates a test catalogue for MSFC approval and test procedures for the actual conduct of the test. You indicated on Col. Fellows' notes that you would like a briefing on this subject. We have contacted Col. Fellows and will arrange for a joint briefing in the near future. ✓

Attachment: Col. Fellows' Notes, October 18, 1965

9/25/11/1

B 11/2

1. Facilities:

a. The Multipurpose Technology Facility, Bldg. 4755, (our new assembly hangar) was completed by the contractor last week and full occupancy obtained. One bay is presently being used for assembly of S-IC-502 and for engine modifications while the other bay is being used for installation work of PVC's, engine simulators, and actuators on S-IC-D. The center bay will be utilized for parts storage, inspection, electrical shop and a few offices. We plan to make this facility a "Model of a Launch Vehicle Shop" with respect to environmental control, cleanliness and process control. For this purpose we need improved janitorial services from the service contractor to include cleaning of this new facility and its equipment, cranes and fixtures.

Dave Newby

FYI B →

b. The relocation of our machine shop from Building 4711 to Building 4706 is in full progress. All foundation work is complete. Approximately 30% of the machine tools are installed. This will also be a first class machine shop with many brand new machines of the latest design including five numerical controlled machines. ✓

2. S-IVB Orbital Workshop: The tasks of removal of the ST-124 and a J-2 engine propellant utilization valve in orbit under zero G conditions will be simulated, using one of our big explosive forming tanks. A ST-124 mock-up is being fabricated in the shop for this purpose, a J-2 valve is available, and a S-IVB LH₂ tank access hatch and associated hardware are being acquired. This is a mandatory early requirement for the S-IVB orbital workshop development. Also, procurement of space tools and a zero G simulator from The Martin Company has been initiated. An improved zero G simulator is being designed by our tool engineers. Assembly of S-IVB orbital workshop mock-up is expected to begin November 1, 1965 with completion by November 29, 1965. ✓

3. Instrument Unit: S-IU-500FS Unit was shipped to R-QUAL for check-out on October 26, 1965. There is still a great volume of electrical changes to be accomplished on this Unit. We have to work with advanced information and EO's which are not yet officially approved in order to avoid further slippage. IO is aware of this situation. ✓

2. VISIT OF MSF POP REVIEW TEAM - An MSF team, led by Tom Newman, plans to visit Marshall on November 1, 1965 to review MSFC POP 65-4. This review will be held on an informal basis, with a schedule to discuss the Saturn V requirements in a morning session and Saturn IB and Engine projects in the afternoon. ✓
3. ANALYSIS OF PHASING COST-R&D TO OPERATIONAL - A brief analysis was made for Dr. Rees, of the change in manufacturing hours expended when phasing from R&D to operational production for typical missile systems - Titan I, Titan II, Atlas and Thor and for Saturn IB. The analysis indicated a step function when the program changes from R&D to operational vehicles. The analysis further indicated that Saturn IB Standard Launch Vehicle costs will produce a similar step function within the historical range of the missile systems analyzed. ✓
4. AAP PROGRAM - On October 27, Norm Rafel phoned in a revised schedule and funding plan for AAP Launch Vehicles, under consideration by the MSF Program Control Office. Norm asked for an informal Marshall general reaction to the plan and whether it would be desirable to have a visit by Rafel and/or Rosenberg for discussion of the plan. One significant aspect of the plan is the slip in the schedule of SA-208 through SA-212. We are coordinating the internal review with the project officers and attempting to determine the relationship of this effort to the scope of the mainstream AAP. ✓
5. DIRECTORY OF MSFC COMMITTEES - The directory of MSFC committees and working groups has been updated and transmitted to the Management Services Office for printing and distribution. ✓

B 11/2

OS 11/1

1. Incentive Contract Conversion:

S-IC Stage:

Reference your comments to Notes 10/18/65 Rudolph (copy attached). I share your concern as to an incentive for early delivery of the S-IC Stage in view of our S-II and ESE lateness. Please note that this was a directed action by Dr. Mueller. I have a letter being prepared to General Phillips, pointing out this inconsistency. ✓

Negotiations with Boeing for converting from CPMF to CPIF were essentially completed on Friday, October 29, 1965, with agreement being received on (1) target cost, (2) target fee, (3) schedule incentive and (4) performance incentive.

S-II Stage:

S&ID cost proposal was not officially sent to NASA. Current planning calls for a complete re-evaluation of funding requirements by S&ID with a submission of firm cost proposal on Tuesday, November 30, 1965. ✓

S-IVB Stage:

Target cost negotiations were recessed on Thursday, October 21, 1965 and are scheduled to resume today, Monday, November 1, 1965.

A major difference still exists in the government and the DAC cost positions. Prospects for settlement cannot be realistically assessed until DAC completes a re-assessment of their cost position. ✓

2. S-II Stage:

Common Bulkhead Test Tank (CBTT) Testing - Testing resumed on Saturday, October 30, 1965, using LN₂ in both tanks. Common bulkhead was tested successfully to 1.3 times the design limit pressure in both burst and collapse modes. ✓ Following inspections and data evaluation (1-2 weeks), the entire test article will be tested to 1.4 design limit loads and pressures. ✓

Quarterly Review - Eleventh S-II Stage Quarterly Review previously scheduled to be held on November 16 and 17, 1965, has been postponed until January 1966. ✓

3. Instrument Unit Ground Test Program:

S-IU-500FS - was transferred to R-QUAL on Tuesday, October 26, 1965. First Article Component Inspection of its ESE was completed on Tuesday, October 19, 1965. ✓

S-IU-500V - late engineering changes have been completed; acoustic testing is expected to start today, Monday, November 1, 1965. ✓

4. GE Control Center - Expected to be completed on/about Friday, Nov. 5, 1965. Charts are patterned after Saturn V Control Center charts and should provide considerable improvement in ESE visibility. ✓

Attachment: Notes 10/18/65 Rudolph (DIR, I-DIR and R-DIR's copy only)

NOTES 11/1/65 REINARTZ

B 11/2

TERMINATION OF SATURN IB/CENTAUR PROCUREMENT ACTIONS:

TWX received from Headquarters on October 20 requested that we terminate the effort involving use of Saturn IB/Centaur for the Voyager Program. Also requested is a financial status and our recommendations for termination or completion of procurement actions. I have issued instructions that all Saturn IB/Centaur procurement actions should be reviewed and terminated at a point in time most advantageous to the government. Maximum dollar limitations were given on specific procurement actions. To date \$2.276 Million has been obligated and approximately \$1.305 Million has been costed. Recommendations for continued effort will be made to Headquarters this week. At least \$6.5 Million is available for reprogramming at this time. ✓

Lee James / Stan Reinartz ↙

Can't we find ways and means to use part of these funds for the badly needed larger manhole and the quick-opening manhole cover for the Saturn IVB "spent stages" project? We may have a leadtime problem here unless we act fast.

B 11/2

B 11/2

NOTES - 11/1/65 - RICHARD

9/11/11,

No submission this week.

NOTES 11/1/65 SPEER

B 11/2

AS 11

1. CHRISTENSEN VISIT: Mr. Christensen will tour LIEF and other MSFC facilities on Friday 11/12/65 (note that this date has changed). Expected to join him are: Gen. Bolender, Capt. Holcomb, Capt. Chat Lee, and Capt. Middleton (who was recently appointed 203 Mission Director).

→ Will not be in town that day! B

2. SATURN TRACKING: Dr. Mueller has requested that KSC perform a 6 month study on utilizing the Apollo/Saturn Unified S-Band System (USB) as interferometer tracking system to follow the Azusa system which is planned to be used through AS-515. We need to monitor this study to make sure that our accuracy requirements will be met. An alternate to using USB tracking would be MISTRAM. ✓

3. WIND MONITORING ACTIVITIES: A review of prelaunch wind monitoring plans for AS-201 was held between R-AERO and I-MO. It was agreed that the launch wind criteria will be submitted to KSC through the Launch Mission Rules. AS-201 prelaunch wind monitoring will be a joint MSFC-MSFC endeavor performed at the Huntsville Operations Support Center (HOSC). The interface between this activity and the LCC and MCC-H operations will be discussed at the next Flight Operations Panel meeting. Basic technical agreements (e.g. simulation program) are being handled through the Flight Mechanics Panel. The wind simulation programs will be completed and test simulations begun in the middle of November. ✓

4. FLIGHT CONTROL MEASUREMENT CALIBRATIONS: A problem is being encountered in obtaining flight control measurement calibration data in a timely fashion and in the proper format for use by the Real Time Computing Complex at MCC-H. The problem is largely due to the variety of formats for this data in use by the various data reduction groups, the MCC-H, and the stage contractors. An effort to obtain a common format has been underway for some time, and it is understood that NASA Hqs. is to issue a directive for such a format. The problem of launch vehicle flight control measurement calibration data for AS-201 is being handled by emergency hand-processing. Continued action will be taken by I-MO to achieve a permanent solution. ✓

NOTES 11-1-65 Stuhlinger

Smith

B 11/2

NEGATIVE REPORT

NOTES 11-1-65 Williams

B 11/2

1. AAP ACTIONS: On the basis of the discussion which took place during our AAP presentation to Dr. Mueller last Thursday, this office has initiated the following actions:

a. Evaluate the advantages and disadvantages of having one, two, or three Phase "C" study integration contractors. *Advantage of three is, that this has been decided to be the number!*

b. Review the statement of work for needed changes to conform to the intent expressed in the meeting. ✓

c. Prepare a proposal for the integration study management including the in-house effort anticipated on the AAP integration. This will run through the Neubert committee. ✓

d. Concentrate on firming up the mission assignments and payload for the early flights. This will be done in conjunction with MSC and the Mission Planning Task Force as well as Bill Taylor's office. ✓

2. LIFTING ENTRY VEHICLE ACTIVITIES: You inquired last week about lifting entry vehicle activities within NASA and the Air Force. We are putting together a summary on current work in this area, as we know it, and can discuss this with you next week. Secondly, we are to be visited on December 1 by Colonel Scoville, head of the Air Force (SSD) lifting entry spacecraft/technology (START) program. We will get a more complete and up-to-date picture of Air Force work at that time. Would you like to talk with Colonel Scoville during his visit? ✓

Yes.

Let's talk thereafter. B

F.W.

B

NOVEMBER 8, 1965

NOTES 11/8/65 BALCH

B 11/14
S-II Test Stand A-2 - Work continued on punch list items. Took beneficial occupancy on LH₂ dump line from top of stand to flare stack, of air lines at observation bunker, and of area and road lights. Completed installation of vacuum-jacketed piping. First flow of LH₂ into Barge No. 3 was started on November 4, 1965 ✓

S-II Test Stand A-1 - Made final concrete pour. Started installation of chilled water and high-temperature water lines. Completed stairs to fifth floor. ✓

S-IC Test Stand - Poured concrete between 75' and 78' elevations. Placed reinforcing between 78' and 92.5' elevations. Erected flame deflector manifolds 1 and 2 and started erection of aspirator and load frame plates. ✓

Technical Systems, Phase I - Aetron continues to have difficulty in completing all items by contract completion date of December 31, 1965, because of late availability of cryogenic and high-pressure gas system components. They will have priority of access to the fullest extent possible. Certain items may have to be completed by others rather than extend the contract and increase the costs. ✓

Technical Systems, Phase II - Installation of S-IC Technical Systems by Wismer and Becker is scheduled to start November 8, 1965. ✓

Technical Systems, Phase III - Design of data lines from Sonic Measuring Facilities to test stand for near field and mid-field data acquisition is now in preliminary stage. ✓

Eighteen MSFC employees on TDY at MTF were made offers this week by MSFC Personnel Office representatives in regard to permanent employment at MTF. No firm acceptances have been obtained to date.

Jack B

To what extent is that the result of your difficulties in offering adequate GS grades? *B*

9/8 11/8

B 11/4

F-1 ENGINE

Engine F-4024 (second S-IC-3 engine) arrived at Michoud on November 2, 1965. ✓

Engine F-4025 (third S-IC-3 engine) was accepted at Canoga Park on October 29, 1965, putting F-1 engine deliveries back on schedule. ✓

Contract NAS 8-5604 (deliverable F-1 engine hardware) incentive conversion negotiations are continuing. ✓

RL10 ENGINE

Testing at P&WA on the dual-position "E-5" test stand indicates that a higher-than-normal thrust overshoot similar to that encountered on the AC-6 vehicle might have been caused by helium ingestion at the fuel pump inlet during start. The dynamics at separation are being reviewed to determine if helium tank pressurant could have been present at the tank outlets. ✓

We understand that the AC-8 vehicle (a two-burn/parking orbit development flight) may be launched during the first quarter of 1966 before the AC-7 flight which is now scheduled for the second quarter of 1966. AC-8 is the first vehicle which incorporates the uprated engines. The AC-7 vehicle will launch an engineering model of the Surveyor and is the first soft landing attempt. ✓

J-2 ENGINE

NASA Headquarters has indicated we must renegotiate our production incentive conversion to include an incremental funding schedule. We should have official notice today. If this is the case, we face a probable work stoppage due to a time problem on legally funding the contract past November 10, 1965. We are iterating this with Rocketdyne and NASA Headquarters and will keep you informed. ✓

The engine for S-IVB 502 was accepted by the Government and will be delivered this week. ✓

Acceptance test of S-IVB 202 was terminated after 1/2 second main-stage operation by the vibration safety cutoff monitor. The engine has been checked out and it appears that stand instrumentation was at fault. ✓

An uprated LH₂ turbopump (205K nominal engine) suffered a mechanical failure during component test, causing considerable damage to the test cell. Reason for the failure and facility repair time is still under study. ✓

B 11/14

1. TRACTOR CRAWLER BEARING PROBLEM AT KSC: A solution to the Crawler bearing problem has been prepared for transmittal to KSC. The solution involves a change from the original bearing design and bearing material. Laboratory tests have shown that a lead-bronze journal bearing used in conjunction with a hardened steel journal affixed to the axle will function satisfactorily for an extended period of time, probably in excess of one to two years, in the KSC calculated load environment. ✓

2. SATURN V/VOYAGER STUDY PROGRAM: In response to the JPL request to perform a parametric study of Voyager payload variations, a study program plan has been prepared. A cursory analysis and assessment of available data were made using intended Voyager payload and shroud data as provided by JPL. It appears that the Voyager payload concept and mission requirements will require modifications to the Saturn V stages. To fully evaluate this, a 5-month study with MSFC and Saturn V contractors participating is planned. Cost is estimated at approximately \$250,000. The technical study effort will be managed by Mr. A. G. Orillion from P&VE Advanced Studies Office. The Advanced Systems Offices' laboratory organizations and IO will be required to support this effort.

→ Fred C.

Please give me an interim briefing on this.
I think this is utterly undesirable and should be avoided by all means, even at the price of payload capability or mission flexibility.
It may indeed kill the entire Saturn V/Voyager idea if we don't succeed in using our standard Saturn V launch vehicle.

THIS IS URGENT.

B

NOTES 11/8/65 CONSTAN

B 11/4

9/8/1/8

1. S-IC

Negotiations were completed on the Boeing Contract NAS8-5608, Schedule I, for converting from the CPFF to the CPIF basis. ✓

2. SEB PRESENTATION

The Source Evaluation Board for Computer Services at MSFC/ Michoud Assembly Facility's Computation Office in Slidell, Louisiana, will make its report of findings to the Director, MSFC, in Huntsville, Alabama, on Friday, November 5, 1965, and to General Bogart and Mr. James Webb at NASA Headquarters, Washington, D. C., on November 8 and 9, 1965. ✓

→ 1A didn't B

NOTES 11-8-65 DANNENBERG

9/5

B 11/14

1. Experiment Coordination - Mr. Denicke, Executive Secretary of the MSFEB has been replaced by Mr. Armstrong of MSC, effective 11-5-65. Mr. Armstrong was Chief of the MSC Experiment Coordination Office, which was the predecessor to Mr. Piland's Experiments Program Office. ✓

The ERB (Experiment Review Board) has approved the following new experiments for presentation to the MSFEB.

MSFC #12 - Radar Return Characteristics, R-ASTR

MSFC #20 - Condensing Heat Transfer, R-P&VE

MSFC #21 - Solar Shields, R-P&VE

MSFC #22 - Strap Down Platform, R-ASTR

These and the previously approved MSFC #18, Extended Plasma Probe, R-RP; MSFC #19, Plasma Electrostatic Potential, R-RP, will be presented to the MSFEB on 11-22-65. ✓

Dr. Turnock has stated that the MSFC Experiment #2, 3, & 4 (Thermal Control Coating, Propellant Mass Determination and Interface Stability) have been assigned to the Apollo Program Office; and the MSFC Exp. #1 (Dielectric Materials) has been assigned to the Advanced Application Office (AAP) for implementation. ✓

KSC personnel and their contractor, Thompson Ramo Wooldridge, visited MSFC for orientation on the Center's experiment program and possible impact of these activities on the KSC facilities. At this time, they were primarily interested in procedures and flow of documentation. ✓

2. Re your question on Notes 10-25-65 Dannenberg (Attachment 1) - A letter has been sent to General Phillips requesting assignment of In-Flight Experiments MSFC #3 and #4 "Propellant Mass Determination" and "Interface Stability" to a specific flight vehicle. A request for funding in the amount of \$1.28M for FY 66 has also been forwarded to Mr. Lilly on the basis of developing these experiments for an assumed flight on AS 208. ✓

Mr. Lord (MT-X) has currently under consideration for funding MSFC's request for \$345,000 to cover feasibility studies of Experiments #5, 6, 7, 8, 9, 11, 13, & 14. It is understood that approximately \$500,000 may be made available. ✓

In addition, funding is under consideration by Mr. Lord's office for MSFC's flight approved experiments #1 through #4. ✓

NOTES 11/8/65 FELLOWS

B 11/14

9/8 11/8

1. Contracting Policy for Saturn Stage Component Studies: A proposed policy statement regarding placement of study and/or product improvement contracts involving Saturn stage flight components has been prepared for your signature. The policy statement, now being staffed, is intended to preserve the stage prime contractor's identification with, and responsibility for, his flight stage hardware. There are three basic provisions of the policy. First, contracts involving single-stage-use components will be placed with the cognizant stage prime. Second, contracts involving multi-stage-use components will be placed with one of the cognizant stage primes; the other prime(s) will be notified and kept advised. As a final provision, exceptions to the above can be made by mutual agreement of the Directors, IO and R&DO. ✓
2. S-IC-1 Status: After a seven-day delay, checkout was resumed on November 2 with the F-1 engines reinstalled. There are still a number of parts needed for complete checkout, and QUAL and ME are in close contact in a concerted effort to supply the parts and complete checkout by January 14. ✓
3. R&D Operations Relationships with IO: To clarify further the understanding of project-technical support interfaces and relationships, Mr. Cook briefed General O'Connor and his staff on November 1 concerning the R&D Operations complex of stage and sub-system personnel who have been designated to provide the different levels of technical response to their IO counterparts. That briefing also provided the opportunity for questions and answers of mutual benefit in streamlining day-to-day operations. ✓
4. Personnel Attrition vs. Hiring Rate: The total number of on-board R&DO personnel, including commitments, continues to remain substantially below the total R&DO authorized strength even though the authorized strength is dropping. R&DO had, as of Nov. 4, 1965, 132 unfilled personnel requests, 21 of which have been in the Personnel Office longer than 90 days. We are initiating discussions with Mr. Gorman to see what can be done to improve the situation. ✓

NOTES 11/8/65 GEISLER

B 11/14

11/8

1. Saturn IB and V Panel Flutter: Re: your comment on item 1, Notes 11/1/65 Geissler, copy attached. This problem was discussed at length in a meeting of Aero-Astro-dynamics and P&VE personnel on November 3, 1965. It was agreed that there is a good probability that panel flutter will occur, but it is not possible to assess the likelihood of structural failure without further tests, which are planned but will be time consuming. An increase in stiffness to prevent the occurrence of flutter appears desirable to us, but P&VE considers the risk of structural failure small enough to postpone structural modifications pending the outcome of further tests prior to the first manned flight. The problem will be presented to Dr. Rees, Mr. Weidner, and IO representatives on Wednesday, November 10, at 9:00 AM.

Read again
15 Nov
B

2. Saturn V Control System Selection: A joint AERO-ASTR meeting was held on November 2 to select the control system for Saturn V from a number of versions studied so far, and to discuss the pro's and con's of closing the guidance loop during first stage flight. There are a number of reasons which make it desirable to use a simple attitude, attitude-rate control system, and not to include a body fixed accelerometer output; the primary reasons being: (a) there is no sufficient assurance of a mounting for the accelerometer atop the SIC stage which would be free of disturbing vibration inputs; (b) elimination of the accelerometer would solve some space problems in the control system. On the other hand, use of a body fixed accelerometer is expected to reduce bending moments during flights up to 7% (depending on wind history). P&VE stated that the present design is considered adequate for the specified loads (including design wind); consequently, it was decided to eliminate the accelerometers from the primary control mode. Trajectory shaping, employing lift throughout most of the nominal trajectory, can be used to either reduce bending moments slightly ($\approx 2\%$) or increase payload ($\approx 2,000\#$) with slight increase of bending loads. The question of whether it would be advantageous to close the guidance loop during first stage flight could not be settled, but requires further investigations. ✓

3. Frank J. Sullivan Visit: Re: your offer to help on subject covered in item 2, Notes 11/1/65 Geissler, copy attached. We are currently pursuing this problem on research funds via Dr. Stuhlinger. Your offer is appreciated, however, we would like to follow through on above approach first, to see whether issue can be clarified at this level. ✓

4. Quarterly Review of Task 8.0 of TBC SE&IS Contract: A quarterly review of task 8.0 (Flight Technology) of the Boeing Company's System Engineering and Integration Support Contract will be conducted in Room 513, Building 4200, on November 12, 1965, beginning at 9:00 AM. An agenda is attached. Personnel interested in attending should contact R-AERO-P, 876-1222 prior to meeting date. ✓

NOTES 11-8-65 GRAU

9/8 11/8

B 11/19

1. S-IC-1 CHECKOUT: Checkout of the S-IC-1 stage resumed November 2, 1965. Every effort will be made to recover lost time; missing parts will continue as the pacing item on this stage, workarounds are being used wherever possible. ✓
2. S-IB INSTRUMENT UNIT CHECKOUT: MSFC and IBM have essentially agreed on a plan for transfer of responsibility for checkout of IU 202 and subsequent to IBM. Only a few minor points remain to be settled as far as responsibility and operational plans are concerned. However, IBM has not yet agreed to accept a firm date from Industrial Operations for shipment of the IU to KSC. IBM wants no strings attached on assembly, and nine weeks for checkout. ✓
3. C-1 ENGINE PROGRAM: A meeting was held recently with Thiokol Rocket Motors Division during which all comments to their C-1 engine quality program plan were satisfactorily resolved. During the same period, meetings were held with resident Navy personnel concerning quality assurance coverage on the C-1 program. It was agreed that MSFC would initiate action to delegate quality assurance functions at Thiokol to the Navy. Formal discussions with the Navy concerning this delegation will take place in the near future. ✓
4. QUALITY AND RELIABILITY ASSURANCE LABORATORY NORTHEASTERN REGIONAL OFFICE: As requested by MSFC, the Electronic Research Center (ERC) has indicated they will continue to provide office space for the Laboratory and Division Representatives. ✓ Secretarial support will be provided on a part-time basis. The secretary will be shared 50 percent of the time with the NASA Northeastern Audit Office. The ERC will also prepare travel orders, issue travel requests, and process travel vouchers upon certification of funds by MSFC. This co-operation on the part of ERC should alleviate some of the administrative problems associated with the operation of offices remote from MSFC. ✓

↳ Very nice.
B

B 11/14

1. GUIDANCE AND CONTROL FOR S-IC BURN: A meeting between R-ASTR and R-AERO personnel, including Dr. Geissler and me, was held on 11/2 to discuss the merit of load relief control schemes and closed loop guidance for the S-IC burn of Saturn V. The agreements reached in the meeting were (1) that the structural load reduction resulting from implementing a load relief control scheme did not justify the additional system complexity and hardware schedule problems associated with the control scheme, (2) that a sound technical basis for closed loop guidance did not presently exist, and (3) that load relief control scheme and closed loop guidance scheme would be implemented if a sound technical basis was identified as the Saturn V program developed. ✓

2. HARDWARE STATUS OF S-IU-201 AND IU-202: Astrionics-supplied hardware, both flight and spares, has been delivered to IBM for S-IU-201. For S-IU-202, Astrionics has delivered all flight equipment with the exceptions of one measuring rack, stabilizing platform system, launch vehicle digital computer (LVDC), and launch vehicle data adapter (LVDA). Due to late delivery of AC amplifiers, the measuring rack will be delivered 11/15. Astrionics will retain the stabilizing platform system, LVDC, and the LVDA until the beginning of checkout which is scheduled for 12/15. ✓

958 11/8

B 11/14

S-1C

Test No. S-1C-12 "automatic" was conducted at 4:40 p.m. on 11/3/65, by Boeing personnel under the supervision of Test Laboratory. The test was erroneously terminated by the lox tank ullage pressure redline observer at 91 seconds of mainstage. The major part of the test objectives were attained. The next test is scheduled for 11/23/65. The planned duration will be approximately 150 seconds, lox depletion. ✓

F-1 ENGINE

Test TWF-070 (60 seconds) is scheduled for 11/9/65, with F-1 Engine S/N F-1002-3 at the Static Test Tower West. Primary test objectives will be to determine the effect of pre-fill level on engine start, and to reduce cutoff roughness by resizing valve control orifices. ✓

S-11

Battleship (Santa Susana) - Due to welding problems on the LH₂ suction line bellows, the first Battleship flight engine firing has slipped to approximately 12/3/65. ✓

S-IVB (DAC)

The acceptance firing of stage 202 is presently planned for 11/9/65, with the countdown beginning Monday, 11/8/65. Several problems which arose during the initial attempt to fire the stage on 11/2/65, are still unresolved. DAC is not definite about the cause of the cutoff on the initial firing attempt, but consider three possible solutions:

1. The shielding on an accelerometer cable was shorting the connector.
2. A loose accelerometer cable was flapping against the engine, or
3. There was a loose cable connector.

DAC has tightened all the connectors, and checked all the possibilities in hopes of preventing another abort. ✓

NOTES 11-8-65 HOELZER

B 11/14

SB 11/8

1. PROCUREMENT PLAN FOR THIRD GENERATION EQUIPMENT: The procurement plan for third generation equipment is still in Headquarters (since August 30). In the case of large computer procurement, it is necessary that Dr. Seamans approve these personally. Our procurement plan had gone through all the offices in the Office of Manned Space Flight and program offices. It was ready for Dr. Seamans' signature when he issued a letter declaring a 30-day moratorium on large computer procurements. The purpose of this moratorium was to take a look at the competitive situation which exists in the large scale computer field. It is our understanding that the sole source to IBM for the computer complex in the Mission Control Center at Houston led to this action. As far as we know, our complete procurement plan is in order. General Bogart has indicated he will request that Dr. Seamans grant exception to the moratorium in our case.

NOTES 11/8/65 JAMES

SA-201: Checkout of the propulsive stages and the I. U. is proceeding satisfactorily. The preliminary operating systems program has been verified and the final version is due November 11. We are still working toward a November 27 delivery date for the LVDC/DA test program. ✓

S-IB STAGE: S-IB-3 is scheduled for arrival at ~~MSE~~ ^{Michigan} tomorrow for static firing. As a matter of interest and to give an idea of the relative hardware status for the Saturn IB Program, six S-IB stages have been clustered and S-IB-7 and S-IB-8 are in assembly at Chrysler. We are at about the halfway point in having hardware built and, of course, are well beyond this point with respect to having hardware ordered and in fabrication. ✓

S-IVB STAGE: S-IVB-202 acceptance firing was unsuccessfully attempted on November 2. An automatic cutoff was initiated at about 3 seconds from engine start by an engine vibration safety cutoff indication. This was determined to be a faulty indication generated by noise in the line. The firing is rescheduled for November 9. ✓

We are continuing incentive contract cost negotiations with DAC. Some progress has been achieved but a substantial difference between our cost positions still exist. ✓

We have also been at odds with DAC (as has KSC) relative to the size of the DAC launch crew at KSC. This effort is to be under KSC contract but we sub-allot funds to KSC. Colonel Teir, Mr. Godfrey, and Colonel Petrone will meet with Jack Bromberg at KSC on this problem this week. ✓

I. U.: We are experiencing some of the problems of late delivery of GSE items on I. U. -202 and I. U. -203 that we had on 201. Most of the items have been delivered for 202 but some of those yet to be delivered are becoming critical. Only 32 of 84 required items have been delivered for 203. We do not feel that this is the sole reason for IBM's schedule problem on the in-process I. U.'s but it is contributing. ✓

S-IVB MANHOLE COVER: We have an engineering change proposal from DAC to enlarge the manhole to a 40-inch diameter with an effectivity for S-IVB-211 and S-IVB-507. We are evaluating this proposal and plan to proceed with this effort. ✓ I-DIR has directed Saturn V to fund this effort hopefully with funds from Centaur or AAP. ✓ Also, after a source of funds can be identified action will be taken regarding the quick opening cover. ✓

NOTES 11-8-65 KUERS

B 11/14

1. Manufacturing Technology Review Meeting: This meeting, organized by ME Laboratory and co-sponsored by MSC, was held at The Grumman Aircraft Engineering Corporation last week. Presentations were made in two parallel sessions for two days by DAC, Grumman, McDonnell, MSFC/ME, NAA/S&ID Apollo, and Rocketdyne. Participants included representatives from NASA/MSF, MSC, Boeing, Chrysler, IBM, MSFC/IO, and Lockheed. All the manufacturing techniques discussed have present applications in our Saturn Stages and Apollo Modules programs and were of a very high level. Some of the highlights of the meeting were discussions on Chemical Processes for Thermal Control and Weight Reduction, Cryogenic Quenching, Valve Problems, Tube Welding Techniques, Fabrication of Light-Weight Bonded Panels, Roll Diffusion Bonding, and Manufacturing Visibility in Depth by Simulation. The great need and value of such discussions and exchange of manufacturing knowledge and experience were evident by the interest and participation shown by key managers like Messrs. Nezbeda (Vice President and Director of Manufacturing, GAEC), B. Coenen (TBC), K. Boucher (DAC), G. Lewis (NAA), and others. Mr. Ed Brazil from the Field Center Development Office of MSF stated at the end of the meeting that he intended to put a record of this NASA-industrial teamwork into the file for Dr. Mueller's congressional presentation.

2. Lower Lox Bulkhead Welding Problem: This bulkhead represents a major schedule problem for S-II-501. After the redesign which provided for a bigger (9 ft.) dollar piece and heavier weld lands, the new tooling required and new process development were carried out with great speed and a minimum number of process verification test samples. The first new bulkhead failed in hydrostatic test--in weld with an excess number of repairs. The second bulkhead--taken away from -502 was of a better quality but had still some repairs of blow holes which made its quality somewhat marginal. It had, however, passed all X-ray and inspection requirements and was subjected to hydrostatic test with all precautions of control by strain gages. Loads were applied in increments with in-between X-rays and ultrasonic inspection operations. This test was discontinued at the end of last week at a load of 55 psi because of some defect indications by ultrasonic inspection. A decision was made to cut out the dollar piece of the first bursted bulkhead and replace it by a new oversize dollar piece which has been manufactured for back-up. The purpose is to come up with an acceptable bulkhead for use on vehicle -501 with a higher confidence level than the present one under test. We are giving maximum assistance to S&ID in this area.

*W.K.
This is the most valuable thing ME can do for MSFC, Apollo, and NASA at this time. It will also greatly strengthen our position for new ME inhouse assignments.
B*

Please do B

B 11/19

NOTES/11/8/65/MAUS
12/1/65

1. MSF REVIEW OF PROGRAM OPERATING PLAN (POP) 65-4 - Headquarters personnel, headed by Mr. Newman, visited MSFC Monday, November 1, 1965, to review the MSFC POP 65-4. Mr. Newman concluded the review by stating that no additional funds are available for FY-66 and FY-67, and that MSFC would probably be cut back to a MSF mark, the same as the MSF POP 65-3. The differences are listed below:

22
↓

	\$ IN MILLIONS							
	FY-66			FY-67				
	<u>MSFC REQ'T</u>	<u>△</u>	<u>PROBABLE MSF MARK</u>	<u>MSFC REQ'T</u>	<u>△</u>	<u>PROBABLE MSF MARK</u>	<u>PROJ △</u>	
Saturn IB	255.9	- 7.4	248.5	220.3	-31.3	189.0	-38.7	
Saturn V	1,187.4	-42.7	1,144.7	1,159.7	-42.6	1,117.1	-85.3	
Engine Dev	<u>148.6</u>	<u>-66.9</u>	<u>141.7</u>	<u>134.8</u>	<u>- 9.2</u>	<u>125.6</u>	<u>-16.1</u>	
TOTAL	1,591.9	-57.0	1,534.9	1,514.8	-83.1	1,431.7	-140.1	

H.M.
But
not
AAP2
B

Funding for feasibility studies for Apollo experiments preliminary to actual experiments' approval by the MSFEB will probably be handled through the SRT channel. Mr. Newman stated that it is almost certain that any funding for approved Apollo experiments for FY-66 and FY-67 must come out of present MSFC funding levels. One possible source under consideration is the recoverable funds from the Saturn IB/Centaur account. ✓

2. HEADQUARTERS REVIEW POP 65-4 - The review is scheduled to run from November 10 through December 6. During this period, it is planned to have the Centers attend a meeting at MSF to receive the official mark up. MSF will review with the Centers Dr. Mueller's comments and reasoning behind any adjustments that have been made to the program. ✓

NOTES 11/8/65 REINARTZ

B 11/14

9/12 11/18

No submission this week.

B 11/14

NOTES - 11/8/65 - RICHARD

QSA 11/13

Standard Launch Vehicle Study: Limited copies of our quick evaluation of the contractor proposals are being distributed this week. We have agreed with the contractor proposals with minor exceptions. ✓ We will discuss this in more detail with you in our meeting of November 18. ✓

Technical Systems Office Operations: The Technical Systems Council is proving to be a valuable mechanism to get at overall systems engineering problems. We are presently expanding its membership to include panel representation (where panels are not already adequately represented). This will provide a total overall system capability and pick up the interfaces to the vehicle system. The Technical Systems Office is functioning as a means of clarifying and coordinating vehicle systems problems on a daily basis. The general acceptance of this operation has been gratifying. ✓ ✓

Panel Activities: We are still working to put panel operations on a better-understood basis within MSFC. Joint action between R&D Operations and Industrial Operations should have this issue clarified shortly. ✓

B11/14

9/18/11/18

1. Saturn V AAP Cost Study - With increasing emphasis on the AAP, the Saturn V Control Office is undertaking a follow-on cost study of vehicle 516 and beyond produced at both 4 per year and 6 per year rate. ✓
2. S-IC Stage:
 - S-IC-T Stage - Boeing, under MSFC supervision, attempted full duration (150 seconds) captive firing Wednesday, 3 Nov 65. Duration was 96 seconds - cutoff initiated by an MSFC observer in error. Gimbaling program not initiated. ✓
 - S-IC-1 Stage - Post Manufacturing Checkout, delayed by part shortages, was resumed on Thursday, 4 Nov 65. Approximately 10 days were lost against checkout schedule. Recovery effort is expected with completion of checkout as scheduled on Monday, 17 Jan 66. ✓
 - S-IC-2 Stage - Joining of Intertank/LOX Tank/Forward Skirt accomplished. LOX and fuel assemblies expected to be joined by Monday, 15 Nov 65. This will complete stage major component assembly. Installation of parts in horizontal position at R-ME will continue until Monday, 17 Jan 66. ✓
3. S-II Stage:
 - Review of Lightweight Structure for S-II-4 and subsequent vehicles - Review of the structural integrity of the S-II Stage resulted in a decision to continue with the "lightweight" (-5,100 lbs) structure on S-II-4 and subsequent vehicles.
 - Common Bulkhead Test Tank (CBTT) - Based on a request from Gen Phillips, representatives from NASA Hdqtrs, MSFC, and S&ID met on Thursday, 4 Nov 65 to review the requirement for the planned 1.4 design limit load and pressure (ultimate load condition) test on CBTT. The decision was made to proceed and on 5-6 Nov 65, the S-II common bulkhead, hydrogen tank walls and forward hydrogen bulkhead were successfully tested with liquid nitrogen to the ultimate load condition. This now structurally qualifies this portion of the S-II Stage and is a major milestone in the S-II Program. ✓ During this test series an ultimate test was conducted on the forward skirt. Local buckling was noted at the 1.3 load and this test was concluded at that point. This problem is currently being evaluated. ✓
4. S-IVB Dynamic Test Stage - The aft skirt for the S-IVB Dynamics Stage conversion to the Saturn V configuration arrived at MSFC on Tuesday, 2 Nov 65 as scheduled. This completes stage hardware deliveries to MSFC for this stage. ✓
5. Saturn V Mechanical Automation Breadboard (MAB) - Reference your comment to Notes 11/1/65 Fellows (copy attached). The provisioning of an F-1 engine for the SDF is not the major problem. ✓ A request has been made to transfer the R-Test/S-IC Program F-1 (001) engine, to MAB. The current review (results due on or before 12 Nov 65) by R&DO involves validating the MAB Program requirements in view of operational lateness. ✓

Attachment: Notes 11/1/65 Fellows (DIR, I-DIR and R-DIR's copy only)

NOTES 11/8/65 SPEER

B 11/14

of B 11/8

1. CHRISTENSEN VISIT: This visit has been rescheduled again for Tuesday 11/9. He will arrive here at 8:30 a.m. His party will include Hubbard, Lee, Middleton, all from his office. Mr. Elms is also scheduled to arrive at MSFC via same airplane. ✓

F.S.

Please advise in next week's NOTES how you made out B

NOTES 11-8-65 Stuhlinger

B 11/14

9/28/18

1. PEGASUS: All three Pegasus satellites continue to produce data. No substantial change. ✓

2. AAP: Two AAP contractor reviews were held this week in RPL - the Emplaced Scientific Station, Westinghouse, and Environmental Effects on Instruments, Hughes. Both contracts seem to be proceeding satisfactorily. Also, Martin made a presentation on the Apollo 3-meter drill development contract which has been completed. A functional prototype of the drill was built. The continuation of this development effort is in the process of being transferred from MSC to MSFC. ✓

3. FY-66 ART/SRT PROGRAM STATUS:

	<u>Annual Plan</u>	<u>Program Authority</u>	<u>Processed To FMO</u>	<u>Obligated</u>
OART	\$16,056,000	\$12,921,000	\$2,951,192	\$539,368
MSF	9,450,000	9,450,000	1,006,145	600,000
OSSA	5,903,000	400,000	201,000	0
OTDA	1,500,000	600,000	141,000	0
TOTALS	\$32,909,000	\$23,371,000	\$4,299,337	\$1,139,368

✓

NOTES 11/8/65 WILLIAMS

B 11/14

11/8

1. Procurement Plan for AAP Integration. The revised procurement plan for AAP integration has been coordinated with the Neubert Committee and is ready for your review. ✓ Mailed to Hq 1/3

2. Revision of Work Statement for Phase C Integration Contracts. The work statement for the Phase C integration contracts is being revised, taking into consideration your latest thinking as well as other planned revisions. Pending the outcome of the 11/8/65 meeting with you on the Phase C management, the proposed RFQ package will be available later this week for you to forward to Dr. Mueller in draft form. The Source Evaluation Board will have the final say on the RFQ package before it goes out and Dr. Seamans will appoint the Board when he approves the procurement plan (hopefully in the next 2 to 4 weeks). ✓



NOVEMBER 15 1965

di'not
970 12/15

TO: Dr. W. von Braun, DIR

December 14, 1965

On my Weekly Notes of 11-15-65 (copy attached), you made the remark concerning the LSSM. Mr. Jim Downey offers the following comments in reply to your remark:

"A presentation concerning the LSSM's cost and an associated lunar surface scientific mission was given Dr. Mueller December 1, 1965. The LSSM portion was given by Mr. L. Bradford, R-AS, and Dr. Mueller's comments regarding this aspect are best left to the interpretation by Mr. de Fries' people. My analysis of his comments concerning our mission planning indicate that:

1. He is not sold on the idea that "science" should dictate the performance of the supporting lunar surface equipment, e.g. the LSSM. He expressed a desire that scientific missions be derived based upon the capability of the system we anticipate sending to the moon.

2. He would like to see not only the optimum scientific mission as we see it, but also a gamut of missions extending from the austere to the complex. This expression is based upon the "money" factor, I am sure.

We are currently preparing an austere two weeks' mission utilizing the support of a minimal performing lunar surface vehicle."

Ernst Stuhlinger

1 Enc:
As stated

1. PEGASUS: No significant changes. *11/15*
2. AAP: H. Gierow of RPL gave a presentation on a lunar surface mission to Dr. Mueller's Science and Technology Advisory Committee (STAC) Meeting held at NAA last week. John Disher sent us an appreciative letter for this presentation. ✓

We are presently preparing, as requested by MSF, a 15-20 minute introduction to the subject of MSFC's lunar roving vehicle program. This presentation, which will be on November 19th in Washington, has been arranged in response to Dr. Mueller's questions concerning the LSSM's development cost. Our introductory remarks will be made to show from the scientific viewpoint that a mobility aid is desirable, and that the science program does indeed impose certain design requirements upon the vehicle. ✓

E.S. know. But we still have to watch out that we are not pricing the whole scientific lunar surface program out of existence because of the high price tag on LSSM, B

3. VISIT BY MR. ELMS: Mr. Elms, MSF, visited RPL briefly last week to discuss (a) the Kollsman Telescope contract which is supervised by RPL; (b) RPL's inhouse laboratory facilities; and (c) MSF program approval and commitment procedures. Mr. Gorman joined the group for the last part of the discussions. No conclusions were reached during the very short discussion. ✓

4. VISITOR FROM GSFC: Mr. Bill Stroud, Chief, Advanced Plans Staff, GSFC, one of the scientists contributing to the Explorer 7 project in 1958, visited RPL last week. He is greatly interested in our part of the AAP program, and he requested continuing close contact between his and our Center with regard to this program. We both emphasized that this close contact should be paralleled by a similarly close contact between the Headquarters Program Offices. ✓

5. FY-66 SRT/ART PROGRAM STATUS:

	<u>ANNUAL PLAN</u>	<u>PROGRAM AUTHORITY</u>	<u>PROCESSED TO FMO</u>	<u>OBLIGATED</u>
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TOTALS:	\$32,909,000	\$32,371,000	\$5,270,795	\$1,193,782

✓

Encl

9/28 11/15

S-II Test Stand A-2 - Continued working on punch list items. Took beneficial occupancy of LH₂ line from dock to trench; of guard house on Road 5 and of sewage lagoon, lift station, and remainder of sewage system. S-II-T schedule is being re-evaluated as a result of insulation problems. LN₂ tanking requirement, and new work items. Rescheduling should be completed by November 15, 1965. ✓

S-II Test Stand A-1 - Reinforcing steel for LOX trench from dock area to test stand was being placed. Installation of stiffleg crane for structural steel erection was in process. ✓

S-IC Test Stand - Poured west pier between elevations 78' and 92.5'. Continued placing water manifolds on flame deflector; erecting aspirator, RP-1 tank, and steel substructure for engine removal and rolling deck platforms; fabricating load frame plates; and installing stairs, duct work, piping, interior electrical system, and potable and industrial water lines. ✓

Technical Systems - Accepted from Aetron instrumentation systems in Test Stand A-2 and in Data Acquisition Facility. Wismer and Becher, Phase II installer, started work on November 8. ✓

Hydrogen Barges - Phase III testing of Hydrogen Barge No. 3 has been completed. Because of minor problems which developed in the facility hydrogen vent system. This system will have to be modified before testing hydrogen Barge No. 2. ✓

Sonic Measuring Facilities - Took beneficial occupancy of the Meteorology Building on November 8. ✓

Logistics - Total requirements for LN₂ have been re-evaluated for the next eight-week period. Maximum delivery potential matches MTF consumption rates, without allowance for reserve inventory. Action has been taken to develop a new source of LN₂ to permit placing about 200 tons per week in inventory for emergency use. ✓

Work Stoppage - At 11:45 a. m. , November 11, twenty-three Robert Shaw Company (sub to Video/Aetron) pipefitters and three foremen stopped work when their general foreman was fired by the company's management. As of 12:30 p. m. , November 12, they had not returned to work, and twenty-six man-days had been lost. Since the effort in which these men were engaged in is the last seven days of its estimated duration, a day-by-day impact on this part of the program is now being suffered. ✓

9/8/11/15

RL10 ENGINE A decision was made to use four three-pound H_2O_2 rockets to achieve the first 2,500 feet of Centaur stage separation from the Surveyor payload during Centaur "retromaneuver." (H_2 tank blowdown through the RL10 engine cooldown valves and O_2 tank blowdown through the injector will follow). Decision was an outgrowth of tests conducted at P&WA to determine the effect of solid hydrogen particles ejected in the direction of the spacecraft.

The LH_2 plant at West Palm Beach, Florida, resumed operation during the first week in November; the reduced LH_2 supply during the past six to eight weeks due to the plant shutdown did not impact the Qual date of the RL10A-3-3 engine. ✓

J-2 ENGINE The problem of obtaining NASA Headquarters' approval for our production incentive conversion (mentioned in last week's notes) has been discussed with General Phillips and he is currently looking into the matter. We must obtain approval by November 19, or face a probable work stoppage at Rocketdyne. ✓

The hydrogen turbine wheel failure reported last week has been diagnosed as a mechanical failure due to a gyration of the turbine wheel and shaft within the rear bearing support. Use of a honeycomb seal on the first stage turbine wheel and tightening the tolerances on the rear bearing support will be implemented to eliminate this problem. P&VE personnel will review this redesign prior to its implementation. ✓

The J-2 pumps on SA-201, S-IVB stage were inadvertently spun last week during an engine sequence check. A pressure of somewhere between 180 - 650 psia was in the H_2 start bottle at the time. Analysis from pump torque check data indicates no damage was done to the engine. ✓

FRT make up testing has been interrupted to conduct additional start tests at S-II LOX recirculation flow rates. FRT make up should be completed and QUAL I initiated by November 22. ✓

H-1 ENGINE During post static checkout of thrust OK pressure switches on Stage S-IB-3, one calips did not pick up when checkout pressure was applied. The switch was expedited through failure analysis at Rocketdyne where it operated within specification limits. It is planned to subject the switch to a complete test series in accordance with the purchase specification, then to engine tests with subsequent disassembly. This is the third instance in which a calips has intermittently malfunctioned; one in R&D tests, one on Stage S-IB-2. Rocketdyne has suggested a complete stage and ESE networks investigation in conjunction with their effort. ✓

F-1 ENGINE Engine F-4025 (third S-IC-3 engine) arrived at Michoud on November 10, 1965, via Aerospace Lines "Guppy" Aircraft. ✓

Within the past two weeks, we have had numerous informal inputs regarding possible use of F-1 engines or hard mockups for both S-IC-D and MAB test programs. We are now attempting to clarify specific requirements so that arrangements can be made to provide suitable F-1 hardware. ✓

NOTES 11-15-65 CLINE

QD 11/15

B 11/21

NEGATIVE REPORT

B 11/21

NOTES 11/15/65 CONSTAN

11/15

LTV AND TSI SELECTED FOR COMPETITIVE NEGOTIATIONS

On Wednesday, November 10, 1965, the NASA Administrator selected Ling-Temco-Vought, Range Systems Division, of Dallas, Texas, and Telecomputing Services, Inc., Panorama City, California, for competitive negotiations leading to a contract for continuity of computation services at Slidell.



NOTES 11-15-65 DANNENBERG

B 11/21

QID 11/15

NEGATIVE REPORT

NOTES 11/15/65 FELLOWS

B 11/21

9/18 11/15

1. Saturn V GSE Acceptance Test Monitoring: To maintain Saturn V GSE delivery schedules, it will be necessary, from now until May 1966, to maintain a three-shift operation for monitoring systems tests and government acceptance of GSE being provided by GE. Astrionics has identified a need for an additional 41 people to support the three-shift operation. R&D Operations and IO are jointly determining the best way to provide qualified personnel to support this effort without adversely affecting other necessary work. ✓

2. Funding of Ultrasonic Cleaning: The continuing reduction in Administrative Operations funding has necessitated that Management Services' Ultrasonic cleaning contract be funded with R&D money for the remainder of this fiscal year. To avoid recurrence of this problem, we have arranged with TEST that they will budget R&DO funds for ultrasonic cleaning in its FY-67 single support contract. ✓

3. S-II Task Team Briefing: At S&ID on November 4, Col. Yarchin's special S-II Task Team briefed Dr. Mueller on results of its study to date. S&ID has projected a minimum of 13 weeks slippage for delivery of S-II-1. Three major problems were identified to Dr. Mueller: Insulation bonding, welding, and lack of an approved Quality Control Plan. To summarize the present status of these problems, Dr. Lucas is continuing his efforts to develop adequate adhesive qualities of tankwall insulation bonding; Mr. Maurer, ME, is working with S&ID to improve the contractor's welding processes so they can produce high-quality welds; in Quality Lab, Mr. McMinn is working closely with IO and S&ID in developing an adequate Quality Control Program Plan which the contractor will submit to IO for approval. ✓

RS 11/15

B 11/21

Kerner
and
D.G.

Somewhat
apparently
impress
someone,
but it
backfired!

Let's stop
phony deliveries
just to make
a schedule
milestone!
B

1. S-IC-501: Initiation of mechanical and pressure functional testing was delayed four days, until November 5, due to incomplete status of several items. Also, on that date power was applied to the stage for resumption of checkout. The status of the stage now is such that beneficial testing can continue in practically every system. ✓

2. IU-500-FS: IU-500-FS was transferred to R-QUAL on October 25, 1965. After analysis of the assembly status revealed that no systems were complete, representatives of QUAL, ME, and the Project Office, decided to return the unit to ME for incorporation of outstanding EO's and addition of available items that were missing. The IU is scheduled to return to QUAL on November 29, 1965.

3. IU-202: In their November 9, Quarterly Review, IBM reported a schedule for completion of checkout for IU-202 of February 9, 1966, which is the date the Center was requesting. IBM will assume complete checkout responsibility for IU-202 and all subsequent IU's. This Laboratory will provide assistance on IU-202 checkout where necessary. ✓

4. RCA 110A COMPUTER SPARES: The availability of RCA 110A Computer spares has been an extended problem. Action has been taken to correct this problem and a logistics contract with RCA is in NASA Headquarters for final approval. The contract, which should be completed this week, will provide depots for spares and repair work in Huntsville, Michoud, and KSC. The target date for establishing the Huntsville facility is May 1, 1966. Interim action to provide spares on an expedited basis is being taken. ✓

5. MSFC SOUTHEASTERN REGIONAL OFFICE: Through agreement with KSC, quality assurance monitoring of MSFC contracts in the Florida area will be accomplished by KSC. As a result we closed our Southeastern Regional Office this month. The Senior Laboratory Representative who headed this Office has transferred to KSC. ✓

NOTES 11/15/65 HAEUSSERMANN

B 11/21

No submission this week. 9/18 11/15

9/15/15

B 11/21

S-1C-T

Engine F-4T2 at Position No. 1 was removed from the stage on 11-10-65, for exchanging the thrust chamber injector. The injector was found cracked during post test inspection on 11-5-65. Preparations continue for the next firing scheduled for 11-23-65. This test is planned for full duration, lox depletion, observer cutoff.

→ K.H. has this one of the new plated ones? B

S-IVB-202 (SACRAMENTO)

The second firing of S-IVB-202 on 11-9-65, was automatically cutoff at 307 seconds due to loss of the LH₂ P.U. indication. The fuel capacitance probe dropped out at start and gave cutoff when the P.U. system was activated at 307 seconds. Current plans are to re-fire on 11-16-65. ✓

S-11

Battleship (Santa Susana) - The fuel suction line bellows welding is not in accordance with required levels and have been removed again for rework. The firing schedule has now slipped to 12-1-65. A 4-1-66 cutoff date for the Battleship has been agreed on by NASA. ✓

NOTES 11-15-65 HOELZER

B 11/21

9/11/13

Negative report.

B11/21

NOTES 11/15/65 JAMES

Q81410

AS-201 SOFTWARE: As you are aware, the checkout tapes have been the MSFC pacing item for the SA-201 launch. As a result, elements of R-ASTR, CCSD and IBM have been on a "backbreaking" schedule. The breadboards are being utilized on a 24 hour-7 day week-schedule to meet the software delivery dates. We see no problems at this time to prevent us from delivering the remaining tapes to meet the KSC need dates. The personnel involved in this effort are certainly to be commended for a fine job under extremely difficult circumstances.

Lee Let's wait until after 201 launch. Then please prepare personal letters to all personnel concerned for my signature B.

S-IVB: The Flight Stage 202 Acceptance Firing ran for 307 seconds of a planned full-duration (457 seconds) firing on November 9. Firing was terminated automatically due to the shorting out of the LH₂ mass probe of the P.U. system. The failure is currently under investigation. We expect to run a full-duration firing this week pending the identification and correction of the P.U. system problem. Also, we will not know the attended impact, if any, on S-IVB-201 until the nature of the problem is identified.

I. U.: We have completed negotiations with IBM and R&DO on the turnover of I. U. checkout responsibility to IBM for I. U. -202 and subsequent. The IU-202 schedule will support a mid-February delivery to KSC, as required, using the Super Guppy.

BUDGET REVIEW: As a result of MSF POP 65-3, which reduced our FY-66 and FY-67 budget, and the Program Authorization Documents in hand, which affect the FY-66 reduction, I have conducted an extensive budget review for the Saturn IB Program. We had already accepted some reductions and feel we had trimmed the budget to the bare minimum. These additional reductions are particularly disturbing since we have known money problems with G. E. and potential money problems in other areas, to say nothing of the fact that we have not yet flown Saturn IB. We have deficits of approximately \$9. M for FY-66 and \$32. M for FY-67. I am continuing to assess this situation and it will undoubtedly be necessary to place budget ceilings on all elements to live within these limitations, particularly in FY-67. A disturbing effect is that budgets this tight affect technical work which should be done.

SA-201 PREFLIGHT REVIEW: We are well into the planning and preparation for our SA-201 MSFC Preflight Review. This review is being structured to permit an overall MSFC assessment of the flight worthiness of the vehicle and to provide us with the necessary information and position we need for the Headquarters Flight Readiness Review. An MSFC Review Board, chaired by you and with key personnel serving as members, will soon be announced for the Preflight Review. The Preflight Review is scheduled at MSFC on December 14 and 15 and the Headquarters Flight Readiness Review is scheduled at KSC December 29 and 30.

NOTES 11-15-65 KUERS

B 11/21

9/8 11/15

1. S-IC-502 Status: One major manufacturing milestone for the second S-IC flight stage has been completed on schedule: the upper structural unit, consisting of the Intertank Section, the Lox Container, and the Skirt Section, has been completed in the Tower Building and moved to the Multipurpose Vehicle Technology Building 4755 for horizontal joining with the Fuel Container and Thrust Structure. For the systems installation phase which is starting now, we suffer again from delays of components. 290 line items are undelivered, of which 134 are overdue. There are now three stages, -501, -F, and -502, which are hungry for critical parts such as valves, pressure switches, measuring devices, etc. New or modified components created by the still numerous design changes are at once needed for these three stages. ✓

W.K.

See Grav's
NOTES, 11-15-65
par. 2 B

2. Instrument Unit Modification: A modification on S-IU-500 FS, removing the Bearing Heat Exchanger from the Air Bearing Panel to a location behind the ST-124, has necessitated returning this IU to our shop. (Reported last week as been delivered.) Return to R-QUAL for check-out is now scheduled for November 29, 1965. ✓

3. S-II Aft Lox Bulkhead Status: An oversize Dollar Piece has now been successfully welded into the first Aft Lox Bulkhead for -501--the one which had developed a crack in the weld seam under hydrostatic test. This new bulkhead seems to be of a much better quality with only minor repairs and will probably replace the head which was considered marginal because of excessive repairs and defect indications in ultrasonic inspection. The schedule impact of this design change--though absolutely mandatory--was certainly underestimated at approval because it was based on full success at first trial of a new manufacturing process. ✓

9/15/15

NASA PHASED PROJECT PLANNING - A policy establishing a NASA-wide management pattern for planning and execution of major research and development projects was signed by Mr. Webb on October 28, 1965. This policy statement will be implemented by a procedure to be developed jointly by the Deputy Associate Administrators for Programming, Industrial Affairs and Administration (Wyatt, Rieke, and Young).

Marshall's comments on February 8, 1965 to the earlier version of this document were to:

1. Avoid excessive controls in Phase 'A'.
2. Establish specific levels of accountability.
3. Provide Marshall an opportunity to review final draft before signature.

NASA action on Marshall's comments:

1. Excessive controls in Phase 'A' were eliminated. ✓
2. Levels of accountability were not included but will probably be covered in the procedure. ✓
3. Marshall was not given the opportunity to review the draft prior to release. ✓ *Understandable, B*

Executive Staff will follow closely and participate to maximum extent possible in the Procedure development exercise at Headquarters. ✓

NASA QUARTERLY MANPOWER UTILIZATION REPORT TO CONGRESS -

In this report by NASA Headquarters to the Subcommittee on Manpower Utilization, for the quarter ending September 30, 1965, 10 out of 36 items covered Marshall activities. These included four (4) on Organizational Improvement, one (1) on Administrative Operations, three (3) on Procurement, Supply and Contract Management, and two (2) on Technical Operations. ✓

NOTES 11/15/65 REINARTZ

AS 11/15

B 11/21

No submission

B 11/21

NOTES - 11/15/65 - RICHARD

9/15/11/15

Launch Hardware Interlock Philosophy: We are formulating a guideline document which we feel is needed in the area of what "designed-in" interlocks should exist in our launch equipment. We are striving for a criteria definition which would lead to the correct system for AS-504. There has been a history of performing an assessment and change in this area just before the launch of each new vehicle or block of vehicles. The lunar launch problem requires a better approach in this area. Some of our interlocking philosophy is outdated and none of it has really considered the impact of missing a launch window. ✓

Documentation for the KSC-MSFC Agreement: (Reference: Col. Fellows Notes, Oct. 18, 1965 and Col. James Notes, Nov. 1, 1965.) We are working with IO and R&DO to make sure that we have a consistent and complete set of documents to define prelaunch checkout and launch operations. We are using AS-203 and AS-501 as key efforts to generate a system which will meet the needs and intent and will provide for updating each follow-on vehicle. Interim effort is being expended to do the best job possible on AS-201 and AS-202. This will also include the system used to generate software requirements. ✓

B 11/21

NOTES 11/15/65 RUDOLPH

11/15

NEGATIVE REPORT

NOTES 11/15/65 SPEER

B 11/21

1. CHRISTENSEN VISIT: Christensen and party (Lee, Middleton and Hubbard) toured LIEF and other MSFC facilities on Tuesday. Dr. Hueter and Dr. Hoelzer were also with the group for the LIEF portion. Christensen appeared to be favorably impressed with our LIEF facilities and plans and he assured me that our capabilities would be given full consideration for possible assignments in AAP: e.g. real time displays to experimentors, experimental data control in flight, and remote control of long duration unmanned missions. ✓
2. AS-201 MISSION SUPPORT STATUS: A meeting was called at Cape Kennedy on November 8 by the AS-201 Mission Director (Gen. Bolender) to review AS-201 Operations Support Planning and Implementation Status. No major problems were detected, although ETR resource commitments were incomplete due to lack of space vehicle antenna patterns from NASA. Launch vehicle patterns have been sent by ASTR, but all S/C patterns are not yet available. A minor scheduling problem exists between downrange site modification for AS-201 and the GT-7 mission. ✓
3. OSRO: In a move to shorten the time required for late requirement revisions, OSRO has decided to formally establish Launch and Flight Support Teams (LST and FST) at KSC and MSC respectively. These teams will be activated 4 weeks or more before launch to handle late revisions for support in flight preparation and mission conduct. The two teams will be in full control of all requirement changes; they have to inform OSRO but do not need OSRO approval. We will nominate MSFC members for both teams. ✓
4. AS-201 LAUNCH WINDOW: We have been informally notified that MSC has made recovery of the spacecraft "Highly Desirable" instead of "Mandatory". This relieves the previous launch window restriction resulting from DOD daylight requirements for recovery. It is possible that KSC will set the launch time somewhat later than previously planned. ✓

B 11/21

1. PEGASUS: No significant changes. ✓

2. AAP: H. Gierow of RPL gave a presentation on a lunar surface mission to Dr. Mueller's Science and Technology Advisory Committee (STAC) Meeting held at NAA last week. John Disher sent us an appreciative letter for this presentation. ✓

We are presently preparing, as requested by MSF, a 15-20 minute introduction to the subject of MSFC's lunar roving vehicle program. This presentation, which will be on November 19th in Washington, has been arranged in response to Dr. Mueller's questions concerning the LSSM's development cost. Our introductory remarks will be made to show from the scientific viewpoint that a mobility aid is desirable, and that the science program does indeed impose certain design requirements upon the vehicle. ✓

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✓

NOTES 11/15/65 WILLIAMS

B. 11/21

11/15

Negative report.

NOVEMBER 22 1965

S 11/22

S-II Test Stand A-2 - Continued working on punch list items, with emphasis on items that must be completed prior to cold shock. Took beneficial occupancy of Observation Bunker and LOX Dump Pit. The overall S-II-T schedule is being re-evaluated because of insulation repairs required on the stage and replacement of several critical components required prior to firing. ✓

S-II Test Stand A-1 - Installed and tested 3-inch potable water line. Completed installation of auxiliary derrick for structural steel erection. Placed last section of 72-inch industrial water manifold. ✓

S-IC Test Stand - Worked on punch list items listed on joint occupancy inspection of Test Control Center. Poured west pier of stand, south half, to elevation 104'. Continued placing water manifolds on flame deflector; erecting RP-1 tank and steel substructure for engine removal and rolling deck platforms; fabricating load frame plates; and installing stairs, duct work, piping, interior electrical system, and potable and industrial water lines. ✓

Technical Systems, Phase I - All basic installation work is completed except final hookup and other work on cryogenic and high pressure valves, the data handling system for the DHC, and work on punch list items from walk-throughs ending November 19, 1965. Video is expected to complete work on punch list items by November 30, 1965. Data handling system for DHC and remaining work on valves hookup will be done by separate craft labor arrangement when components for these systems not yet available have been available. ✓

Technical Systems, Phase II - Plan for transition to MTF of all Phase II personnel has been submitted by GE. Strike at Rome Cable may delay key cable delivery. Concurrence was given to GE to negotiate a cost plus award fee contract with Wismer and Becker for technical systems installation. ✓

Technical Systems, Phase III - Purchase order for the permanent acoustic monitoring system has been issued. ✓

Hydrogen Barge - Loading of LH on Hydrogen Barge No. 2 began on November 17, 1965, and was completed on November 18, 1965. Problems encountered were minor. Phase III testing of this barge is presently being completed. ✓

NS 11/22

H-1 ENGINE

During acceptance test of Engine H-4072 on November 16, at Rocketdyne/Neosho, a fire developed in the turbopump gearcase and localized burning resulted. LOX leakage past the dynamics seal between the LOX pump and gearcase was verified during disassembly late November 17. The carbon seal was found to be cracked. The investigation will include detailed discussion with the vendor and expedited failure analysis at Rocketdyne. Materials Division of P&VE Lab will participate in the failure analysis and corrective action plans. ✓

J-2 ENGINE

We were notified by phone on November 18 that the J-2 production incentive conversion had been approved with the condition that we negotiate a revised incremental funding clause. Reopening of negotiations with Rocketdyne will be investigated upon receipt of the official conditional approval. Approval of actions continue to be a major task. ✓

P&VE (Structures) is conducting a stress analysis on the previously reported LH₂ turbine wheel failure and will be at Rocketdyne within the next two weeks for further review. ✓

Engine testing with S-II LOX bleed rates is continuing in lieu of initiating the QUAL I demonstration program. It is planned to initiate QUAL I by December 1, with a completion date of December 31. ✓

RL10 ENGINE

We are working with the Centaur Project Office in defining minor RL10A-3-3 (uprated Isp) engine changes which will result in 60 to 90 pounds of payload increase (in addition to the 250 pounds resulting from the up-rating) for the first fully operational Surveyor launch (AC-12) now scheduled for February 1967.

The following launch (AC-13) and subsequent vehicles will have lengthened Atlas tanks to provide 300 pounds more payload. The RL10 improvements result from one to three seconds improvement in specific impulse and 15 pounds per engine weight savings. Total performance increase for the RL10 over the past six years accounts for 700 pounds toward the payload. The first Surveyor engineering model soft landing attempt is now scheduled as a two-burn, parking orbit on AC-8 in March 1966. (AC-7 has been recycled back into production to update it to the AC-10 configuration and will be launched at a later date, perhaps in September 1966.) ✓

New
vehicle
dynamics,
umbilical
stations,
etc.

F-1 ENGINE

Test stand 1A at RETS has been restored to service after a several week shutdown for run-tank calibration, flame deflector repairs, water system modification and routine maintenance. ✓

Engine F-4022 (fourth S-IC-3 engine) was accepted on November 15, and arrived at Michoud on November 19. ✓

1. S-IVB-202: The ^{third} second attempt to acceptance test S-IVB-202 on 11-19-65 ended in an abort when a stage storage battery exploded early in the countdown. Propellants had not been loaded at the time of the incident. Preliminary reports state that damage was restricted to some electrical cabling and structural stringers in the thrust structure area. ✓

NOTES 11/22/65 CONSTAN

B 11/25

9/8 11/22

1. FRONTIERS OF SCIENCE FOUNDATION, INC. MEMBERS VISIT MICHLOUD

Approximately 50 members of the Frontiers of Science Foundation, Inc., a non-profit Oklahoma organization, is scheduled to visit the Michoud Assembly Facility on Sunday, November 21, 1965. This group will be briefed on Michoud programs and conducted on a tour of the manufacturing facility. ✓

2. DCASR

An exploratory type meeting is scheduled at Michoud on Tuesday, November 23, 1965. At this meeting representatives of MSFC (Huntsville and Michoud) and the Dallas Defense Contract Administration Services Region (DCASR) will discuss the turnover of Michoud quality assurance functions to DCASR. ✓

NOTES 11-22-65 DANNENBERG

B 11/25

903 11/22

1. Experiment Coordination - The MSFEB is going to clarify and formalize the procedures and requirements for experiments presented to the Board for approval. In the future the Board will consider only those experiments concretely defined as to hardware, instrumentation requirements, probable costs, tentative schedules, etc. Such experiments will be approved for "Feasibility Study" to determine carrier vehicle and mission compatibility. It was decided after discussions between Messrs. Weidner, Gray and Lord on the foregoing that MSFC will not propose any experiments to the MSFEB meeting on 11-22-65. ✓

Dr. Turnock (Apollo Program Office) and Dr. Lundholm (Apollo Applications Program Office) have indicated that vehicle assignments for the four MSFEB approved MSFC experiments will probably be assigned as follows:

- | | |
|---|-----------------|
| MSFC #1 - Dielectric Materials | AS 210 (AAP) |
| MSFC #2 - Thermal Control Coatings | AS 209 (Apollo) |
| MSFC #3 - Propellant Mass Determination | AS 209 (Apollo) |
| MSFC #4 - Interface Stability | |
- ✓

MSFC #1 & 2 are still under discussion and contingent upon availability of funding and hardware could be assigned to earlier flights. ✓

2. ICD Management - Draft of R&D Operations Management Directive "Interface Management" is being given final review by R&DO and IO with anticipated publication in time for the 12-1-65 meeting with all MSFC contractors. ✓

Q12 11/22

1. Stress Corrosion Program: A better understanding of the causes of stress corrosion and the means of prevention and detection have been an R&D Operations concern for some time. As a consequence, P&VE has proposed seven studies which collectively form a minimum comprehensive program totaling about \$435,000. Considering the importance of this work, we have asked Saturn V to give technical approval of the stress corrosion studies. ✓

2. Non-destructive Testing Laboratory: Bids were opened November 10 for the Non-destructive Testing Laboratory, an FY-66 C of F project for P&VE. The low bid of \$358,808 was submitted by the Bryson Construction Company, Decatur, Alabama. (The government estimate had been \$422,000.) Award of the contract is expected about the end of November. That will conclude contract awards for the three-project FY-66 C of F Program. Construction contracts were previously awarded in October for the other two C of F projects: the Test Engineering Building Extension and the Addition to the Materials Laboratory. ✓

3. S-II CPIF Contract Document Review: R&D Operations has completed a review of all contractual documents required for conversion of the S-II contract to CPIF. Consolidated R&D Operations comments, amounting to nearly complete re-write in many instances, were provided on November 16 to IO, which initiated action with S&ID to prepare final revisions of all documents. R&D Operations is prepared to perform a final review on the revised package when it is received. ✓

4. Space for Personnel in Support of the Systems Development Breadboard Facility (SDBF): Saturn V GSE schedule slippages have dictated an increase of Boeing personnel in support of the SDBF, with a consequent requirement to provide space for 115 additional desks. That space will support a three-shift Boeing operation. We have arranged to reassign the trailer complex west of P&VE to provide the needed space. Boeing S-IC structures people, who have been occupying those trailers, are being relocated to the recently completed Addition to the Load Test Annex. We are also working with the Quality Laboratory in an effort to provide space in the main Quality building, immediately adjacent to the Breadboard Facility, to house 15 KSC people and to provide room for key Boeing and MSFC Breadboard management people. ✓

1. Saturn IB and V Panel Flutter - Saturn V Aerodynamic Noise Program:
Re: Notes 11/8/65 Geissler, item 1 and Dr. Rees' 11/10/65 memo, copies attached. The panel flutter and aerodynamic noise problems were presented to Mr. Weidner and IO representatives on November 15, 1965. (1) Panel Flutter - There is still a high probability panel flutter will occur. R-P&VE feels that panel failure is unlikely to occur and is willing to take the risk for the unmanned Saturn IB vehicles. R-AERO feels that no adequate information as to the type of flutter, limited amplitude or divergence, has been obtained so far; therefore, the risk of panel failure cannot be excluded. The question of the stiffening influence of buckling was raised. With buckling, the minimum dynamic pressure (q) required to initiate flutter is higher than for panels loaded up to the point of incipient buckling. However, it is doubtful that the effect is significant enough since the minimum flutter q has been found to be 180 psf in recent Langley test (maximum flight q is 650 psf). Pictures were shown which indicate buckling in recent static tests. It is questionable whether all panels around the perimeter of the S-IVB forward skirt were buckled. Therefore, the worst condition, which is the condition at incipient buckling, may be encountered in flight. Action items resulting were: (a) IO will ask DAC to begin preliminary investigation of a structural fix which could be incorporated on AS-201 as emergency solution; (b) R-P&VE will check results of recent tests to make sure that all panels were buckled and furnish pictures taken at the test; (c) R-AERO will estimate the cost and scheduling of a qualification type wind tunnel test to be performed on a segment of a full scale S-IVB forward skirt. (2) Aerodynamic Noise - Reports from MSFC, KSC, and contractors indicate that AS-501 and 502, could be instrumented to measure unsteady aerodynamic flow on the S-II forward skirt and S-II/S-IVB interstage without schedule impact. Dr. Rudolph questioned that all aspects and details associated had been considered. Mr. Marshall, R-P&VE, will continue to act as group chairman and pull together the complete impact of implementing the measuring program on AS-501 and 502 or 502 and 503. This will include MSFC/KSC/Contractor cost, schedule, manpower, etc. The possible use of some Redstone Missiles has been ruled out and a wind tunnel program for determining more information on unsteady aerodynamic flow including protuberance effects is being outlined by R-AERO. A MSFC follow-on meeting prior to a presentation to General Phillips is planned for November 29, 1965. Minutes of the November 15, 1965, meeting will be published this week. ✓
2. SA-203 Orbital Venting: Preliminary study results of the effects of vent forces of SA-203's S-IVB stage upon orbital tracking acquisition and loss times indicate that the effects of maximum or minimum vent forces and maximum or minimum injection conditions (due to vehicle perturbations) are small (within 5 seconds) at the end of three orbits. Currently, effects of hardware guidance errors on the perturbed injection conditions are being studied. Complete study results are to be published soon. ✓

URGENT

NOTES 11-22-65 GRAU

B 11/25

QTS 11/22

Arthur
Rudolph
From a
man as
sound
and
softspoken
as Dieter
Grau
this is
strong
tobacco.
if it is
true that

1. ELECTRICAL SUPPORT EQUIPMENT: The Saturn V Program Manager made the decision to eliminate the systems testing of the Saturn V Launch Site Electrical Support Equipment prior to delivery. Needless to say that this Laboratory disagrees with such a decision which is made under the pressure of schedule and moves the entire troubleshooting into the KSC area. The preference which has been given to schedule lately in several areas is definitely not helping the quality case, and I want to make sure that everyone is fully aware of the risks which are being taken and the consequences it might have someday. The success of the first ten Saturn I flights might turn out to be the worst thing which happened to MSFC and NASA.

2. CALIBRATION: The Laboratory mobile calibration van will return to service at MSFC this week after an absence of approximately three months, during which time KSC used the van for claibration of launch complex pressure measuring instruments. This Laboratory has assumed responsibility for calibration of all mass scales and balances at MSFC which was previously a function of Technical Services Office, TS-M. ✓

3. BOEING TRACEABILITY SYSTEM: The audit of Boeing-Michoud identification and traceability system has been completed using the September 1965 draft, "Apollo Program Identification for Traceability Standard," as a guide. Boeing has an adequate system and there were no noteworthy discrepancies. ✓

We are
recklessly cutting
corners to make
the schedule, then
I am ready to go
to GEM and
suggest a schedule
relaxation.

I mean this very seriously, please take this up with Ed O'Connor.

B

B 11/25

98 11/22

1. SATURN IB CONTROL COMPUTER COOLANT LEAK: A leak in the coolant lines was discovered in the SA-202 Control Computer while it was under test at MSFC. The unit was returned to the contractor (Electronic Communications, Inc.) and the leak condition has been corrected by providing a better seal between the coolant lines and external connectors. A review of the test procedures used by the contractor revealed that the coolant system is pressure tested before the computer connector plate and external coolant connectors are attached. As a result of the leak in the SA-202 computer, the SA-201 flight unit was checked at KSC using helium leak detection techniques. A leak was detected, but the exact magnitude could not be established with available test equipment. Consequently, the unit was returned to ECI to assure that the proper seal was made and verified. The SA-201 spare computer was checked at MSFC and no leakage problem exists in the unit. It is available for immediate shipment to KSC. In the future, the completed control computer assembly with cover plate and connectors installed will be tested at the contractor's plant to verify proper sealing before shipment to MSFC. ✓

2. PERFORMANCE CHECKOUT OF SA-201 CONTROL COMPUTER: Checkout showed fixed point stability checks were in excellent agreement with the theoretical design, and vehicle response characteristics were as expected. ✓

3. ESTABLISHMENT OF SYSTEMS DEVELOPMENT OPERATIONS OFFICE: With the increasing importance of the Saturn Development Facilities (SAT IB and V SDFs) in assuring systems compatibility and ground checkout program verification, we will (in agreement with Mr. Fichtner) abolish the current Systems Development Operations Section and establish the Systems Development Operations Office within Mr. Fichtner's Division. The five civil service personnel now assigned to the SDFs will be members of the new office with ten more being assigned in the near future. Chief of the Office, reporting directly to Mr. Fichtner, will be Mr. Charles Riley presently a member of the Laboratory's Systems Engineering Office. The new office will serve as the focal point for system development operations, coordinating requirements and activities with Mr. Richard's Technical Systems Office, other elements of MSFC and KSC. Details of this reorganization plan have been reviewed with R-DIR and formal request for approval will be issued today. ✓

11/22

B 11/25

F-1 ENGINE

Test TWF-070 was conducted at the Static Test Tower West F-1 Test Facility on November 16, 1965, with F-1 engine, S/N F-1002-3 for a main-stage duration of 56 seconds. All test objectives were accomplished satisfactorily. ✓

S-1C-T

The helium fill and dump valve was removed from S-1C-1 and installed on S-1C-T for the next test. This indicates the shortage of flight configuration components. One Parker lox interconnect valve was replaced with a Whittaker valve for test S-1C-13. Pre-test checkouts are in process for the static firing scheduled for November 23, 1965. ✓

S-11

Battleship - All stage prevalves and fill and drain valves are to be removed for modification following component qualification failure. They will then be installed on S-11-T. Suction line bellows is pacing item; firing now slipped to December 7, 1965. ✓

S-11-T - Insulation closeouts have been foamed in place. Modification request documents are being written to repair 71 leaks in the insulation. The MTF A7-71 helium pre-cooler made by Linde, was received at MSFC for LH₂ flow tests by R-TEST-C. ✓

S-1VB (MSFC)

Test No. S-1VB-008 was conducted on November 16, 1965, for a duration of 418 seconds. Three major objectives were accomplished during the test as shown below:

PU System was operated, closed loop, (B.S. type baseline run to compare with the modified lox probe). ✓

S-11 Hydraulic System was operated for the first time during a hot test. ✓

S-1VB Lox Tank Pressurization System, latest configuration was operated. ✓

A preliminary look at data indicated all systems operated satisfactorily. ✓

STAGE 202 - S-1VB

During an overnight, November 19, 1965, hold in the countdown for acceptance firing Stage 202, one of the primary flight batteries caught fire and caused minor cable damage to the APS simulator. Minor stage damage was sustained. The cause of the incident is being investigated, but at this time, it is unknown. Plans are to replace the damaged parts and turn-around as quickly as possible. The most optimistic firing date is November 24, 1965. ✓

B 11/25

NOTES 11-22-65 HOELZER

9/8/11/22

1. COMPUTER LANGUAGE FOR TRAJECTORY CALCULATIONS: Fourteen modules have been received by Computation Laboratory from Propulsion and Vehicle Engineering Laboratory for programming and implementation by usage of computer language for trajectory calculations. These modules will be used for developing a large Design Integration Program.
2. NEW COMPUTER SYSTEMS: The first IBM 1130 computer system for the Computation Laboratory has been procured. This system is an inexpensive system which can be programmed in FORTRAN IV. It will replace the RPC 4000 computer in Astrionics Laboratory's Instrumentation and Communication Division around January 1, 1965. This procurement is part of the Computation Laboratory's plan for actions on small computers, which should minimize problems during the transition to remote stations of the Third Generation computer by converting programs to FORTRAN IV. Simultaneously, significant savings to the Government will occur due to the replacement of uneconomical systems. ✓
3. ATOLL II PRESENTATION: Test Laboratory expressed some desire to know more about ATOLL II and how the complex language could help them in their checkout effort. At their request a presentation was given for Test Laboratory and their contractors about ATOLL II. ✓

SA-201: The launch vehicle checkout is proceeding satisfactorily and is on schedule. SA-201 checkout tapes are being processed at the breadboard and we expect to deliver the remaining tapes to KSC by the expressed need dates. ✓

The LVDC for IU-201 has been returned to IBM, Owego, for incorporation of a change in the memory module. We expect it to be returned to KSC by November 23 and no schedule impact is anticipated. An ECS malfunction occurred Thursday and the pump was "off the line" for about 5 hours. We have hardware available at KSC to modify this system for operation without the pump if this becomes necessary. ✓

S-IVB-202: During the countdown for a scheduled acceptance firing on November 19, a primary battery (56 volt Eagle Picher) located in the aft skirt section, exploded. The major portion of the explosive force vented through the port provided for the auxiliary propulsion module which was not installed. Propellants were not on board at the time. DAC and Eagle Picher personnel are investigating the cause and extent of damage. A new battery was installed and we hope to resume the countdown in time for a Wednesday firing. A battery of this same configuration is on S-IVB-201. Depending on the identification of the cause of this failure, some action may be required for S-IVB-201. ✓

SATURN IB PRESS RELEASE KIT: We have reviewed a Saturn IB press release kit prepared by PAO which will be used for news releases concurrently with the announcement of the AS-201 flight. This is a very thorough document and appears to be one of the best press release documents we have reviewed to date. We understand this kit will be updated on a vehicle-to-vehicle basis by PAO. ✓

SATURN IB BUDGET REVIEW: Reference James Notes 11/15/65 (copy attached). I have completed a detailed review of the Saturn IB budget, taking into account the Headquarters cuts and restraints for FY-66 and FY-67. It is necessary to place some rather restrictive ceilings on all of our prime contractors as well as our in-house efforts. The only way we can possibly live within these ceilings is to cut out everything but the absolute necessities -- both in the known program and in mandatory changes. We are taking action to do this and will require the full cooperation of R&DO. I would like to emphasize that I have no APA in FY-66 and FY-67. ✓

JB 11/22

1. S-II-T Insulation Problem at MTF: The insulation on the LH₂ container of the -T stage was found to have a number (40-50) of debonded or damaged spots and also a number of small pinhole leaks on the outer surface. We have reviewed and discussed with S&ID and MTF personnel the plans and techniques for repairing these defects while the stage is on the test stand. The following agreements have been reached:

a. To erect a light scaffold (commercial construction) around the LH₂ container for immediate access to the whole surface and to speed up the repair time.

b. To provide for proper environment for bonding by use of plastic curtains in connection with the scaffold. For this purpose, we have already shipped by truck some of our portable cleanroom and air conditioning equipment to MTF.

We will monitor and support this activity until the insulation is satisfactory and accepted. At this time we do not predict the insulation to become the pacing item for S-II-T, but rather the late hardware items to complete the stage. ✓

2. Titanium Structural Development: The experimental titanium crossbeam (33' long and 7' high) has been completed and is presently located in Building 4705, waiting for structural testing next Spring. Three Boeing engineers from the S-IC team in Michoud and twelve engineers from manufacturing development and STT team in Seattle have been briefed by the LA Division of NAA in Los Angeles, and intensive exchange of experience in titanium technology is going on. Also, Lockheed engineers have been briefed for application in the C-5 Aircraft. OMSF representatives (from E. Z. Gray's office) have expressed interest in the continuation of this development which would then continue between Boeing and NAA, while R-ME will pursue the general development of titanium technology. ✓

NOTES/11/22/65/MAUS

B 11/25

9/18 11/22

Negative Report.

NOTES 11/22/65 REINARTZ

9/18 11/22

B 11/25

No submission this week.

B 11/25

NOTES - 11/22/65 - RICHARD

OKS 11/22

Saturn V Pressure Switch Launch Site Calibration: Systems analysis has been made of the Saturn V pressure switch checkout loop configuration and signal error. In a discussion with R&DO personnel and subsequent investigation, it was shown feasible to use the mobile launcher computer complex instead of providing additional ground support equipment. ✓

J-2 Engine Thrust Oscillation: In last week's review of the S-IVB propellant utilization system and its interaction with the guidance system, Mr. Rees and Mr. Godfrey (IO) requested that the Technical Systems Office conduct an overall system review with the laboratories and reach an early solution to this problem. ✓

B 11/25

P 11/22

1. S-IC Stage:

S-IC-T Stage - Boeing, under MSFC supervision, has scheduled a full duration (150 seconds) captive firing for Tuesday, November 23, 1965. ✓

S-IC-1 Stage - Post manufacturing checkout at R-Qual is progressing satisfactorily and 7 of the 10 days behind schedule have been recovered. ✓ Total schedule recovery is expected by Friday, November 26, 1965 and completion is expected as scheduled on Monday, January 17, 1966. ✓

2. S-II Stage:

S-II-1 Stage Aft LOX Bulkhead Hydrostatic Test - The S-II-1 Aft LOX Bulkhead was successfully tested to 105% of pressure for 10 minutes on November 16, 1965. The bulkhead is now ready for stage final assembly. ✓

MSFC Designed Telemetry for S-II-1 - The MSFC designed S-II Stage Telemetry for the S-II-1 Stage has been delivered to S&ID, ahead of the required dates for S-II-1 Stage container installation. ✓

3. S-IVB LOX/Hydrogen Burner - The first injector firing was conducted on Wednesday, November 10, 1965, one day ahead of schedule. To date six firings have been conducted at the Sacramento Test Site. Current indications are that a comprehensive test program can be successfully completed prior to Monday, January 3, 1966. ✓

4. Stabilized Platform ST-124M - The fourth quarterly review was held with Bendix on Thursday, November 18, 1965. Only minor problems are existing and hardware deliveries are in line with demands. ✓

A.R. ✓

Are you talking about
the helium heater, or what?

B

B 11/25

OS 11/22

1. FLIGHT OPERATIONS PANEL: Upon my request I met with Chris Kraft and J. Hodge on 11/15 at MSC to discuss at length the future of subject panel (FOP). MSC had taken the position that the panel has fulfilled its function and that all further coordination should be performed directly between line organizations. This would specifically reduce or eliminate Headquarters participation. I defended the panel because: (1) there will be a continued need for regular coordination meetings in the flight operations area including other Centers and MSF; (2) there will also be a need for formal documentation of agreements reached; (3) elimination of FOP would require operations personnel to attend more meetings of other panels; (4) the Mission Director would start calling meetings equivalent to FOP meetings. Kraft accepted these and other reasons and decided that MSC would continue the FOP. He promised to personally attend some of the meetings. We agreed to review this problem again in about six months. Kraft stated in a related discussion that MSC is strongly opposed to the concept of appointing Mission Directors; during the mission period he wants to report directly to Dr. Mueller. MSC is also going to attack the present OSRO concept (see next note). I believe it is doubtful that these attempts will be totally successful or that they would necessarily be in the best interest of MSF as a whole. However, it appears that Dr. Mueller is somewhat sympathetic with MSC's position. ✓

2. OSRO: A presentation was made to Dr. Mueller by OSRO on 15 November 1965 outlining the history of OSRO, its accomplishments, problems, and troubles (it will be repeated in Executive Meeting on 11/23). Apparently this presentation was a result of constant objections by MSC to the OSRO concept. MSC had proposed that specific portions of the requirements be prepared by various Centers who in turn would deal directly with the support Centers and agencies. This would create eight separate documents, with the supporting organizations having the burden of collation and resolution of conflicts. Dr. Mueller appeared to favor the central organization. ✓

3. AS-201 PRE-FLIGHT REVIEW: Agreement has been reached with the IB Program Office whereby the Mission Operations aspects of AS-201 will be presented as part of this review. Agenda will include Mission Rules; Network Status; Flight Control activities and Operations Support activities. ✓

4. CORRECTION TO NOTES 11/15: I had received information that CM recovery in Mission 201 had been changed to 'highly desirable'. This is incorrect. The actual change concerns the requirement for 3 hours daylight for recovery. This requirement is now highly desirable while CM recovery is still a primary mission objective. ✓

NOTES 11/22/65 Stuhlinger

B 11/25

98 11/22

1. PEGASUS: No substantial change. ✓
2. AAP: Lunar Surface Exploration: FY 66 funds for contractor studies of lunar surface instrumentation are still withheld in Dr. Seamans' Office. OSSA will hold a meeting in Headquarters this week concerning resources planning for lunar exploration under the AAP. ✓

Earth Orbit Payloads: As the planning for the AAP vehicle schedule is progressing, the requirements for objectives analysis, mission planning, and experiment definition for each payload system are increasing rapidly. RPL, in conjunction with ASO and with Headquarters offices, is working on preliminary mission plans for the earth and lunar surface sensing systems (507 and 511); the astronomical and optical technology (509); and the communications and navigation system (513). A meeting with Dr. Schwarzschild (Princeton) is planned for December 8. ✓

3. NASA-UNIVERSITY RELATIONS: Dr. D. E. Cunningham, professor of physics at Adelphi University, Long Island, New York, visited MSFC on November 18. Dr. Cunningham is at present working out of NASA Headquarters on a study of the relations of NASA with the science faculties of the some 1900 colleges and universities which take no part in the research and development programs at NASA. Dr. Cunningham's objective is to discover any scientific research ability useful to NASA that may exist among these 1900 schools. Dr. Edmonson, RPL, acted as host to Dr. Cunningham. Conferences were held with Dr. Rees and Mr. Newby of the Director's Office, Dr. Head of P&VE, Mr. Doane of Astrionics, Mr. Dowdy of the Training Office, Dr. Stuhlinger and Dr. Shelton. ✓

NOTES 11/22/65 WILLIAMS

B 11/25

New Mission Planning Document for AAP. The Headquarters offices (Jones/Taylor) are putting out a new mission planning document-type package for AAP. Although I have not had an opportunity thus far to review this new document, I feel that it will not have a major impact on the current and planned activities at MSFC and specifically on the integration RFQ and study work. The revised version is tentatively due to be presented by Dr. Mueller at the Management Council Meeting tomorrow, 11/23/65, and we will be given a copy of it later this week. I am intentionally holding up on updating of our in-house work on AAP and integration until we have had an opportunity to review this new document. One of the reasons for updating the document was MSFC's inputs to the previous package, and from my discussion with Taylor, I feel that there will be no objections to the revised version and it should fit nicely into our current activity. MSFC will be asked to comment on the revised package and will be given approximately two weeks in which to respond. I will assume the responsibility of preparing this response, unless you wish someone else to do so. ✓

NOTES 11/26/65 BALCH

B 12/4

QTB 11/29

S-II Test Stand A-2 - Worked on items critical to cold shock tests. Reviewed S&ID's revised S-II-T working schedule. Insulation repairs to stage started this week. X-Ray of forward LH₂ bulkhead revealed a large number of miscellaneous foreign objects, which will have to be removed prior to tanking. MTF recommendations to S-II Stage Office on S-II-T firing date scheduled to be submitted by December 1, 1965. ✓

S-II Test Stand A-1 - Completed placing LOX trench slabs from LOX barge dock area to west wall of test stand. Installed supports for 72" industrial water manifold. ✓

S-IC Test Stand - Continued working on punch list items from joint occupancy inspection of TCC. Poured west pier of stand, north half, to elevation 104'. Continued work on flame deflector manifolds, aspirator, RP-1 tank, steel substructure for engine removal and rolling deck platforms, load frame plates, stairways, duct work, interior electrical system, A/C piping and plumbing, and potable and industrial water lines. ✓

Technical Systems, Phase I - On November 23, 1965, control systems in S-II Test Stand A-2 were turned over to the Government on DD Form 250. Approximately 80% of the installation under this contract has now been turned over to the Government. ✓

Technical Systems, Phase II - On November 24, 1965, GE submitted for review subcontract with Wismer and Becker for installation of Phase II Technical Systems. ✓

Technical Systems, Phase III - Pressure calibration system is in place in EI&M Lab. A trial equipment setup for the community acoustic monitoring system has been checked out and is operating satisfactorily. ✓

High Pressure Gas Facility - Held beneficial occupancy inspection of total helium system, console (panel no. 21), and all floor areas except at air system area. Took beneficial occupancy of half of air system on November 24, 1965. Hydrogen pumps not yet accepted. ✓

Cryogenic Barge Service Building - Took beneficial occupancy on November 22, 1965. ✓

Barges - All propellant barges have been delivered to MTF. LOX Barge No. 3 was delivered to S-II Test Stand A-2 barge dock on November 24, 1965 for fit-up and check-out in preparation for cold shock. ✓

Main Canal - Water will be brought to operational level for S-II A-2 complex this weekend. ✓

903 11/29

F-1 ENGINE

Three high-ductile braze injectors have been delivered to MSFC for retrofit of S-IC-2 engines. The remaining two are about two weeks late because of a facility problem with the 2A test stand which has resulted in the loss of one injector plus the delay in checkout of the remaining two units. The ME Laboratory has, by work-around, absorbed the delay without stage impact. ✓

We are awaiting a counter-proposal from the contractor in our incentive negotiation of the deliverable hardware contract, which at the present time is stalled over cost, fee, incentive structure, and hot test risk clause. ✓

F-4026 (fifth S-IC-3 engine) was accepted on November 24, 1965. ✓

RL10 ENGINE

A cast-in-place silver throat which is added to the RL10 chamber to optimize throat contour has accumulated 25 firings with no erosion or cracking. Approximately 1-1/2 seconds of Isp are gained through this type of throat optimization. ✓

Spare engines are available that were not used in the Saturn I program and that were made available in the Centaur program due to use of the new uprated engines. We are continuing to look at programs where these engines can be used and to make others aware of their availability, especially the Marshall people who are planning experiments for AAP. ✓

H-1 ENGINE

Continued investigation into the cause of the LOX seal failure which resulted in fire damage to engine H-4072 has not revealed any seal discrepancies that would lead to a broken carbon element. December 7, 1965 has been established for Rocketdyne to present their findings and recommendations of corrective action. ✓

J-2 ENGINE

The FRT make-up tests have been completed. The Qualification Demonstration engine is being installed in the Delta-2 test stand and firings will commence on Wednesday. ✓

P&VE structures and propulsion personnel will visit Rocketdyne this week to review in detail the LH₂ turbine wheel failure and the planned redesign. ✓

The fifth flight engine for S-II 502 was delivered last week. ✓

Official MSF conditional approval of our production contract incentive conversion has been received from NASA Headquarters. The new incremental funding clause which Headquarters demands we use, if Rocketdyne will not agree to remove all reference to incremental funding requirements, has been forwarded to Rocketdyne for their consideration. Rocketdyne, in turn, has referred the matter to their corporate office. ✓

GENERAL

Extensive rains in lower California have caused considerable damage at the Santa Susana test area. Investigation of road damage, erosion, etc. is underway. ✓

B 12/4

NOTES 11-29-65 CLINE

QB 11/29

NEGATIVE REPORT

NOTES 11/29/65 CONSTAN

CRS 11/29

B 12/4

Negative Report

B 12/4

NOTES 11-29-65 DANNENBERG

11/29

1. Experiment Coordination - In the 11-22-65 meeting the MSFEB requested MSFC to prepare a feasibility review, an error analysis and a development schedule for our proposal MSFC #15, "Precision Optical Tracking". OART still has this proposal under consideration as a technology experiment along with MSFC #16, "Optical Guidance System". ✓

The Apollo Program Office and the Apollo Applications Program Office were requested to conduct a feasibility study on OSSA proposal S-27, "Galactic X-Ray Mapping", which would be mounted in the Instrument Unit, and to review various MSFC proposals previously submitted. ✓

Mr. Lord (MT-X) made a presentation analyzing the proposed experiments for AAP and recommended a revised procedure, which was approved and will be implemented as a "Memo of Agreement" by the three Associate Administrators. The submission of additional preliminary information to a lower level "Experiments Coordination Board" will be required before experiments can be proposed to the MSFEB.

PHASE	APPROVED BY:
A- Experiment Definition	Experiments Coordination Board
B- Feasibility Study (vehicle compatibility)	MSFEB
C- Implementation and Flight	MSFEB ✓

2. Data Management - R&DO Management Directive 4-13, "Implementation of Data Management within R&D Operations", has been signed by R-DIR and released for publication. This Directive puts R&DO on the same basis as all stage contractors in regard to Data Management of Saturn/Apollo hardware. ✓

Recent implementation of these Data Management procedures resulted in deletion of 98 line items of requirements from a total of 229 line items originally submitted by NAA for the S-II stage. ✓

3. Configuration Management - R&DO will assist IO in two presentations to all in-house and stage contractors, scheduled in the Morris Auditorium at 9 a. m. "Interface Management" on 12-1-65 and "Configuration Management Accounting Procedure" on 12-2-65. ✓

NOTES 11/29/65 FELLOWS

B 12/4

RD 11/29

1. Saturn Program Initiation Plans: As a result of extensive reductions in the R&D Operations dollar resources for the Saturn Program and because of our relatively low level of commitments early in the fiscal year, each laboratory was asked to prepare initiation plans, by month, at the stage level so that procurement requests for contracts would be into FMO by the end of March. Initiation plans were also made by each laboratory for seven categories of fiscal activity for Saturn IB and Saturn V. By tracking laboratory initiations by stage and by category, any weak spots can be detected and recovery action taken immediately. ✓
2. R&D Operations Relationship with IO: An R&DO Management Directive 4-12 has been prepared to establish a standard system for designating internal R&DO technical responsibilities in support of IO launch vehicle programs. Matrices have also been prepared to identify individuals responsible for support activities designated in the directive. Both the directive and matrices will be distributed this week. ✓
3. Space Vehicle Research Laboratory: On November 24, MSF personnel presented to Mr. Wyatt a reclama, based on MSFC comments, for RPL's Space Vehicle Research Laboratory. Preliminary information indicates that Mr. Wyatt will support our position, and it is anticipated that Dr. Seamans will present the reclama to BOB next week. ✓
4. Incentive Conversion of Boeing Contract: IO has initiated action to convert the Boeing Contract (Schedule II, NAS8-5608) to an incentive fee basis. A representative of this office has been appointed as the principal R&DO representative on the conversion team under the leadership of Mr. Urlaub in IO. January 1, 1966, has been established as the contractual baseline for the conversion; it is expected that the RFQ will be issued early in February, with negotiations planned for completion by the end of May and the incentive conversion submitted to NASA Headquarters by June 30. The most important groundrule for the conversion is that the original negotiated cost will not be re-negotiated; negotiation will be primarily limited to cost differences stemming from scope of work changes. ✓

NOTES 11/29/65 GEISSLER

B 12/4

KS 11/29

1. Funds for Guidance Studies: In notes 11/1/65 Geissler (copy attached), we reported our discussion with Frank Sullivan, Director, Electronics and Control Division, OART, concerning the complete cut-off of funds for guidance studies at MSFC. While attending a November 17 meeting at ERC, Mr. Baker, Chief of our Astrodynamics and Guidance Theory Division, contacted representatives of Mr. Sullivan's division, Messrs Kantor and Pontius, who incidentally attended the same meeting. At this meeting, problems which ERC wants to support were presented to representatives of industry and universities. The results of this meeting are outlined in attached trip report. In essence, Messrs Pontius and Kantor restated their unwillingness to give funds in this area to Centers other than Research Centers. They also restated their belief that ERC had inherited all the talent in this area.

However, they indicated their willingness to consider some guidance studies by MSFC, supported by use of presently authorized OART funds, subject to Dr. Stuhlinger's concurrence. This matter is being negotiated with Dr. Stuhlinger. This research work represents advancements of state of the art in areas in which we are aware of shortcomings in existing techniques (this is somewhat the dry lake type category). It would be desirable to obtain some fundamental clarification between OART and OMSF as to: (a) mission delineation of ERC vs MSFC, and (b) provision of funds for MSF field centers for research work beyond immediate application.

2. Manned Vehicle Re-entry Studies: An Aero-Astrodynamics representative attended the final review of a study conducted by Lockheed concerning manned vehicle entry into the earth's atmosphere at hyperbolic speeds. Ames Research Center, sponsor of the study, furnished data which will be used in the MSFC in-house study of Mars and Venus flyby missions, since the Apollo Command Module is being considered for re-entry speeds above parabolic. Results of current MSC studies, being conducted by Lockheed/Sunnyvale, indicate that the Apollo Command Module is suitable for re-entry speeds up to 50,000 ft/sec. ✓

3. Incentive Contracts: Preparation of the S-IVB/IB Flight Performance Plan is nearing completion. The plan includes the areas of predicted payload capability, mission oriented flight performance, telemetry performance, and sub-system performance during flight. The sub-system performance during flight is included on an award fee basis which means that MSFC will determine after the flight what portion of the award will be given to DAC. ✓

Memorandum

TO : Director, Aero-Astrodynamic Laboratory, R-AERO-DIR DATE : November 19, 1965

FROM : Chief, Astrodynamic & Guidance Theory Division

SUBJECT : Trip Report: Guidance Theory and Trajectory Analysis Conference held at ERC, Nov. 17, 1965

The purpose of the meeting at ERC was to present to industry and universities the types of research problems which ERC would like to support. These problems were:

1. Series Reversion Techniques for Guidance Development
2. Guidance Function Expansion Methods
3. Multivariate Polynomial Curve Fits for Guidance
4. Study of Explicit Guidance Techniques similar to MSFC I.G.M.
5. Optimization of Apollo Trajectories from Earth to Moon
6. Special Orbit Perturbation Technique
7. General Orbit Perturbation Techniques
8. Use of Delaunay Elements to Attempt to Simplify Integration of Interplanetary Trajectories
9. Study of Behavior of Satellites in the Vicinity of Libration Points
10. Study of Enke Integration Routines
11. Long Arc Trajectory Integration Techniques
12. Solution of Hamilton-Jacobi Equations
13. Lyapunov Stability Theory
14. Three-Body, Four-Body, and N-Body Celestial Mechanics

15. Canonical Transformation of Hamilton Jacobi Equations
16. General Survey of Interplanetary Trajectories
17. Classification of Periodic Orbits
18. Three Dimensional Orbit Transfers
19. Higher Order Integration Techniques
20. Variable Step size Integration Techniques
21. Modular Concept of Computer Programming
22. Symbolic Machine Manipulation of Mathematical Problems.

These problems are essentially identical to the areas which Dr. Hoelker, Mr. Braud, Mr. Miner, and Mr. Schmieder were pursuing while still at Marshall. No technical discussions of these problems were presented at the meeting.

BA ✓ It appears to me that there is something drastically wrong when an Electronics Research Center undertakes such an ambitious program in the fields of Guidance and Astrodynamics.

By previous agreement, immediately following the meeting I met with Chuck Pontious and Jules Kanter who work for Mr. Sullivan in OART in an attempt to recoup our OART research funding for our guidance, optimization and astrodynamics work here at Marshall. The following reasons for cutting our funds were given by Pontious and Kanter.

1. Reassignment by MSFC of funds allotted by OART to tasks other than those specifically authorized. This comment referred specifically to money which was diverted from Hoelker and Miner near the bitter end when it became obvious that they were not going to effectively use money allotted to them.

2. Research competence of AERO-G has been transferred to ERC. My comment to this remark was that, although Dr. Hoelker was an intelligent and competent man, the primary emphasis given by Dr. Hoelker to the research work especially in the guidance area was not producing the realistic guidance concepts necessary to meet the schedules of the Saturn flights. I further explained that the transfer of some ten people from outside Dr. Hoelker's Division into R-AERO-G actually strengthened the capabilities of the group to find practical solutions to pressing practical problems as well as to continue the advancement of the state-of-the-art in Astrodynamics and Guidance Theory.

3. OART will not support any research work in low thrust guidance at MSFC. Mr. Pontious stated that adequate work was being done at other NASA centers in this area and that it should not be a function of MSFC. *I think in this area our political position may be quite weak. B*

I expressed my feeling that some of this work should certainly be done at Marshall in order that we may be prepared for any low thrust stages which may be eventually boosted by MSFC vehicles. This argument was rejected by Pontious.

4. OART money should go primarily to Research Centers. My response to this remark was that in my opinion, research work, many times, is more effective when carried out by those people who are familiar with the practical aspects and difficulties in an active space program. Mr. Pontious agreed with this idea but it was obvious from the beginning of our discussion that his mind was essentially closed toward reinstating our OART research funds.

However, one concession which Pontious and Kanter were willing to consider was to discuss with Dr. Stuhlinger a possible re-assignment of present OART money allotted to MSFC so that this division might get some support. They agreed to talk to Dr. Stuhlinger and then to call me within one week.

Clyde D. Baker
Clyde D. Baker

Enc:
Agenda of Meeting

GUIDANCE THEORY AND TRAJECTORY ANALYSIS CONFERENCE

DATE: November 17, 1965

LOCATION: ERC, 575 Technology Square
Cambridge, Massachusetts
Combined Rooms #902, #904, & #926

AGENDA:

- 1:00p.m. Opening address by Dr. R. Langford, Asst. Director for Guidance, Control, and Systems
- 1:15p.m. Research Goals and an Integrated Approach - R. F. Hoelker, ERC
- 1:45p.m. Research in Celestial Mechanics
M. Payne, ERC
- 2:30p.m. Intermission
- 2:45p.m. Research in Astrodynamics and Computer Exploitation - N. Braud, ERC
- 3:30p.m. Research in Optimization & Guidance Theory - D. Schmieder, ERC

Session to be chaired by R. F. Hoelker.

Due to the limitation in conference facilities, attendance has to be cleared through the Office of the Guidance Lab (Mr. Braud, Telephone No. 491-1500, Ext. 405). The presentations of the meeting will be available in print after the meeting.

9/8 11/29

B12/9

1. S-IC-1 CHECKOUT: Mechanical and instrumentation checkout continues. There are problems concerning leaks in the LOX dome purge and LOX pre-pressure lines. Rerun of LOX tank pressurization test was required due to leaks. Instrumentation is experiencing problems with telemetry and waiting delivery of parts from Michoud; other phases of instrumentation checkout continue. ✓

2. S-IVB PROGRAM: The S-IVB-202 Stage experienced another delay in efforts to refire when the primary stage battery ruptured and burned, causing damage to the stage electrical harnesses and minor damage to the structure. A new static firing is set for November 29, 1965 if repair and retest can be completed in time. The S-IVB-204 stage is located in Checkout Tower #6 at Huntington Beach. Simulated Flight Test is anticipated approximately December 15 with completion of checkout about December 22, 1965. Continuity test of the S-IVB-501 stage began November 22, 1965. Completion of stage checkout is expected in late January, 1966. ✓

3. SPACE CRAFT, INC. QUALITY SURVEY: A recently performed quality survey of Space Craft, Inc., Huntsville, Alabama, revealed that their inspection system was far below the minimum requirements of NPC 200-3. A survey report is being written and corrective action requirements will be submitted to the contracting officer for transmittal to the contractor. Space Craft is now performing under Contract NAS8-11728 and numerous subcontracts with NASA prime contractors. ✓

4. CCSD INCENTIVE CONTRACT: The CCSD Incentive Contract proposal has been received for review. The proposal is presented in a format that will make determining a close dollar value very difficult. Advance information is that CCSD is asking \$20 million for qualification testing alone and a considerable amount for NPC 500-10 (Apollo Test Requirements). ✓

B 12/4

1. PRECISION GYRO BEARING PROBLEM: As a result of recent failures in the gyro wheel bearing, several meetings have been held with the precision bearing manufacturers which are New Departure, Barden, and Minature Precision. Since our requirements represent a very small percentage of their total business, the manufacturer's are not sympathetic with the problems. The gyro wheels which have failed had Barden manufactured bearings. Investigation of causes revealed a change in dimensional tolerances and a change procedure of final machining. Barden has agreed to rectify both of these changes and to allow a Bendix resident inspector at their plant. To prevent re-occurrence, Bendix has been requested to submit a plan to fully inspect all precision bearings before installed. This plan has been discussed with IO and they concur. Certain phases of this program can be initiated immediately, but 3 to 6 months will be required before the complete plan can be put into operation. This is because certain required instruments are not commercially available and will have to be developed. Other sources for bearing manufacture are also being investigated. One which we recently visited is the Speed Ring Corporation in Detroit. They have reviewed the drawings and have made price quotations for a small quantity of bearings. These will be ordered and put under test. The feasibility of Bendix manufacturing precision bearings is also being considered.

2. SWITCH SELECTOR ALLOCATION CHANGE: Because of a International Resistor Corporation (IRC) resistor cracking problem, IBM will provide five (5) non-flight switch selectors for use in stage checkout and breadboard. All units shipped to the stage contractors will be changed out with flight units prior to static firing. These units will contain resistors from another vendor which have received 100% screening.

3. ESE SPARES: The spare parts situation is rapidly approaching a condition that will cause operation delays. Industrial Operations has the responsibility for logistics but necessary contractual coverage and contractor efforts have not occurred rapidly enough. The problem is general but a few examples are:

- a. I-V-G is still negotiating with General Electric to perform a spares selection study.
- b. The RCA maintenance contract is not expected to be signed by NASA Headquarters before the present interim contract expires on Nov. 30, 1965.
- c. The Bendix maintenance is just now being settled.
- d. The plan to phase in Boeing to provide logistics support for equipment not supplied by General Electric and RCA is adding to the confusion.

ASTR has been spending considerable effort in this area and it is felt that the problem should receive top priority attention by IO.

4. BATTERY PROBLEM: S-IVB/202 STATIC FIRING: The #2 aft battery in S-IVB 202 exploded during preparation for static firing. Preliminary investigation by DAC and R-ASTR-E indicates a malfunction in the battery heating blanket caused excessive temperature, a fire and subsequent explosion. Minor damage occurred to the aft skirt and electrical cabling. DAC expects to repair the damage and static fire early next week.

W.H.
How many bearings are in the Saturn IB and Sat. V pipeline that haven't gone thru this wiring? Can these individually checked bearings be retrofitted without invalidating qual and acceptance tests of entire platform?
B

El
O'Connor
FYI
B

led by
Nov.

S-1C-T

Test S-1C-13 was aborted on 11-23-65, when an automatic ignition hold came at X-4 seconds as the result of too low a lox dome purge pressure. Reason has not definitely been determined as yet. Lox and fuel were left on board overnight to determine effects of long hold with propellants on board (a possible launch condition). Only unusual occurrence was icing of F-1 engine injector faces which can be avoided procedurally. Test S-1C-13 was successfully performed at 1:07 p.m. on 11-24-65. This test was terminated as planned upon lox depletion at 148.4 seconds of mainstage. No major damage was inflicted. The last S-1C-T test, S-1C-14, is tentatively scheduled for 12-9-65. ✓

S-1VB (MSFC)

Test S-1VB-009 was conducted at the S-1VB Test Stand on 11-23-65, for a planned 300 seconds duration with approximately 200 seconds of gimbaling on the S-11 hydraulic system. All test objectives were accomplished satisfactorily. ✓

S-1VB (DAC)

It is still uncertain what caused the heater on the primary flight battery to malfunction, and the batteries were sent to Huntington Beach for further analysis. DAC plans to use primary batteries for the next test, but will install a shield around them to prevent damage to the stage should they malfunction again. Repair of the damage caused by the battery fire is continuing. Present plans are to enter the countdown Tuesday, 11-30-65, and fire Wednesday, 12-1-65. ✓

S-11 - BATTLESHIP

Work continues toward a 12-7-65, firing. All bellows have been installed in the LH₂ suction ducts and all lines have passed the dye penetrant test. Only the proof pressure test remains. This test will be conducted as soon as the LH₂ tank is closed out. ✓

GSE RANDOM MOTION SIMULATORS

The acceptance test of the S-1VB Forward Position was successfully completed 11-23-65. Six out of eight positions have now passed the acceptance test. AMF is scheduled to complete the last two positions (service module and S-11 Forward Position) by 12-15-65. ✓

SERVICE ARMS

The pacing items, the hinges, for the S-1C Forward and S-11 Aft service arms have not yet been received and as a result, testing has not started. Delivery of hinges, manufactured by Hayes, is uncertain. No schedule impact anticipated at present. ✓

for the
next 6 or 8
months

K.H. Please arrange, thru Bonnie, a 30 to 45 min briefing for me on our test program of MSFC with the S-1VB Battleship. B

NOTES 11-29-65 HOELZER

QD 11/29

B 12/4

Negative Report

NOTES 11/29/65 JAMES

B 12/4

11/29

AS-201: During the S-IB Stage RP-1 loading test Wednesday, it was noted a small amount of fuel was leaking around the fuel vent valve. Neither the tanking computer nor the overflow sensors indicated fuel at a level where such a condition should exist. The problem is being investigated and KSC will probably repeat the fuel loading test sometime after the LOX loading test. ✓

The LVDC, LVDA, and the control computer were returned to KSC last week without any schedule impact. ✓

The LVDC/DA program tapes have been shipped to KSC. These tapes were critical for the schedule and were delivered to meet KSC need dates. The remaining tapes are being processed on schedule. ✓

S-IVB: We are presenting our DAC incentive contract negotiations position to Dr. Mueller in Washington on Wednesday. With Headquarters approval, we can proceed into full negotiations. We feel good progress has been made toward arriving at the baseline cost but there is still some hard negotiations ahead to reach agreement. Resumption of negotiations is scheduled for December 6. ✓

SA-201 PREFLIGHT REVIEW: We plan our dry run for this review on December 2 and 3. It will not be necessary for the Review and Assessment Board members to be present at this dry run although members may attend if they desire. The review is still scheduled for December 14 and 15. You are chairman of the review board. ✓

MSFC/KSC SUBAGREEMENTS: There are two subagreements which have not yet been signed by KSC. These are the Program Control Subagreement and the Test and Checkout Subagreement. I discussed both of these with Col. Petrone last week at KSC. Apparently KSC has just been delinquent in getting the Program Control Subagreement out and I was assured it would be signed this week. ✓ In the Test and Checkout Subagreement, we had a requirement on KSC for the verification of tests conducted by the contractors. There had been some reluctance on the part of KSC to agree to this requirement. Col. Petrone agreed to the requirement in our recent discussion and promised to get the subagreement signed this week. ✓ At your request, we have a briefing planned for you on Wednesday covering the Test and Checkout Subagreement and our new way of doing business with KSC under this subagreement. ✓

LN
has
a
work
meeting
B

NOTES 11-29-65 KUERS

9/18 11/29

B 12/4

Negative reply.

11/29

MSF POP 65-4 - We have received from Headquarters the official mark for the MSF POP 65-4. This confirms the figures discussed in the review at MSF on November 16, attended by representatives from IO, FMO, and my office. For the MSFC FY-66 plan we are utilizing the MSF project level figures. ✓

The funds for S-II had been made available in the MSFC submission to Headquarters by reducing other areas. By this action the S-II is in a better position than in MSF POP 65-3.

The Saturn IB/Centaur money has been left in the Saturn IB Program. ✓ Two million of the FY-66 funds will be utilized for Apollo In-flight Experiments which is carried as a Saturn IB system. ✓ The remaining funds are to be used for Saturn IB effort. ✓

It must be pointed out that in FY-66 we have no APA. The hurricane damage previously carried in our planning has now been eliminated at the request of Headquarters, since it is planned to be funded from Gemini funds. Any funding problem that we have in FY-66 will be covered by reducing the unfilled orders at the contractor's plant. ✓

With regard to FY-67 we anticipate difficulty in meeting the program commitments with the funds presently indicated available. Our requirement exceeds availability in FY-67 by \$82.3 M total after utilization of the \$25 M APA identified by Headquarters as the Apollo Program Director's reserve. ✓

A summary of changes from MSF POP 65-3 to MSF POP 65-4 by project for FY-66 through FY-68 and total is attached. It reflects our requirements above the MSF POP 65-3 and the subsequent reduction from our POP 65-4 to the MSF POP 65-4. ✓

We do not anticipate any problem in meeting the MSF POP 65-4 submission schedule. The revised MSFC portion of the MSF POP is being processed by the computer, and the consolidated run of all centers should be made by November 30. The consolidated tape will be available to MSF on December 1, and MSF will print and distribute the MSF POP 65-4 to Dr. Seamans by December 6. ✓

→ Hans Maus

Request an occasional informal (and very personal) briefing on the techniques and procedures now in operation for these computer runs, and data collection and dissemination. (No flip charts. Just papers as used in the actual procedure. Not over 30 min). B

NOTES 11/29/65 REINARTZ

B 12/4

11/29

SATURN IB/CENTAUR TERMINATION: On November 4 we recommended that \$1.1 million be authorized for continued effort on fabrication and test of honeycomb panels, feasibility demonstration of a non-contaminating retro-rocket, and Saturn V-Voyager aeroballistic studies. We received a teletype from John Disher on November 18 which stated that Dr. Mueller had disapproved our request to spend the additional money. Action has been taken to terminate all Saturn IB/Centaur contracts. It is anticipated that closeout of all contracts including termination charges will be completed by the end of December. The November 18 teletype indicated that any funding needed for the Saturn V-Voyager definition will be authorized by separate action.

That's correct
B

Stan R. ✓

All Sat. IB/Centaur funds
reverted to Saturn IB,
and some of them may
find their way into AAP, i.e.,
to you!
B

NOTES - 11/29/65 - RICHARD

B
12/4

RB
11/29

No submission this week.

B 12/4 7/1

RB 11/29

1. Follow-on Stage Procurement (Vehicle 511 thru 515) - Advance copies of the procurement plan for S-IC and S-II Stage follow-on procurement (Vehicle 511 thru 515) were submitted to MSF on Tuesday, November 23, 1965. The follow-on procurement plan is currently being staffed through MSFC and plans are for an official submission to MSF by Friday, December 10, 1965. Final approval by MSF is expected by Friday, December 31, 1965. ✓

2. Saturn V Systems Engineering and Integration Support Contract - Activity has begun on the incentive conversion of the Boeing - Systems Engineering and Integration Support Contract. A firm schedule for conversion of this contract will be provided in next weeks (12/6/65) notes. ✓

3. S-IC Stage:
 - S-IC-T Stage Firing - Captive firing was successfully accomplished by Boeing, under MSFC supervision on Wednesday, November 24, 1965 for 148.4 seconds. No significant malfunctions occurred. ✓
 - S-IC-1 Stage Status - Time previously lost on the checkout schedule has been recovered by R-QUAL and completion is expected by Monday, January 17, 1966, (on schedule). ✓
 - S-IC-F (Boeing Michoud) - Post manufacturing checkout started on Friday, November 19, 1965. Delivery to KSC expected by Friday, January 21, 1966, (on schedule). ✓

4. S-II Stage:
 - S-II Battleship Stage - The next firing of the S-II Battleship Stage (with Flight type engines) is forecast for Tuesday, December 7, 1965. This firing was scheduled for Friday, November 19, 1965. Major cause for this delay was welding problems on the fuel line Bellows (fix has been made) and the fact that heavy rains caused work on the S-II Battleship Stage to virtually stop for 2-3 days while crews were involved in sand-bagging and cleanup operations. ✓
 - Common Bulkhead Test Tank (CBTT) - The contractor has been directed by letter to terminate further testing of the CBTT based on successful testing to the 1.4 level. A review is currently being made by R-P&VE to determine possible future use of the CBTT. ✓

5. MSFC S-IVB Battleship Stage - A firing of 300 seconds planned duration was accomplished on Tuesday, November 23, 1965. The engine pump purge module and chilldown pump purge module were installed and operated for the first time. Preliminary data indicated that all installed systems operated successfully. ✓

6. Instrument Unit Quarterly Review with R&DO - The fourth quarterly Instrument Unit review was held with R&DO on Tuesday, November 23, 1965. In addition to the IU-IB Flight hardware problems, hardware delivery problems are apparent for the ground test articles - IU-500FS and IU-500ST. Work-around solutions are being investigated. ✓

NOTES 11/29/65 SPEER

B
12/4

9/18/11/29

1. AS-201 Flight Control Simulation: A simulation of the complete AS-201 Mission was successfully performed at the Houston Control Center on 11/22/65. This simulation included both launch vehicle powered flight and post S-IVB cutoff attitude maneuvers. These tests represent a major milestone in our pre-mission flight control preparations. ✓

NOTES 11-29-65 Stuhlinger

PS 11/29

B
2/4

NEGATIVE REPORT

NOTES 11/29/65 WILLIAMS

9/18 11/29

B 12/4

Negative report.