

# SATURN V PROGRAM MANAGER

## MEMORANDUM

TO: Dr. von Braun, DIR

SUBJECT:

*Just  
1/9*

My understanding is that SPACO will continue the school on a commercial basis. It is hoped that past users, recognizing the merits of the school, will continue to support it. Of course everyone is watching how we use Apollo R&D money during the phasedown and I don't think we should ever initiate R&D Apollo support of the school. However, if support is insufficient as a private venture we could explore supporting the training received by MSFC employees.

I suggest Mr. Grau watch the support he gets and inform us if he has a problem.

*Dieter Grau* ↑  
*B* 1/10

*Lee B. James*  
Lee B. James  
9 January 69

cc: Gen. O'Connor



# OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	<input type="checkbox"/>	<input type="checkbox"/>	A C T I O N	I N F O R M A T I O N
DIR	Wernher von Braun					
<i>LBJ</i>	<i>What are</i>					
<i>your views on this?</i>	<i>Wernher</i>	<i>113</i>				

REMARKS *Should we*  
 Wernher: *continue to support Dieter's school - at what party? B117*  
 Sorry I overlooked this one for so long. The school was fully subsidized by MSFC at about \$370,000 a year, all from AO appropriation. Under present arrangements, the school continues as a private venture. MSFC can now use R&D funds or AO funds, pay only for training received by MSFC employees.

It is true that we cannot guarantee the school's survival. While I have no objection to exploring this with Lee James, I would not recommend going back to the old technique of full subsidy until the "misgivings and apprehensions" are backed up by experience and demonstration of need. There is no problem really in reinstating a full subsidy school, providing the money can be made available.



Harry

*Seems that nothing short of a major setback (or catastrophe) can render this prof! B*

CODE DEP-A	NAME H. H. Gorman	DATE ;2-26-68 <i>117</i>
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1. CORROSION OF RCA 110A COMPUTER CONNECTORS: The sulfide corrosion on the RCA 110A printed circuit boards (reported in NOTES 10-28-68 GRAU, copy attached) is presently in testing at RCA, Van Nuys, and R-QUAL laboratories. However, a report from KSC on the computers to be used on AS-503 launch stated that an additional corrosion was found, green in color, in combination with the black sulfide corrosion. This presents a more serious problem in that the green corrosion is a chloride, progressively destructive in nature, which increases electrical contact resistance. A sample of this condition is being flown to RCA and our laboratory. Personnel from this Laboratory have also been dispatched to RCA to correlate testing plans at both facilities; thus, avoiding excessive redundancy and providing the advantages of complementary analysis.
2. QUALITY TRAINING TERMINATION: As directed, this Laboratory terminated contractor support to our Quality Technique Applications Group October 31, 1968; thus, eliminating quality training which we have provided to NASA, DCAS, other government agencies, and contractors associated with our programs for the past six years. The apparent necessity for this action is recognized; however, I view the cessation of this activity with misgivings and some apprehension. We estimate some 7500 persons have received instructions in such quality areas as reliable electrical connections, methods and techniques for quality achievement in accordance with NPC documents, plastics application technology, optical alignment, and contamination control. The school was an excellent vehicle for achieving rapid response and corrective action on general quality problems, served as a source for standard interpretation and application of NASA quality and reliability requirements, and, in general, propagated the MSFC quality philosophy throughout the industry. As is common with programs of this nature, no direct cause-effect relationship can be empirically demonstrated, but I have no doubt of the substantial contribution this effort has made to the MSFC success record. The contractor (SPACO) will attempt to continue some of the courses on a commercial basis, open to anyone. Whether the courses will be commercially self-sustaining is questionable. At a later date, it may become apparent that we need to reinstate the quality training effort.



Harry Soruman

Has much money did this action save? How if A.O. funds? If so, maybe

ATTACHMENT: NOTES 10-28-68 GRAU (Dr. von Braun's and Mr. Weidner's copy only)

Apollo R&D  
should be ready to pick up the tab. Please expense with Lee James B

NOTES BALCH 11/4/68

MISSION:

S-II-5 - Post static checkout continued in the A-1 Test Stand. Current working plans call for shipment to KSC on 11/23/68 instead of 11/26/68 as previously scheduled. Turnover meeting will be held at MTF on 11/4/68.

S-II-6 - Stage is still in the Vertical Checkout Building undergoing modifications, and reinstallation in the A-2 Test Stand is still set for 11/16/68.

S-II-7 - Stage was shipped from Seal Beach on 10/29/68 and is scheduled to arrive at MTF on 11/12/68.

S-IC-7 - After repeated postponement because of erratic LOX level sensor operation and a final delay of one day because of fuel leakage past the seals of instrumentation feed through plugs on a plate assembly in the lower bulkhead of the fuel tank, static firing was accomplished on 10/30/68 for the planned duration of approximately 125 seconds. So far, there is no indication that any major anomaly occurred during the firing. Removal of stage from stand and shipment to Michoud, previously scheduled for 11/6/68 and 11/7/68, respectively, will be delayed because of delay in static firing.

S-IC-8 - Arrival of stage at MTF, previously scheduled for 11/13/68, is dependent upon ship date for S-IC-7.

BOMEX - Negotiations are in progress with GE for design and fabrication of the Signal Conditioning and Recording Device (SCARD) and the Data Facility Decommuation Unit (DECOMM).

University Research - The Candidate tasks from both Louisiana State and Mississippi State Universities have been transmitted to MSFC for detailed review prior to award of MSFC grants to these institutions.

GENERAL:

Labor Relations - As a result of a hearing held at MTF on 10/25/68 by the National Labor Relations Board, an election has been scheduled for 11/22/68 to determine whether approximately 33 North American Rockwell employees wish to be represented by the Teamsters Union for collective bargaining purposes.

## NOTES 11/4/68 BELEW

BIOMEDICAL HARDWARE DEVELOPMENT: Representatives of MSC and Hq. were here on October 30 for our presentation on developing medical experiment hardware items at MSFC. Following the presentation and lab tour, we held a working session on October 31, to work out details. (In my opinion the briefing and tour was an outstanding effort on the part of MSFC.) Agreement was reached that MSFC would develop the Gas Analyser, Ergometer and Task Board for M050, Metabolic Activity; also the LBNP (Lower Body Negative Pressure) for M051, Cardiovascular Function, and the ESS (Experiment Support System). We will receive end item specs on the two experiments from MSC. MSFC will develop the spec on the ESS, based on the needs of the experiments supported and other available support, as part of our normal integration function. Dr. Dietlein, representing Dr. Berry, indicated that Dr. Gilruth would write a letter immediately to Dr. von Braun accepting our proposal.

APOLLO 7: The results of Apollo 7 activities appear to be directly applicable to AAP. I have recommended to Hal Luskin that he set up a briefing by MSC to AAP at large within the near future. Suggest you consider a similar input to Dr. Mueller/Mr. Mathews.

VISIT OF GRUMMAN MANAGEMENT: Joe Gavin, Saul Ferdman and others from Grumman were briefed on the AAP, and toured through the MSFC facilities on Friday, November 1, (They were here for the Manuf. in Space Symposium).

AIRLOCK MODULE TECHNICAL BRIEFING: Technical briefings on various aspects of the Airlock Module were given to approximately 150 people from KSC, MSC, MSF, and MSFC on Thurs. and Fri., October 31 and November 1, at MSFC by MDAC-ED (Eastern Division).

WASTE MANAGEMENT CONFERENCE: The Waste Management Workshop at Battelle Memorial Institute, October 29-30, 1968, addressed itself to spacecraft waste management concepts being pursued by Government and Industry. The conference confirmed that the most promising concept for the near future improvement of spacecraft WM systems is the air flow entrainment method which is the basis of the present MOL WM System. Dr. Berry was in attendance and emphasized the need for WM Systems improvement over the Gemini bag which is presently being used in the Apollo.

NOTES 11-4-68 BROWN

F-1 Engine - The Quality Maintenance Program on F-1 engine 6067, delivered to R-QUAL on July 22, 1968, has progressed through component teardown. Only minor discrepancies were found.

S-IC-7 acceptance test of 125 seconds was successfully conducted on October 30, 1968. Preliminary data indicate that all F-1 engines performed satisfactorily.

J-2 Engine - An engine system test, wherein loss of fuel NPSH is simulated, is scheduled for November 11, at Rocketdyne. This test is in support of the flight mission rules and is to verify the engine failure mode. The test will be conducted as follows:

1) Run for 60 seconds at normal NPSH (176 feet min.) and a mixture ratio of 5.5.

2) Reduce NPSH to 120 feet and run for 10 seconds, at which time the vent valve will be closed and the pressurization system shut off.

3) Continue to run with a decaying NPSH until the engine fails and/or is shutdown by the thrust O.K. pressure switch (TOPS).

The failure mode is expected to be fuel turbine wheel failure or gas generator burn out.

On November 6, a calibration test is scheduled to be conducted wherein the above procedure will be followed, except that tank pressurization will remain active and ground test safety devices will be operative. (In flight, the TOPS is the only safety cutoff device.) It is expected that the GSE turbine overspeed switch will terminate this test.

A safety team composed of personnel from Industrial Safety, R-TEST, P&VE and the Engine Office was at Rocketdyne last week to review the test plans, the emergency procedures, and the test stand armor to assure maximum safety and minimum facility damage. The team found Rocketdyne's preparations to be very good. Only three recommendations were made:

1) Put a sand bag barrier on the LOX side of the engine to guard against a secondary explosion of the LOX pump.

2) Wrap primary structural members of the test stand with aluminum foil tape to prevent failure in the event they are sprayed with cryogenics.

3) Add blast gages to provide blast data in the event the test is more catastrophic than expected.

The activities of this team have been coordinated with Jim Murphy.

QUALITY AUDIT

The NASA Headquarters Quality and Reliability Audit Team visited Michoud Assembly Facility October 30-November 1. Teams members are George Erickson, Bob Cromwell, Mort Shaw of the Apollo Q&RA (MAR) Office, John Gresham of I-V-Q, and Don Thayer, GE/Daytona Beach (recorder), Dennie Shultz of I-V-SIC attended as an observer. Dave Spokely of MAR with Scott Fellows and Morris Dyer of MSFC joined the group for the exit interview held November 1.

All of the audited items were found to be satisfactory; no discrepancies were encountered.

1. Apollo Program Work Load: Laboratory work load in the operational trajectory area for Apollo is increasing drastically for an already overworked group of people. Experience with 503 C prime mission, plus other continuing overtures from MSC to cut down response time in mission planning, is good indication of trend of times. We had been working to variable launch azimuth & lunar targeting capability on 505. Now we're doing it on 503. All our planning, both inhouse and at Boeing, called for starting operational trajectory with targets defined 34 weeks prior to launch. On 503, first variable azimuth lunar mission, we didn't start until 15 1/2 weeks prior to launch. There was even some serious consideration given to starting targeting only 9 weeks ahead of launch for new additional launch window for 503 using an Atlantic rather than Pacific injection which we have worked. Luckily, this idea has not yet been pursued due to resistance from MSC. It is technically feasible to support a shorter response time for new targets if we have additional manpower working in operational trajectory area. This would require immediately diverting personnel from future missions & advanced planning to Apollo. If this can't be done, then this laboratory cannot support the type of short mission planning activities now being discussed by NASA Hq. & MSC. Computation support may also be a problem.
2. NASA Technical Advisory Group Relative to Global Atmospheric Research Program: Mr. W. Vaughan, of our Aerospace Environment Div, attended a meeting of this advisory group (established by Dr. Naugle) on Oct 22, at Wallops. Mr. Buckley is Chairman; membership is from OSSA, OTDA, Wallops, ERC, MSFC, LRC, & LeRC (Ames & GSFC being invited). Group's functions: (a) Provide long range thinking on future worldwide program involvement by NASA, & (b) Assist ESSA BOMEX Project on system integrity. Dr. Tepper, OSSA, reviewed BOMEX project history and NASA's current roll in BOMEX as essentially a "service" agency, however, he said it was their interest to go beyond this role for future worldwide projects drawing on BOMEX experience. There evidently have been meetings, discussions, & tentative commitments by scientific groups & government representatives on an international level concerning the scientific merits and justifications for a global atmospheric research program. BOMEX is one of first efforts. Support seems to be gaining momentum &, unless major change in course of events occurs, the program - in some form - seems certain to occur in 1970's. There is obviously a potential for application of NASA's management, systems engineering, instrumentation system development, & data handling talents. These jobs can be rather large & complex. NASA's position & degree of leadership in the programs & relative priorities for agency resources will have to be developed. For MSFC there may be some future opportunities for participation in all areas, if desired by Center's management, assuming NASA Hq. endorses & supports the program. At this time, NASA focal point on the program is OSSA.
3. Crossed-Beam Technology Support by ESSA & FAA: Dr. Bradford Bean, Wave Propagation Laboratories, ESSA, will visit MSFC Re: the joint MSFC-ESSA Meteorological Experiment (Notes 10/7/68 Geissler). Dr. Bean offers to continue matching funds for this program in FY-69. He has also been asked to participate as one of the prime investigators in BOMEX. Do you want Dr. Bean to brief you on the joint MSFC-ESSA experiments & on BOMEX? Mr. Ken Power, Chief, Sonic Boom Staff, Office of Noise Abatement, FAA, tried unsuccessfully to contact you by phone (Notes 10/21/68 Geissler) Oct. 22. He proposes to support MSFC in development of a ground-based crossed-beam system, that could be used for sonic boom test sites. We feel, that this enterprise would be beneficial to our Center and our University relations, since manpower involved would essentially be provided by student trainees. We are in contact with Col. Mohlere on this matter, & suggest a short briefing to you at your convenience.

## NOTES 11/4/68 HAEUSSERMANN

1. ATM Harvard College Observatory Experiment. Recent data have shown that the HCO experiment may have some problems related to the operational altitude. There are two types of problems; namely, (a) the high voltage electronics for the channeltrons (the ultraviolet detectors) can be damaged above certain pressure levels, (b) in the 400 to 700 Angstrom spectrum range, there is a high absorption by certain elements (atomic oxygen and others) and the absorption increases with decreasing altitude. Further detail assessment will be accomplished within the next few weeks to determine the degree of the problem and what potential work around solutions may exist. Prior to uncovering this problem, the Principal Investigators desires had been to operate at lower altitudes to minimize the film fogging problem caused by the radiation belt. All experiments utilize film for data recovery except HCO. Our assessment will attempt to establish an optimum altitude for all experiments.
2. ATM Building Facilities. An arrangement has been made whereby Building 4656 will be utilized for ATM activities such as the alignment and checkout function of the Goddard X-ray telescope (built by MSFC). Building 4656 has been used for Saturn V swing arm development by Boeing and will be retained in a standby condition for this activity should the need arise for Saturn V. KSC has been involved in these decisions and an inter-Center agreement is being written for subsequent sign off by both Centers. The use of Building 4656 for ATM will negate the ATM requirements for Building 4472 along with the \$40,000 work order for facility modifications.
3. ATM Computer Approach: NASA Headquarters has requested by letter that a study should be made to make the ATM computer system all digital and to also provide redundancy of the digital computer system. The present system consists of an analog computer with a backup computer for redundancy and a single digital computer. The analog computer performs the critical functions of stabilization and the mission would be lost with a failure of the analog system. The digital computer provides functions which simplify the astronauts activities and the loss of the digital system would only result in a degraded mode of operation. To consider an all digital system at this point in the program would impact the entire ATM system and result in escalated costs and overall complexity of the system. The reliability of an all digital system would not be greater than the analog system with respect to the mission critical functions. An appropriate answer to NASA Headquarters is being worked out with IO/SAA.

S-II STRUCTURAL TEST PROGRAM

The S-II (V7-21) Stage Structural Test, Phase VIII, was successfully accomplished 11/1/68. This was the final test on this test specimen.

S-IVB (MSFC)

No tests made on S-IVB Test Stand. Test cancelled on Thursday, 10/31, when an explosion in the main hydrogen vent line blew off half the bubble caps at the burn pond. A failed (leaking) bellows in the facility vent line allowed air to enter the vent line when the run tank was vented of gaseous helium. This air mixed, just upstream of the burn pond, with residual hydrogen left from burn pond ignition check. Bellows will be repaired and all systems checked prior to next operation. Incident indicates need for periodic leak check of hydrogen vent systems and other facilities will be alerted to take appropriate action.

F-1 ENGINE (POGO TESTING)

Continued installation of the fuel outboard pulsing system at the West Area F-1 Test Stand. The facility should be ready for additional testing during the week of 11/11/68.

ACCESS ARM NO. 9 (AA-09-02)

System tests are in process. It appears that the AA-09-02 Access Arm (LUT 3) Test Program can be successfully completed in time to meet the present KSC need date.

MOBILITY TEST ARTICLES

Testing on the Bendix and General Motors vehicles continued and should be completed during the week of 11/4/68.

APOLLO TELESCOPE MOUNT

Work continued on the hardware assembly in Building 4649 for the deployment mechanism development fixture.

NOTES 11-04-68 HOELZER

GRAPHICS DISPLAYS:

Discussions were held with Dr. William Johnson (Experiments Office) and members of his staff concerning the possible use of the low-cost (\$3,000 to \$4,000) interactive graphics displays developed under the AMTRAN program.

Inquiries about the system were also received from Mr. Alan Anderson at NASA Headquarters and from Mr. Nelice Adams at Jet Propulsion Laboratory. Mr. Anderson then visited MSFC on October 25 and October 29, 1968, to see the graphics displays and associated software and to discuss the handling of research task submissions with members of the Research Programs Office.

Dr. Seitz attend a meeting of the A.I.A.A. Computer Systems Committee of which he is a member. The session was held in Philadelphia on October 20, 1968. The meeting concerned the organization of the forthcoming Technical Specialists Conference on Aerospace Computing which will be held in September 1969.

1. KSC Bench Testing of Components: Regarding the subject of KSC/MSFC bench test, there must be a division of responsibility between the Development Center and the Operation Center concerning a fundamental principle: hardware design and performance adequacy (MSFC) versus test, checkout and launch activity (KSC). The KSC approach goes further than the replacement of a part with a spare by leaving to KSC the right to determine why a part malfunctioned and also the right to bench test any suspect part even though the component is performing within spec limits. Test conditions and results have not been officially reported in the past to the Development Center. Home plant contractors have complained that they are left out of the loop on such action. My position is to identify components for bench testing, require a tight configuration control on test equipment, maintain test procedures and specs for the selected list, and require any deviations or waivers to be approved by MSFC prior to test. So far this position has been unacceptable to KSC. Any other way will cloud the issue of development center responsibility.
  
2. Strain Gage and Wind Correlation for Launch Constraints: A meeting was held November 1, 1968, to discuss strain gage and pull test requirements for AS-504 and subsequent. The use of strain gage measurements as a correlation to ground wind constraints was also discussed with the following recommendations and assigned actions:
  - a. Pull Test requirements for AS-504 and subsequent are to be deleted.
  - b. R & DO recommended that strain gage measurements be the primary method for determining launch release with respect to ground wind constraints for AS-503 and subs. Anemometer measured wind data should be the secondary method and used for long range wind predictions prior to fueling vehicle.
  - c. Determine the cost and schedule impact of requesting the installation of strain gages at station 760 on AS-504 and subsequent for measuring bending moments resulting from ground winds.
  - d. Requirements for installation of gages and measuring and displaying the data, if decision for installation of strain gages is made, to be resolved in conjunction with KSC and MSC.
  - e. Changes to the Mission Rules regarding wind limit constraints using strain gage data to be discussed and, if necessary, resolved in conjunction with KSC and MSC.

NOTES 11/4/68 JOHNSON

Supporting Development Quarterly Review/Annual Payoff Review - Messrs. Donlan, Lord, Hall (plus Hall's immediate staff) conducted the Review on October 28 and 29. Representatives of MSC, KSC and MSFC (Messrs. Chase and Miles from R-EO) involved with Supporting Development Program planning and management participated; OART and Office of Program Plans and Analysis were represented. An Executive Session was held on October 28 during which a review of the program (for Mr. Donlan's information), current status and the general plans for FY-70 were presented. Considerable discussion ensued regarding the lack of planning and funding stability in the program and the impact of singular items taking too large a share of the funding available. These are the key issues to be addressed in the Hide-away meeting suggested by Dr. Mueller on Advanced Studies and Supporting Development. As of November 1st, a date and location for that meeting have not been set.

On October 29 a tour of MSC was conducted of the following areas:

Space Environment Simulation Laboratory  
Subsystem Test Bed  
Life Systems Laboratory

Nature and progress of work was very impressive, particularly the Subsystem Test Bed (Modular Space Laboratory). Hand out of STB briefing material is available if you would like to review it. The afternoon was devoted to presentations by the three MSF Centers covering selected "payoff" items to illustrate accomplishments in the Supporting Development Program during the last twelve months which directly benefited mainstream MSF programs. Progress on several other significant items was also reported. Generally, this session fell short of its goal because of format guidelines given by Headquarters and the time allotted precluded in-depth treatment of the items selected. A report is being compiled as requested by OMSF which will augment the presentations. It is to be submitted to Headquarters by November 11.

1. Manufacturing Engineering Laboratory Status Report: The ME Laboratory has today -- although it has suffered more than 25% reduction during the last years -- more diversified capabilities than ever before. These capabilities exist in four areas:

a. Manufacturing Know-how: We have up-to-date facilities, equipment, knowledge, and skills in all modern manufacturing techniques needed for development of structures, propulsion systems, assemblies of launch vehicles and payloads. The manufacturing disciplines included in this capability are: numerical control machining; precision machining; metal forming and heat treatment; welding; plastics' work; foaming; bonding; chemical milling and surface treatment; electrical work; etc.

b. Manufacturing Engineering: We have a group of engineers in ME who are competent in tool engineering, plant engineering, and manufacturing technology, including flight experiment development. This is a unique capability which is not existing in other NASA Centers and includes knowledge and experience in the modern techniques of planning and controlling the flow of work in the manufacturing process.

c. Field Service: In support of our prime and sub-contractors we have a small but effective group in the field. Our engineering personnel in this group are specially selected and trained to serve as consultants to industry in order to prevent major problems in the area of manufacturing.

d. Zero Gravity Simulation: Last but not least we have during the last year developed the equipment and capability to conduct tests in simulation of zero gravity by mechanical and neutral buoyancy techniques.

In general, the ME Laboratory has a competent team which is capable, ready and eager to accept the challenge of new tasks, such as development of a space station, scientific payloads and modules, and to develop manufacturing-in-space technology.

NOTES 11-4-68 LUCAS

1. S-II "A" STRUCTURE: The final test condition (burst and collapse mode on the common bulkhead to 130% of limit load) was completed successfully on Friday, 11-1-68. Thus, the part of the light-weight S-II stage design represented by the "A" structure is qualified for flight.
2. POGO: The sixth POGO Working Group meeting was held 10-31-68. Stability analysis results for the S-IC stage of AS-503 C' were presented by TRW, Martin/Denver, Boeing/Michoud and MSFC. Results of these individual analyses were in close agreement and confirm our preliminary report of last week that the four outboard lox-line prevalve accumulator fix provides more stability margin in all modes of S-IC powered flight than the five accumulator fix. The recommendation of the Working Group is to use four outboard fully charged prevalve accumulators for the AS-503 flight. The S-IC-7 stage was statically fired successfully for the intended duration of 125 seconds on 10-31-68 with four prevalve accumulators charged and the inboard accumulator helium supply blocked off.
3. AS-205 FLIGHT: In view of reported Astronaut remarks about bumpiness during the early part of S-IVB flight we have reviewed the data again. We could find only a low amplitude longitudinal oscillation of  $\pm 0.04$  g's in a frequency range between 20-40 Hz. Astronaut Cunningham explained that the space vehicle longitudinal oscillations were felt primarily before lift-off. The S-IVB powered phase was real smooth. There is no basis to think about Pogo during S-IVB flight of AS-205.
4. APOLLO 7 CABIN VENTILATION FANS: During the flight of Apollo 7, the spacecraft crew reported the following: "We turned both cabin fans off about an hour ago because the noise is really terrific." As a result of this report, we reviewed the noise level in the spacecraft from the ground test reports. These tests were accomplished at 1/3 atmosphere and with all the equipment items including the two cabin fans operating. The speech interference level in the cabins was measured to be 62 db. This is 7 db higher than the noise criteria for the OWS, as specified by MSC.
5. STRESS CORROSION FAILURE: CCSD personnel inspected an S-IB LOX fill and drain valve from storage and found 17 of 24 7075-T6 fasteners cracked due to stress corrosion. A second valve was pulled from storage and 19 of 24 fasteners were found to be cracked. The same type valve is used in the S-IC for both fuel and LOX fill and drain and for the LOX interconnect valves. There are a maximum of 240 7075-T6 fasteners used in this particular application per S-IC stage. CCSD and TBC found the fasteners, which are lubricated with AR-1F material, torqued to  $150 \pm 10$  inch-pounds; MSFC-SPEC-486 specifies a torque valve of 45 inch-pounds. TBC plans to replace the fasteners with A-286 fasteners, effective on S-IC-503; CCSD will make a similar fastener change. No schedule impact is foreseen.
6. AIRLOCK ENVIRONMENTAL CONTROL SYSTEM (ECS) THERMAL CAPACITOR: With reference to your question, we are familiar with phase change thermal radiators as mentioned in Dr. Stuhlinger's notes of 10-7-68. The Airlock Environmental Control System uses a phase change thermal capacitor. The liquid coolant from the radiator passes through a heat exchanger containing about 20 lbs. of tridecane, a wax which melts at  $21^{\circ}\text{F}$ . The capacitor increases the system minimum heat rejection capability 4000 BTU/hr which is about a 25% gain. Without the capacitor, the system's heat rejection capability during extra vehicular activity would be inadequate.

## NOTES 11/4/68 MAUS

### FY 1969 NASA OPERATING BUDGET:

A TWX has been received from Harold B. Finger notifying us that the President has signed NASA's Appropriation Bill. In addition, the BOB has approved an apportionment of funds and the FY-69 Interim Operating Budget now becomes a firm operating budget. Although the NASA Appropriation Bill was approved at the \$3,995.3M level, the BOB approval of the Interim Operating Budget requires NASA to operate within a \$3,854.1M level. The following table compares the FY-69 operating plan with corresponding amounts of the appropriation.

	<u>Appropriation</u>	<u>Interim Operating Budget</u>
R&D	\$3,370.3M	\$3,195.1M
C of F	21.8	35.7
AO	<u>603.2</u>	<u>623.3</u>
TOTAL NASA	\$3,995.3M	\$3,854.1M

### MSF INSTITUTIONAL STUDY:

We have learned that MSF plans to initiate a new Institutional Planning Study to be performed between now and January. Program assumptions will be specified and the centers will be asked to state their manpower requirements and cost estimates to support it. Roles and missions for future projects such as the space station will not be defined. Effectively the centers will "bid" on portions of the project. The current plan is to initiate this study within the next one to two weeks.

WEEKLY NOTES MOHLERE 11/4/68

We now have agreements (Joint Space Act and OED Title I-C) with Mississippi State University and Louisiana State University similar to that recently concluded with Alabama A&M.

Although the idea leading to these agreements belongs to Ames, considerable original work was done by Chief Counsel. That office, in my opinion, is due much credit for producing a singularly flexible and useful arrangement that facilitates the MSFC university relationship mightily.

On November 14, Dean Lear and a faculty group from the College of Engineering will respond to an invitation to become better acquainted with Marshall. The University has shown definite interest in a closer working relationship particularly with the MSFC Lab structure.

Activity proceeds in the case of MSU/LSU utilization of certain facilities at MTF. Currently, some 30 candidate tasks for possible performance at MTF and of interest to MSFC have been reviewed by the two universities and outline proposals offered for appropriate Lab review.

NOTES 11/4/68 MURPHY

J-2 Low NPSH Test at Santa Susana:

We are participating as part of a Safety Committee which was established by the Engine Office to review the conditions of the planned low NPSH test on the J-2 Engine at Santa Susana. The Committee visited the test set up on Friday, November 1, 1968, and concluded with the incorporation of some additional safety measures that the test arrangements and plans are satisfactory. See Brown's Notes for details.

NOTES 11/4/68 RICHARD

No submission this week.

## NOTES 11/4/68 SPEER

1. AS-205 Launch Winds: As you may know, we launched AS-205 with ground winds exceeding the 18 kt steady state launch release limit at the 60 ft. level. This limit was established in the Launch Mission Rules for the case that land impact was predicted for an early flight abort, in order to make land impact an acceptable risk. During the countdown, the winds were such that land impact was predicted. At about T-2½ hours, the Mission Director decided to use an equivalent speed limit (21 kt) using a 162 ft. level anemometer on the ETR meteorological tower rather than the 60 ft. pad anemometers. The parachutes are about 120 feet above the spacecraft, making the 162 ft. level winds more representative of spacecraft horizontal velocity at impact than 60 ft. level winds. At launch, the limit was violated based on 60 ft. data and was marginal at the 162 ft. meteorological tower. R-AERO is analyzing the actual against the stated winds and the differences between the 60 ft. and 162 ft. measurements.

2. ATM Data Management Review: Fourth in our series of meetings, the ATM Experiment S-055 (UV Scanning Polychromator-Spectroheliometer) Mission Data Management Meeting was held with Dr. Reeves (Harvard) and others. This is the only ATM experiment that yields its major scientific data through telemetry. Therefore, large amounts of delayed real time data for experiment quick look assessment are requested by the P.I. The next and last such data review will be held on 11/6 and 11/7 (Spectrographic Telescope experiment). Following this, MSC's Flight Operations will finally present to all P.I.'s their concept of AAP flight/experiment operations. This meeting, scheduled for 11/20, is overdue and will address questions as: what is ATM flight control; MCC capability; expected duties of the P.I.'s.

3. Launch Vehicle Flight Control: MSC has agreed to add two control positions to the Staff Support Room. The following positions are now established for Apollo 8 and subs and adequately cover all necessary functions: 3 Booster Systems Engineers (BSE) in the Mission Operations Control Room; 7 Flight Controllers in the Staff Support Room. These functions are split into disciplines. Frank Van Rensselaer is Apollo 8 BSE #1, the MSFC lead position at the MCC.

## NOTES 11-4-68 Stuhlinger

- 1. SPACE SCIENCES BOARD MEETING:** The Earth Orbital Panel of the Space Sciences Board will meet at OSSA on November 12. The agenda will include discussions of the manned astronomy program planning. Panel members include Drs. Friedman, Findlay, Mayall, Johnson, and Hall. We have been asked by OSSA (Marc Aucremanne) to provide support in discussions of scientific instruments for high energy, solar, and stellar astronomy. Members of SSL, ASO, and IO will attend the meeting.
- 2. ATM PROTON SPECTROMETER:** The proton spectrometer, developed and built at SSL (Drs. Gunther, Parnell, Oran) for a flight on AAP #2 was calibrated successfully at the Harvard University proton cyclotron facility.
- 3. HIGH ENERGY PHYSICS EXPERIMENTS:** An ad hoc committee on high energy physics experiments, sponsored by OSSA, met at MSC last week. Recommendations from the committee included a study panel to recommend a high energy nuclear physics facility in the post 75 Space Station and determine the instruments and procedures for the facility. Another recommendation was a request that a GSFC-MSFC study be initiated on unmanned platforms for large (3-10 tons) single astrophysics/high energy nuclear physics experiments as precursors to the Earth Orbiting Space Laboratory. Dr. Parnell was named a member of both panels.
- 4. NEW NAS FELLOW:** Dr. Neil M. Reid, a NAS associate, has joined SSL to work in the field of reaction kinetics as related to contamination problems. Dr. Reid has just received his Ph.D. in the physical chemistry of fast reactions from the University of St. Andrews, in Scotland.

## NOTES 11/4/68 TEIR

### S-IB STAGE FUEL FILL AND DRAIN VALVE (STRESS CORROSION):

During CCSD rework of a spare fuel fill and drain valve, one of the connect flange bolts cracked when torqued to approximately 80% of the required torque of 150 inch pounds. The bolts had been installed approximately two and one-half years. An analysis of the cracked bolt revealed evidence of stress corrosion. The remaining 23 bolts were then removed and subjected to a dye penetrant test, which indicated that 16 of the bolts had some cracking. The bolts from another valve were checked and some 19 were found to be suspect. CCSD is continuing to investigate this problem and, we expect, will recommend changeout of these bolts in all stages.

CCSD was questioned as to why this did not show up in the stress corrosion survey. They stated that the stress analysis showed sufficient stress levels (above 15,000 psi) to warrant a change, however, when the information was tabulated an error was made which showed lower levels of stress. CCSD subsequently has begun to reverify all of the tabulated figures on all of the components surveyed. I understand that the Saturn V Program Office is working this same problem with Boeing.

SATURN IB PHASEDOWN: During the last several weeks we have continued to work with our contractors to phasedown to the minimum manpower level. At this date it appears that at the end of the phasedown period we will be at a total contractor strength of approximately 500 of which the CCSD effort on the S-IB Stage, Systems Engineering, MGSE, and the Saturn IB Systems Development Facility will be approximately 250.

Any effort on the production of the I. U. and S-IVB for SA-213 and 214 will be in addition to the above manpower level.

I. EARTH ORBITAL PROGRAM

Space Station Phase B Work Statement: Significant progress was made this week. Contributions have been received from most of the Labs and the work statement is being reviewed throughout the Center. Headquarters personnel visited us and MSC this week to review the Center status and plans on the work statement. The schedule is for the Centers to submit work statement drafts to Headquarters on November 12, which will be followed by joint action among ourselves, MSC, and Headquarters to consolidate inputs and prepare the single work statement for the Agency. We are going to sit with MSC here on November 18 and 19 to discuss the drafts with the objective of resolving differences and start planning for areas of mutual support in preparation for the joint work with Headquarters.

II. LUNAR PROGRAM

Lunar Roving Vehicle (LRV): Mr. Milwitzky was at MSFC October 31 to discuss the LRV. The statement of work and RFQ were reviewed and we were given the "go-ahead" from Ben to proceed. We are proceeding toward an RFQ release on November 15, and it is hoped that by that date a Center position will be forthcoming. The RFQ will not go out until Mr. Weidner gives the OK.

III. LAUNCH VEHICLE PROGRAMS

a. Integral Launch & Reentry Vehicle System Study: MSFC and MSC will have paralled studies for \$300K each. As a result of meetings between us and MSC, a joint RFQ was released October 30. Proposals are due November 29. We will jointly evaluate the proposals and negotiate the two contracts.

b. Low Cost Earth Orbital Transportation System Synthesis by Economic Analysis Study: The RFQ on this study was released October 30. Proposals are due November 29.

Nov 17, 1968

cc: Lucas

2445

11/27

~~12/18 9/8~~  
B/11

1-7  
2.1/10

*J. T. Eden*

November 25, 1968



Thru: Mr. Weidner, R-DIR

TO: Dr. von Braun, DIR

In response to your note on my 11/12 Notes to you (copy attached) regarding the Lunar Cargo Delivery System Study, it is currently planned that MSC will do the study. We have provided them our statement of work, inhouse study results and overall study plans to assist them in getting the study underway.

Frank Williams

1 Enc:  
As stated



11/12 gcs

B 11/13

F.H.

Can I get a copy?

B

A copy was sent to him on 11/13.

I. Earth Orbital Program: The Space Station Project Definition work statement will be sent to Headquarters on November 12. Copies of this version will be distributed internally on the afternoon of the same day and sent to MSC, KSC, and Langley. A copy of MSC's work statement will be delivered to the MSFC representative (Jeff Hamilton) for us. It is still planned to meet initially with MSC, and then with Headquarters and other Centers for finalization of the coordinated work statement. ✓

II. Lunar Program: MSFC received \$300K to perform the Lunar Cargo Delivery System (Saturn IB or Titan III plus Centaur plus landing stage) study. On the basis of our FPPB meeting, I informed Headquarters that we do not have the manpower to manage the study. Headquarters (LEO) then asked JPL to manage the study; they accepted. C. Mathews heard of this and asked MSC if they would do the study. MSC (Faget) said yes. We have been asked to supply MSC with a copy of our statement of work, past study results etc., in order to prepare for the study, and are doing so. ✓

Who does it now? JPL or MSC?

III. Other Technical Program Related Data: Mr. Weidner was briefed on November 8 on status of preparations for our participation in the Grumman PX-15 Underwater Project. Mr. Weidner agreed in principle with the MSFC involvement in these activities; we are proceeding with necessary steps for implementation and will keep you informed of progress. ✓

~~CONFIDENTIAL~~

UNCLASSIFIED WHEN ENCLOSURES ARE DETACHED

NOTES BALCH 11/12/68

11/12/68

MISSION:

S-II-5 - On 11/9/68, stage was removed from the A-1 Test Stand and placed in the S-II Stage Service Building for LH<sub>2</sub> tank inspection, which was started on 11/10/68. Shipment to KSC has been postponed until 12/12/68 because of decision to incorporate insulation changes resulting from a failure on the S-II-4 stage at KSC. During the additional time at MTF, new Parker prevalues will also be installed in the S-II-5. On 11/14/68 stage will be placed in the Vertical Checkout Building for this and the installation changes. Turnover meeting has been postponed from 11/14/68 to 11/21/68. ✓

S-II-6 - Stage was removed from the Vertical Checkout Building and installed in the A-2 Test Stand on 11/8/68 approximately a week ahead of schedule to make transporter available for the S-II-5 movements described above. The remaining modifications scheduled to be completed in the Vertical Checkout Building will now be accomplished in the test stand. Schedule calls for shipment of stage to KSC on 1/26/69, but extensive insulation modifications may impact this schedule. ✓

S-II-7 - Stage is scheduled to arrive at MTF about noon today and to be installed in the A-1 Test Stand tomorrow 11/13/68. ✓

S-IC-7 - Stage was removed from the test stand on 11/8/68 and shipped to Michoud at approximately 5:00 a.m. the following morning. ✓

S-IC-8 - Stage is scheduled to arrive at MTF on 11/13/68 and to be installed in the test stand the following day. Stage contractor's current working schedule calls for "power-up" on 12/5/68 and static firing on 12/31/68. ✓

BOMEX - Regarding your question concerning Government-furnished surplus equipment for BOMEX. We are looking for five time-code generators, tape transports, and discriminators. We are now starting to dig into the software for this project. Bill Vaughan, R-AERO, is assisting us. ✓

INSTALLATION:

New Prospects for Non-Apollo Work at MTF - Representatives from the Bureau of Public Roads and the U. S. Coast and Geodetic Survey visited MTF on 11/6/68 to look over available facilities which could be utilized for proposed research activities by these agencies. ✓

~~CONFIDENTIAL~~

UNCLASSIFIED WHEN ENCLOSURES ARE DETACHED

NOTES 11/12/68 BELEW

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11/12/68

ZERO "G" TESTING: Zero "G" test flights, are planned for 11/12-14/68, to test the aft penetration sealing devices. MSC has been requested to support the test with equipment and personnel including the crew. ✓

MDA/AM STRUCTURAL STATIC TEST SET-UP: A very recent re-evaluation of mating and instrumenting the MDA/AM prior to receipt of a payload enclosure test fixture indicates that the start date of the test can be improved by approximately 1 1/2 months - start test 4/1/69. We have, therefore, requested the AM be delivered by McDonnell on 1/15/69. ✓

MDA CREW STATION REVIEW: A meeting was held between MSFC and Douglas to review the packaging of workshop equipment that is to be stowed in the MDA at launch. A schedule of informal mock-up design reviews and fabrication dates was established based on a tentative date of 3/1/69, MDA crew station review. ✓

HABITABILITY SUPPORT SYSTEM: An initial meeting of the Habitability Support System requirements team was held to outline the steps to be taken to arrive at a contract end item spec by 12/20/68. The unofficial data document we received earlier from MSC is the baseline document for modification of requirements. ✓

MISSION EVALUATION PANEL: The first meeting of the AAP Mission Evaluation Panel was held at MSFC on 11/7/68. Co-chairmen are Vic Neshyba, MSC and Ernest Nathan, MSFC(R-AERO). The primary purpose of this meeting was to establish the panel membership, organization, and policies. The primary topic which the panel will address in the next few meetings will be data handling, as opposed to date evaluation. ✓

EXPERIMENT M052, BONE AND MUSCLE CHANGES: A meeting is being held at MSC on 11/14/68, to define the requirements which M052 will impose upon the habitability equipment and to discuss the possibility of combining M052 hardware with the Waste Management System under the MSFC development contract for MSC. ✓

11/29/68

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F-1 Engine - The AS-503 configuration flex line verification test program (resulting from the J-2 ASI fuel line failure on AS-502) has been successfully completed. ✓

The F-1 heat exchanger and related lines have been requalified at expanded limits. The requalification was necessary due to out of specification operation of the heat exchanger on AS-501. The test program included a minimum of 20 starts and 2250 seconds on each of three heat exchanger systems. ✓

The "soft" shutdown verification testing has been successfully completed and included: component cycling and durability tests in the laboratory on the conical and cylindrical filters, engine hot fire testing at RETS for 20 tests and 2250 seconds on each of the two sets of filters, and limits testing on the gas generator ball valve closing force margin on two samples. The F-1 soft shutdown is now fully qualified and available if needed. ✓

During removal of the S-IC-7 stage instrumentation cables by Boeing at MTF, the engine on position #4 (engine 6053) was damaged by a falling test stand protective cover. The cover made a dent in the top of the exhaustorator four inches long, one inch wide and 0.1 inch deep. The dent is smooth and without sharp depressions and is considered acceptable without corrective action. In addition, three thermal insulation studs mounted on the thrust chamber were bent. These studs will be removed and replaced at MAF. ✓

J-2 Engine - The calibration run for the loss of fuel NPSH test was conducted on November 7, 1968. The test was terminated by a cut off signal from the fuel pump overspeed switch at a fuel NPSH of approximately 90 feet.

The fuel depletion test was conducted on November 11, 1968, according to the conditions listed in my 11-4-68 Notes. The test was terminated by a signal from the main stage thrust O.K. pressure switch at a fuel NPSH of approximately 50 feet. An inspection revealed that the crossover duct between the fuel and LOX pumps had ruptured just downstream of the fuel pump. The failure mode is being investigated. The engine appears to be undamaged with the exception of the crossover duct. After replacing the crossover duct and the fuel pump, another test will be scheduled for November 18, 1968.

We have not yet received official approval from Headquarters to negotiate the J-2 Operational and Flight Support follow-on contract; however, we are proceeding with formal negotiations on the basis of verbal sanctions from General Bogart. We presently have a major area of disagreement with Rocketdyne on the incentive structure. ✓

NOTES CONSTAN 11-12-68

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Nothing of special significance.

B 11/13

1. SNAP-27 Reentry Safety: (C) MSFC is represented on the Reentry Working Group of the SNAP-27/ALSEP Interagency Safety Evaluation Panel (MSFC member: Mr. Scott Fellows) by Mr. von Puttkamer of this laboratory. During a final meeting last week, the Working Group prepared its recommendations to the Panel. In general, the group does not agree with General Electric, the manufacturer and original safety evaluator of SNAP-27, that the (already manufactured) container of the radio-isotope fuel will survive reentry in all possible abort cases with no fuel release to the atmosphere. The Pu<sup>238</sup> O<sub>2</sub> fuel is normally contained within a tungsten-steel capsule, enclosed in a coated beryllium cylinder acting as secondary heat shield, inside a cylindrical primary heat shield cask made of pyrolytic graphite composite material. During the earth-to-moon phase, this Graphite LM Fuel Cask (GLFC) is mounted outside the LM descent stage in a Bendix titanium support structure. The GLFC is required to survive intact the reentry environment due to suborbital aborts, orbital decay aborts, and superorbital aborts (reentries from translunar flight). GLFC failure modes depend on entry angle and velocity. Suborbital aborts, orbital decays, and low-angle (-3.9 degrees and less) superorbital entries may lead to failure and fuel release due to high internal temperature. At higher angles of superorbital abort entries, ablation of the graphite heat shield becomes dominant, culminating in total heat shield loss at angles around 4.25 degrees. At still higher angles, high internal temperatures and, then, thermal stresses are the leading failure modes. At angles from 20 to 90 degrees, the thermal stress problem and graphite loss due to spallation can result in GLFC failure. Each failure mode has its own failure probability, as has each Apollo flight phase. The overall probability of releasing plutonium fuel in the earth atmosphere is presently estimated by the Working Group to be in the order of 0.1% for each Apollo mission, based on the current estimate that 21 of 100 Apollo missions will be aborted between liftoff and accomplished lunar orbit insertion. The Working Group has produced these results only very reluctantly, since in many instances they are based more on engineering judgment and "educated guesses" than on knowledge. We are dealing with materials which are still highly "exotic" at present, and with an extreme environment with little understood physical effects. Due to its intense internal heat source (at the 1600°F level), the full GLFC assembly can also hardly be flight-tested. Limited ground-testing has been done, but our confidence in most of these tests is low. Mainly because of EVA problems known to you, ALSEP will not be on the first lunar landing flight. Also, Hq. personnel are apparently considering a new ALSEP version, reduced in size and mission (only two experiments), powered by solar cells. It would also require a small isotope heat source for instrument survival during the lunar night (approx. 60 thermal watts against 1500 thermal watts of the SNAP-27). ✓

2. Mountain Wave and Turbulence: Personnel of our Aerospace Environment Division are coordinating with LeRC and Edwards Air Force Base (EAB) personnel on their near future mountain wave and turbulence program. It is possible that the FPS-16 Radar/Jimsphere system will be used to monitor wind profile conditions at EAB during the periods in which planes, optical radar, constant level balloons, etc., are to be used to acquire data. The data gathering period for this program (in which ESSA is involved) is scheduled for March and April of 1969. ✓

E.G.  
Is the group's findings serious enough to ground the SNAP-27, and thus the original version of ALSEP?  
B

~~CONFIDENTIAL~~ TO Unclassified  
(New Classification)  
BY Nancy M. Gwiri  
(Official Authorizing Change)  
DATE 10-10-75

11/12/68

B 11/13

1. SATURN I WORKSHOP PROJECT: This Laboratory participated in the review of the McDonnell-Douglas "Bare Bones" proposal, and we are very concerned with their concept of quality and reliability assurance. Drastic reductions in the areas of quality assurance, reliability assurance, acceptance testing, and checkout are proposed. Some specific examples are as follows:

See Below  
FYI and comments

- a. Limit checkout operations at Sacramento to the booster stage only and conduct all OWS checkout and verification at KSC.
- b. Deletion of all formal qualification testing and replacement with design verification testing at the discretion of the contractor.
- c. Deletion of internal quality audits.
- d. Major relaxation of vendor procurement controls.
- e. Elimination of all government inprocess inspection.
- f. Deletion of quality reporting documents.

This list is by no means complete, but it indicates the scope of the contractor's approach. The R&DO Engineering Manager has been informed through formal memorandum of this Laboratory's position and discussions are being held with the Lead Laboratory at this time.

D.F.  
Please keep me posted B

2. MTF QUALITY & RELIABILITY SURVEY: A survey of the MTF organization and all associated contractors, except the Boeing Company, was conducted during the period October 21-November 1, 1968. Approximately 40 discrepancies were noted against the various elements. From a quality systems standpoint, the Rocketdyne/government interface area had the most problems. It was the opinion of the survey team that MTF and the associated contractors, in general, have adequate quality systems.

3. SA-503 COMPONENT CERTIFICATION OF QUALIFICATION (COQ): The current status of SA-503 COQ's is as follows:

<u>Stage</u>	<u>Required</u>	<u>Signed</u>	<u>Open</u>
IU	69	69	0
S-IVB	218	209	9
S-II	300	287	13
S-IC	155	150	5

✓

NOTES 11/12/68 HAEUSSERMANN

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Workshop Attitude Control System - Analog Versus Digital. The current design approach on the Workshop Attitude Control System is primarily analog with digital logic being employed as required for mode switching, command processing, etc. The system is totally redundant, including multiple sensors, multiple electronic channels and multiple APS engines.

We have been directed by Headquarters to evaluate the possibility of using a digital computer to accomplish the onboard control, computation and mode selection functions. An ATM type digital computer and a modified ATM input-output assembly could be employed. To attain reliability commensurate with the current analog approach, which is inherently redundant, it would be necessary to employ three digital computers and input-output assemblies.

The trade-off study between the analog and digital approaches shows that the digital approach (employing three computers) weighs approximately 60 pounds more and requires approximately 160 watts more power during the active phases. Assuming that the analog implementation makes maximum utilization of Saturn electronic modules, the analog approach would be approximately \$500,000 less expensive. However, the apparent cost advantage of the analog approach could be reversed if late hardware changes are required due to mission modifications, added onboard functions, etc. The strongest points in favor of the digital approach are that it would provide increased flexibility to accommodate mission changes and late system optimizations. In addition, an inherent growth potential for unknowns could be more easily provided. However, the digital system would be more complex for the system verification and checkout.

Because of the apparent weight and power advantage, a possible cost savings and the fact that the design has progressed further based on the current baseline, we propose to continue with the analog system rather than to change to the digital approach. In making this recommendation, we must assume that the current WACS baseline requirements will not be influenced significantly by late mission changes, added experiments, astronaut preferences, etc. If significant mission, configuration, experiment requirement, or other major changes are anticipated, we would be compelled to recommend the digital approach in spite of the added weight, power and cost. In consonance with your recent request for a simpler IU, we would appreciate your support for reduced flexibility towards new requirements. We could give you a presentation if you need more quantitative details.

Lee Bole  
How soon  
is this  
assumption  
in your  
view

↑ No, I'd rather get an idea of the views of the entire AAP team (if necessary in the form of a trade-off matrix or something like that) ↑

B 11/13

11/29/68

F-1 TURBOPUMP

According to the latest information from P&VE Laboratory, the inboard PVC duct (503 configuration) will be available to Test Laboratory for testing on 11/14/68. P&VE has requested that we accumulate at least 500 seconds of run time on the PVC duct prior to 12/1/68, and 2,000 seconds prior to 2/1/69. This will require a maximum effort with overtime. ✓

S-11 TEST PROGRAM (MTF)

A presentation entitled "Combined Cryo-Proof and Static Firing of S-11 Stages" was given by North American Rockwell at MTF 11/7/68. The proposed plan which is designed to shorten test time at MTF will be submitted to NASA for formal change action later this month. The proposed effectivity is for full implementation on S-11-8. The real objective here is the deletion of the contractual requirement for propellant load test prior to static firing. If Boeing's experience on S-1C-7 (where they tried this for the first time) with sensor and fuel leakage problems is any indication, then any time-saving may be pure imagination. ✓

S-11-6 (MTF)

Upon entering the lox tank on S-11-6 following the acceptance static firing test, several pieces of foreign debris were found lying in the bottom of the tank. The objects were listed as green plastic, white plastic, dirt, lox lube and other matter. Investigation is underway to determine the origin of this debris.

ACCESS ARM NO. 9 (AA-09-02)

System testing continues on schedule. Barring any unforeseen difficulties, the test program should be completed and the AA-09-02 hardware delivered to Boeing by 11/23/68, for shipment to KSC. ✓

MOBILITY TEST ARTICLES

The test series involving sand, soft dirt, with obstacles on the Bendix and General Motors vehicles was completed satisfactorily. Data is being evaluated. One more test series remains on the dynamic and power studies of the MTA's. This series will use gravel as the test bed. ✓

K.H.  
How  
clean  
can we  
expect

SII-3  
(in 503)  
to be? B

NOTES 11-12-68 HOELZER

11/12/68

3 1/13

REDSTONE SCIENTIFIC INFORMATION CENTER REAPPRAISAL:

MSFC and MICOM will undertake a joint reappraisal of RSIC data processing requirements and methods in the near future. The purpose of this reappraisal will be to determine the most efficient and economical method of providing data processing services for RSIC in view of funding cutbacks. ✓

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1. S-IC Fill and Drain Valves: The aluminum bolts on the Parker LOX and Fuel Fill and Drain Valves and LOX Interconnect valves are similar to those which failed on the S-IB stages in stress corrosion. Replacement is in process on S-IC-3 and S-IC-4 at KSC and has been accomplished on S-IC-5 and S-IC-9 at Michoud. No schedule impact is expected. ✓

2. S-II Structures Test: (a) Final test of the "A" Structure Test program was successfully completed at 130% of limit load on November 1, 1968. (b) The "B" Structure Bulkhead Test will be conducted November 18, 1968, to obtain additional data. This test is no longer considered a constraint on the S-II-3 launch. (c) Repairs have been completed on the "C" Structure and the "Two Engine Out" Test is scheduled for the week of November 11, 1968. ✓

3. Strain Gages for Wind Monitoring: The advantage in using strain gages for launch release wind criteria was reported in the structural assessment portion of the DCR. The strain gage system in S-IC-3 uses flight instrumentation and will be active for countdown of AS-503. The strain gage systems for S-IC-4 and S-IC-5 are hard wire to the LUT and work load and design problems with the new systems resulted in the gages being dropped. An R&DO team will meet with KSC this week to attempt to find a work-around solution which can be incorporated in AS-504. ✓

*Lee J  
To use the  
Config. Control  
Board's famous  
logic!  
If the gages  
were mandatory  
for 503,  
how can  
they be  
dropped for  
504?  
Wind is!  
Wind!  
B*

4. S-II Corrosion: Corrosion problems have been encountered under the new S-II spray foam insulation. The problem has been isolated to the primer used on the aluminum prior to spray foam application. A new primer has been qualified and planning is underway to replace the spray foam over the weld close-out areas in S-II-8 and S-II-9. The new primer will be used on all subsequent stages prior to spray foam application. ✓

5. AS-504 Launch Pad: KSC has inquired as to possible constraints if AS-504 were changed from the presently assigned Pad B to Pad A. We have established with R&DO that only minor software changes would be involved and no schedule impact on software delivery would be incurred if the decision is made by December 25, 1968. ✓

11/12/68

B 11/13

MSFC Support of MSC - Mr. Jack Heberlig (Asst. to Max Faget) visited MSFC and talked with EO, ME, and P&VE about need for fabrication assistance in connection with a Supporting Development program. In lieu of funds for supporting contractor he hoped MSFC could fabricate in-house various items for their STB (Subsystems Test Bed) beginning with a "window frame." The possibility will be further discussed within and between the two Labs and an alternative idea of using MTF will be considered.

*See my remarks on Shop's attached note 12*

OART Research Program Review - This review which was to be held at MSFC for Dr. Kurzweg on November 12, 13, and 14, has been rescheduled tentatively for January 14, 15, and 16. ✓

Materials for OART Congressional Presentations - A second supplementary package of materials for the OART Congressional Presentation (requested by Mr. Beggs) was sent to Headquarters November 4. The package contained descriptions, exhibits and one film clip. ✓

Dr. von Braun:

Shop

This cooperation is a fine idea if by cooperating and doing this type of work for MSC, we do not slow down our internal efforts. I think if we commit to Faget to do this fabrication for their Subsystems Test Bed, we should make certain that our mockups, medical instrumentation and concept of the new space station have been adequately considered. ✓

*Yes. In addition, Fab Lab should determine whether they could really take this on without any additional supporting contract or funding. Suggest to tie in Lee Below who*

JTS

11-12-68

*Knows the overall MSFC - MSC interface best.*

1. AS-205/S-IB RETRO ROCKET PERFORMANCE: The performance of the S-IB retro rockets on AS-205 has been concluded to be satisfactory and within the specified limits based on performance parameters which were obtained from analysis of the accelerometer data by Chrysler and considered to be accurate within 10%. The multiple (15) pulsations noted in the luminosity of the exhaust gases are therefore believed to be an indication of shock wave disturbances and not an indication of possible malperformance of the retro rockets. Similar pulsations were found in previous Saturn IB launches but not as frequently or distinctly.
2. S-II STRUCTURES TEST: "B" Structure: The test specimen is being prepared for a test on 11-18-68 to accomplish the test of the S-II end boost condition prior to the AS-503 FRR on 11-20-68. "C" Structure: The "C" Structure repair was completed on 11-4-68, 5-days ahead of schedule, through the extra week-end and night effort of personnel from R-ME, R-QUAL and R-P&VE-S. We expect to begin the small amount of remaining testing this week.
3. BIO-MEDICAL EXPERIMENTS: Dr. Gilruth's letter to you authorizing us to proceed has been delayed, apparently due to Dr. Dietlein's (Dr. Berry's Assistant Director) illness (he caught the flu at MSFC) and a subsequent TDY. Dr. Dietlein has told his people that he wishes to write the letter himself.
4. S-II STRESS CORROSION FAILURE: A 7075-T6 frame segment was found to be cracked during the post static firing checkout of S-II-505 at MTF. The frame segment, which is machined to a complexed shape from bar stock, is used to mount one of the instrumentation signal conditioning boxes to the aft skirt. North American Rockwell (NR) is considering removing the other frame segments and reheat treating to the T-73 condition. This is the first stress corrosion failure detected on the S-II stage and the item had been identified by NR on the survey. No impact on AS-503 is expected.
5. S-II PRIMER/CORROSION STUDIES: We made another comprehensive review of work at NR relative to the elimination of corrosion that has been observed under certain of the insulation systems. The involvement of NR "Science Center" personnel at the time of the last review contributed significantly to the program. Analyses of the mechanism of corrosion by the Science Center personnel were beginning to yield results that tend to corroborate earlier speculation about the influence of water, freon, and the Primer on the corrosion.
6. LOW FUEL NPSH J-2 ENGINE TEST: The malfunction simulation test conducted at Rocketdyne in which loss of fuel NPSH was programmed resulted in a safe shutdown. Shutdown was caused by failure of a bellows in the cross-over duct between the fuel and lox turbines resulting in loss of power to the LOX pump and a subsequent fuel rich shutdown. Temperature measurements indicated that the fuel turbine exhaust gas temperature was 1040°F which was not hot enough to cause burn-out of the duct. The exact cause of the duct failure is therefore not known at this time. During this test the NPSH decayed from approximately 120 feet to approximately 50 feet at failure in 26 seconds. A rerun of the test is being considered in which the worse case S-IVB decay rate (12 seconds from 120 feet to failure) will be programmed.

B.L. Could it fail in the same fashion in a vacuum? (ASI line phenomenon should remind us not to be too quick in our judgment!) B

11/12/68

B 11/13

TASK WORK PACKAGE SYSTEM (TWP) - The objective of the TWP system proposed by MSF is to assemble a description of the tasks to be done and the schedule and manpower required to do the work into one document. The test implementation, initiated July 17 and completed October 17, did not adequately accomplish this objective. The output from the test was invalid because of changes to programs which occurred after the guidelines were published by MSF (June 14, 1968).

H.M.  
Didn't  
take much  
imagination  
to foresee  
that result!  
B

The requirement to plan manpower by stage, down to the laboratory organizational element, made the system data difficult and cumbersome to assemble and to change/maintain. The further requirement to list skills by project added to the data manipulation and the result was of doubtful value. Mr. Wible has informed us that the required detail may be reduced. We feel that project level for each Center should be sufficient for MSF planning purposes.

Mr. Wible has recommended to Dr. Mueller that a system be implemented on a semi-annual basis, probably in conjunction with the POP cycle. His proposed management instruction is due here next week for our preliminary review.

MSF INSTITUTIONAL PLAN - This week we received preliminary Institutional Planning Study guidelines from MSF. The study is to be developed under the general guideline that MSF resources must show a decline and it requires that we identify the resources (costs, civil service, support and prime contractor manpower, and facilities) thru 1974 required to support current and proposed MSF programs. In addition we are asked to identify the following:

1. Possible elimination of existing contracts or effort
2. Cost reductions under present contract structure
3. Possible contract consolidations
4. Changes to present funding of support contracts
5. Changes to work being performed in-house vs out-of-house
6. Restructuring of our organization to improve over all operations
7. Utilization of existing facilities including proposed closings or consolidations and description of new facilities required
8. Proposed changes to present budget structure
9. Capabilities and desires for performing future planned MSF programs
10. Capability and availability of resources to assume new work (NASA or non-NASA) not covered in present MSF plans
11. Resource requirements for various production and flight rates

only  
MSF  
pro-  
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How  
about  
MSF  
and  
OSO  
work?  
E

We are scheduled to review the preliminary guidelines with MSF on November 13, receive final guidelines on November 18, and then have an in process review with MSF during week of December 15. Submission of the Center plan is due on January 15 and a presentation to MSF management is scheduled for February.

Please brief me with this

In the light of the complete uncertainty of the FY 70 budget, this is just another attempt to "pin down the unpinable". Suggest we send MSF a questionnaire on hard questions which must be answered first B

# OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	<input type="checkbox"/>	<input type="checkbox"/>
DIR	J. T. Shepherd		A	I
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			R	N

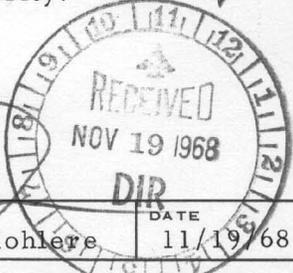
**REMARKS**

Subject: Notes 11-12-68 MOHLERE

Responding to the questions raised by Dr. von Braun re "National Academy of Sciences" entry:

a. Dr. Shelton was the MSFC liaison between the Center and the NAS for the Postdoctoral and Senior Postdoctoral Resident Research Associateships supported by NASA and tenable at MSFC. Dr. Curry, NAS Program Administrator, was quite anxious to have a designee to succeed Dr. Shelton. Dr. Bucher's name was submitted by Dr. Stuhlinger. The thought is that Dr. Bucher and I will monitor the Program.

b. Re Dr. Curry's statement endorsing MSFC as a desirable location for NAS research activity - he was referring to the desirability of MSFC as a location for placing Associates. My apologies for the lack of clarity.



CODE	NAME	DATE
AST-U	E. D. Mohlere	11/19/68

NATIONAL ACADEMY OF SCIENCES

In recent discussions with Dr. Tom Curry, National Academy of Sciences, George Bucher of Space Sciences Laboratory has been nominated as replacement for Dr. Shelton. Dr. Curry indicates considerable interest in Marshall as a particularly desirable location for NAS research activity.

as what?

RELATIONS WITH UAH

What does that imply? B

For some time we have been engaged in an endeavor to have UAH recognize certain of MSFC part time professorial talent as adjunct professors. Leadership at UAH indicated favorable reception of the idea but have been somewhat difficult in getting to specifics. I intend to make one more effort locally before raising the issue to Tuscaloosa. Marshall seems to be about the only Center that does not enjoy such a relationship.

Following are the advantages of establishing adjunct professorship:

- a. Recognition of participating MSFC personnel by the academic community as members of the university faculty. This identification I consider the most important advantage.
- b. Enhancement of the ties between University and MSFC.
- c. Provide a first step for facilitating the degree of interchange between MSFC Labs and University Labs envisioned by the Federal Council for Science and Technology.
- d. In general, the move should pave the way toward a closer and more meaningful MSFC-University relationship to the advantage of the MSFC image as a science oriented center.

11/12/68

1. AAP Safety Requirements from MSC:

The Flight Safety Group at MSC is concerned about hardware and operational safety requirements for the AAP systems at MSFC in which the Astronauts are a part of the system. Currently, they are staffing a letter through program channels from Mr. Thompson to Mr. Belew requesting an early joint Center meeting to discuss these requirements. Local efforts were successful in changing an original MSC plan to arbitrarily impose manned safety standards and criteria without any prior discussions.

We now need to be well prepared for this meeting.

Lee Belew

2. System Safety Activities for Future Space Station:

We participated in a review of the future Space Station, Phase B Work Statement at Dr. Jack Wild's office, NASA Headquarters, on November 7, 1968. Working with the Advanced Systems Office, we are assuring that systems safety requirements are clearly portrayed in the work statement to insure necessary planning for maximum systems safety needs of the future Space Station.

NOTES 11/12/68 RICHARD

11/12/68

BMB

No submission today.

B 11/3

1. Zero "g" Manufacturing Technology Meeting: The meeting was attended by senior representatives from 48 industrial companies (50 had been invited), very largely non-aerospace and from five government agencies. Comments received since the meeting indicate a high level of interest and, in fact, Hans Wuenschler has been requested to give briefings to senior management at Chrysler (Detroit) and at DuPont (Wilmington). Although we had not intended to do so, demand has made it necessary for us to put together a book of all the papers presented for distribution to the participants and others. The publication will be ready in about two weeks.

2. Plasma Energy Analyzer: A 127° energy analyzer was delivered to SSL on October 31. The device is intended for the analysis of the energy spectrum of plasma streams for later ionospheric applications. The apparatus was designed by ME Lab's Tool Engineering Branch from a conceptual sketch and design criteria supplied by Dr. Rehmann, an NSF Fellow attached to SSL. The analyzer can be baked and is suitable for use in a vacuum of  $10^{-9}$  torr. It consists of 21 precision machined parts with tolerances in a range of  $\pm .0001$ " to  $\pm .001$ ". It weighs 810 grams and can easily be contained in one's hand. Special fixtures were made for assembly and alignment to tolerances of  $\pm .001$ ". Close liaison with Dr. Rehmann plus producibility evaluation on certain parts reduced design and fabrication time to approximately eight weeks.

M.S.  
 There will we later apply this analyzer? Is this an AIP experiment?  
 B

3. Manufacturing Technology for Application of High Performance Insulation: The objective of this program which has been carried on over the past few years at a low priority level is to develop manufacturing technology and processes for applying high performance multilayer insulation to space vehicles. Plans at this point include completion of the insulation of a 105" tank to test the thermal performance of the insulation system developed under contract with Goodyear, and completion of the modification of a 105" tank to obtain better applied thermal conductivity data on large scale tanks. During the past year, our shops have insulated one 20" diameter tank, manufactured many small samples for materials tests, and provided support to the Structures Division of P&VE on sled test of the 105" tank insulated with the Goodyear insulation. Under contract, Boeing demonstrated manufacturing techniques for application of thick layers of multilayer insulation to a large conical support structure. Presently, under contract, Boeing is developing a low heat leak conical support for the 105" tank. We have learned through our experience and that of our contractors that one of the major problems yet unsolved in the application of multilayer insulations is that of the control of the number of layers for a given thickness, and therefore of the control of the K factor.

NOTES 11/12/68 SPEER-

11/12/68

B 11/13

Apollo 8 Launch Rules: The Apollo 8 Launch Mission Rules Review was held at KSC on 11/8. The MSFC group was headed by Lee James and myself. Items of general interest: (1) Principal agreement was reached on how to use bending moments in addition to anemometers for implementing launch wind constraints; (2) The present assessment of a 36.5 knot (60 ft.) wind limit for swing arm #9 is of considerable concern due to long exposure times and will be re-evaluated; (3) Range safety analysis for engine #3 out and southern azimuths is yet to be completed by the Eastern Test Range; we expect the usual problems; (4) KSC proposed modifications in the present hold/recycle constraints of the L/V functional sequence prior to lift off; these will permit a longer hold capability during chilldown by giving up one of the recycle capabilities and will be of great potential value as we approach the end of a daily launch window; (6) An additional review is required of the rules and interlocks associated with the depletion sensors in each of the three stages. ✓

NOTES 11-12-68 Stuhlinger

11/12/68

B 11/13

No submission this week.

NOTES 11/12/68 TEIR

11/12 9FA

B 11/13

SATURN IB APOLLO RUNOUT COST: In preparation for the forthcoming Congressional sessions, Jerry Kubat, NASA Headquarters, is reviewing the overall reasons for the increase in the Apollo Program runout cost. Jerry Kubat has requested a chronology of the changes with reasons in the Saturn IB runout costs since POP 67-1. Our evaluation shows an increase of \$15. M in the Saturn IB costs between the MSFC January 1967 POP 67-1 (\$1,033.5M) and the MSFC October 1968 POP 68-2 (\$1,048.5M) projected runout costs. Net changes in runout cost in the last two years have been small despite schedule stretch-outs due to our continuing actions to support economy measures. ✓

NOTES - WILLIAMS - 11/12/68

11/12 95A

B 11/13

F.H.  
Can I  
get a  
copy?  
B

I. Earth Orbital Program: The Space Station Project Definition work statement will be sent to Headquarters on November 12. Copies of this version will be distributed internally on the afternoon of the same day and sent to MSC, KSC, and Langley. A copy of MSC's work statement will be delivered to the MSFC representative (Jeff Hamilton) for us. It is still planned to meet initially with MSC, and then with Headquarters and other Centers for finalization of the coordinated work statement. ✓

II. Lunar Program: MSFC received \$300K to perform the Lunar Cargo Delivery System (Saturn IB or Titan III plus Centaur plus landing stage) study. On the basis of our FPPB meeting, I informed Headquarters that we do not have the manpower to manage the study. Headquarters (LEO) then asked JPL to manage the study; they accepted. C. Mathews heard of this and asked MSC if they would do the study; MSC (Faget) said yes. We have been asked to supply MSC with a copy of our statement of work, past study results, etc., in order to prepare for the study, and are doing so. ✓

Who does  
it now?  
JPL  
or MSC?

III. Other Technical Program Related Data: Mr. Weidner was briefed on November 8 on status of preparations for our participation in the Grumman PX-15 Underwater Project. Mr. Weidner agreed in principle with the MSFC involvement in these activities; we are proceeding with necessary steps for implementation and will keep you informed of progress. ✓

Dr. von Braun:

I believe our participation in the PX-15 should be pursued; however, you should be aware that Chuck Mathews has some grave doubts about the PX-15 project.

JTS  
11-12-68

Please file me in on this B

*nancy*  
**NOTES** file  
*dieter 11/27* JFS  
NOV 27 1968 B11/30

NOTE TO: Dr. von Braun, DIR ✓

FROM : Manager, Saturn/Apollo Applications Program,  
I-S/AA-MGR

SUBJECT: Mr. Grau's Weekly Notes to von Braun concerning  
Saturn I Workshop Project dated November 12, 1968

Dieter Grau's note to you concerning the MDA C "barebones" proposal on the Saturn I Workshop Project was obviously written before the evaluation of the proposal was completed. The reductions in the area of quality assurance, reliability assurance, acceptance testing and checkout, as proposed by MDA C, was the minimum program that they, as a company, were willing to conduct and still stand behind the Workshop as a flight-worthy piece of hardware.

The total proposal has been under evaluation by the R&DO labs and my office since mid September. All cognizant labs participated in the evaluation. Mr. Henning and Mr. Landers, who work for Mr. Buhmann of R-QUAL, were the active participants from the Quality Laboratory. Mr. Garrett and Mr. Faulkner of P&VE attended discussions of the proposal last week at Huntington Beach.

To answer Mr. Grau's concern specifically, the following agreements were reached:

a. Proposed: Limit checkout operations at Sacramento to the booster stage only and conduct all OWS checkout and verification at KSC.

Resolved: Complete checkout of the Workshop at SACTO will be accomplished and a thoroughly checked out stage will be delivered to KSC.

b. Proposed: Deletion of all formal qualification testing and replacement with design verification testing at the discretion of the contractor.

Resolved: Qualification testing will be accomplished on all criticality categories I and II components, with NASA participation and control.

agenda ~~held~~  
12/12/68  
11-11:30

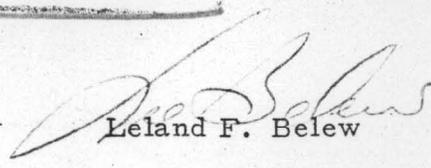
- c. Proposed: Deletion of internal quality audits.  
Resolved: Internal quality audits will be required.
- d. Proposed: Major relaxation of vendor procurement controls.  
Resolved: Vendor procurement controls will be implemented.
- e. Proposed: Elimination of all government inprocess inspection.  
Resolved: Inprocess government inspection will be required.
- f. Proposed: Deletion of quality reporting documents.  
Resolved: Monthly quality reporting will be required.

The AAP-2 Systems Engineering effort to be performed by MDAC is currently undergoing evaluation by Ludie Richard and George Hardy with Lab participation. The MDAC and Martin participation in Systems Engineering support to MSFC is being evaluated jointly to assure adequate Systems Engineering effort with a minimum of duplication by the parties involved.

The total evaluation of the MDAC proposal is essentially complete. I feel it will be appropriate for us to give you a presentation on the currently planned Workshop Program. We could be prepared to do this any time after the end of next week.

Shup  
or  
Jonnie

Please arrange  
2/1/30

  
Leland F. Belew

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

Enc:  
Cy of Grau Note

has taken place  
12/10/68  
Discussion per Belew

11/15/68  
B 11/13

1. SATURN I WORKSHOP PROJECT: This Laboratory participated in the review of the McDonnell-Douglas "Bare Bones" proposal, and we are very concerned with their concept of quality and reliability assurance. Drastic reductions in the areas of quality assurance, reliability assurance, acceptance testing, and checkout are proposed. Some specific examples are as follows:

- a. Limit checkout operations at Sacramento to the booster stage only and conduct all OWS checkout and verification at KSC.
- b. Deletion of all formal qualification testing and replacement with design verification testing at the discretion of the contractor.
- c. Deletion of internal quality audits.
- d. Major relaxation of vendor procurement controls.
- e. Elimination of all government inprocess inspection.
- f. Deletion of quality reporting documents.

This list is by no means complete, but it indicates the scope of the contractor's approach. The R&DO Engineering Manager has been informed through formal memorandum of this Laboratory's position and discussions are being held with the Lead Laboratory at this time.

Lee Below  
FYI and comment

D.F.  
Please see me posted

Drummond  
Prepare brief  
reply on  
approach +  
status  
very quickly  
f

2. MTF QUALITY & RELIABILITY SURVEY: A survey of the MTF organization and all associated contractors, except the Boeing Company, was conducted during the period October 21-November 1, 1968. Approximately 40 discrepancies were noted against the various elements. From a quality systems standpoint, the Rocketdyne/government interface area had the most problems. It was the opinion of the survey team that MTF and the associated contractors, in general, have adequate quality systems.

3. SA-503 COMPONENT CERTIFICATION OF QUALIFICATION (COQ): The current status of SA-503 COQ's is as follows:

Stage	Required	Signed	Open
IU	69	69	0
S-IVB	218	209	9
S-II	300	287	13
S-IC	155	150	5

11/21

✓

Nov. 18, 1966

212

B  
11/19

NOTES 11/18/68 BALCH

11/18/68

MISSION:

S-II-5 - Stage was installed in the Vertical Checkout Building on 11/14/68 for insulation modifications and repair and installation of Parker pre valves for LH<sub>2</sub>. Schedule is now firm for shipment to KSC on 12/7/68. Turnover meeting is still set for 11/21/68. ✓

S-II-6 - Stage is in the A-2 Test Stand undergoing post-static checkout. Shipment to KSC is scheduled for 1/26/69. ✓

S-II-7 - Stage arrived at MTF on 11/12/68 and was installed in the A-1 Test Stand on 11/13/68. Cryogenic proof pressure test and static firing are scheduled for 1/7/69. ✓

S-IC-8 - Stage arrived at MTF on 11/13/68 and was installed in the test stand on 11/14/68. "Power-up" has now been rescheduled from 12/5/68 to 12/2/68, and static firing is tentatively rescheduled from 12/31/68 to 12/19/68. ✓

BOMEX - Discussions meeting on BOMEX software was held at MSFC on 11/14/68, with representatives from ESSA, R-AERO, R-COMP, I-DIR, and MTF attending. The ESSA representatives were well impressed with the talent and capabilities of the MSFC specialists, and our MTF representatives were very pleased with their cooperation. We will continue to call upon their scientific expertise, which is so necessary for the success of the BOMEX program. ✓

INSTALLATION:

University Research - Ed Guilian and Col. Mohlere are due at MTF today to discuss MTF delegation for university affairs. Sustaining grant to Mississippi State University has been reviewed at MTF and is being released to NASA Headquarters for approval and funding. ✓

GENERAL:

Legal Affairs - In the suit of M. O. Pigott against Boeing for damages from the static firing of the S-IC-5 on 8/25/67, a hearing was held on 11/16/68 before Judge Dale of the Circuit Court of Pearl River County, Mississippi, of arguments relating to a Boeing motion to dismiss the case. The judge sustained the motion to dismiss. It is possible that the ruling may be appealed.

11/18/69

B 11/19

ATM EXPERIMENT COORDINATION MEETING: An ATM Experiment Coordination Meeting will be held at MSC on November 20-21. Representatives of the Principal Investigators, ESSA, NASA Headquarters, MSC, KSC, and MSFC are expected to attend. Items to be discussed include: (1) Mission Control Center, (2) H-Alpha Telescope Cross-hairs, (3) LM Cabin Photographic Camera Requirements, (4) Radio Noise Burst Monitor, (5) Spacecraft Contamination, and (6) AAP RF TV Downlink. ✓

LM/ATM UNMANNED RENDEZVOUS AND DOCKING: MSC presented the final results of their study on LM/ATM unmanned rendezvous and remote docking to Dr. Mueller and the AAP Program Managers last week. MSC results show that unmanned rendezvous and station keeping can be accomplished using the LM Guidance System and manned simulations have shown that the LM/ATM can be docked to the cluster from a remote station in the MDA or by manual backup control from the CSM. High fidelity simulations will be conducted in the next two to four weeks. ✓

AAP SOFTWARE REVIEW: Last week, MSFC and MSC presented each Center's approach to the development of software for AAP to the AAP Software Task Team headed by Dr. Mueller. MIT now has ten people assigned to start working the CSM and LM software and MSC expects to retain MIT at this level until mid 1969, then peaking at 250 in FY70. This level would support the Grumman requirement for simulation software by mid 1970 and software for flight hardware checkout by mid 1971. ATM software being developed by MSFC will be available for crew simulations in early 1970 and for systems verification during the last half of 1971. A decision has not been made to date as to which Center will let the AAP LM software contract to MIT. ✓

NOTES 11-18-68 BROWN

BROWN 11/18/68

F-1 Engine - The potential return of the 1A Test Area at Edwards to the Air Force was discussed in a joint NASA/Air Force meeting at Edwards on November 6, 1968. The Air Force proposes to use test stands 1A and 1B plus the applicable sections of the Control Center in the Low Cost Booster Test Program. The Air Force identified their requirements and submitted a tentative plan of action, which will be coordinated at MSFC. No NASA commitment was made.

Notes  
B 11/19  
Bill  
Brown  
Request  
a briefing  
B

J-2 Engine - Reference my notes of 11-12-68. A repeat of the November 11 fuel depletion test was conducted November 15, 1968. The test was terminated by the thrust O.K. pressure switch (as was the first test). The fuel NPSH at shutdown was less than 50 ft. An inspection revealed that the crossover duct which carries hot gases from the fuel pump to the LOX pump had ruptured. The duct failure was the same as that experienced on the first test. Test data and the failure mode are being reviewed before a decision to conduct further testing is made. ✓

At the PFRR on November 15, a decision was made to replace the S-IVB-503 start tank fill valve. This change was considered necessary because of a recent failure of the refill portion of the valve in flight worthiness verification testing at Rocketdyne. The replacement valve arrived at KSC November 17, 1968, and the installation is currently underway. ✓

During an inspection of fuel pump ball bearing assemblies at Rocketdyne, some small cracks were found in some of the ball bearings. Of 52 new bearing assemblies inspected, 3 were found to contain a total of 4 cracked ball bearings. Inspection is continuing. As yet we have not identified any cracked bearings in engines. Rocketdyne Quality Control is running a traceability study at the vendor's plant in an attempt to locate all discrepant hardware. A fuel pump is being built up with a bearing assembly containing cracked ball bearings and tests will be conducted to evaluate the discrepant bearings. AS-503 is unaffected by this problem so far as we know at this time. ✓

CONSTAN 11/18/68 NOTES

11/18/68

B 11/12

Nothing of significance to report.

GEISSLER

11/18 JVS

1. Pre-launch Loads on AS-205: Some confusion has apparently developed concerning the relative accuracy of the predicted ground wind bending moments and the actual measured moments on AS-205. Measured data shows the loads varied between approximately  $1.25$  to  $1.85 \times 10^6$  in.-lbs at vehicle station 942 for the time period of approximately one minute before launch. Using wind data for this same time period results in predicted loads of  $1.4$  to  $2.1 \times 10^6$  in.-lbs for the same vehicle station. Considering these small loads, this comparison is very good. Notes 10/21/68 Lucas indicated a measured bending moment of  $3 \times 10^6$  in.-lbs prior to launch of AS-205. This load occurred approximately three hours before launch. The wind data for this time period indicates the wind direction was varying from approximately 70 to 88 degrees. Over this wind direction range, the predicted ground wind loads vary quite sharply; however, using this wind direction variation and the associated wind magnitudes, the predicted loads would be from  $1.9$  to  $3.2 \times 10^6$  in.-lbs, which brackets the measured data very well, even though the system was exposed only to small loads. It should also be remembered that predicted ground wind loadings are the maximum loads predicted to occur under the design wind profile condition. Thus, these are predicted loadings that are not expected to be exceeded under design conditions. Therefore, valid comparison between measured and predicted ground wind loads can only be made after predicted loads are connected for the actual wind conditions.. ✓
2. AS-503 S-II Actuator Hardover Inboard: A new mission rule has been written for an S-II engine actuator hardover in the inboard direction. If this failure occurs it will cause the engine heat curtain to burn through. The hot gases will subsequently enter the boat tail of the S-II and burn through a wire bundle and ultimately the thrust structure will fail. It has been determined that approximately 15 to 25 seconds will elapse, after the heat curtain burns through, before the electrical harness fails. There are no spacecraft cues to allow the crew to determine which direction the actuator has failed; therefore, the ground must request the abort or early staging, which ever is required. The cues will be: (a) Actuator deflection hardover inboard and (b) Roll attitude error of 5 degrees and (c) Roll angular rate of 5 degrees per second. The ground action will be: (a) Abort prior to S-IVB capability to orbit or (b) Early stage after S-IVB capability to orbit. ✓
3. BOMEX: Upon request of MTF, personnel of our Aerospace Environment Division met with representatives of MTF, GE, ESSA, IO, and COMP on the software definitions. Two aspects of the problem exist-data reduction and scientific computation. ESSA requirements dictate both subjects and they still need more definition and documentation by ESSA. The discussions revealed little if any advantage to adapting our atmospheric data reduction and scientific programs due to unique ESSA needs and data formats. To be successful, the Bomex software work will require a close working relationship between GE programmers and ESSA-BOMEX personnel with MTF coordination. Due to nature of data and project, a detailed contract definition of all software needs will be very difficult, if not impractical, at this time. However, the Bomex software effort as discussed at the meeting can be accomplished if the GE-MTF-ESSA contract working relationships are reasonably flexible on software. We will continue to provide consultant services to MTF wherever feasible. ✓

11/18/68

1. NONDESTRUCTIVE TESTING PANEL DISCUSSION: Mr. Robert Neuschaefer of our Laboratory recently taped an educational television show entitled "R&D Review" for Channel 28, KCET, in Los Angeles, California. He participated as a panel member with Messrs. Bill Hitt of Automation Industries and Conrad Boekamp of General Dynamics/Convair, in a discussion moderated by Dr. Albert Hibbs of Jet Propulsion Laboratory, on the subject of nondestructive testing. The fifty-six minute show is scheduled for showing on fourteen educational TV stations throughout the nation, including those in Los Angeles, San Francisco, Houston, and Seattle. It is anticipated that the program will be shown on additional stations in the future.
2. NASA SAFETY DIRECTOR'S FUNCTIONS: The NASA Safety Director, Mr. Jerome Lederer, addressed last week the local chapter of the American Society for Quality Control on the subject "Product Integrity". I enjoyed listening to Mr. Lederer and was impressed with the practical approach he takes. About 70% of his talk was devoted to subjects this Laboratory deals with even if not in all cases to the extent he would like to see it. The rest of the talk explained his place in the NASA organization in the introductory part, and in the closing part a strong endorsement of the need for manned spaceflight where he bucked the present propaganda that unmanned flights are all we need. He cited correcting steps taken by astronauts during the Apollo 7 flight as well as manufacturing in space to illustrate his position.

As I had noticed during the speech Mr. Lederer's preoccupation with quality and reliability problems (which are the foundation for safety assessment), I asked him after the meeting about his relationship to Dr. Condon's office and I received the surprising answer: "I do not know John Condon and what he does, but it is on my program to see him in the very near future."

Since some elements of Headquarters showed so much interest lately in the functional and organizational setup of quality and reliability in MSFC, you might have some day the opportunity to point out that some streamlining in the upper echelons would not be a bad idea either.

I invited Mr. Lederer to come to this Laboratory for an informal orientation. He gladly accepted and will try to incorporate such a visit into his schedule within the next 3 weeks. ✓

NOTES 11/18/68 HAEUSSERMANN

11/18 JTS

1. Hydrogen Maser Relativity Experiment. We have postponed your briefing on the Relativity Experiment originally scheduled for November 27 for the following reasons. A preliminary estimate of the cost for this project came to about 40 million dollars. This figure includes a Titan III C launch vehicle (21 million) and the satellite (15 million). The PI's, particularly Professor Ramsey (Harvard), are concerned about the cost of the total project. One factor which may have initiated their concern is the drastic general reduction of research money for universities. Within the next three weeks, the PI's will decide if they will support the experiment at this cost level. In the meantime, possibilities for reducing the experiment weight resulting in a less expensive launch vehicle will be investigated. The scientific value of the experiment has not been questioned at any time. Actually, a recent change in the experiment concept (use of a highly elliptical synchronous orbit instead of a circular synchronous orbit) has increased the scientific content of the experiment considerably. The cost of the elliptical orbit experiment may be higher than the 40 million estimated for a circular orbit. The impact of the elliptical orbit scheme on the experiment implementation will be analyzed during the next months. We will reschedule the briefing within a few weeks as soon as we see a clear situation. ✓

NOTES 11/18/68 HEIMBURG  
11/18/68

B 11/19

ECS TEST ON SPACECRAFT/IU/S-IVB INTERSTAGE CONFIGURATION We have a set-up to perform tests for P&VE on the IU/SLA Prelaunch Environmental Control System and to develop the changes to the system required when MSC installs the Radioisotope Thermo-Electric Generator (RTG) on the LM Landing struts. The test setup consists of an S-IVB aft skirt, S-IVB forward skirt, LH<sub>2</sub> forward bulkhead, IU and LM stages in the SLA. The first test to establish the present Cape conditions was made last week. A thermal model of the RTG will be installed and subsequent tests will develop and check the modifications to the ducting and gas flowrates required. ✓

ACCESS ARM NO. 9 (AA-09-02) The test program on the AA-09-02 Access Arm should be completed by 11/21. A post-test review of the test program is scheduled with KSC on 11/19. Approximately three days are required to remove the arm system from the Test Area; therefore, Boeing should have all hardware by 11/23 for shipment to KSC. ✓

S-II LH<sub>2</sub> FILL LINE STRUCTURAL TEST At approximately 2 p.m., 11/15, word was received to prepare for and conduct additional S-II Structural Stage Tests to verify stage structural integrity when applying new LH<sub>2</sub> propellant line disconnect interface loads. Tentative plans are for one ambient test late this week and a cryogenic test approximately three working days later. ✓

MOBILITY TEST ARTICLES Testing on the Dynamic and Power Phase of this project has been completed. Additional tests will be conducted only if required, due to bad data, etc. A meeting was held this week with Dr. Rodgers of R-P&VE (Human Factors) to discuss the Human Factors Phase of the project. These tests will probably begin late in December 1968. ✓

H-1 TEST STAND (MSFC) A 140 seconds duration test firing of H-1 Engine H-2039 is planned for week of 11/18-22/68. This is a 188K engine that has been in storage for five years. ✓

MODERATE DEPTH LUNAR DRILL The Joy Manufacturing Company contract has ended and the hammer/bits designed and fabricated under this contract have been received. This system will be set up at Building 4649 and testing should begin the first week of December 1968. ✓

F-1 ENGINE Final preparations were made for testing with the fuel out-board pulsing system at the West Area F-1 Test Stand. This testing will be held until completion of rejuvenated S-II fill line testing. ✓

F-1 TURBOPUMP The inboard PVC duct (503 configuration) has not been received by Test Laboratory for testing. We were to have received it on 11/14. According to P&VE Laboratory, the PVC duct is on the Arsenal and should be delivered to R-QUAL today for inspection and to Test Laboratory tomorrow, 11/19, for testing. Every effort will be made to accumulate 500 seconds on the PVC duct prior to 12/1/68. ✓

11/18/68

B 11/19

1. INQUIRY FROM JPL ON REMOTE TERMINAL EXPERIENCE: The Jet Propulsion Laboratory has requested information concerning our experience with remote terminal inquiries into engineering data files maintained in computer storage. They are apparently considering going on-line with certain engineering data in the near future. A representative from JPL plans to visit Computation Laboratory for assistance in planning their system. ✓

2. SATURN V CONFIGURATION INTEGRATION AND TRACKING (SCIT) AND CONFIGURATION MANAGEMENT ACCOUNTING (CMA) PRODUCTION MILESTONE: A dynamic data retrieval and reporting system has been implemented for use in selecting, formatting, and reporting information from the SCIT and CMA data base. By completion of a single form, a user can define the criteria or constraints that must be met for data selection from the data base, and the report format desired. This retrieval and reporting system is currently operating in a batch mode which allows for overnight turnaround of requested reports. However, when plans for installing remote terminals are complete - now scheduled for first quarter 1969 - this capability will exist in an on-line environment thereby assuring access to SCIT and CMA data base information on a more timely basis.

H.A.  
Are we  
doing this  
by request of  
The Apollo  
Program Office?  
Who pays for  
this?  
B

11/18/68

1. S-IVB Auxiliary Propulsion System (APS) Modules: An APS Module Test program was initiated in December 1967 to satisfy Gen. Phillips' request to provide modules capable of 90-day standby time after loading hypergolic propellants. Scheduled testing of the first module was completed in September 1968. Although no problems were encountered that were attributed to corrosion, the interaction of moisture with fuel residue in the combustion chambers caused a gradual reduction in chamber pressure with subsequent firings. As a consequence, burp firings on the launch vehicle at KSC were eliminated on AS-205, AS-503, and subsequent. Of greater significance were the vibration problems encountered in the first module during the vibration test at the end of the hold period. A part of the problem was attributed to an overtest condition, in an attempt to simulate the new higher levels actually encountered on AS-501 and AS-502 flights. These levels were higher than originally used in the qualification of the module. As a consequence, a new module was subjected to the vibration test. The test was completed on November 7, 1968, with the desired levels being more closely simulated and no significant failures encountered. The APS modules are qualified for flight, AS-503 and subsequent, and MDAC/MSFC have reached agreement to extend the hold capability to 75 days for AS-503. Analysis is underway to extend the hold capability to 90 days for AS-504 and subsequent. ✓
2. Completion of the "Two Engine Out" Test of the "C" Structure closes out the planned S-II Structural testing at MSFC. The test indicated that the structure would sustain a 110% limit load without failure. Some additional testing may be required on the "C" Structure at the test lab in the LH<sub>2</sub> and LOX fill coupling areas. Investigations and test are underway at Seal Beach on a potential load problem due to change of predicted load by KSC from the Facility Flex lines. If further analysis and testing does not clear the problem, high priority tests may be necessary on the "A" Structure to prove adequate margins for the AS-503 launch. ✓
3. GAO's Review of S-IVB-503 Accident: NASA/GAO Exit Conference was held November 15, 1968. MSFC representatives were Messrs. Dyer, I-DIR; Eubanks, I-CO-S; Hughes, I-V-SIVB; Carr, R-QUAL; and Lunde, R-QUAL, Rep. at Huntington Beach. Mr. Hughes presented the results of the MSFC review of the draft GAO report with the support of the MSFC team members, Mr. White, Apollo Rel. & Q.A. Office, and Mr. Condon, Headquarters Director, Rel. & Q.A. Office. The MSFC comments were favorably received. However, it is difficult to judge to what extent the draft report will be revised. It did appear that GAO was willing to remove or alter statements criticising NASA and the Air Force quality assurance programs. ✓

11/18/68

B  
11/13

Meeting of the OART Advisory Committee on Electronics - I attended the scheduled meeting of the Committee at Boston on November 12-13. The purposes of the meeting were to review and summarize the work done during the past twelve months by the Committee and the subcommittees, to lay out the topics and approaches for the discussions this year and to review the E. R. C. work in electronic components research and development. ✓

The early portions of the meeting were spent in presentations on the restructuring of E. R. C. E. R. C. has been reorganized for the purpose of providing a better flow from advanced research to development (project) activities in-house and a better interface with the development centers. The new organization consists of three major elements: 1) a research group (still most of the operation); 2) an applied (system) research group (new and small); 3) a projects group (now working principally on Avionic Systems). The systems group will be the principal external interface element. Its role (at the current staffing level) is to be sure that E. R. C. research on components is available, NASA-wide, for system applications; not to undertake large applied research tasks in-house. Gene Mannella will be heading this part of the operation. He is quite easy to work with; but he is E. R. C. oriented. It is going to require close association between the other NASA centers and his operation to keep from soaking up all of the research dollars in electronics by pursuing totally in-house projects born in the research group, "nurtured" in the applied research group and projectized "at home." I have the very distinct impression that both he and Jim Elms would welcome much closer working relationships (in the applied, system development area) with the development centers. ✓

Frank Sullivan requested that the Committee spend the next several months reviewing the status of electronics applicable to the development of an Advanced Air Traffic Control System and to provide him guidance concerning the NASA role in this area. The Committee agreed. ✓

B 11/19

11/18/68

1. MSC BIOMEDICAL MEETING DEVELOPMENTS: On Thursday, 11-14-68, key members of the Biomedical Task Teams and OWS Program Office met with their MSC counterparts at Houston to determine the extent of support required of MSFC on Experiment M052 (Bone and Muscle Changes - involves waste management and diagnosis). We had assumed that the responsibility for the development of the OWS Waste Management System was transferred to MSFC in connection with the habitability transfer. The MSC Program Office representatives took the position that all waste management is an experiment requirement and hence the sole responsibility of MSC; and, that transfer of the M487 Habitability Experiment to MSFC did not constitute transfer of responsibility for the waste management portion. Dr. Dietlein has now prepared the letter of approval for Dr. Gilruth in which he states complete agreement on MSFC doing Experiments M050, M051 the ESS (Experiment Support System), but he leaves the M052 level of MSFC support open for negotiation. Dr. Armstrong has been named as MSC's single point of contact on the Biomed, and despite the MSC Program Office position on Waste Management, the technical activity is moving positively. ✓

2. AEROSPIKE THRUST CHAMBER: The second of a series of nine performance evaluation tests was successfully conducted (duration of 4-seconds) recently on an aerospike thrust chamber at Rocketdyne's Nevada (Reno) Field Laboratory. This "sea level" (site conditions) test was the first to employ three base flow conditions in one test. The chamber pressure and mixture ratio were 900 psia and 3.5, respectively. Base flows were 2.5%, 1.0% and 0% of the total propellant flow. No hardware damage occurred. The performance data are being evaluated. The altitude chamber diffuser will now be installed for the continuance of the test series at altitude conditions. ✓

3. KSC PARTICIPATING IN J-2S IMPACT STUDIES: On 11-7-68, KSC was given a comprehensive briefing describing the objectives and status of the J-2S Impact Studies. Special emphasis was placed on the impact, identified to date, on the Launch Facility and Launch Operations. The presentation was well received, and KSC was invited to participate in the remainder of the study by determining the total effect on KSC operation. They have responded enthusiastically. In one week, they have prepared a 1122, obtained Headquarters approval for the funds, assigned a COR, and prepared a work statement. We have a copy of the work statement and will give our comments immediately. ✓

B.L.  
J-2S  
in S-11B  
or also  
in S-11B  
(for S-11)  
B

4. AS-503 VIBRATION EXCEEDANCE RESOLUTION: At various times during launch of AS-501 and AS-502, a total of 61 vibration measurements exceeded the predicted environments. These 61 exceedances were analyzed and their effect on the qualification status of nearby components evaluated. The following is a summary of the number of components in each stage that had not experienced qualification testing equal to or greater than the measured flight environment: S-IC - none; S-II - 6 components; S-IVB - 25 components; IU - none. New specifications were established and additional tests were conducted successfully to qualify each of the above 31 components to the exceedance flight environment. The successful completion of this activity verifies that all of these components on AS-503 are compatible with the predicted flight environment. ✓

5. "C" STRUCTURE: The "C" Structure was successfully tested to 110% of limit load for the two engine out case without environmental temperature. This concludes the test program for this structure and the portion of the S-II structures test program assigned to MSFC. ✓

MSF INSTITUTIONAL PLAN - Representatives from MSF and the NASA facility office visited KSC, MSC and MSFC this week to discuss tentative guidelines for the MSF Institutional Plan, that we reported in last week's notes. It was planned to incorporate the Center comments and issue revised guidelines by November 22. However, with the NASA "Hide-away Meeting" scheduled for November 21 and 22 to discuss NASA institutional planning it is not certain what the impact will be on the MSF Institutional Study. ✓

BOB MARK OF NASA FY 1970 BUDGET - BOB submitted its tentative FY-70 Budget "mark" of \$3.6B to NASA on November 8. As you know, NASA submitted plans at the \$4.7B, \$4.2B and \$3.8B levels. A breakout of BOB \$3.6B compared to the \$4.2B (Plan B) submission are shown below. The major reductions were made within the Saturn V and Apollo Applications Programs. Other significant cuts were made to Lunar Exploration and the Space Station. The Lunar Exploration Program "mark" is based on a Saturn V launch rate of only one per year.

	"B" BUDGET SUBMISSION	△	BOB "MARK"
<u>TOTAL NASA (Millions)</u>	<u>\$4,218.4</u>	<u>-\$595.4</u>	<u>\$3,623.0</u>
R&D	3,495.1	- 566.1	2,929.0
C of F	79.2	- 29.3	49.9
AO	644.1	-0-	644.1
<u>TOTAL OMSF (Millions)</u>	<u>\$2,188.1</u>	<u>-\$354.5</u>	<u>\$1,833.6</u>
*Apollo	1,653.9	- 100.0	1,553.9
Apollo Applications	<u>345.1</u>	- 145.1	<u>200.0</u>
Supp. Develop.	20.0	- 1.8	18.2
Adv. Missions	7.5	- 5.0	2.5
Lunar Exploration	<u>94.6</u>	- 44.6	<u>50.0</u>
Space Vehicle Prod.	9.0	- 9.0	-0-
Space Station	<u>58.0</u>	- 49.0	<u>9.0</u>

\*The Apollo reduction results from a deferment of further production of SA-514 and 515 effective January 1, 1969.

MSF has prepared a reclama to the BOB tentative mark. This reclama includes the total Apollo and Apollo Applications reductions. MSF is requesting restoration of \$20M of the \$44.6M cut to Lunar Exploration. Also, a \$15M reclama for experiment definition is expected to increase the Space Station efforts to \$24M in FY-70. No reclama is being made for the reductions to Supp. Develop., Adv. Missions, and Vehicle Production.

Dr. Paine is expected to meet with Mr. Zwick on November 22nd and with President Johnson on November 27th to discuss the FY-70 Budget. ✓

11/18/68

B 11/19

VISITS OF CONSEQUENCE

On Wednesday Dean Lear and nine faculty members of the University of Alabama College of Engineering spent the day attending Laboratory presentations and visiting installations of interest. From the questions asked and the discussions engaged in, one can conclude that the group was well impressed. I consider the visit an important step leading in the direction of your desires for a full and healthy relationship with the University.

Similar visits from other universities in the region are planned. Spacings will be arranged with due regard for laboratory work loads. This will be coordinated with R&DO. ✓

Dr. Langsam, President of the University of Cincinnati, was our guest on Friday. He was accorded an opportunity to visit with UC co-op students of which there are six pairs at MSFC. ✓

UAH RELATIONSHIP

In my notes of last week I voiced impatience at the lack of reaction from UAH in the matter of establishing adjunct professorships. I am guardedly happy to report that the latest letter somewhat stern in tone elicited a minor flurry of activity by UAH. ✓

AID TO UNIVERSITIES

Investigations have been launched into techniques and procedures for transfer of certain excess/surplus properties and material to universities, without involving the time-consuming, complex and ponderous procedures normally associated with such exercises. This is no small undertaking in light of the traditional ultra-conservatism of property custodians. Chief Counsel is helping here. ✓

NOTES 11/18/68 MURPHY

11/18/68

B 11/18

NASA Safety Research Program:

We are coordinating the MSFC reply to the request from Mr. James M. Beggs (Associate Administrator for Advanced Research and Technology) for identification of technical activities at the Center which are for the purpose of seeking practical solutions to safety problems in the existing research and development programs. It is planned by OART that this information will be used to identify topics of special interest prior to a planned visit to MSFC by Mr. Pinkle who is Director of the Aerospace Safety Research and Data Institute at LeRC, and Mr. Strass who is the Chief of Aerospace Safety Research Program, OART, at Headquarters. ✓

NOTES 11/18/68 RICHARD

11/18/68

B 11/18

AAP Software Meeting at Headquarters. A review of AAP Software plans and development needs was held by Dr. Mueller's Software Task Force on November 13. MSFC and MSC each presented their approach and described their present activities. Astrionics described ATM flight software development to demonstrate our way of handling software. The general feeling of the Committee was that things are headed in the right direction. However, Dr. Mueller gave us a few action items, as is usually the case. His principle question on software pertained to us doing the ATM programming inhouse, which Astrionics is investigating. ✓

AAP Specification and Criteria. Development and review of design criteria documentation in support of the Cluster Systems Performance and Design Requirements Specification is proceeding on schedule for a January release. The specification and its supporting criteria documentation is the formal control paper for the Apollo Application Program. The first releases to Headquarters, the other MSF Centers and major contractors for review will occur within two weeks. ✓

B 11/19

11/18 9/18

1. AAP Payload Enclosure: The program requires six enclosures (AAP-2 AAP-4, AAP-6 and AAP-8 flights plus two test units). Each enclosure will be approximately 51 feet tall and 21 feet in diameter. The test units are to be used in conjunction with the MDA and ATM structural and acoustical tests. We are presently estimating 18,000 man-hours of direct labor to manufacture each flight article and 13,500 hours to manufacture the test articles. This is a program that has been followed by R-ME for a number of years and hence we were able to initiate some actions before receipt of the formal authorization to proceed. At the present time, we are designing tooling and manufacturing stiffeners for the cylindrical sections. We are out for procurement of the rings from McDonnell-Douglas. The procured rings are of the same configuration as production parts used in the S-IVB forward and aft skirts. These rings for which tooling exists are used to save effort and money in manufacture and to shorten procurement time. All parts except these rings will be fabricated in-house. From the initial program of unmanned flights (SA-203 and AAP2 and 4), we still have the fixtures for the manufacture of the conical nose-cone sections. The only new assembly fixtures that will be required are those for the cylindrical sections. These fixtures will be built in-house. ✓

2. Gold-Plating of Aluminum Expulsion Bladder Mandrels: P&VE designed a gold-lined expulsion bladder for use on the Workshop Attitude Control System. The fabrication method calls for gold-plating, by a special process, the external surface of a 1' diameter by 3' long aluminum mandrel, coating the gold surface with rubber and then leaching out the aluminum mandrel, thus leaving the gold-lined bladder. ✓ The mandrels had been planned for contractor fabrication, as an in-house capability did not then exist. Recently, we were asked to determine if we considered it feasible to implement the necessary facility and process changes to apply gold-plate to Thiokol furnished aluminum mandrels in-house. We established a program to develop the methods, modify the facilities and train the personnel in the procedures required. Several problem areas have been resolved; e.g., modification and installation of solution tanks to accept the large mandrels, changing electrical contacts from mercury to carbon brushes and appropriate surface preparation of the aluminum. A pre-production test of the plating process was completed November 13, using a small six-inch Thiokol furnished, globular type aluminum mandrel. The plating process produced satisfactory results on all areas of the mandrel except over the welded joint where some blistering occurred. Upon investigation, it was found these blisters were caused by weld porosity. It appears that gold-plating can be accomplished provided a mandrel without porosity is furnished. ✓

note to 11/22

M.S.  
Could I see  
that process  
occasionally?  
B

3. Manufacturing in Zero 'g' Environment: A review of space manufacturing technology was given by Mr. Wuenscher to a group of professors at the University of Minnesota over the weekend. The discussion was in preparation for the White Paper for the STAC Winter Study. Dr. W. G. Shepherd, Vice President of the University, accepted the subject of developmental research and manufacturing processes in space for his paper. ✓

NOTES 11-18-68 Stuhlinger

B  
11/13

OSSA SENIOR COUNCIL MEETING: J. Naugle, O. Nicks, and H. Smith held this meeting at GSFC on 11/14 with about 20 participants from HQ and Centers. The two major agenda items were (1) Institutional issues and questions; and (2) Proposed reclama of FY 1970 budget line items cancelled by BOB. Discussions of Item (1) led to the following statements: Centers prefer a "competitive market" in the O SSA support of Center SRT/ART and advanced studies to a "Lead Center Concept." Centers feel an urgent need for a "discretionary fund" which the Center Director can apply to SR tasks of an exploratory nature. This fund would be accounted for at the end of the FY, not at the beginning. Flight projects should be assigned to Centers on a "competitive bid" basis, not according to a foregone "Missions and Roles" designation. The loser among the bidders could become a subcontractor to the winner. In selecting the winner, consideration should be given to experience, previous good performance, competence, resources, and institutional viability of the Center. When project studies are assigned to a Center, HQ Program Directors should not ask the Center for a commitment for follow-on project development work. Centers should be prepared for diversified Center programs in the future, in contrast to highly specialized programs in the past. OSSA feels an obligation to assist Centers in the transformation from a specialized program to a diversified program. OSSA wishes to strengthen its contacts with the Centers in connection with planning and definition studies for scientific flight projects.

E.S.  
By whom?  
B

✓  
B

Proposed budget cuts in FY 1970 were discussed in Item (2). Scientific research, and flight projects with flight dates not later than 1972, suffered almost no reduction. Cuts were heavy in new applications studies and university support; and almost complete in flight projects for 1973 and later (new starts). OSSA is planning to reclaim many of these items, expecting that OMSF successfully reclaims ATM. If ATM should be lost, OSSA would more strongly reclaim unmanned astronomy projects.

Fin - But you might suggest that Fred coordinate with Bart & develop a plan for release of & use of the film. MSF must be planning something -

Yes. Fred: please coordinate w/ Bart. Shep: Please get into the act, too B Shep- 11/18

NOTES 11/18/68 SPEER

11/18/68

B 11/19

1. Apollo 8 Flight Rules: Bill Schneider's Flight Mission Rules Review was held at MSC on Saturday, 11/16. Both Flight Director Charlesworth and Schneider accepted our go/no-go criteria for restart which has been the subject of much discussion. In essence, restart is go if remaining consumables provide a 95% confidence level to achieve guidance cut off. In cases of functional deviations which constitute no catastrophic hazard, restart is go unless we are reasonably certain that there is no 95% confidence of making satisfactory injection. Our recommendation to abort for S-IVB LOX overpressure due to the cold He shut-off valve fail to close during early power flight caused concern on MSC's part on how to implement a rapid get away after LES jettison. Abort due to S-II actuator hard over inboard (rapid overheating) was accepted. Latest test results for J-2 low NPSH appear to obviate the need for changing Gen. Phillips' AS-205 decision. S-II two engines out would result in either abort, early S-IVB staging, or continuation of flight dependent upon flight phase. Applying this rule to the events of Apollo 6, the crew would have early staged at chi freeze and achieved orbit but not have attempted a manned S-IVB restart. Scott Hamner's group will brief the crew on all new rules later this week. ✓

2. Lunar Trajectory Movie: In response to action from Staff and Board, plans have been established to produce by December 16 a movie of approximately 10 minutes duration for press release which will depict Mission C' flight trajectory. Working within the short time remaining, the movie will use graphic presentations, computer generated trajectories, and sound to portray the total flight history, with particular emphasis on the distinguishing characteristics of free return and lunar orbit trajectories. This development is being accomplished through a combined effort with AERO, COMP, and Photo lab. ✓

3. Apollo 8 (AS-503) Mission Support Review: We participated in a review of the overall NASA and DOD mission support required for Apollo 8. DOD reported that ships and aircraft can adequately support the mission and will be on their test support positions at L-4 days. ✓ Position updates will be based on the launch azimuth 1° increment updates. Action items assigned during the review were principally related to data aspects and we are coordinating these items with the MSFC elements concerned. A critique of Apollo 7 support data was also held to identify all possible improvements to Apollo 8 support. ✓

NOTES 11/18/68 TEIR

11/18 97's

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S-IB-13 & 14: CCSD proposal MG-472 for completion of S-IB-13 & 14 stages was received on November 13, 1968. We should have technical evaluation completed by November 29, 1968, and begin negotiations in December. ✓

SATURN IB FY-70 FUNDING: The Bogart Cost Reduction Committee results (reduction of a total of \$7. M from MDC, IBM, and G. E. in FY-70) have left us with a completely inadequate Saturn IB funding situation in FY-70. I am not recommending that we exercise this any further with Headquarters at this time but believe that all MSFC management personnel concerned with the budget must be aware that some adjustment will have to be made later in accordance with overall AAP and Apollo funding available to MSFC. ✓

I. EARTH ORBITAL PROGRAM

11/18 95A

B 11/19

A. Space Station Program Definition (Phase B) Work Statement: Comparison of the MSFC and MSC work statements submitted to Headquarters indicates a number of differences between the two approaches as we had anticipated; will attempt to eliminate discrepancies with MSC at a meeting here on Nov. 18. Final discussions on consolidation of the work statements will be held the week of Nov. 18 in Washington; Headquarters is preparing a combined draft based on Center inputs. Participants at Headquarters will be MSFC, MSC, LaRC, KSC, and Bellcomm. We plan to review the effort with Dr. Lucas and then schedule a meeting to review the program with you. ✓

B. Saturn V Workshop B<sub>0</sub> Concept: The B<sub>0</sub> concept was presented to Messrs. Weidner, Belew, and Richard as general information and to receive guidance regarding future action including the desire for a presentation to Mr. Luskin. The B<sub>0</sub> concept is use of back-up workshop hardware for dry launch on a Saturn V with use of two Saturn IB logistics flights. The workshop is modified by removal of propulsion equipment and all experiments are incorporated, which might be available, principally, Earth resources, longer duration biomedical, EMR type astronomy, and others including space manufacturing. The B<sub>0</sub> concept appears technically feasible, although power and attitude/pointing control are marginal. If pursued, it appears that approximately \$20M would be needed during the next 2-3 years. As a result of several sensitive aspects of the concept, it was decided to delay presentation to Mr. Luskin until we obtained further guidance from you.

II. LUNAR PROGRAM

↳ F.W. request briefing B note 11/22

The RFP for a \$400K, 8-month, preliminary design study (Phase B) for the LRV was released Nov. 15; proposals are due Jan. 6. ✓

III. LOGISTICS SYSTEMS

A. S-IC Simplification: As a follow-up to our recent discussions on logistics vehicle alternatives, a meeting was held Nov. 14 at P&VE to initiate study activities to define the design of a low-cost, simplified S-IC that could be used with the S-IVB/IU. KSC will be asked to participate since it is believed significant savings could be realized through the design modifications being considered. The study will be a "Quick-Look", and it is proposed to have results in a month to present to you if findings are sufficiently interesting. ✓

B. Pressure-Fed Launch Vehicle: We plan to send a man to Washington to participate in the TRW study oral review, and to continue to monitor SAMSO activities in this area per our recent agreements on logistics candidates. ✓

C. Simplified Saturn IB: We participated in a meeting Nov. 12 with IO and R-SE on this item. Areas where ASO inputs are needed include: (a) Mission planning/schedules and (b) descriptions of typical logistics space craft and mission profiles. Target dates for action plan, being prepared by the I-IB and R-SE offices, is mid-December. ✓

## NOTES 11/25/68 BALCH

### MISSION:

S-II-5 - MTF-to-KSC Turnover Meeting was held on 11/21/68 as planned. Current plans call for transferring to KSC only 166 manhours of work on the S-II-5, which is much less than has been transferred on any S-II stage we have shipped to KSC to date. All work on the stage is considered on schedule to meet the 12/7/68 ship date to KSC.

S-II-6 - "Power-up" was accomplished on 11/21/68, and engine leak checks were started on 11/22/68. Shipment to KSC is still set for 1/26/69.

S-II-7 - It had been planned that cryogenic proof pressure test and static firing would be combined and performed on 1/7/69. It is now tentatively planned to perform cryogenic proof pressure test on 1/3/69 and static firing on 1/14/69.

S-IC-8 - The stage contractor's revised internal working schedule dated 11/14/68 changes the "power-up" date from 12/2/68 to 11/27/68, the static firing date from 12/31/68 to 12/19/68, and the off-stand date from 1/14/69 to 1/3/69. POGO modification is scheduled to be completed today, and all other work is progressing satisfactorily to meet the "power-up" date of 11/27/68.

BOMEX - Activity continues toward software definition. Project execution plan now details conversion times to fixed-price. Hardware phase is progressing satisfactorily.

### INSTALLATION:

University Research - Each of the various research projects to be carried out at MTF is being definitized in terms of specific tasks to be performed and the detailed support requirements to be furnished at MTF.

### GENERAL:

Legal Affairs - Information has been received from the General Counsel's office that two additional suits have been filed against the Government for injuries alleged to have been suffered as a result of the accident on the S-IC test stand on 10/31/66 that resulted in the death of a Mr. Stell and a suit by his widow. The plaintiffs in the two additional suits are Mr. Oscar Musgrove and Mr. James A. Crawford.

NOTES 11/25/68 BELEW

AIRLOCK MODULE: The final review session with MSC and McDonnell Douglas Astronautics Company (MDAC) is scheduled for November 25-27 at MSC. In addition, the mechanics of completing the transfer are to be finalized. In discussions with MDAC this week, we were made aware, for the first time of a memo of agreement between Dr. Gilruth and General Bert (AF) dated June 1966. This apparently turned over management and accountability of the residual Gemini GSE, which is to be shared between the Gemini B program and the AM program, to the Air Force. We plan to have some specific recommendations within the next few weeks to resolve this item.

SATURN I WORKSHOP PROPOSAL: Representatives from this office and R&DO attended meetings at MDA C-WD to discuss MSFC comments on MDA C's preproposal for the Saturn I Workshop which was submitted on September 17. MDA C will incorporate MSFC's comments and will submit their revised proposal to MSFC by January 1969.

ZERO "G" TESTS - WORKSHOP: Saturn I Workshop Zero "G" testing was conducted at Wright-Patterson Air Force Base November 12-14, with crew participation. Testing indicated the chilldown return seal, and the fill and drain seal are acceptable as flown. Items requiring minor modifications were the LH<sub>2</sub> feeding seal, chilldown pump seal, and improved storage provisions for the anti-vortex screen.

HABITABILITY SUPPORT SYSTEM: At our request, we were visited by Dr. Roth of Whirlpool Corp., November 22. Dr. Roth reviewed the food and waste management equipment they are furnishing the Apollo Program. We have borrowed a 20 minute film which describes the Apollo Food and Waste Management System. Dr. Roth emphasized that the Apollo food and waste management systems are functional, but both systems could be optimized and improved. This background information will assist us in the preparation of the Part I CEI for the Habitability Support System.

ATM NEUTRAL BUOYANCY TESTS: Current plans for neutral buoyancy tests for ATM is as follows: (1) first week in December test the trolley concept for film removal; (2) second week in December test an alternate two rail system. The latter will be on the ATM neutral buoyancy article and will also test ingress/egress from the LM end work station.

LUNAR MODULE MODIFICATIONS: A three day technical meeting was held last week to familiarize MSFC with the Lunar Module modifications for AAP and to review and update Contract End Item specification. Areas which require further resolution were identified and these areas will be discussed at MSFC December 12. (Establishment of a technical baseline in mid December is required to definitize LM modification contract by May 1969). Grumman's firm proposal will be delivered to MSFC prior to February 17, 1969.

## NOTES 11-25-68 BROWN

### GENERAL

Quality Maintenance - As a part of our quality assurance and flight worthiness verification activities, a program has been initiated at Rocketdyne to retest, inspect and evaluate selected engine spare parts which are of the same configuration and vintage as those being flown. Parts will be subjected to functional leak and proof tests. The effort is programmed to continue for about one year, at which time the need for a continuation will be reviewed. Testing of F-1 components began on November 21. Testing of J-2 components should begin shortly.

Review of Computation Costs - During the past 16 months, a comprehensive evaluation of Rocketdyne's computer operations has been performed by personnel from the Engine Office and Comp Lab. The study began as part of the overall retrenchment program in 1967 and two follow-up meetings were conducted in 1968. Significant savings, achieved to date, were mainly in areas of remote or off site equipment and their communication links to Canoga Park. The approximate \$9.7M annual costs of FY67 and 68 have been reduced to an estimated 8.0 - \$8.5M in FY69 with further reductions to \$6.5 - \$7.0M in FY70. These figures are well below Rocketdyne's original planning. Most of the savings will be indirect costs since 80% of Rocketdyne's computation is charged to G&A.

F-1 ENGINE - The predelivery review of S-IC-5 (held at KSC on November 18) gave a very positive indication that we can support next year's rigorous launch schedule. The only open work on the engine was replacement of a seal in an electrical connector, retest for this connector and a leak check of the helium pressurization system because of a transducer seal replacement at Michoud. All retest will be done in sequence with required KSC tests.

J-2 ENGINE - Reference my notes of 11-18-68. Fourteen more bearing assemblies from used fuel pumps have been inspected and no discrepant bearings have been located. A fuel pump has been assembled with two cracked ball bearings in one bearing assembly. This pump has accrued 4000 seconds in full scale fuel pump testing assimilating actual engine conditions. This test is scheduled for completion and disassembly by November 26.

## CONSTAN NOTES 11-25-68

### VISITORS

Dr. Kurt Lotz, Chairman of the Volkswagenwerk, Board of Management, Rudi Maletz, Public Relations Director, Volkswagen, and Stuart Perkins, President, Volkswagen of America, visited Michoud Assembly Facility November 17, 1968. They were accompanied by Mr. Willard Robertson, President, International Auto Sales and Service, New Orleans, Louisiana. The visitors were conducted on a tour of the facility by Mr. Earl L. Jensen of our Facilities Office.

Mr. Byrus, Fire Consultant Engineer to NASA Headquarters, visited Michoud Assembly Facility this week for the purpose of evaluating our fire protection program to compare it with the programs of other NASA facilities. No major deficiencies were noted; however, a formal report will be made and forwarded to I-MICH-MGR in the near future.

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NOTES 11/25/68 GEISSLER

1. Ground Winds as Related to Apollo Launch Operations: At the 503 Pre-Flight Review, 11/15/68 and the Flight Readiness Review, 11/19/68 there was considerable discussion in regard to ground wind limits for launch. For the Apollo Access Arm (swing arm #9) there is a particular problem in the ability of the arm to track the launch vehicle. This imposes wind limits which vary with wind directions. The wind limits vary from 36.5 knots peak wind from the south to > 80 knots from the north. The probability (%) that the peak wind limit (defined by wind speed and direction) will exceed the arm tracking wind constraint on the pad as a function of staytime during December is 2% for 1 day, 17.5% for 15 days, 21.5% for 20 days, and 28.5% for 30 days. At the Flight Readiness Review, MSC presented a wind constraint of about 54 ft/sec steady state (1 minute average wind) at 160 ft reference level. This is equivalent to about 33 knots peak wind at the 60 foot reference level nominally used. The actual wind limit depends on the shape of the wind profile and gust characteristics. We have been working with MSC on an operational procedure to monitor the wind profile during the countdown to reduce the uncertainty that was experienced on AS-205 relative to the spacecraft touchdown velocity constraint associated with a land landing. The procedure is patterned after the MSFC inflight wind simulation procedure. At Cape Kennedy there are over 100 anemometers at different heights and locations to measure wind for various organizations and purposes. The plan is for MSC to obtain the wind measurements from our NASA 150 m meteorological tower for this operation. This will be the primary source of the wind measurements for the spacecraft touchdown velocity estimate. For the launch release structural wind constraint, MSFC and MSC will continue to monitor the wind measured from the pad area and the real time bending moment measurements. There are a number of space vehicle operational constraints that can be defined in terms of wind constraints. How definitively these wind constraints can be stated depends on the nature of the problem. The solution of these problems involves several scientific disciplines. Therefore, we offer to you and Dr. Rees at your convenience a technical briefing to include the following subject material: (a) Classification of ground wind constraints for aerospace vehicle operations; (b) The wind profile up to 150 m height; (c) Design and operational problems due to wind loading on vehicle, spacecraft, and GSE interface; and (d) The use of wind statistics for design and operational planning.

2. SNAP-27 Safety: In answer to your question (NOTES 11/12/68 GEISSLER copy attached), the Go/No-Go decision has not been made yet. The possibility that SNAP-27 (and the original ALSEP) may have to be grounded as a consequence of the Reentry Group's findings, pending possible redesign, is very real and presently the cause for much concern and particularly careful analysis of the problem by the Group. The decision will have to be made by the Interagency Safety Review Panel, the National Aeronautics and Space Council, and ultimately by the President who will have to approve the SNAP-27 for spaceflight anyway. The Panel will also be advised on biomedical, oceanographical and meteorological aspects of plutonium release and dispersion in the atmosphere. The decision to ground or not to ground will depend on what criterion is applied to the fuel release probabilities supplied to the Panel by the Reentry Group ("How much fuel release is permissible, from the viewpoint of human physiology, animal and vegetal life, ecology, and politics?") The Panel meets December 9/10 in Washington.

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FROM ENCLOSURES

S-IC: We recently received a report from The Boeing Company, "Impact, S-IC Quality Maintenance Program", which is a summary of their experience to date. Boeing has completed 35 Vendor Awareness Visits, 31 Vendor Hardware Audits, and 137 Hardware Evaluation Tests since the Quality Maintenance Program was proposed in early 1967. They have this to say about the Program: "This concept has proven itself to be an exceptional motivator, not only for the S-IC hardware suppliers as originally intended, but also for The Boeing Company; in certain instances, the recognition of latent defects has established tremendous cost savings for the S-IC program; and the Quality Maintenance Program has discovered problems which, under certain conditions, could probably have perpetrated a catastrophe had they gone undetected." A typical example is the Quality Analysis of the Power Transfer Switch. Investigation revealed that, in the transfer mode, the cam was 27° from top dead center. Their assessment was that normal vibration during flight could probably cause a switch in this position to open, thus removing stage power. If this condition would occur, the vehicle could be lost. All switches have been corrected to eliminate this condition.

Other primes have indicated similar benefits. We are pleased to see the contractors acknowledge this seldom recognized side of the quality and reliability contributions, and hope that it will receive prime consideration during rationalization of resources allocation as our programs become more financially austere.

NOTES 11/25/68 HAEUSSERMANN

1. ATM PI Coordination Meeting. An ATM PI coordination meeting was held last week at MSC. Flight Operations personnel of MSC gave a briefing on the operations and capabilities of the Mission Control Center and how the ATM might be handled with respect to mission operations. The Flight Operations presentations can be summarized as follows: (a) They have not been able to get deeply involved with ATM due to personnel requirements for Apollo. (b) They expect that, early next year more personnel will be available to support the ATM program.
2. Modification of the 100 Meter Optical Tunnel. Modifications to the 100 meter optical tunnel in Astrionics Lab are planned in several steps that will greatly enhance the optical and X-ray testing capability of MSFC. The tunnel will be cleaned to increase the vacuum capability; an inhouse fabricated chamber 4.7 meters long and 2 meters in diameter will be added at one end and an evacuated X-ray source added at the other end. These modifications allow more testing of the ATM Goddard X-ray telescope and provide a capability of testing 0.5 meter diameter telescopes. In addition to these modifications, there are plans to extend the 2 meter chamber which will allow testing of larger diameter X-ray telescopes mirrors. Furthermore, the large chamber will allow vacuum testing of a wide variety of optical and infrared instruments, including optical communication systems, laser rendezvous guidance systems, laser station keeping systems, star trackers and a variety of astronomical instruments. ME Lab personnel have agreed that the fabrication of the chambers can be done inhouse. We are also discussing with IO the funding requirements.

NOTES 11/25/68 HEIMBURG

ACCESS ARM NO. 9 (AA-09-02) Qualification testing of the Access Arm was completed on Wednesday, 11/20. The hardware was removed from the test area and turned over to Boeing. Chamber tracking limitation remained an open problem as it has been since initial tests on first modified Access Arm. This completes service arm test activities for KSC and we will now mothball the test facility. We believe it significant to note that all KSC service arm need dates were satisfied without resorting to multi-shift test operations.

F-1 TURBOPUMP The modified inboard PVC duct (503 configuration) was received on 11/19 and was installed in the lox suction line at the F-1 Turbopump Facility. Five tests, totaling approximately 450 seconds of mainstage operation, were successfully conducted on 11/21 and 11/22. Although 500 seconds of test time on the PVC duct had been requested by P&VE, they agreed that 450 seconds would be sufficient for evaluation. The PVC duct will be removed on 11/25, sent to R-QUAL for inspection, and then re-installed for additional testing.

ENVIRONMENTAL CONTROL SYSTEM TEST ON SPACECRAFT/IU/S-IVB INTERSTAGE CONFIGURATION Six tests at different IU purge flowrates and inlet temperatures were made last week to plot the environmental temperatures of the LM stage and IU. The spacecraft purge was held at constant flow and temperature for all tests. Testing will continue.

MODERATE DEPTH LUNAR DRILL The Joy Manufacturing Co. Hammer/Bit Assembly was installed in the test fixture at Bldg. 4649 and checkout tests were conducted. Preliminary evaluation of the data on the 10 minute test indicates the performance of the drill is as predicted by the Joy Manufacturing Co.

H-1 STORAGE TEST H-1 engine H-2039, after being stored for five years, was checked out and static fired on the Power Plant Test Stand for a planned duration of 140 seconds on November 20. No problems were encountered and all engine parameters were normal.

S-11-3 CLEANLINESS (Reference comment on 11/12/68 NOTES) S-11-3 lox tank has same lox sump screen installation as S-11-6. This screen is designed to prevent harmful contamination from going out of the tank into the engines. Additionally, S-11-3 lox screen installation and tank will be inspected after CDDT at which point its cleanliness can be determined.

S-IVB TEST STAND VENT LINE EXPLOSION (Reference comment on 11/4/68 NOTES) Responsible personnel at KSC, MTF and SACTO have been notified of the accident and its causes.

NOTES 11-25-68 HOELZER

PROJECT BOMEX: Computation Laboratory arranged to give Project BOMEX 4000 magnetic tapes and an FR 1800 seven-track magnetic tape recorder. The 4000 tapes came from an inventory of 6800 magnetic tapes from the Pegasus project.

NOTES 11-25-68 JAMES

1. KSC Bench Testing of Components: Reference your note on my 11-4-68 submission. The principal issue at present narrows down to that of bench testing components for the purpose of fault identification and removal of components from the vehicle for bench testing based on suspected malfunction. Component testing is usually done by factory procedures and is not a normal launch area activity. Our insistence on using our procedures is the issue. We have talked to Mr. Kroeger and others and are in general agreement with KSC on bench testing of spares prior to installation. I do not recommend that you get involved at this time. Ed O'Connor and I talked with Rod Middleton last week and we still hope he will see the development center concerns.
2. AS-503 Software/Slingshot Maneuver: We and several elements of R&DO worked Friday on four (4) possible software changes for AS-503. Considerable effort by the Labs found ways around three (3) of them and we will make the fourth change concerning missing the moon using the slingshot maneuver. I cleared with George Mueller that this will give us a good probability of missing the moon and he accepts that. We will utilize the S-IVB APS ullage motors for additional  $\Delta V$  for the maneuver. This requires software sequence commands to be added to Time Base 7 to start the ullage motors after the LOX dump is completed. The ullage motors will burn until the APS tanks are depleted. The new flight tape delivery for this change will be November 28 and should not require re-running the FRT checks as the new sequence commands are at the end of the program and can be verified directly by comparison with the original tape. The S-IVB attitude will be changed to  $150^\circ$  which will degrade communication, and may cause loss of data during the dump and ullage motor burn. Efforts are underway to secure better ground antenna coverage of these events.
3. KSC Meeting on Sanders Equipment: Dr. Rees conducted a meeting at KSC on November 22 with KSC, MSFC, Sanders Associates, and IBM. The complete history of the DDP-224 computer problem on AS-503 FRT was presented. The boards in the computer will be inventoried to assure that there are no boards which have ever been suspected as causing an outage unless the failure on the boards was found and corrected. The computer will be turned on continuously from several days before CDDT till after launch. The failure which caused the FRT outage has been definitely attributed to a bad printed circuit board. This board is presently undergoing failure analysis at Sanders Associates, with a preliminary report due today (November 25).
4. Strain Gages for Wind Monitoring: Attached is a note on this subject regarding your note on my 11-12-68 submission. (Copy of attachment to R-P&VE only.)

**NOTES 11/25/68 JOHNSON**

**Nothing of significance to report.**

NOTES 11-25-68 LUCAS

1. KSC PARTICIPATING IN J-2S IMPACT STUDIES: Reference Notes 11-18-68. The impact studies are applicable to both the Saturn V, S-II and S-IVB stages, and the Saturn IB, S-IVB stage.
2. LOW FUEL NPSH TESTING COMPLETE: Analysis of the data from the two low fuel NPSH tests on the J-2 engine indicates that the engine has in effect a "Safety Valve" protecting against excessive fuel pump speed. Failure of the cross-over duct in each case resulted in loss of Lox pump power and shutdown by the thrust OK pressure switch. Although data analysis is continuing, it is now considered that the flight mission rule requiring abort for the fuel NPSH levels below 100 ft. will not be required. The test program is considered complete. Regarding your question on our 11-12-68 Notes, we do not expect any change during vacuum operation. The situation differs from the ASI line problem. We have a hot duct (above 1000°F).
3. "B" STRUCTURE: Test condition XI simulating the ultimate flight end-of-S-II-boost loads and environment was completed successfully 11-19-68. The significant loading was pressurization of the upper regions of No. 6 cylinder and forward bulkhead of the S-II LH<sub>2</sub> tankage simulated on the "B" structure. 130% of flight limit pressure (42.9 psig) at a temperature environment of -250°F while applying ultimate maximum predicted flight body loads (2.1 g X 1.3) were sustained. The structural capability demonstrated by this test verifies the decision made previously to remove the launch constraint on the AS-503 lightweight bulkhead and establishes a significant milestone for qualification of the lightweight S-II structural design typical of S-II-4 through S-II-10. Two ultimate tests remain to be run on the "B" structure. These conditions are the end of S-IC boost (Condition X) and Max Q<sub>d</sub> (Condition IX). Test condition X can be initiated about 12-5-68, and the program can be completed about 12-20-68, after Condition IX has been run.
4. REQUEST FOR ASSISTANCE BY SOUTHERN RAILWAYS, INC.: Representatives from Southern Railways visited the Materials Division (arrangement made by Technology Utilization Office) seeking assistance and/or consultation on solution to problems in wheel wear rate, traction improvement on grades, traction reduction on curves, reduced maintenance in lubrication and corrosion protection of cars, and improved life of rails. They expressed considerable interest in our work in lubrication, corrosion protection, sealing, and high strength metals. They have requested future meetings for several of their specialists with our specialists. There was every indication that they would like to use us as their materials consultant. We will proceed with caution.
5. KC-135 FLIGHT: Crew design verification simulation with Astronauts Paul Weitz and Bruce McCandless participating on the Saturn I Workshop aft penetration seals and associated equipment was completed 11-14-68. No basic problems were encountered. A few minor modifications were requested. On 11-15-68 Messrs. Luskin and Disher from NASA Headquarters were briefed on the Workshop equipment which had been tested by Astronauts Weitz and McCandless earlier in the week. As part of their orientation flight, Messrs. Luskin and Disher performed the penetration sealing tasks in mockup #3 in a shirt-sleeve environment.

NOTES 11/25/68 MAUS

MSF INSTITUTIONAL PLAN - This is in answer to your question on our 11/12/68 note. (See Attachment).

Manpower and facility resources for programs other than MSF will be included in the Plan.

Last week MSF and Center representatives met with General Bogart and developed the following changes in the guidelines: 1) Removal of the general guideline that MSF resources must show a decline. 2) Elimination of detail manpower projections for the Space Station, Space Shuttle and LEO programs in fiscal years 1973 and 1974. 3) Addition of a MSF Operation line item for activities common to several programs (includes laboratory operations). 4) Slipped the MSF submission date from January 15 to February 15.

Our suggestion that each Center be assigned tentative roles and missions for new programs was not granted. Rather, each Center is expected to state their desire and capability for new program elements.

CURRENT POSITION ON NASA FY 1970 BUDGET - The NASA reclama to the BOB mark of the "B" (4.2B) Budget submission creates a new "C" Budget totalling \$4,074.2 million. Dr. Paine's position is that this budget should be presented to the President as the alternative that maintains NASA capability at a minimum level and preserves options for future decision. He emphasized that this is the appropriate alternative for the President to consider in the event he is not able to support the recommended forward-looking program at or approaching the "A" Budget level. A comparison of the "B" Budget submission, BOB "mark" and the new "C" Budget level are shown below.

	<u>"B" BUDGET</u>	<u>BOB "MARK"</u>	<u>"C" RECLAMA</u>
<u>TOTAL NASA (Millions)</u>	<u>\$4,218.4</u>	<u>\$3,623.0</u>	<u>\$4,074.2</u>
R&D	3,495.1	2,929.0	3,369.5
C of F	79.2	49.0	60.6
AO	644.1	644.1	644.1
<u>TOTAL OMSF</u>	<u>\$2,188.1</u>	<u>\$1,833.6</u>	<u>\$2,113.7</u>
Apollo	1,653.9	1,553.9	1,653.9
Apollo Applications	345.1	200.0	345.1
Supp. Develop.	20.0	18.2	18.2
Adv. Missions	7.5	2.5	2.5
Lunar Exploration	94.6	50.0	70.0
Space Vehicle Prod.	9.0	0	0
Space Station	58.0	9.0	24.0
<u>TOTAL OSSA</u>	<u>\$ 625.2</u>	<u>\$ 522.9</u>	<u>\$ 590.0</u>
<u>TOTAL OART</u>	<u>\$ 327.5</u>	<u>\$ 260.3</u>	<u>\$ 318.5</u>

NOTES 11/25/68 MOHLERE

NEGATIVE REPORT.

NOTES 11/25/68 MURPHY

Boeing TIE System Safety Effort: (Reference my Notes 10/21/68, copy attached).

On November 13, 1968, a teleconference among the MSF Centers was conducted to discuss the plans for the work in System Safety for AS-503 by Boeing TIE as originally established by headquarters. During the meeting, it was decided that the analysis being directed by MSF would be terminated, and that the individual field centers should initiate and have Boeing or other contractors perform safety analysis effort which they felt should be conducted. Since this decision, and based on the fact that extensive analysis effort has been done in the design in the past, MSFC has discontinued its system safety analysis effort by Boeing TIE on AS-503. The MSC Flight Safety Office is, however, still concerned about their hardware and operations and are continuing an extensive Boeing TIE safety analysis effort.

## NOTES 10/21/68 MURPHY

### Boeing TIE Systems Safety Effort

The second status meeting of the Boeing TIE Analysis work in System Safety was held at MSC on October 16, 1968, with OMSF, MSC, KSC, MSFC, and Boeing TIE. After the Boeing briefings, Bill Schneider held a separate meeting with the three Centers to discuss some of the things that KSC had brought up in an earlier meeting with Gen. Phillips. KSC had raised questions as to the validity of the Boeing TIE effort in System Safety and also questioned their future role for calendar year 1969. Recognizing both the operational and political impact of such a decision, Gen. Phillips gave Chuck McGuire the task of coordinating with Jerry Lederer (OMSF) and the Centers on the future work in System Safety for Boeing TIE. Some specific questions that the Centers are to answer are as follows:

- a. Should the present work on fault tree (a logic diagram technique) analysis be continued; if so, in what form?
- b. Should we redirect the fault tree analysis to the lunar mission?
- c. Should the System Safety effort be reoriented, or should the entire Boeing TIE effort in System Safety be discontinued?

We expect to get an official request from Gen. Phillips the first part of this week to meet with him at an early date and provide a Center position on these questions. We are working very closely with IO & R&DO in this area and will keep you informed.

NOTES 11/25/68 RICHARD

AS-503 Crew Safety Review Board: This activity has been concluded. I believe you have witnessed the summary presentation by W. Schneider in a recent delta DCR. Our representative is of the opinion that such reviews of the launch vehicle systems by a Crew Safety Review Board should not be projected as a future activity since several other management functions continually review developments affecting crew safety. We find little in the AS-503 Crew Safety Review Board deliberations which were unique to that Board and really nothing in the final report (as we understand it will be written which is significant).

## NOTES 11-25-68 SIEBEL

1. Saturn V Damper System: Since the three arms have been completed and shipped, our involvement has declined but still remains such as to employ about five people. Since April 1, 1968 (after the last major shipment left MSFC), 50 EO's and 518 revisions have been received and processed. This was done either by modifying components returned to us, or by supplying mod kits to KSC. For example, after modification the Hook Box for ML-3 has been shipped back to KSC last week. At a meeting at KSC last week, agreement was reached to transfer the Damper design sustaining and support effort from MSFC to KSC by January 1, 1969 or earlier. MSFC-IO will transfer funds requested by KSC as soon as the official request has been received. P&VE will furnish a complete package of all drawings, EO's, waivers, manuals, test reports, and a complete history of all components. R-ME has been working on the latter and we should be in good shape in this area.
2. S-II Container Welding Back-up Program: A program was started over a year ago to test, on hardware of representative size, the effect of weld imperfections and repairs and, more specifically, to compare by room temperature and cryogenic tests the properties of Pulsed Arc-MIG versus TIG welds. Two tanks 10' in diameter were built using Titan bulkheads procured from Martin. At a meeting last week with Messrs. Weidner, Heimborg, Dr. Lucas, and others it was decided to phase out this program after room temperature proof tests of the two tanks. It was agreed that sufficient experience has now been accumulated on the cryogenic properties of the S-II structure so that the expense of providing manpower, instrumentation, facility modifications and LH<sub>2</sub> can no longer be justified. The experience and results obtained from the manufacture and proof pressure testing of the tanks will be documented in a report for possible future applications.
3. Space Manufacturing: Mr. Wuenscher participated last Thursday in a meeting of MSF personnel supporting the STAC Winter Study. At the meeting, which was called by Captain Freitag, the Bellcomm "White Papers" were discussed and handed to the representatives from MSFC and MSC for review and coordination with Headquarters and Bellcomm personnel and eventually with the STAC committee members. Seven specific areas of potential manned space flight uses during the 70's have been established. Space Manufacturing is one of these areas. The deadline for our final version of the "White Paper" back to Headquarters is November 27.
4. Cryogenic Scuba for Neutral Buoyancy Simulator: The use of liquid air in backpack type life-support systems is becoming increasingly common. An example is equipment used by fire fighter personnel at KSC. Such a system, packaged as a Scuba, holds the promise of increasing the fidelity of neutral buoyancy simulation by freeing the aquanaut test subject from the restraint of the umbilical line. We have designed and are building a prototype liquid air Scuba. Component test has started. The system is designed for an in-water time of one hour while delivering air at a flow rate of five standard cubic feet per minute for both breathing and suit pressurization.

1. Cold Helium Shutoff Failure: Failure of the S-IVB cold He shutoff valves during S-IC and S-II boost was identified as an abort condition for AS-503. Result is almost certain freezing of both LOX tank relief valves and ultimately burst of LOX tank. The original mission rule required abort after freezing of both relief valves, leaving 12 - 15 sec. before burst. This is adequate prior to LES jettison but too short for an SPS type abort. It has now been agreed that after LES jettison we will early stage the S-IVB when the cold He shutoff failure is detected, without waiting for relief valve freezing. Once the S-IVB is started, the tank pressure will be safely reduced. This new rule affords an adequate time to take action (more than 60 sec.) and permits the S/C to reach orbit in some cases. We have to accept a small risk of unnecessary abort. This problem is virtually eliminated on AS-504 and subs.
2. Apollo 8 Manned Restart: Original criteria for manned S-IVB restart required 95% confidence in achieving guidance cutoff (TLI). This resulted in ten J-2 engine related No-Go conditions (e.g., no chill-down) where the engine might sustain damage during start and quit before TLI. This was questioned as being too conservative. In these cases, the engine will probably not start at all; however, if it starts it is more likely to run through TLI. Our difficulty lies in the required high level of confidence. Kraft has now agreed to reduce his original requirement to the one-sigma level. This will eliminate most of the engine No-Go rules. However, we will retain the 95% requirement for propellants and other major consumables to reach TLI.
3. S-IVB Lunar Impact: To avoid L/V lunar impact on Mission C' two software changes are most promising: (1) provide additional velocity by an APS ullage burn to depletion, and (2) change the vehicle attitude by approximately 36 deg. This attitude is expected to result in loss of communications during the LOX dump and loss of attitude control after the APS burn. We are taking steps to alleviate the impact on communications by using a deep space dish and proper switching commands to the onboard antenna systems. This conflict between communications and slingshot geometry can be minimized for future missions if there is a capability for multiple maneuvers and a ground command capability for updating or inhibiting such maneuvers and sequences. These requirements had been previously stated for the slingshot method in our correspondence with Headquarters. However, due to tight scheduling on C' it was decided to simplify in line with established priorities. These requirements will be restated for flight programming on future missions.

NOTES 11-25-68 Stuhlinger

1. HIGH-ENERGY ASTRONOMY: Two meetings with OSSA on this subject are planned for the first half of December: a X-ray telescope working session at Columbia University, with participation from ASTR and SSL; and a short presentation by SSL to the High Energy Panel of the Astronomy Missions Board and the SSSC Astronomy Subcommittee about the possible grouping of mutually compatible experiments (UV, X, and gamma ray) on AAP-type flights. ASO will attend this presentation.

2. RADIATION SPECTRUM IN EARTH ORBIT: Mr. Burrell, SSL, visited the Space Environment Branch in MSC's Space Science and Applications Directorate (SSAD), to discuss radiation measurements on Apollo 5 and 6 which MSC members have evaluated. Their findings indicate that the proton spectrum has a much larger fraction of energetic protons than assumed in the "standard spectrum" by J. R. Vette of GSFC. You may recall that SSL has been developing a proton spectrometer (Dr. Gunther, Dr. Parnell) for the AAP 2 flight as a proton radiation monitor; hopefully, this instrument will become routine equipment on all workshops. Its development was funded largely through workshop funds (B. Brooksbank). The instrument recently achieved a very successful calibration test with the Columbia proton accelerator.

SSAD in Houston seems to be quite successful in building up scientific strength and competence. W. Hess told me last week that he has now 40 Ph.D.'s and many M.S.'s, and that his present effort is devoted to a strengthening of engineering and technician support of his scientists. SSAD activities will cover research, flight experiments, individual flight projects, and support of the MSC program with scientific studies and development.\*

3. METEOR OBSERVATIONS: The excellent weather this week allowed 14 hours of meteor observation, including an all night vigil to catch the very fast early morning meteors. Measurements are made simultaneously with a 60" searchlight mirror and PM tube for peak light and integrated light, and with an image orthicon for trajectory determinations. We expect to develop the system further for more trajectory information, and for spectral information of the emitted light. A number of very fast meteors have been observed this week which may have been stragglers from the Leonid shower which peaked on November 17. Unfortunately, the weather was cloudy on that particular night and we missed the main portion of the shower.

4. ENGINEERING LUNAR SURFACE MODEL FOR MOBILITY CONSIDERATIONS:

Mr. B. Milwitzky expressed his appreciation for a job "well done" for the Engineering Lunar Surface Model which was authored by Mr. O. H. Vaughan, R-AERO-Y, and Dr. Costes, SSL. This document will be incorporated as part of Annex C of the RFP on the Lunar Roving Vehicle Contract Study.

\*This includes the Lunar Receiving Lab, MSC's Earth Resources Program, and the ALSEP.

NOTES 11/25/68 TEIR

SATURN IB PROGRAM CHANGE POLICY AND CONTROL:

MSFC Program Directive (MPD) 8040.7, "Saturn IB Program Change Policy and Control," has been issued. The purpose of this directive is to establish change policy and control for the planning period between the last Saturn IB/Apollo mission and the first AAP launch. Due to the reduced change activity during this period, the Saturn IB Level II Configuration Control Board will only meet on call.

NOTES - WILLIAMS - 11/25/68

1. Space Station Study: We have basically completed the preparation of the joint statement of work for the study. Hdqrs. had drafted a combined statement of work drawing on the inputs from MSFC and MSC. For the most part it was our (MSFC) statement of work, we had submitted the previous week. A task team of Hdqrs. MSC, LaRC, & MSFC met all week to complete this task and reviewed it with Mathews on Nov. 22. In general, the study will be conducted along the lines that we had desired. One prime concession Hdqrs. made which both MSC and we wanted, i.e., each Center will negotiate its own contract. Several points which were decided that may be of interest are: (a) Baseline will be a 9 man station; (b) LV for station will be: S-IC + S-II, S-IC + S-IVB, 260" solid + S-IVB, or 156" solid + S-IVB; (c) LV for Log. will be Sat IB, T-IIIM, 260" solid + S-IVB, or 156" solid + S-IVB; (d) Log. S/C will be either existing S/C, mods to existing S/C, or new S/S (MSC didn't want to consider existing S/C); (e) Experiments for station will receive major emphasis (MSC didn't want to denote much effort in this area). I plan to review the current statement of work, plans and implementation with Mr. Weidner, Dr. Lucus, and others and would like to review it with you, possibly the first week in Dec.
2. Cost Format for Studies & Program Plans: Wood and Rutledge met in Washington with Don Turner and others to finalize the cost format for use in the space station contracts. It appears that major problems between MSFC, MSC, and Hdqrs. have been resolved and a final version of the procedures will be out by the end of the week. This format will also be implemented to the extent possible in the I-20, the Integral Launch Vehicle, and the DMRV studies. We are pleased with the results to date as it appears that compatible cost data from studies will soon be attained.
3. JPL Request for Vehicle Data: Nash Williams of JPL requested additional data on Saturn vehicles for use in the JPL trade studies on the Grand Tour missions. They are at this point considering five vehicles for the precursor mission in 1974 or 1975: (1) T-IIIB/Centaur; (2) T-IIID/Centaur/Burner II; (3) Saturn IB/Centaur/Burner II; (4) S-IC/S-IVB/SMIS; and (5) S-IC/S-IVB/Centaur. JPL is planning a Dec. 16 presentation to OSSA and OART and wants MSFC support in preparing that briefing.
4. Saturn V Derivative Study: Boeing, McDonnell-Douglas, IBM; and Rocketdyne participated in the contractor orientation meeting here at MSFC on Nov. 21. The NASA study panel, consisting of Hdqrs., KSC, and MSFC personnel, agreed on and briefed the contractors on study ground-rules and agreements. Milt Page of this Office is COR on this \$300K, ten-month effort.
5. Lunar Program: Information from Hdqrs. is that a significant number of dollars (\$1.5M to 2.0M of FY69) are available for lunar science hardware and mission studies. These monies are under Dr. Allenby's cognizance, but are available for LRV, science definition, according to Mitwilzky. These monies are significant but require immediate action by MSFC to be able to utilize.