

Nov 2, 1969



B 11/3

^{9/11/3}
S-IC-12 - Static firing countdown on 10/29/69 was terminated at approximately T-40 minutes because of indications that noise levels in certain local communities would create excessive annoyance. Fuel was left aboard the stage, and static firing is now rescheduled for today. The problem with the fuel loading probe circuit, reported in last week's NOTES, was corrected by replacement of an electronic package. ✓

S-II-9 - Stage is in the vertical position in the S-II Stage Checkout and Storage Building. Final modification period will start today. Shipment to KSC remains scheduled for 1/8/70. ✓

S-II-10 - Removal of the stage from the A-2 Test Stand remains scheduled for 11/4/69. After removal from the test stand, the stage will be stored in the S-II Stage Checkout and Storage Building until 1/27/70, at which time it will be installed in the A-1 Test Stand for completion of post static firing checkout. ✓

S-II-11 - Cryogenic proof pressure test was successfully accomplished on 10/31/69. Static firing has been rescheduled from 11/13/69 to 11/14/69. ✓

Space Shuttle Activities - Representatives from Chrysler Corporation Space Division were at MTF on 10/30/69 to inspect the S-II Test Stand relative to a planned proposal to perform Space Shuttle booster vehicle testing at MTF. ✓

MTF Combined Agencies Campaign - MTF successfully completed its 1970 CAC last week. Against a planning goal of \$70,000, MTF employees and companies contributed or pledged \$110,684.19, 158% of goal. Approximately 93% of the employees participated for an average contribution of \$48.59. Very little cash was collected with maximum utilization of payroll deduction against 1970 earnings being used. ✓ ✓

Final MSFC Camille Recovery Assistance Checks - NASA/MTF employees who suffered personal losses from Camille received supplemented checks from the MSFC/Huntsville committee which resulted from late contribution and balance from initial allocations. This tremendous gesture from Huntsville to MTF was extremely beneficial to our NASA employees and elevated their morale and met their needs when most needed. A heartfelt "Thank You" is in order to all who participated. ✓

Bart S.
 could make a fine item on Marshall Star
 B

9F 11/5

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CSM/MDA INTERFACE LOADS: We have investigated the problem of docking loads with ASTN, MSC, and MMC, and all parties involved confirm the realism of the load condition generally referred to as the "zipper effect." This condition occurs after the docking probe has captured and is pulling the CSM and Cluster together. With the docking interfaces (rings) misaligned by a small amount, the automatic latches are actuated on one side of the docking ring and the others follow later as the docking rings are forced together. Analysis by MMC and ASTN (generally confirmed by MSC) indicates that a latch load of 12,000 pounds and a bending moment of 599 KIPS could result. The MDA is designed for a latch load of 3,760 pounds and a bending moment of 300 KIPS. The "zipper effect" loading condition has been suspected for some time, but apparently the reality and seriousness of it with the CSM/MDA only developed over the last few months. Two solutions (or combinations thereof) are being pursued. The first considers a modification to the latches such that six latches fire automatically when docking occurs and the remaining six are latched manually. The automatic latch preload would be reduced (e.g., from 2,700 pounds to 900 pounds). This would probably require also some minor mods to the MDA in the tunnel area. The second approach considers major mods to the MDA structure. There is, as could be expected, some "first reaction" to resist mods to the Apollo docking hardware/operations.

L.B. →
to trace
a
similar
problem in
CSM/LM
docking?

SWS NO. 2 AD HOC GROUP MEETING: A meeting of the SWS No. 2 Ad Hoc Group was held at KSC on October 27 and 28, with appropriate MSFC representation. As a result of this meeting, a minimum mission option plus six delta options were identified. The next meeting of the Ad Hoc Group will be to report a proposed work plan to Mr. Schneider, Mr. Thompson, and General Morgan. This meeting is not firmly scheduled, but should take place some time during the week of Nov. 10.

BIOMEDICAL EXPERIMENT HARDWARE: MSFC's Bioastronautics Task Team delivered a functional breadboard of the LBNP device to MSC by air freight on October 30, 1969. This is a three segment, rigid wall unit with waist seal and saddle which will be tested and evaluated by MSC in support of the PDR on November 18.

ATM EVA: MSC proposed to set up a five or six person task group (headed by a senior astronaut) at MSFC for several months to work the critical area of ATM EVA through design concept and simulation. MSFC agreed and Bob Thompson (S&E-ASTN) will serve as MSFC's lead man to work real time decisions and trade-offs with the MSC group that is chartered to speak for the Flight Crew Operations Directorate and MSC. This operation will be initiated on Nov. 7.

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FY 1970 CONTINUING RESOLUTION - The FY 1970 Continuing Resolution providing funds through October expired October 30, 1969. The Senate is not in session and will not reconvene until Tuesday, November 4, 1969. NASA will be without operating funds until possibly Wednesday afternoon or Thursday morning dependent upon when the bill is passed and signed by the President. Emergency funds have been received from Headquarters and we have attempted to cover all known requirements through next Thursday (Personal Services and Travel). ✓

R&PM FY 1970 OPERATING PLAN - The center has received the MSF Markup of the Research and Program Management POP 69-3 for FY 1970. The adjustments are as follows:

Funding (Obligational) Levels

<u>Prior Guideline</u>	<u>MSFC Request</u>	<u>Latest Guideline</u>
\$118.4M	\$122.5M	\$121.1M
←	←	←
	Δ \$4.1M	Δ \$1.4M

The \$2.7M increase in our guideline results from the case made during the POP review with Headquarters personnel at MSFC. ✓

Action is being taken to operate within the MSF obligational authorization and we expect to be able to live within the cost ceiling of \$125,484,000 established by MSF. ✓

CONVERSION OF WAGE BOARD EMPLOYEES TO GS - Plans have been completed to convert approximately 390 Wage Board employees to GS (General Schedule) classification effective Nov. 2, 1969. This conversion will cost approximately \$138,000 annually but should enable MSFC to more effectively utilize its employees. ✓

The conversion will improve our Center's workforce by allowing more skilled employees to work in broad areas rather than in their narrow "specialty" as they did under the Wage Board pay plan. It should improve the employees' attitude and morale by removing him from a category which he feels the center has placed "at the bottom of the list". It should also help to strengthen the Center's research and development image by shifting people from a category usually associated with "production" activity to one with an R&D association. ✓

NOTES 11-3-69 BROWN

B 11/3

JK 1/3

AS-507 CDDT - The AS-507 CDDT proceeded satisfactorily. The only engine problem noted was an erratic #1 oxidizer pump bearing temperature measurement on F-1 engine, F-6053. The engine heater panel "temperature high" and "temperature OK" indications were used as backup and the countdown was continued uninterrupted. Subsequent investigation indicates a faulty temperature transducer. Adequate panel indications are available as backup and due to the extremely limited access, the transducer will probably not be replaced. ✓

J-2 Engine - On October 24, a test on J-2S engine J-114 was terminated after 392 seconds by the mainstage OK pressure switch. Severe damage to the fuel turbopump and thrust chamber occurred. The leading edge section of the fuel pump inducer blade broke off and lodged in the pump causing a LOX rich shut-down. The high LOX surge at cutoff fractured the main LOX valve housing and caused extensive thrust chamber throat erosion. Mainstage testing has been temporarily suspended pending results of the failure analysis. Fatigue failure of the inducer blade is a primary suspect. The failure is similar to a prior failure on Engine J-112 in November 1968 which at the time was attributed to failure of a fuel quality meter immediately upstream of the pump. ✓

General - Last week's issue of the Rocketdyne employees' newspaper included a letter from Sam Hoffman to all employees notifying them of the planned personnel reduction of 1200 people. because NASA "funds planned for existing rocket engine programs had been severely reduced." ✓

- 9/11/3
1. HIGH ENERGY ASTRONOMY OBSERVATORY: Dr. Naugle has not yet released the Announcement of Flight Opportunities to the scientific community. Mr. Jesse Mitchell visited MSFC last week. He informed us that Dr. Naugle is awaiting some preliminary feedback from the BOB regarding the FY-71 budget before he releases the AFO. We are continuing preparations to permit letting Phase B contracts by about April 1970. ✓
 2. IONOSPHERIC PHYSICS SUBCOMMITTEE: Dr. Ed Schmerling of OSSA indicated that he would like to have the next meeting (January 1970) of his Ionospheric Physics Subcommittee at MSFC. He is particularly interested in the possibility of incorporating certain experiments on the Space Station and desires a briefing on our Space Station effort. I indicated to Dr. Schmerling that we would be very pleased to accommodate the committee meeting. Mr. Bill Roberts of my Space Physics Group will host the meeting, make all administrative arrangements, and serve as an observer to the Committee. Mr. Roberts will make or arrange for appropriate briefings on the Space Station effort and for a general tour of Center facilities. ✓
 3. SPACE BIOLOGY SUBCOMMITTEE MEETING: Dr. Hilchey attended a meeting of the Space Biology Subcommittee on October 24 and 25. A number of discussions resulted in actions by the Subcommittee which may cause considerable impact on future OSSA policy and plans.
 - a. The Subcommittee undertook to respond to the expected impact on NASA of the Space Biology Summer Study carried out by a National Academy of Sciences ad hoc group. The Subcommittee differs sharply with a significant number of summer study recommendations, both in substance and priority. The Subcommittee's position is in general alignment with the body of professional conviction expressed by most of the national level bodies who have examined the problem of space biology policy. ✓
 - b. The Subcommittee is strongly urging added flights to followup the results of Biosatellite III, the flight of the monkey, "Bonny." Aside from the highly publicized remarks recently expressed, a number of extremely important observations on the cardiovascular system and on the problems of body water loss were made. Understanding the mode of action of the physiological mechanisms involved is of paramount importance. ✓
 - c. The Subcommittee deplores the problem created by the lack of a bioscience flight program. Based on its discussion of potential flight opportunities the Subcommittee strongly urged that the earliest possible arrangements be made for inclusion of a variety of space biology experiments aboard proposed manned space flight systems ranging from SWS I and II through and beyond the Space Station. ✓

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E.F.
Request
short
briefing
with
sketches
(30 min
or so)

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1. INHOUSE SPACE SHUTTLE BOOSTER CONCEPT: We have derived a delta-winged booster for the inhouse shuttle study as a backup for the Martin concept, with a basic layout similar to the orbiter geometry except for the fly-back and landing configuration. Hypersonic entry at high angle of attack with heat shield forward is comparable to the orbiter's entry maneuver, with similar attitude and control requirements. Fly-back jet engines do not have to be stowed inside the body since they would be protected from entry heating by the shading of the wings. Entry is followed by a normal pitch and bank at supersonic or subsonic speeds until completion of the turn-around; then, the booster is rolled 180 degrees to a wing-up, heat shield-up orientation for fly-back. Advantages of this concept include enhanced stability through the dihedral effect of the high wing, and the positioning of the now-exposed jet engines in excellent flow field conditions in the wing roots at the underside. Also, landing gear trucks and struts do not have to penetrate the heat shield (now the top of the fuselage) but are lowered from the body as on the B-52 or from side pods. Finally, the pilot compartment, equipped with pivoted seats, is now on the "belly" of the fuselage where visibility for fly-back and landing is excellent. ✓

2. KSC GROUND WIND MONITORING: Currently, we are basing our real-time ground wind monitoring at KSC during launches on measurements from 60 ft masts at a distance around 1000 ft from the vehicle. Wind constraint computations for higher levels (up to 150 m) are then performed with a power-law relationship involving the 60 ft wind speed and a statistically distributed exponent k which is updated in real time by quick-look analysis of measurements from our 150 m tower at KSC. As a potentially considerable improvement of this method, KSC personnel and we are now in the process of bringing anemometers and wind direction vanes on top of the LUTs at the 445 ft level to operational status, to be used eventually as new reference for our ground wind constraints. Current problems are mainly based on the fact that the sensors are on top of the 360 degree-freedom LUT cranes (difficulty of hardline connection, updated information on crane position for wind direction vane orientation, electrical interference by hoist motors, etc.), and on the possibility of measurement errors due to wind-induced mast motions. Personnel at HOSC will monitor real-time on-pad data during AS-507 launch. Use of the 445 ft level anemometer on the LUT for operational reference depends on (a) KSC getting all associated problems solved (coordinated by us on a day-to-day basis), (b) the results of MSFC and MSC studies on how many 60 ft reference level constraints can be referenced to the 445 ft level, and (c) the workload associated with the constraint calculations requested. ✓

3. DLRV HAZARD AVOIDANCE STUDY: A status report of study NAS8-25099, "Use of Non-Imaging Sensors for Hazard Avoidance During Movement of the LRV," conducted by Bendix, was given by Mr. Robert Lewis of the Dynamics and Control Division to Ben Hilwitzky of CMSF during his one-day visit here on October 29. ✓

NOTES 11/3/69 GODFREY

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SATURN:

9K 11/3
1. AS-507 CDDT: The wet and dry CDDT's were conducted with only minor holds. The Launch Vehicle and GSE experienced two significant problems during wet CDDT. Two S-IC LOX Depletion Sensors (one inboard and one outboard) failed, but the countdown was continued by jumping the outboard sensor interlock. The sensors have been replaced by cryogenic tested spares. Failure analysis is in process and any additional action will be defined after completion of the analysis. ✓

The S-II GSE Hydrogen Heat Exchanger Level Sensor failed. After a period of operation in the manual backup mode and additional data analysis, the unit was returned to automatic level control and functioned properly during the remainder of the count. Post CDDT analysis indicates that the level sensor loss was probably due to a loose electrical connector.

Over 87 minor test problem reports from KSC are being analyzed to be sure that the launch vehicle and GSE issues are properly closed out. ✓

2. S-IC-12: The S-IC-12 static firing scheduled for October 29 was cancelled. The unfavorable weather conditions which prevailed would have resulted in an unacceptable sound level in neighboring communities. The static firing has been rescheduled to today (Nov 3) at 3 p.m. ✓

LRV:

A letter contract between MSFC and The Boeing Company for Lunar Rover Vehicle development and manufacture was signed on Wednesday, October 29, 1969. A "kick-off" meeting was held with the contractor on Thursday, October 30, and pre-negotiation meetings will continue throughout the month of November. Definitive negotiations are tentatively scheduled for the first week in December. ✓

1. SPACE SHUTTLE

The Space Shuttle Task Team has requested our Office to initiate several new studies in support of MSFC's response to the action items which resulted from the Space Shuttle Design Review at the 10-18-69 Management Council Meeting. The following new efforts are now underway:

(1) Investigation of a high thrust-to-weight ratio jet engine for shuttle use, utilizing hydrogen as the fuel. Outlining a development program required to achieve such an engine.

(2) Investigation of the merits of the F-1 engine as a reusable Shuttle propulsion system from the performance/sizing viewpoint. It will be necessary to disregard the 3.5 million-pound gross lift-off weight ground rule for the investigation.

(3) Investigation of the use of a pressure-fed idle-mode main engine for on-orbit maneuver and de-orbit requirements.

(4) Investigation of trade-offs between utilizing hydrogen and RP-1 fuel for air-breathing engines.

In addition, we are continuing the MSFC normalization study of the Shuttle configurations, eliminating the 3.0 million-pound gross lift-off weight vehicles.

2. HIGH ENERGY ASTRONOMY OBSERVATORY (HEAO)

Our Phase A design effort is on schedule and we are now concentrating on final system iterations required for conclusion of the Phase A baseline satellite design and on comparative analyses of configuration alternatives. A series of meetings has been held this week to review the overall design status and to initiate the Phase A documentation effort. Our current schedule requires final documentation by 12-8-69, in order to have adequate time for printing copies before the release of the Phase B RFP in early January 1970.

Although we still must complete power and thermal analyses for final confirmation, it appears as of now that the HEAO baseline design will be able to accomplish the desired 30-day galactic scan during the first phase of the overall mission profile. Use of a custom solar array instead of ATM modules should provide the additional power capability required for this portion of the mission. Pop-up solar array panels have been examined as an alternative for further power requirement growth but do not appear necessary for our baseline design.

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DUAL MODE LUNAR ROVING VEHICLE - Rod Stewart received the following TWX from Bendix Aerospace Systems Division: "As indicated in our letter of October 24, 1969, Subject: Initial planning data for DLRV extension, the plans presented therein were based upon Bendix winning the LRV contract. Since that is not the case, the plans presented are being re-evaluated and undoubtedly will change accordingly. They will be re-examined as a part of an overall assessment of the future Bendix position on DLRV necessitated by the outcome of the LRV competition. I will make every effort to keep you informed of the progress of this activity."

We will inform you if it appears that Bendix is dropping out of future Roving Vehicle effort.

SPACE STATION GENERAL - Mr. Dannenberg participated in an October 23 visit to MDAC by Chuck Mathews, Frank Williams, and Jack Small. Ted Smith, MDAC, presented 10 critical problem areas which led to a detailed discussion on the requirements for artificial gravity for a future Space Base. He especially expressed his desire for a more balanced distribution of artificial gravity and zero gravity working and living areas than indicated by the presented MDAC baseline program. Another version which provides counter rotation in two different rotational planes appealed to him greatly since it is not restricted in its attitude capabilities, and he encouraged a further analysis of concepts of this type. Chuck Mathews expressed his belief that the first station will not necessarily become an integrated part of the final operational Space Base. He reiterated the need that all Space Station activities have to be compatible with the NASA integrated plan. He also emphasized the need to look into operational aspects of space operations and especially during the Space Base buildup. He did not want to change at this time from a 1975 launch date for the first station element, although MDAC expressed considerable concern in regard to the proper selection of the most advantageous subsystems and concepts.

DISCUSSIONS WITH AIRLINES & AIRCRAFT MANUFACTURERS - SHUTTLE SUPPORT -

We are continuing discussions with support personnel of major airlines and selected aircraft manufacturers. Much valuable info has been obtained in planning for support, in the introduction of advanced maintainability concepts and in actual operations techniques. Through close coordination, aircraft manufacturers and airlines have obtained dramatic reductions in aircraft downtime. They have also developed cargo management techniques which are applicable.

FUNDING FOR LUNAR EXPLORATION HARDWARE - Detailed reviews were held with Ben Milwitzky and others from Hdqs., to establish requirements and to obtain agreement on MSFC funding for Lunar Exploration Hardware Definition. It was agreed MSFC would be funded at a level of \$5M for FY70 for Lunar Exploration Hardware Definition. The bulk of the work to be performed will be in support of systems and subsystems for DMLRV, and includes technology implementation, prototype fabrication, analysis and prototype testing. We are preparing work statements & plans for initiation of work & commitment & obligation of funds. Hdqs. has indicated they will fund us an additional \$2M if funds are available, assuming we are able to obligate the \$5M in a timely and efficient fashion. Additional funds will be requested later for initiation of a Phase B effort on the Lunar Drill and the DLRV Science Package integration.

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PRIME CONTRACTOR QUALITY SURVEYS: The Quality Sub-Task Team has completed assessment of three of the five prime contractors to be visited. Those visited have been most cooperative, and provided the essential environment for an objective review of the existing quality program activities, of significant changes made since January 1, 1969, and of the planning initiated to support follow-on contracts. Unfortunately, on Thursday evening before the planned review on Friday, Rocketdyne cancelled the review, and many of the team members found themselves in Canoga Park on an aborted mission. Hopefully, the team effort and enthusiasm can be rekindled for a new start when permission is received to visit Rocketdyne. ✓

In brief, the Quality Sub-Task Team has found no real serious problems and no conclusive evidence of complacency to date. Some findings were noted which one might conclude resulted from lack of attention to detail; but, such findings were not considered more prevalent today than in the past. The team was impressed with the acknowledgement of all levels of contractor management of their responsibility to prevent complacency, and the effort they were expending to do so.

With regard to the follow-on activity, the area of most concern to the team is supplier readiness and capability for follow-on production. Since, from the prime contractor standpoint, it is not appropriate to delve too deeply into supplier intentions without a contract, we are left in a somewhat open-ended situation. One recommendation of the team was that particular emphasis and strong prime contractor source support be provided critical suppliers on initial hardware production for follow-on.

As a by-product of having contractors assigned as members of the Task Team, some mutual benefits are already evident, and future exchange of communication between contractors will increase these benefits. ✓

NOTES HAEUSSERMANN 11/3/69

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NO NOTES THIS WEEK.

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NOTES 11-3-69 HEIMBURG

1. S-IC-507 CDDT LOX DEPLETION SENSOR FAILURES: Two of the lox depletion sensors did not indicate wet when lox was loaded. The count was held at T-10 minutes to jumper out the sensors so that the count could continue. The center engine does not utilize the depletion sensor, but has a timer shutdown. The outboard engines shutdown when 2 of 4 sensors indicate dry. All outboard sensors must indicate wet for launch. The failed sensors have been replaced. They were flown to Bendix for failure analysis. Bendix found a bad transistor in the center line sensor. No problem has been detected with the other sensor. Investigation is continuing. ✓

2. PROPOSED REVERSAL OF OWS FLOOR: Your question regarding the finality of our decision not to reverse the OWS floor (Heimburg Notes of 10-20-69), it was our understanding that the change from "wet" to "dry" was not to include any changes which were not essential. Based on that ground-rule, we chose not to propose such a significant change. Recent events indicate clearly that the original "no change" criteria no longer is in effect. Not only is the reversed floor direction expected, but MDAC is now redesigning the crew quarters wardroom. With this dramatic change in direction, it is becoming clear that AAP management is no longer serious about a 1972 launch. A large measure of the work that has been completed for the OWS has been negated by these changes.

Lee Beler
Do you agree?
B

3. AAP FOOD MANAGEMENT: Personnel from this laboratory met with Dr. Jon E. Vanderveen, a nutritionist from Brooks Air Force Base, on 10-23-69 to discuss state-of-the-art in food preparation and consumption in a zero-g environment. It was noted that conventional cooking methods can leave odors and noxious gases in the workshop for several hours. Dr. Vanderveen suggested that a microwave oven could be employed. It has the advantage of quick cooking and no harmful odors. It has the disadvantage of losing flavor in meats; of over cooking frozen foods on the outside, while the inside remains frozen, and the possible danger of exposing the crewman to microwave radiation. It was suggested by Dr. Vanderveen that several ex-Manned Orbiting Laboratory nutritionists may be available to MSFC as support personnel in the food management area. ✓

4. OWS BACKUP FAN: We have continued our search for a backup to the AiResearch Corp. \$9,000 fan. Recently, after reviewing our requirements, IMC Magnetics Corporation has submitted a proposal for 5 fans for a total cost of \$4500. It is anticipated that a contract will be signed by the end of this week. Fan delivery is as requested: 1 unit 1-2-70 and 4 units 4-1-70. ✓

5. MODERATE DEPTH LUNAR DRILL: Drill bit 20-22 (similar to the bit which went 50 ft except it has double the number of chip relief areas) was used to drill 74 ft.8 in. in Dresser Basalt during tests at the Hoffman Brothers Plant in Punxsutawney, Pa. At this point the bit crown failed, the penetration rate was still at 1.9 in/min and if the crown had not failed could possibly have drilled 10 additional feet. The cause of failure is being investigated. ✓

1. GYRO-RELATIVITY EXPERIMENT: A two-day meeting, organized by Dr. Decher, was held on October 28 and 29 with the Stanford group to discuss the gyro-relativity experiment. Stanford showed up in strength, i. e., the P.I., Dr. Bill Fairbanks, and six of his co-workers. Members from several laboratories and from PD participated. One of the results was that the experiment should be approached in three steps: (1) an all-up technology experiment (which might already produce scientific results), (2) a scientific experiment with the objective to measure the relativistic effects of the orbital motion in a non-polar orbit, and (3) a final experiment in a polar orbit to measure both relativistic effects of the earth orbit and the earth's spin on the gyro (7 and 0.05 arc sec/yr). The relativity experiment has not as yet been baselined for the Space Station. As a result of our meeting with Stanford, the request by Bill Fairbanks to have the experiment included in the Space Station has been relayed by PD to OSSA for inclusion in the "Blue Book." Bill Fairbanks was very interested in the possible use of the shuttle to deliver experiments in any desired orbit and to bring them back if needed for repair or for updating of the science. ✓
2. Ph. D. CANDIDATES: Messrs. Robert Naumann and Ed Klingman passed the math exam, in addition to their earlier prelims in physics. This makes both "Ph. D. candidates." Bob Naumann's thesis has already been written and accepted. The next and final step is the defense of his thesis in Spring 1970. ✓
3. VISIT OF DR. CURRY: Dr. Tom Curry, who heads the program for NAS Postdoctoral Associateships, visited MSFC at the invitation of Dr. Stuhlinger's office. I had a real good discussion with Tom Curry during a luncheon together with Dr. Bucher, who is in charge of the MSFC program. Dr. Curry is in full agreement with the approach which we adopted recently, i. e., we start the selection of NAS candidates by correspondence and matching their capabilities to our SSL program needs and available lab equipment. Dr. Curry intends to go a step further in his next proposal to NASA: to provide 2-3% of the funding for a trip by an accepted associate to the Center several months before the start of his tenure. This will help to cut down the time required for the associates to come up to full steam. ✓ With respect to your question in the 10-13-69 Notes (attached): Dr. Bucher has requested from OMSF an increase of the number from 12 to 18. We seem to have a fair chance that this will go through; however, the decision cannot be expected until Congress votes on the FY-70 budget. ✓

NOTES 11-03-69 HOELZER

B_{1/4}

NEGATIVE REPORT.

NOTES 11/3/69 HUBER

B 11/4

1. AEROSPACE CORPORATION STUDY: As you know, the Aerospace Corporation is undertaking a study of future manned space flight activities, jointly funded by NASA and the Air Force. We understand that the USAF Space and Missile Systems Organization (SAMSO, Gen Phillips is Commander), will have direct responsibility for the Aerospace effort. Mr. C. J. Donlan, MSF, has been assigned action for NASA. Mr. Donlan has designated a team of NASA Headquarters people to assist him, with Mr. Dan Schnyer, MTV, as his deputy for the over-all effort. The Aerospace work scope concentrates on major elements of the NASA Integrated Plan (Shuttle, Space Station, Tug, Nuclear Shuttle, etc.), including sub-system studies and cost studies. The relationship between the Aerospace effort and the normal advanced study programs with the Centers is not at all clear yet. We will keep you posted on further developments.

B.H.
I haven't
even been
told about
it by
MSF B

2. SATURN WORKSHOP NO. 2: An ad-hoc inter-Center committee was formed under Mr. Schneider's sponsorship to formulate plans to define the second Workshop mission and concept (a Phase A type effort, to prepare for conduct of Phase B in FY-71). C. Ellsworth, PD-SA, and J. Waite, PM-AA, are participants in this Committee for MSFC. The committee met at KSC on October 28 and 29, to finalize a proposed plan for the Phase A effort. It is planned that this material will be presented to Mr. Schneider and Mr. Matthews after the November Management Council meeting. ✓

3. AUBURN UNIVERSITY PROPOSAL: The Auburn University School of Architecture and Fine Arts has contacted Program Development, to express an interest in habitability design studies for future space stations. We feel that there is prospect for work of mutual benefit here, and are making arrangements through Col. Mohlere for further discussions with the Auburn group. ✓

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NOTES 11/3/69 HUETER

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11/4

DISABLING INJURY INCIDENTS:

Mr. John Hauser of the Facilities Office has been appointed as the Accident Investigating Official to investigate the disabling injury to Mr. Billy Cornelius of Technical Services Office. On October 23, 1969, Mr. Cornelius suffered extensive body bruises when caught by an unguarded rotating heating unit blower driveshaft. Lost time charged for this injury will be approximately one week.

Mr. Joe Johnson of ME Lab has been appointed as the Accident Investigating Official in the case of a disabling injury sustained by Mr. Luther Emery of Qual Lab. On October 29, Mr. Emery was helping to load furniture on a fork lift when his hand was caught and crushed by the lift cargo stabilizing frame beams which sissor into position to balance the load. Lost time charges are undetermined at this time pending results of surgery and the degree of recovery.

✓

NOTES 11/3/69 JOHNSON

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Nothing of significance to report.

NOTES 11/3/69 MOHLERE

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No submission this week.

NOTES 11/3/69 MOORE

B 1/4

1. ATM EXPERIMENT POINTING SYSTEM MOTION SIMULATOR: The test fixture which will allow us to perform design verification of the ATM experiment pointing system has been received from Perkin-Elmer Corporation and is being assembled in our ATM simulation area. This fixture utilizes mercury, flexure pivots, and mass balancing to simulate a zero gravity condition for verification of the experiment pointing system design and performance. When coupled to our vehicle motion simulator (already installed), it will provide a means of testing the overall cluster stabilization and pointing control system. Installation and checkout should be complete in mid-December. ✓
2. ATM SOLAR ARRAY WING ASSEMBLY: The full size development model of an ATM solar array wing has been assembled in Bldg 4649 and was successfully deployed manually using the deployment fixture for the first time on October 28. The wing will now be wired and readied for optimization tests scheduled for December 1. ✓
3. WET WORKSHOP SUN SENSORS: Prompt action in terminating a contract with Adcole Corporation for eleven sun sensors originally required for the Wet Workshop has resulted in recouping \$156,000 in AAP funds. Government liability in this termination was limited to \$8,600. Sun sensors in the ATM module will be utilized to provide pitch and yaw references for the Dry Workshop. ✓
4. DUAL MODE LUNAR ROVING VEHICLE: In conjunction with Program Development we conducted individual technical reviews for Mr. Ben Milwitzky, NASA Headquarters, last week on the technology tasks we have proposed in support of DLRV. Mr. Milwitzky was able to assure us of approximately \$2.5 million in the Astrionics area with some hope of an additional \$500K within a few months. Major tasks for which these funds would be used include motor drive development, imaging data processing/TV camera, scanning laser radar, power sources, and navigation sensors/requirements. Approximately twenty tasks in addition to the above will also be worked both in and out of house. Of course we are highly pleased with this significant, tangible Headquarters endorsement of our proposals. ✓

NOTES 11-3-69 SIEBEL

B 11/4

1. Submissions for Congressional Presentation: We submitted three items through S&E-R to OART for use in congressional budget hearings. They were as follows:
 - a. A seamless cylindrical tube demonstrating the Omniweave process, a three-dimensional weaving process.
 - b. A Boron-Epoxy honeycomb cylinder depicting the plywrap fabrication process. This is the results of OART funded project titled "Development of Technology using Composite Sandwich Structures." The cylinder is 30" in diameter and 10" high plus attach rings.
 - c. A final report on the project for developing the design and process for fabrication of a Cryogenic Tank support structure. ✓
2. Single Crystal Growth (Flight Experiment for AAP OWS): A meeting with Westinghouse was held at MSFC on October 30, 1969. This meeting occurred at approximately the mid point of the contract. Westinghouse presented a status report on their development efforts on the Single Crystal Growing Experiment. They appear to be on schedule with the delivery of the first ampoule in February. ✓
3. Floor for Alabama Space and Rocket Center: A six-foot diameter air bearing floor was poured for the Alabama Space and Rocket Center. ✓

B 11/4

NOTES 11/3/69 SPEER

1. Apollo Site Selection Board (ASSB): The ASSB met on 10/30 and reviewed the many factors related to site selection as the program shifts emphasis to scientific exploration objectives. Operational and payload capabilities are major limiters to scientific desires. The Apollo 13 (H-2) landing is planned for the Fra Mauro site (major surface feature near Mare Imbrium), which is considered difficult to achieve due to a limited safe landing area. If pinpoint (<1 Km) landing accuracy is not demonstrated on Apollo 12, the Apollo 13 site will be changed to Hyginus (a smooth crater and rille formation), which is less demanding operationally and less desirable scientifically. The 6R site (smooth western mare area) will be used in the future as a standard back-up site in case the launch window for a primary mission site is missed. J-mission (Apollo 16 and subsequent) commitments remain flexible pending further experience with operational capabilities and detailed assessment of payload capabilities. The Tycho site (a fresh impact crater in Southern Highlands), which is a highly desired scientific site, is particularly in question due to the operational difficulty both in reaching the high inclination and rough landing area. MSC presented a proposal to fly a Navy reconnaissance camera (Hycon K-74) in the command module on Apollo 13-15, in lieu of the present Hasselblad camera. The new camera system, which carries a price tag of more than one million dollars, would permit obtaining 3 m resolution of an approximately 15 x 2000 mile strip on the lunar surface for qualification of future landing sites, and is the best solution available prior to a special mapping camera being developed for J-missions. Proposals for J-mission surface experiments were due on 10/28 and 115 had been received in NASA Headquarters. MSFEB commitment to those which will be carried is scheduled for 1/26/70. ✓

2. Apollo 12 CDDT: MSFC support of the Apollo 12 Wet CDDT was provided from the HOSC on 10/28. The CDDT was successfully completed with no major launch vehicle problems at 10:24 a.m. CST, with only a single 2 1/2 minute hold preventing it being the first Apollo on-time CDDT completion. The Dry CDDT was completed on schedule, with no problems, at 10:22 a.m. CST 10/29. Due to steady high winds, S&E wind monitoring personnel remained on station in the HOSC through final damper transition and MSS replacement at the vehicle. Based on their assessment of the actual wind profile, we were able to relax the normal 35 kt wind limit for damper removal and prevent a work delay of several hours. ✓

NOTES 11/3/69 STAMY

B 11/4

Nothing of significance to report.

B 11/4

NOTES 11-3-69 Stuhlinger

1. STUDY REQUEST BY ASTRONOMY MISSIONS BOARD: Dr. L. Goldberg wrote a letter to Dr. Newell in which he requested NASA to make three studies, (1) the six-month study on a stellar ATM as offered by Dr. Mueller; (2) continuation of the solar ATM-B study; and (3) a study of advanced OAO systems with man-attendance, leading toward a large (3 meter) space telescope. An earlier request for a detailed study of the cost-effectiveness of man in space telescope systems was repeated. Dr. Goldberg suggested that these studies be made in the same spirit of excellent cooperation which has prevailed in the HEAO Project between OSSA, MSFC, and GSFC. ✓

2. ALVAREZ SPACE EXPERIMENT: At a recent review of space experiments at GSFC, Dr. L. Alvarez expressed considerable dissatisfaction with present space science project plans, and with the handling of scientific programs at NASA in general. Subsequently, he cancelled his visit at MSFC planned for November 10. As you may recall, Dr. Alvarez proposed a very large cosmic ray experiment (about 15,000 kg) for the space station. After consulting with Dr. Hagge at MSC, who has been working closely with Dr. Alvarez during recent years, I called Dr. Alvarez and offered that Jim Downey and I visit him. At the same time, I assured him of our great interest in his experiment as a potential project for the space station. Dr. Alvarez declined this offer, but he said that he will visit MSFC at a later time.

3. VISIT BY DR. ORR REYNOLDS: Dr. Reynolds, Director of Bio-science Programs at OSSA, would like to visit MSFC for 1 or 2 days with several of his associates in order to learn details of our space station and shuttle plans, and to familiarize us with space bio-science programs. He will call you soon and ask you to endorse this visit. ✓ I strongly recommend that we invite Dr. Reynolds to visit us at a convenient time. ✓

There are several distinct groups of promising biological experiments on satellites; some of them require the presence of man. Among them are the following: exposure of low forms of plants and animals to 0-g; observation of genetic cycles at 0-g; cultivation of normal and abnormal tissues under 0-g; production of enzymes and vaccines under 0-g; exposure of heart-transplanted animals to 0-g; life functions of higher animals (reptiles, mammals) under 0-g. ✓

Nov 10, 1969



ELITE

25% COTTON

B 11/15

NOTES 11/10/69 BALCH

S-IC-12 - Static firing was successfully accomplished on 11/3/69 for a duration of approximately 125.1 seconds. Removal from the test stand is scheduled for 11/17/69. ✓

S-II-9 - Stage is in the vertical position in the S-II Stage Checkout and Storage Building. Final modification period started on 11/3/69 as scheduled. Shipment to KSC remains scheduled for 1/8/70. ✓

S-II-10 - Stage was removed from the A-2 Test Stand on 11/4/69 and installed in the horizontal position in the S-II Stage Checkout and Storage Building. Insulation repair is in progress. ✓

S-II-11 - All work is on schedule for static firing on 11/14/69. ✓

Legal Affairs - Federal District Judge Harold Cox has ruled in favor of the Government in the case of Pigott vs U. S., a suit for damages allegedly caused by static test firing at MTF. Damages claimed in this suit were the same type as those claimed in the prior suits (Rester, et al vs U. S.) wherein Federal Judge Nixon ruled against the Government. Judge Cox found that the static test did not damage the plaintiffs and that NASA was not negligent. Appeal actions regarding Judge Nixon's decision now appear more likely. However, an appeal cannot be taken until such time as Judge Nixon acts upon a motion which the Government has submitted in an effort to get him to alter and amend his decision. ✓

7/11/10
FLIGHT DEVELOPMENT VERIFICATION UNIT (FDVU) ROCKET LAUNCHES: The sounding rockets carrying the AS&E and NRL-A flight design verification units were launched on November 4, 1969. Preliminary data indicate that the launches were successful. ✓

IN-FLIGHT STOWAGE FOR AAP: We have received printed copies of the stowage list from MSC. There are some corrections which did not get incorporated in this revision; however, they will be shown in a change sheet accompanying the stowage document. Distribution of this document will be via a Configuration Control Board Directive this week. ✓

LAUNCH VEHICLE INTERFACES: This week a meeting was held with the LV Systems Engineering Office regarding the AAP requirements on the LV. We had prepared a diagram defining the documents which levy requirements on the LV. At the conclusion of the meeting, it was agreed that to properly track the implementation of the Cluster requirements, a list will be jointly prepared by the two offices which record the method of implementing each requirement. An example is for the SAS deployment command required through the IU Launch Vehicle Digital Computer (LVDC); this requirement will be listed as well as the document which implements it, i. e., the LV switch selector ICD. ✓

IMPLEMENTATION OF EARTH RESOURCES EXPERIMENT PACKAGE: ECR's are being sent to MMC and S&E-ASTN requesting ECP impacts on the proposed installation of the Earth Resources Experiment Package in the MDA. The optimum location for the IR Imager and spectrometer would be within MDA Docking Port No. III (Radial Port). Bill Schneider has requested this detailed information to include in his consideration concerning possible approval for inclusion in the AAP. ✓

B 11/15

9K/10
CONGRESSIONAL STATUS - Senator Mansfield has stated that the Continuing Resolution will be taken up the latter part of the week of November 10. All independent agencies are awaiting either passage of a Continuing Resolution or their Appropriation Act. ✓

The House and Senate have approved the House/Senate Conference Report on NASA's FY-70 Authorization by voice vote without debate. The bill totaling \$3,715.5M has gone to the President for signature. ✓

The Senate Appropriations Committee has approved the FY-70 Independent Offices Appropriation Bill which includes NASA funding with the same breakouts contained in the Authorization Bill, i.e., R&D - \$3019.9, C of F - \$58.2, R&PM - \$637.4, totaling \$3715.5M. The schedule for Senate floor action has not been announced. ✓

TRAVEL PER DIEM - On October 27 we reported that Congressional action had increased travel per diem from \$16 to \$25 prematurely since at that time the bill was still in conference. It is now an enrolled bill (passed by both houses of Congress) and the President has until November 12 to either sign or veto the bill. If he does not act by November 12, it automatically becomes law. ✓
Agencies are required to absorb the increase. This means our restricted travel situation becomes more austere since this represents approximately an 18% decrease in MSFC travel capability. Headquarters is considering (1) a supplemental request, or (2) some figure less than \$25 a day or a sliding scale, dependent upon destination, if Congress is not receptive to a supplemental request. ✓

MSFC OPERATING BASE - MSF has requested a manual addendum with POP 69-2 that contains our Operating Base funding and manpower requirements. The FY-70 Operating Base manpower guideline (combined civil service and support contractor) for the MSF Centers is shown below:

MSFC - 8,267

MSC - 10,000

KSC - 10,000

This is only manpower located in the geographic area of the Centers. It excludes MSFC civil service and support contractors at Michoud, MTF and contractor plants. These guidelines are the same as those discussed at the MSF retreats in April and May and show MSC and KSC declining to 10,000 each and MSFC remaining level. ✓

Subsequent to the MSF retreats, our civil service ceiling was increased from 5851 to 5969, some civil service people were moved from off-site to Huntsville, plus our requirements for Engineering and Institutional support contractors have increased. As a result the manpower level in our Operating Base submission will be approximately 400 above the MSF guideline. ✓

NOTES 11-10-69 BROWN

B 11/15

^{9/11/10}
F-1 Engine - S-1C-12 was successfully static fired for a program duration of 125 seconds on November 3, 1969. Preliminary data indicates two engines, positions 3 and 4, did not meet the end item test plan tolerance requirement of +15K from predicted. Engine F-6075, position 3, had a thrust level of 1516.8K (predicted was 1533.2) and engine F-6083, position 4, had a thrust level of 1502.6K (predicted was 1523.5). Engine F-6074 had a thrust level of 1495.5K which is 4.5K below the minimum of 1500K allowed by the F-1 Engine Model Specification. Investigation of the phenomena is in process. ✓

J-2 Engine - AEDC Activities: The impact on AEDC personnel of the reduction in J-2/J-2S test effort at AEDC is being evaluated by ARO, Inc. and the USAF. An estimate of the personnel impact is anticipated by November 21, 1969, with actual reductions to begin approximately two weeks later. We will report the extent and timing of the reduction when it is known. ✓

B 11/15

9/11/10

1. MARS ORBITER STUDY: JPL has been requested by the Planetary Programs Office of OSSA to do an in-house study of a High Data Rate Mars Orbiter Mission. The primary purpose of this proposed mission is to provide high resolution imagery of the surface of Mars. Mr. Donald Bartz of JPL was aware that Dr. Stuhlinger, Mr. Carroll Dailey (now Chief of the Space Physics Group of my Office), and others previously in SSL had recently completed an MSFC in-house study of a high data rate Mars imaging payload mission. Mr. Bartz requested our assistance in JPL's present study, which is a relatively low level effort. Mr. Dailey visited JPL at their request during a recent trip to the west coast and discussed the High Data Rate Mars Orbiter study with Mr. Jim Long, Mr. Bartz, and others. We are sending JPL various reports and other data and will maintain contact with them during their study effort. ✓

2. BIOSATELLITE III FLIGHT: You requested that we contact Dr. Reynolds' Office and obtain general information on the flight of the monkey "Bonny." Dr. Reynolds would be glad to give you a "thumbnail sketch" over the phone if you desire. Meanwhile, Dr. Hilchey is assembling a short report on the events of the flight, the physiological problems which arose, the hypothesis accounting for the animal's condition and the immediate cause of death. He will also touch lightly on some of the scientifically or politically sensitive areas. ✓

Dr. Reynolds will make a presentation on this subject to Congressman Karth on November 12th. ✓ We are attempting to get a copy of the presentation material to supplement our report. Dr. Berry of MSC will present his views on the results to Congressman Karth on November 17th. We will also attempt to obtain a copy of his briefing as well. ✓

This flight has achieved a degree of notoriety which makes it imperative that we validate carefully any material we present to you. We will keep you advised as fully and as quickly as possible; in the meantime we recommend caution in any public statements. ✓

J.D.
Have all info I need by now
B

I read it.
B

7F11/10

B 11/15

1. REVIEW OF LASER DOPPLER VELOCITY SYSTEM: A review and status report on the CAT and aircraft trailing vortex detection systems was given to NASA/OART personnel from HQ, followed by a demonstration of vortex visualization and detection. As a result of the presentations, the HQ personnel indicated their strong interest in completing both programs. They noted the MSFC situation on additional manpower requirements and our request for support from other centers, appreciated the problems and did not exert strong pressure to increase manpower at this time. The urgent need for a vortex detection system was emphasized; development of a three-dimensional system was agreed on to be justified, as well as slow-down of the CAT system development. Mr. Evans of the Aeronautics Division is apparently taking steps to substantially increase the 1971 funds in the vortex area. Now available FY 70 funds are 670K. ✓
2. DIRECT ASCENT LUNAR LANDING MISSION: Although the Saturn V can be prepared to accept a direct ascent mission and a significant payload increase (5,000-6,000 lbs.) can be attained, a direct ascent mission is not in an operational status. ✓ An extensive and expensive effort would be required to bring a direct ascent mission to an acceptable level of confidence for commitment. Before such an endeavor is undertaken, it must be recognized that our Apollo inhouse and contractor work force has been reduced to a level in consonance with a standard Apollo mission. Some of the more significant deviations from a standard Apollo mission are: (1) Vehicle Constraints: The heating environment would increase approximately 15%, and the maximum dynamic pressure would increase about 7%. Although we would expect an analysis to show that we could accept such a change when coupled with 108K payload, we would anticipate this "new" environment will cause constraints that will propagate its effects into the following area. (2) Abort Limits and Malfunctioned Flight: The more severe flight environment will narrow the acceptable flight corridor, and the trajectory characteristics will cause the vehicle to "dive" toward the atmosphere during the S-IVB burn. Therefore, we will have a new path through the flight corridor. Consequently, we would expect a re-evaluation of malfunction flight, mission rules, abort limits and new abort procedures. (3) Crew and Support Personnel Training: New ground launch procedures will have to be developed since no orbital spacecraft checkout time is available. A new spacecraft takeover procedure, in the event of a platform failure, may be required. New booster systems engineer go/no-go criteria will be required. (4) Spacecraft ΔV Capability: The heavier spacecraft will have less ΔV capability; hence, we would expect a hybrid TLI profile would be used to maintain an acceptable ΔV contingency budget. Direct ascent profile with hybrid characteristics has not been analyzed. (5) Landing Site Accessibility: Direct ascent trajectories have their earth-moon geometries relatively fixed. To arrive at any landing site requires that we approach the moon from above, below, and in the earth-moon plane. The ability to approach any landing site has not been assessed for direct ascent trajectories. (6) Tracking and Communications Coverage: Landing sites accessibility requirements could force us to flight azimuths where ground based coverage is minimal during powered flight. We might be hard pressed to locate ships and ARIA aircraft properly to provide acceptable coverage. In summary, we advise caution when considering direct ascent profile in the present time-frame. ✓
3. AS-507 ACCELEROMETER FAILURE ANALYSIS: Recent investigations have revealed that the AS-507 vehicle may not be able to make a contingency orbit following an X-axis (vertical at L.O.) accelerometer failure prior to \approx L.O. + 50 seconds. The backup acceleration presettings were derived for a September "G" mission and the S-IC stage thrust changed for the November launch. ✓

Saturn:

1. S-IC Hydraulic Supply & Checkout Unit (HSCU): During 507 CDDT with the S-IC fuel tank loaded, RJ-1 fuel leakage occurred through HSCU pump case into pump servo system reservoir (MIL-H-5606 Fluid). Leakage occurs when the system is in standby condition (pump not operating). MSFC Materials Lab has high confidence that RJ-1 and 5606 fluid compatibility will be no problem. Tests have been run at Sat V breadboard with 25% 5606 fluid dilution with RJ-1 to demonstrate no lubrication problems. KSC and MSFC agree that the best plan is to leave system as is for AS-507 launch rather than expose system to contamination by rework. The check valve and servo block or pump will be changed out after launch. ✓

2. Saturn Payload Capability: MSFC plan to meet 107K payload capability was presented to Headquarters and MSC on October 30, 1969. Most of our proposals were accepted except for 4.35g S-IC cutoff and reduction in launch window. MSFC and MSC are to give further consideration to one second shorter holddown time and lower (85 n.m.) earth parking orbit. These two changes would provide approximately 900 lbs additional payload. We believe the 107K payload commitment can be met with no major hardware changes. ✓

3. Reference your comments on the Balch Notes 10/20/69: We have been analyzing the recent trend of component failures at the static test sites as well as at KSC. The number of such failures has decreased over the past year, but now seems to have leveled out. We also find about the same failure rate at KSC as we have at the test sites. The large majority of the failures were caused by improper processing or lack of quality control at the time the component was assembled, at the vendor, typically three or more years ago. We believe that static firing offers no solution to these problems. It appears that more emphasis on component inspection and testing is necessary. ✓

LRV:

Weight growth, as a result of additional requirements, continues to be a significant problem for the LRV project. LRV weight has been impacted by 20-25 lbs since Dr. Mueller's "go-ahead," as a result of navigation requirements, improved EMU, communication and TV equipment, etc. To date, we have retained the 400 lb target; however, all future new requirements with weight impact will be resisted unless the maximum allowable LRV weight is renegotiated and a very tight weight control system will be implemented with the prime contractor.

A debriefing to the unsuccessful LRV bidders, Grumman, Bendix, and Chrysler, was held at NASA Headquarters on Friday, November 7. ✓

B 11/15

1. AIR-BREATHING ENGINES FOR SPACE SHUTTLE

A list of preliminary guidelines, assumptions, and questions was compiled in reference to air-breathing engine requirements for the Space Shuttle. This material was generated to aid in MSFC activity concerning the action items assigned to DOD relative to the current development status of high thrust-to-weight ratio engines. The material was forwarded to the Aerospace Corporation for use in soliciting a response from the jet engines contractors relative to the developmental status of jet engines potentially applicable to the Space Shuttle. It was also submitted to the Space Shuttle Propulsion Subcommittee on air-breathing engines. Personnel from this Office met on 11-5-69, with Mr. W. Stewart, LeRC, who, it is understood, will head up the air-breathing subcommittee under Mr. Jerry Thomson. As a result of this discussion Mr. Stewart will invite the jet engine contractors, as well as representative NASA and DOD personnel, to a two-day meeting at LeRC on November 19-20, 1969. The preliminary guidelines, assumptions and questions compiled by this Office will be forwarded to the invitees in advance of the meetings to insure a response to the meeting that will serve MSFC interests with respect to the action items. ✓

2. SPACE SHUTTLE NORMALIZATION STUDY

Personnel from our Office visited the following contractors during the week of October 27-31, 1969: NAR, GD/C, LMSC, MMC and MDAC. The purpose of this visit (relative to weight estimating and data normalizing in-house activities) was to discuss weight determination and estimating techniques, vehicle sizing methods, vehicle performance analyses approaches, and to verify selected data. A very beneficial meeting resulted with most of the contractors, and considerable data and system insight were obtained. The results of this trip are forthcoming in a trip report and the material obtained is being utilized to further our normalizing activity relative to all 3.5 million-pound gross lift-off weight vehicles. ✓

9/11/10

SPACE SHUTTLE FACILITIES - Jim Love, NASA Safety Director, Flight Research Center, EAFB, visited MSFC to discuss facilities at EAFB and their potential application to the Shuttle Program. He delivered data on the larger buildings (C5A & B70) and will furnish additional information on their projected utilization, and on tankage and other equipment which may be available from the Haystack Butte complex at Edwards. ✓

SPACE SHUTTLE IN-HOUSE DESIGN - For MSFC to carry out its assigned responsibility of evaluating the Space Shuttle configurations, an in-depth understanding of the many trade-off parameters which determine the optimum configuration is required. The most efficient way to acquire the necessary technical data base is to do some in-house design work. ✓ The S&E Lab and Preliminary Design Office of PD under the direction of the Space Shuttle Task Team are pursuing a joint design, not with the purpose of designing a Marshall-sponsored configuration, but with the purpose of building a technical data base. ✓ A useful by-product of this effort may well be identifying some of the pitfalls that the contractors should avoid during Phase B. ✓

SPACE STATION REVIEWS - Monthly Review Meetings with NAR and MDAC were held in Los Angeles Nov. 5 & 6. The Field Director's Review Group attended and held review sessions. Both contractors showed considerable progress over previous meetings. MSFC attendance was very limited due to the travel budget. In-depth reviews of contractor activities in the Space Base and Planetary Mission Tasks are planned at MSFC for Nov. 13 & 14. A follow-on review of mission design activities, considered to be necessary in preparation for the forthcoming quarterly review, is planned for Los Angeles, Nov. 18 & 19 at MDAC. ✓

SPACE STATION TECHNOLOGY PROGRAM - On Oct. 31 Messrs. Keller, Gray and Chase represented MSFC at the Headquarters (OART) meeting on Space Station Technology. Five panels have been established for the definition of Space Station Technology requirements and the implementation of their solution by suitable study efforts. Some objections to the planning and proceedings of the meeting were noted privately to Bob Lohman (OMSF) with the hope that improvements in certain areas can enhance success of the effort. Present actions for MSFC include: (1) establishment of informal relationships between the five panel chairmen (all from OART) and prospective Center membership, (2) continuation of efforts to define an adequate technology program, and (3) initiation of efforts within the Center to achieve a satisfactory role for MSFC. ✓

DLRV CONFIGURATION - Both Bendix and Grumman have evolved acceptable configurations of the DLRV which meet the maximum weight requirement of 650 pounds. Grumman appears to excel in mobility systems and Bendix in the design and the packaging of electronic and power components. Redirection was given both contractors this week to finalize a baseline configuration. We still hope to continue with both contractors in a low level sustained Phase B effort through FY 1970 to allow start of the development phase late next year. ✓

B 11/19

NOTES 11-10-69 GRAU

9/11/10

COMPONENT QUALIFICATION AS-507: All Certificates of Component Qualification for AS-507 have been signed.

NOTES HAEUSSERMANN 11/10/69

B 11/19

9/1/10

1. Complex 34: S&E, PM-SAT and KSC have been studying the pros and cons of upgrading the LC-34 operating system to a Saturn V-type operating system. KSC strongly supports the upgrading. The available time frame for working the change made the S&E recommended proposal acceptable to PM. A suggested Mechanical Ground Support Equipment change will not be considered as a part of this upgrading. PM is taking steps to secure the necessary funds before an official turn-on is authorized. Launch availability for AAP rendezvous missions will be improved. The greatest asset will be realized in the KSC and IBM operations due to the fact that the LC-34 and LC-39 operating systems will be very similar.

2. S-IC-12 Static Firing: S-IC-12 static firing was successfully completed for a full duration of 125 seconds on November 3. Preliminary evaluation indicates a slightly lower than predicted thrust on three engines. Several measurements were especially monitored as a result of AS-507 CDDT experience. These were: a. LOX and fuel cutoff sensors - no anomalies, and b. The existence of a gas bubble in the prevalve cavity was confirmed for all outboard engines. ✓

3. Systems Engineering Course: Eight CSE people attended the General Electric Systems Engineering Course given locally last week. All eight were highly complimentary of both the course and the instructors. ✓

4. LRV Drive Motor Subsystem: Boeing and General Motors (GM) presented a trade-off study for the backup mode of the drive motor, that is a comparison of the Lundell d.c. motor and the permanent magnet motor; both are brushless. The comparison is, in my opinion, very one-sided and of the "not-invented-here" type by GM. Boeing will be directed today to proceed with the permanent magnet brushless d.c. motor. If, in their opinion, the Lundell motor is so much preferable, our suggestion to them is to develop it instead of the standard brush-type d.c. series motor, which they intend to use as the primary mode. ✓

W.H.
What kind of cost are we talking?
Can some of the RCP 110A equipment bought for Complex 38 be used, should be available due to minimal-out Sat V launch schedule
B

NOTES 11-10-69 HEIMBURG

B 11/19

1. APOLLO 12 CDDT EVALUATION: All open items from the AS-507 CDDT have been closed out and the vehicle is ready to support launch countdown. The S-IVB stage real time prediction program has been run several times and the output has been verified to be compatible with the AS-507 final prediction. The situation is go for the simulation on Nov. 7, and the launch on Nov. 14. ✓

2. ATM THERMAL SYSTEMS UNIT: During the ATM review for you on 10-30-69, it was reported that we were 6 weeks late. To set the record straight, when the ATM program management reported to Schneider that we could make a 3-72 launch, the report was made without S&E concurrence. According to our schedules, documentation releases, S&E-ME reported to PM that they would be 12 weeks late for a 3-72 launch. Since that time, we have managed to reduce this 12 weeks to 6 by working closely with S&E-ME. Therefore, the 6 weeks "late" was actually a 6-week gain over that to which both we and S&E-ME had committed. I believe the Center should be most cautious in committing to headquarters the delivery of hardware, in spite of apparent schedule incompatibilities. Incidentally, we now believe we can make up most of the remaining 6 weeks by using overtime with our mission support contractors, a very costly way to meet commitments which were never agreed to and, if you recall, Schneider said he didn't expect us to agree to but only asked if we could meet the date to see how close we would be to meeting a 7-72 launch. ✓

3. OWS FAN VERIFICATION: The operational phase of in-house development life testing has been completed. Approximately 3600 hours of operating time at 5 psia in an oxygen environment and at 60 to 100 percent relative humidity was obtained. Vacuum storage testing is in progress. ✓

4. DOCUMENTATION RELEASED FOR OCTOBER 1969: During October we processed and released 1891 documents (including drawings, parts lists, EO's, DRL's, ICD's, etc.) to the repository (A&TS-MS-D) for reproduction, distribution, and storage. In addition to the drawings not released through the official channel, this represents an increase of 112 percent over the previous month's output and is 72 percent greater than that of any other month this year. Astronautics Laboratory, Astrionics Laboratory, and Central Systems Engineering were involved in the preparation of the documents. We believe this trend to in-house engineering is encouraging. ✓

5. MSFC COLLAR SWAGED CONNECTOR DEVELOPMENT (CONTRACT NAS8-20572, PARKER AIRCRAFT COMPANY): The contractor has completed qualification testing on the 1/4, 3/8, and 1/2 inch size fluid connectors. These connectors assure zero leakage at a considerable savings in weight and possibly cost over the best available anywhere today. Problems with thermal shock and vibration on some larger connectors will require redesign. Because of the lack of funds, the contract has been put "on hold". In the meantime, MSFC will proceed with further development and follow-up effort to prepare the small connectors for future applications. ✓

NOTES 11-10-69 Heller

B 11/19

9/11/10

1. SOLAR PHYSICS SUBCOMMITTEE: I attended the Solar Physics Subcommittee as a member on November 5 through 7. Thirty proposals for OSO-I (eye) were evaluated and categorized. The meeting was very interesting, and I found that the selection is done very carefully and is connected with a lot of hard work. Also, the competition is quite tough. Among 14 proposals for the sun-oriented "sail," 5 were placed in category I; and among the 16 proposals for the rotating "wheel," 3 were placed in I by this Subcommittee. Other Subcommittees, like Nancy Roman's Astronomy Subcommittee, had already selected several stellar proposals for I. A further narrowing down was made the third day when a specific payload for OSO-I was selected with 2 experiments on the "sail" and 5 in the "wheel." The scheduled flight time is end of '72. ✓

2. PHYSICAL SOCIETY MEETING: Five members of SSL are presenting six research papers at the Annual Meeting of the Southeastern Section of the American Physical Society in Gainesville, Florida, this week. In past years MSFC has had no papers or at most two at this meeting. Transportation to the meeting will be at no cost to MSFC; all are traveling in an Army airplane chartered by the MICOM Physical Sciences Laboratory. In addition, one member of SSL-N will attend the meeting on permissive orders. ✓

NOTES 11-10-69 HOELZER

2/11/10

B 11/19

NEGATIVE REPORT.

B 11/19

1. MSF ADVANCED STUDIES FOR FY-70: ^{9/10/10} Recent meetings and discussions with MSF have resulted in some significant changes in the Advanced Studies Program for FY-70. A draft PAD has been prepared and will be presented to Dr. Newell for signature on November 7, 1969. The proposed program contains the following studies:

FY 1970 ADVANCED STUDIES CONTRACTS

<u>TITLE</u>	<u>RESPONSIBLE CENTER</u>	<u>FUNDING</u>
1. Manned Planetary Requirements	HQ	In-house
2. Planetary Experiment Requirements Study	HQ	300K
3. Nuclear Shuttle Feasibility	MSFC	300K
4. Lunar Surface Exploration (USGS)	HQ	350K
5. Lunar Orbit Station	MSC	250K
6. Lunar Base System Synthesis	MSFC	350K
7. Space Tug Concepts	MSFC	250K
8. Automated Techniques for Spacecraft Systems Monitoring	MSC	200K
9. Orbit Navigation and Guidance for Long Duration Missions	MSC	150K
10. Mission Control Data Base Study	MSC	280K
11. Cost Data Acquisition	MSC	50K
12. Lunar Mission Safety and Rescue	MSC	300K
13. Space Base Nuclear Safety	MSFC	200K
		<u>2980K</u>

Whereas previous plans left open the assignment of Nuclear Shuttle and Space Tug studies (MSFC or MSC), note that both are assigned to MSFC in this proposal. This resulted in part from recent addition of studies and funding for MSC in "mission control" and "cost analysis" areas.

The proposed program (\$2.980M) is over the budget of \$2.5M; however, MSF is recommending use of FY67 funds to make up the difference. If this is not approved, the proposed program may have to be reduced. Also the relationship of these studies to the Aerospace Contract effort still has not been defined. We will keep you informed of any changes. ✓

2. SCHRIEVER-McKEE CONTRACT: Gen. R. C. Richardson of Schriever-McKee Associates (SAMA) visited MSFC on 11-3-69, for preliminary discussions regarding the contract negotiated recently with SAMA. After some further follow-up with Gen. Richardson, we will be in a position to propose to you areas where SAMA efforts should be concentrated over the next several months, plus target dates for review meetings with SAMA. Although you were away at the time, we did meet briefly with Mr. Gorman during Gen. Richardson's visit. Luke Spears has been designated COR for this contract; Jim Murphy is also following the effort. We will keep in touch with A&TS and PM during the course of the contract.

Jay Foster

Request a briefing on latest status and plans before I go on my A.L. B

9/10/10
Marshall Safety Advisory Group: The third meeting of your Advisory Group was conducted at the Boeing Company in Seattle at the invitation of Dr. Leslie Ball on November 4-5, 1969. Group representatives included Messrs. Neubert (chairman), Shepherd, Huth, Evans, and Dr. Mrazek, Dr. Ball of Boeing, Dr. Shultz of GE, Captain Wortman, Navy, Mr. Grose of Tustin Institute, and Headquarters visitors included Messrs. Harris and Bolger.

During the two-day visit a very good review was made by Boeing representatives of not only the corporate requirements and attitude toward safety, but also how systems safety is treated in the Boeing 747 project, and specifically the Supersonic Transport (SST) project. Some interesting notes include:

- 1) The corporate policy combines safety, reliability, and maintainability. It was explained that this was probably more applicable in the aircraft area than in the rocket effort because of the safety problems created by human errors during maintenance. ✓
- 2) A comprehensive aircraft accident/incident data bank is maintained by the commercial airplane group for purposes of improving safety through the knowledge and experience gained from all accidents and/or incidents.
- 3) Risk models and analytical methods are being utilized in the 747 as well as SST program for safety purposes.
- 4) Boeing has performed some tasks in the industrial safety area to evaluate safety belts, lanyards, and shock-absorbing devices for workers performing activities in elevated positions (AF-Silo activities).
- 5) Boeing has performed a considerable amount of development work in the fabrication technology area of titanium, that is, vacuum forming, forming at elevated temperatures, and rolling of specific alloys of titanium. They have also developed titanium fasteners that qualify for their fabrication requirements. It is planned to use titanium to a great extent in the SST design (about 90%). ✓
- 6) Dr. Elworth and some colleagues of Boeing have done extensive research in night-visual approach. This research was made to understand more about the possible cause of some accidents (commercial airlines) that have occurred on approaches at a distance greater than 4 1/2 miles from touchdown. The report is not yet published, but the simulated investigation shows that visual judgment about the altitudes during approach at night are affected and vary with the extent of lighting in a city, that is, total lighting and lighting patterns and the topograph of the city. ✓

NOTES 11/10/69 JOHNS ON

9F 11/10

B 11/13

Nothing of significance to report.

B 11/19

9/11/10

Ed M
 they did
 that new
 prospect
 cancel
 his visit?
 B

UAH PRESIDENT SEARCH: Wednesday of this week (5 Nov.) I picked up Dr. Hallowes and journeyed to Decatur to see Mr. John Caddell once again to emphasize our mounting concern over the lack of a guiding hand at UAH. John, who has recently recovered from an eye operation, voiced agreement and expressed some impatience with other members of the trustee selection committee for not pressing on vigorously during his illness. He did indicate that he had an excellent prospect engaged in discussions. A suspicious mind could have doubts about how excellent he may be for UAH in view of John's statement that the prospect is viewed favorably by Volker of UAB and David Mathews of UAT. One should bear in mind that under the current autonomous relationship, there is a strong competitive aspect--budgetary--involved among the three in forthcoming years. Under these conditions, Volker and Mathews may be more impressed with the prospective incumbent's tractability than with his academic management capability.

COOPERATION WITH GEORGIA TECH: NASA Headquarters is funding predoctoral systems design training grants at five universities including Georgia Tech. Very recently, Georgia Tech indicated an interest in promoting collaboration between MSFC and certain numbers of graduate students, primarily NASA trainees, who are becoming involved in a significant health systems design project. Briefly, this project, which is essentially a systems engineering exercise, will be a study of the ways in which recent advances in engineering technology can be economically utilized to improve the quality of the environment in such a way as to reduce physical and mental disabilities. Air and water pollution, noise abatement, treatment of the ill, diagnostic services, etc. are areas where engineering innovations may result in an improved environment for health. Desired MSFC participation would include visits by MSFC personnel to Georgia Tech as well as assistance in reviewing project planning and results. The proposed interaction seems to offer a desirable type of MSFC-university collaboration and one that gives expression to your interest. This will mean a certain level of MSFC input but one that we can maintain at a level that is not too burdensome to MSFC supporting organizations. We will also assure that the endeavor is meshed with other systems engineering activities currently under way. Program Management has been good enough to allow use of Mr. Ben Chereek as part time coordinator for the project. His experience with Universities of Kansas and Missouri should be most helpful.

B 11/19

9/6/10

B.M.
Since LRV is in serious weight trouble with any new navigational gear that may be required, this sun compass looks awfully attractive to me. That is Sonny Mores' reaction?
B

1. LRV SUN COMPASS: A sun compass, fabricated by our G&C Division, has been field tested on the Arsenal to determine its usefulness as an emergency navigation device on the lunar surface in the event of a disabled LRV or its navigation system. The field results substantiate an approximate statistical model of 3° accuracy. Over a 5 kilometer course, this accuracy results in a 3σ miss distance of 80 meters. Test subjects were asked to traverse a given heading for periods varying from 1 1/2 to 2 1/2 hours, using the sun compass as often as desired to obtain heading information. Miss distance was measured from a predetermined target unknown to the test subject. The inherent accuracy of operator-sun compass system is approximately $1\ 1/2^\circ$ (3σ).

2. MADKIN MOUNTAIN LASER EXPERIMENT: The digital control system, which is the final major component of the Madkin Mountain laser communication experiment, has been received and is being installed and tested. Work is progressing toward interfacing all telescope, communication, and control system hardware. Alignment of the telescope optical system is being completed. Only minor problems remain to be solved prior to full operation of the telescope electronic systems. We should be ready to demonstrate operation of the laser communication experiment to you in approximately 4 weeks.

Please advise when ready B

3. SPACE SHUTTLE INTEGRATED ELECTRONICS TECHNOLOGY: OART Electronics and Control Division (Mr. Frank Sullivan) announced by TWX last week the distribution of tasks and dollars to the various Centers for the Space Shuttle Integrated Electronics Technology Program recommended by the Wedan Committee. We had reported in earlier notes our disappointment as to the content of the Committee's recommendations. The distribution of assignments and dollars is even more disappointing. Dollar distribution is as follows:

ERC	<u>1,400 K</u>
MSC	<u>375 K</u>
MSFC	<u>350 K</u>
GSFC	<u>150 K</u>
LARC	<u>150 K</u>
ARC	<u>100 K</u>
FRC	<u>50 K</u>
	2,575 K

Assignments in the Power area are not included in the above, but will be made separately by OART shortly.

Our analysis of the Center assignments is that ERC, to our detriment, is being assigned significant tasks that are primarily in the development area normally handled by MSFC, MSC, etc. We have scheduled a meeting this week with Dr. Johnson and Dr. Mrazek to discuss appropriate rebuttal on this principal issue, and will report further to you on it.

DD FORM 136-1

FORM APPROVED

NOTES 11-10-69 SIEBEL

9/11/10

Ba/13

No significant items to report.

B 11/19

NOTES 11/10/69 SPEER

- 9 Feb 10
1. AS-507 Command System Test: A test was successfully run this week between the Mission Control Center and the L/V to verify the execution of uplinked commands to the transponder and command decoder that were changed out after the CDDT. Although it was not possible to radiate any commands with the LVDC flight program in a plus time mode, the new command system hardware is considered to be adequately verified. ✓
 2. Apollo 12 Photographic Data: We have made a special effort for this mission to alleviate deficiencies experienced on Apollo 11 with photographic data from MSC. In addition to improved coordination, we have submitted a special formal request for specific items. ✓
 3. Apollo 12 Range Safety: ETR Range Safety has accepted the NASA request that the S-IVB/IU be allowed to over fly Africa as long as the spacecraft is predicted to achieve orbit, even if this requires an SPS burn and means that the S-IVB/IU will deplete and impact Africa. ✓
 4. Launch Wind Reference Level: Reference Notes Geissler 11/3/69 (copy attached). I have felt for some time that use of the 445-foot reference level for Saturn V wind monitoring activities will provide for more realistic and somewhat relaxed launch operations constraints while still insuring adequate vehicle protection. Winds measured at the 445-foot level are closer to the region of the vehicle where aerodynamic forces produce the greatest contribution to bending moment loads than at the present 60-foot reference level. It should be pointed out that the vehicle strain gauges are our best means of assessing any wind situation and the wind data should be used primarily as "warning signals." We are planning a meeting with KSC after Apollo 12 to discuss details for changing the wind reference level. ✓
 5. Use of Intelsat with AAP: It has been decided not to use Intelsat for the first Orbital Workshop; however, it may be used in a prime mode for the backup workshop. We believe this is a good idea as long as we have a secondary capability via either VHF or S-Band. In addition, the OTDA proposal to use Intelsat as a relay between the remote sites and a central processing facility seems to be gaining acceptance inside NASA. This will not only impact the information systems on AAP, but will also have a significant impact on the information systems of other programs; e.g., Dual Mode Lunar Rover and Super Explorer. ✓

1 Attachment

As stated (Dr. von Braun and Mr. James' copies only)

NOTES 11/10/69 STAMY

B 11/13

2/11/10

SATURN TECHNICAL AUDIT TEAMS: The Saturn Technical Audit Teams chaired by Mr. Richard G. Smith, PM-SAT-MGR, completed surveys at MAF in the areas of manufacturing, stage checkout, stage test, and quality assurance. The result of these surveys indicated no significant discrepancies in these areas. ✓

Congrats!
B

FEDERAL EXECUTIVE ASSOCIATION DISTINGUISHED SERVICE AWARD: The Federal Executive Association, whose membership is composed of top management executives of all Federal agencies in the Greater New Orleans area, presented its Distinguished Service Award for 1969 to Mr. John R. Demarest of the NASA/MAF Quality and Reliability staff. The presentation was made on Thursday, November 6, 1969, by Mr. Ronald Mulligan for the Honorable Robert E. Hampton, Chairman of the U. S. Civil Service Commission. ✓

UNITED FUND CAMPAIGN: The NASA/Michoud Assembly Facility participated in the United Fund Campaign of the Greater New Orleans area. Again this year MAF received the United Fund's coveted Torchlighter Award for outstanding employee participation. Ninety-six percent of NASA/MAF employees contributed an average individual gift of \$15.00. ✓

NOTES 11-10-69 Stuhlinger

B 11/19

9/11/10

1. STG PROGRAM, OPTION II: Grave concern is being expressed by scientists inside and outside NASA because this program, designated by the Administrator as the baseline for the next decade, provides so little opportunity for the space sciences to develop. Two adverse consequences appear almost unavoidable. First, good science experiments as passengers for space station and shuttle, which must be considered "long lead time items", will not be available in the 1976-1978 period unless started in 1970-1972, with unmanned precursory flights in 1973-1975. The Option II program does not allow adequate initiation of these experiments in the 1970-1972 period. Second, the sharp reduction in funding and flight opportunities, and the concurrent increase in rigid "science management" (committees, panels, approval routes, documentation requirements, binding experiment definitions, long-time schedule commitments) act as an efficient deterrent to scientists. They are now turning more and more toward unmanned space science with small rockets, balloons, airplanes, and ground-based equipment. By the time the shuttle, the station, the tug, and the nuclear stage become available, the space program may have lost its most important customers. Of even greater concern is the fact that this present de-scientification of the space program will deprive the development effort for space vehicles (shuttle, station, planetary craft) of its most convincing justification. As we expend this great effort to develop a product, we should also take the proper steps to develop an appropriate market for it. We should even try to make the customers' needs the driving force for the development of the product. I believe that this could be accomplished by a slight redistribution of funds; if 10% of the present funds for "product development" were transferred to "development of customer needs", this driving force would be certain to develop soon enough to assure a stable and purposeful growth of the shuttle, station, tug, and nuclear stage project.

E.S.
I want you to know that I fully share your concern. I discussed it with George Low already
B

2. ELECTRIC PROPULSION STUDIES: Mr. Jim Lazar, Chief of the Electric Propulsion Division in OART, requested our assistance in two study efforts presently under way, (1) a study assigned to JPL (Jim Long, Don Bartz) on a high-data-rate Mars orbiter (members of MSFC wrote several study reports on this subject during past years); and (2) a study of an electric propulsion stage proposed recently by Jerry Mullins in Jim Lazar's office. This stage could find application in projects such as an asteroid belt probe, an out-of-the-ecliptic probe, a near-sun probe (0.1 AU), and high-data-rate orbiters around Mars and Venus. A suitable reply will be worked out together with PD and S&E.



Nov 17, 1969

B 11/21

NOTES 11/17/69 BALCH

9/11/17

S-IC-12 - Removal of stage from test stand, scheduled for today, is in "hold" status due to unfavorable winds. As soon as wind conditions are acceptable, removal will be resumed. Shipment to Michoud is scheduled for 11/19/69. ✓

S-IC-13 - Stage is scheduled to arrive at MTF on 11/20/69. ✓

S-II-9 - Stage is in the vertical position in the S-II Stage Check-out and Storage Building. Final modification period is scheduled for completion on 12/17/69. Shipment to KSC remains scheduled for 1/8/70. ✓

S-II-10 - Stage is in horizontal position in the S-II Stage Check-out and Storage Building. Insulation repair is in progress and is scheduled for completion on 12/13/69. ✓

S-II-11 - Static firing was successfully accomplished on 11/14/69 for a duration of approximately 372 seconds. Removal from the A-1 Test Stand remains scheduled for 1/13/70. ✓

General Accounting Office Survey - Entrance conference with representatives of General Accounting Office was held on 11/10/69 in regard to their survey of MTF Automatic Data Processing Systems which began on 11/12/69. ✓

M. von Braun

NOTES 11-17-69 BELEW

9/11/17

B 11/21

CSM/MDA INTERFACE LOADS: Reference your question on my Notes 11/3/69 (copy attached). The MSC structures can accommodate loads induced by the "zipper" effect during lock-up of CSM/LM and they have no problem. Further investigation by MSFC/MSFC now indicates that problems associated with the structural impact associated with the MDA will be reduced. Further detailed studies are in progress by ASTN. ✓

CLUSTER SYSTEMS REVIEW: Instead of having a series of individual, module level, delta Preliminary Design Reviews, a single cluster system level review is now scheduled for December 2-4, 1969, at MSFC. After a brief general session, a number of system groups will meet to examine the requirements and design implementation. Later in December, the changes to the baseline requirements and/or design implementation will be considered and disposed of by the program managers after internal MSC, KSC, OMSF and MSFC consolidations. ✓

DEVELOPMENT AND QUALIFICATION PLAN: A meeting was held at MDAC-ED, St. Louis, Mo., to resolve comments generated during the contract fact-finding which pertained to the Airlock Development and Qualification Plan. A few areas will require additional effort by MDAC-ED prior to resolution. These areas do not affect cost. ✓

INSTRUMENTATION AND COMMUNICATIONS: The fourth I&C Technical Meeting is scheduled for November 24 at MSFC. A major topic is related to discussion of the Cluster Review scheduled for early December. ✓

OWS/EXPERIMENT INTERFACE CONTROL DOCUMENTS (ICD's): Preliminary Electrical ICD's for T027, ATM Contamination Measurement; S020, Ultra Violet/X-Ray Solar Photography; and M507, Gravity Substitute Workbench, were delivered this week. The mechanical ICD's will slip about two to three weeks, due to rotation of the floor. The inboard profile drawing locating all experiments in the OWS will be reviewed at MSC on November 18, 19, 20, 1969, and on November 21, 1969, at MSFC. The output will be considered as the final location plan. Relocations after this review will result in impacts. ✓

IBM DIGITAL COMPUTER EFFORT: A technical and status review was held with IBM on November 13 and indications are that they are moving along satisfactorily. Functional definition is complete and design is proceeding in all areas. The proposal relating to the increased effort is expected by the first week in December. ✓

9/11/67

B 11/21

Personnel Management Evaluation - The NASA Personnel Office/Civil Service Commission Personnel Management Evaluation at MSFC started November 14. The evaluation team is composed of representatives from the Civil Service Commission, NASA Headquarters Personnel Office, Office of Manned Space Flight, Langley Research Center, and Manned Spacecraft Center. At the request of Mr. Grove Webster, Director of Personnel at NASA Headquarters, Ray Crouch of this office is serving on the evaluation team. The evaluation is expected to take two weeks during which time approximately 550 MSFC employees, supervisors, and members of middle and top management will be interviewed. ✓

Status of Continuing Resolution - The House and Senate passed a Continuing Resolution for NASA providing operating funds for November 1 thru November 30, 1969. The President signed the Bill Friday evening, November 14. The Bill provides operating funds for NASA for the month of November 1969. ✓

BOB "Mark" of the Agency FY 71 Budget Submittal - We have been informed that the BOB "Mark" of the Agency FY 71 Budget was received on Friday, November 14. The "Mark" was \$3.350B vs the agency request of \$4.497B for FY 71 New Obligational Authority. Details of the OMSF R&D and the Agency R&PM "Mark" are shown below:

	FY 1971 (Millions)		
	<u>Agency Submit</u>	<u>BOB Mark</u>	<u>Δ</u>
OMSF R&D			
Apollo/Lunar	1,160.0	810.0	-350.0
Lunar Exploration Phase II	60.0	0	- 60.0
Saturn V Follow-on	100.0	0	-100.0
Apollo Applications	500.2	450.0	- 50.2
Space Station	-98.0	10.0	- 88.0
Space Shuttle	170.0	32.0	-138.0
Adv. Development	18.5	12.0	- 6.5
Adv. Missions	2.5	2.0	- 0.5
OMSF TOTAL	<u>2,109.2</u>	<u>1,314.0</u>	<u>-793.2</u>
Agency R&PM	707.0	678.0	- 29.0

Without consulting the centers, MSF Headquarters plans to submit a reclama to the BOB on Tuesday, November 18, and the Agency Reclama will be submitted by Dr. Paine to Mr. Mayo on Friday, November 21. ✓

NOTES 11-17-69 BROWN

B 11/21

9/11/17

APOLLO 12 FLIGHT - First look at data from the Apollo 12 flight indicates that engine operation was satisfactory throughout. However, we did experience up to about 9g peak-to-peak oscillations (POGO) at about 16 Hz on the S-II center engine LOX dome. While the data is not yet fully evaluated and the exact loadings are not known, it is clear that the level is higher at an earlier time in the S-II burn than previously experienced. ✓

F-1 ENGINE - Corrosion has been found on a cadmium nut in the main LOX valve sequence valves on six engines at MAF. Analysis indicated that the corrosion is a metal salt which resulted from contamination in the hydraulic fluid used in the engine checkout carts at Rocketdyne. The valves have been cleaned, rebuilt, and reinstalled. To further assess the magnitude of the problem, the 4-way valve on the engine which had the worst corrosion was returned to Canoga Park for teardown and inspection. A slight trace of corrosion was noted in three places on the valve. It was concluded that the corrosion found on these parts would not adversely affect the functionability of the engine control valve. We are presently considering a Rocketdyne recommendation that on the basis of these findings the investigation be closed. ✓

ROCKETDYNE MSFC WAREHOUSE CLOSEOUT - Rocketdyne has been instructed to close the warehouse operation at MSFC in the most expedient manner consistent with proper hardware handling and shipping procedures. We anticipate the phaseout of hardware and associated personnel will be complete by June 30. ✓

FOLLOW-ON RFQ - The RFQ for F-1 and J-2 engine for Saturn V 516 - 521 was released to Rocketdyne on November 14. Since the funding and the PAD for the Follow-on have not be approved, Headquarters approval of the RFQ release is conditional. We are limited to planning and preliminary negotiations and no agreements may be consummated without specific prior approval of Headquarters. ✓

9/11/7

B 11/21

EARTH SURVEYS PROGRAM: Mr. Harry Craft of my Office attended three meetings concerning earth applications. These included the Earth Observations Program Review (OSSA), November 5; the Earth Resources Experiments/Instruments Review (NASA Headquarters), November 6; and the Earth Surveys Steering Panel meeting of the PSG at Goddard Space Flight Center on November 7.

a. Earth Observations Program - The Earth Observations Program Review was very general in nature and provided a broad overview of the NASA programs in earth applications and meteorology. Dr. Leonard Jaffe, OSSA, presented the earth applications review. He briefly touched on funding and noted the involvement of many universities in the program. The present emphasis is being placed on the Earth Resources Technology Satellite (ERTS) missions. Accomplishments of the past year have been the multispectral photography of Apollo 9, an accelerated and improved earth resources aircraft effort at MSC, and an improved ERTS system definition. Dr. Morris Tepper, OSSA, discussed the Meteorology Program and listed its objectives as follows: (1) global cloud imaging, (2) continuous viewing of the atmosphere, and (3) global quantitative measurements of the atmospheric structure. The goal of the program is long term global weather prediction.

b. Earth Resources Experiments/Instrument Review Meeting - This meeting was called by Dr. Tepper to review the earth resources sensors proposed for SWS I. Instrument specialist teams from JPL, MSC, GSFC and ERC, representing each of the sensor systems, presented brief discussions of their sensors in terms of rationale for selection, potential users, cost, operational mode, and data processing. The sensors presented were a multiband camera system, a wide range imager, an IR spectrometer, a microwave system, and an altimeter. These sensors will be presented to the MSFEB for consideration on December 5th.

c. Earth Surveys Steering Panel - The purpose of this meeting was to discuss and investigate meaningful roles for man in the earth surveys missions. The meeting started with a brief status report from Mr. Ayers, Langley Research Center, on the Earth Orbital Experiments Program and Requirements Study. Dr. Rod Johnson then gave an overview of other advanced manned space flight studies. Following the status reports on the different studies, the earth resources, meteorology, and earth physics disciplines were discussed first from the experiment standpoint and then concerning the role of man. Valid and meaningful uses of man's abilities were noted such as target acquisition, initial data reduction, visual annotation and experiment equipment selection. After discussing the experiments, the subject of the meeting changed to Space Station and Experiment Module Studies. The discussions centered around some of the initial concepts for accomplishing earth surveys from manned platforms.

Jill D.
Please arrange (with Jay Foster) a 1 to 2 hr briefing for me on this subject. I'm interested in more detail.
B

(heavily underlined subjects in particular)

← See also my remarks on 11/17/69 nowhere NOTES B

9/1/17

1. INTERAGENCY MEETING ON TRANSONIC TESTING: To investigate certain sizable discrepancies between aerodynamic data obtained from wind tunnels and free-flight tests (models attached to a sting on F-104 fighter plane), the Air Force has asked NASA for an interagency cooperative program. By resolutions passed by three NASA Advisory Subcommittees and two Air Force Advisory Panels, an Ad Hoc Group on Transonic Test Techniques has been established which met the first time on Nov. 12 at Lewis. NASA representatives came from Hq, Langley, Lewis, Ames, FRC and MSFC (the latter being represented by Mr. Heinz Struck of the Aerophysics Division). Under the chairmanship of Lloyd Jones of Ames, the Group has begun to list and discuss a number of more significant problems of transonic (i.e., near to Mach 1) testing, and the Centers represented have been asked (a) to come up with recommendations of specific problems of interest in their areas of responsibility, to be worked on with existing manpower, and (b) to specify additional manpower needed to obtain satisfactory solutions for all problems. The work of this group definitely bears watching because of its immediate relevance to Space Shuttle development testing. In general, it seems that we are on the right track with our High Reynolds Number Equipment. ✓
2. PRESENTATIONS ON ACOUSTIC ENVIRONMENT: An invited paper by Mr. Stanley Guest of the Aerophysics Division, on "Surface Pressure Cross-Correlation Characteristics for a Rocket Engine Vehicle System," had to be read to the Acoustic Society of America by one of our contractor personnel attending the meeting, due to travel funds shortage. The paper created much interest and many questions, not all of which could be answered satisfactorily by the presenter. A paper from Langley reviewed Langley's involvement in acoustics and pointed out the severity of the rising problems associated with the Space Shuttle, especially as far as acoustic fatigue and necessary testing for the whole acoustics area are concerned. LRC appears to be taking a leading role in this area, having already stated some crude estimates about the Shuttle environment which we are working on at present. MSFC has a definite disadvantage in obtaining and supporting technical programs related to the Shuttle due to lack of travel funds whereas LRC is making the most of the situation in this area. ✓
3. UTILIZATION OF MSFC CORRELATION ALGORITHMS FOR EARTH RESOURCES SERVEYS: Mr. T. A. George, Manager, Earth Resources Survey Flights, OSSA, invited Dr. Fritz Krause to brief him on the utilization of crossed-beam technology for earth resources surveys on Nov. 5. Mr. George arranged immediate additional briefings to the U.S. Naval Oceanographic Office, the U.S. Geological Survey and the U.S. Department of Agriculture. During these briefings, all the User Agencies stated: (a) The potential benefits of MSFC correlation algorithms to the earth resources program are such that fundamental research on pattern and target signature definition by correlation functions should be initiated as soon as possible. (b) The user agencies will make data tapes available and would like to initiate the above research in close cooperation with MSFC as soon as possible. We will prepare a program plan for such joint research programs and initiate associated funding request and cooperative research and education programs. ✓

NOTES 11/17/69 GODFREY

B 11/21

Saturn:

9X 11/17

1. IU Command Decoder and Transponder: The IU Command Decoder S/N 18 and Transponder S/N 110 replaced on IU-507 (for missing commands) have been returned to Huntsville for tests. IBM has performed tests on the decoder and transponder without results using MSFC tapes. By using recordings of KSC tapes, IBM has been able to repeat the KSC anomaly; however, at this time IBM has not isolated the problem.
2. S-II-11 Static Firing: Static firing for full scheduled duration was completed on 11/14/69. Quick look data indicates a complete success. Data analysis is continuing. ✓
3. Actuator Fluid Leak on S-IC-7: On November 10, the #1 yaw actuator on engine position #1 was observed to be leaking in excess of specifications. The specifications allow 6 drops per minute at the piston rod seals at 1400 psig hydraulic pressure. The observed leakage on this actuator was 10 drops per minute. The decision was made to waive the leakage requirement on the basis of two 100 cycle gimbal tests indicating that the leakage was not increasing. The F-1 engine insulation was protected from R-J1 saturation by an aluminum foil cover. The possibility of a stress corrosion crack causing the leakage was discounted when the leakage ratio between 30 psi and 1400 psi hydraulic pressure did not correlate to the same orifice size. In addition, if a crack was the cause, it would have to be subcritical, since the leakage did not increase during the 100 cycle gimbal tests. ✓
4. AS-507 Launch: Initial quick look analysis of data indicates good launch vehicle performance. In attempting to find evidence of an electrical disturbance during S-IC boost corresponding to the spacecraft problems, the only launch vehicle data immediately available after launch at KSC or MSFC which correlated to the time of the spacecraft disturbance (T +36 seconds) was a 1 data bit - (40 millisecond) failure indication from the ST-124 platform. Oscillations were again noted on the S-II center engine several times during the S-II burn. The oscillations build up and damp out as on AS-505 and 506, but appear to go to a higher amplitude. An open indication was received from the hydrogen burner LOX valve after the second S-IVB burn. The valve apparently closed after a ground command signal was transmitted. The open valve may have contributed to damage of the hydrogen burner and the subsequent leakage observed by the Apollo 12 crew. Analysis of these and any other anomalies will proceed as soon as telemetry data are available. ✓

9/27/17

1. F-1 ENGINES FOR SPACE SHUTTLE: Preliminary performance data has been generated on shuttle vehicles utilizing F-1 engines as the booster propulsion system. High chamber pressure bell engines were used in the orbiter. Parametric studies performed show the effect of booster and orbiter mass fraction on vehicle lift-off weight for a 20,000 pound payload. Also, a study was performed to determine the required booster and orbiter mass fraction to yield a 20,000 pound payload with a fixed lift-off weight of 3.5×10^6 pounds. Results of the study show that high booster mass fractions (0.9 or greater) are required to obtain reasonable vehicle lift-off weights. This is due to the low specific impulse of the F-1 engine. Based on the above mentioned studies, the present F-1 engine does not appear to be a reasonable engine contender for the shuttle booster propulsion system. At present, no future effort is planned on this item. ✓

2. STRUCTURAL ANALYSIS: A method of analysis has been developed and equations derived for a computer program to analyze space shuttle landing gear requirements, vehicle dynamics, and structural loads during space shuttle landing. Programming of the equations is now in progress. Although certain limitations and simplifications were made in the method of analysis, the completed program is expected to become a useful tool for evaluating landing gear requirements and predicting resulting structural loads for preliminary design purposes. The limitations and simplifications made in the method of analysis include restrictions of the dynamics of motion to three degrees of freedom (vertical, longitudinal and pitch), linearization of the elastic characteristics of the landing gear and tire, and idealization of the load-stroke-velocity characteristics of the oleo-pneumatic shock absorber.

Existing computer programs used by this Office to determine flight structural loads on expendable launch vehicles have been found unsuitable for use in determining flight loads for the space shuttle. This is due to the necessity to consider concentrated introduction of forces and moments into the primary structure such as imposed by parallel attachment of the orbiter to the booster, by the landing gear and others. As a consequence, a new flight loads computer program is being written. ✓

NOTES 11/17/69 GOODRUM

B 11/21

JK 11/17

LUNAR EXPLORATION HARDWARE FUNDING - Approximately \$1.5M of the \$5M allocated for Lunar Exploration Hardware Definition (Dual Mode Lunar Roving Vehicle) in FY 70 will be requested from Headquarters this week for urgent items which are awaiting funding. We understand that these funds are available in Headquarters as part of the Apollo "continuing resolution" funds. ✓

CONTINUATION OF PHASE B ACTIVITIES ON DLRV - A decision has been made to continue the Grumman and Bendix Phase B activities at a low or sustaining level (\$250,000 each) through September 1970. This work will consist of fabrication and updating of full scale mock-ups, definition of a remote driving system, systems engineering effort to keep each version current with the state-of-the-art, and special tasks such as development of a titanium wheel by Grumman and definition of an on-board thermal control system by Bendix. This decision has been verbally approved by Headquarters and the funds will be a part of the total \$5M allocated to lunar mobility in FY 70. Grumman and Bendix will be here on Tuesday, the 18th, to further discuss this extended Phase B effort. ✓

SHUTTLE TEST FACILITY - A presentation on Shuttle Test Facility options resulted in the following conclusions (pending your concurrence): (a) MTF will be required to support shuttle testing, and (b) engine testing (two contractors) will require modification of both MTF S-II stands and four Edwards F-1 stands. ✓

MSFC stands will be considered as an alternative during the planning phase. A briefing is scheduled for you and Dr. Rees on December 2. ✓ A request to NASA Headquarters is being submitted for Preliminary Engineering Report (PER) funding. ✓

LaRC SWING WING CONFERENCE - Discussions centered around the technical feasibility of fixed wing, swing wing and lifting body concepts. Both FAA and General Dynamics/Convair made presentations which created considerable discussion on stability and control, performance and structures. Convair presented details on design and test related to the F-111 swing wing fighter. Many technical problems surely to be encountered in swing wing and/or fixed wing concepts were well presented and discussed in considerable detail. ✓

SPACE STATION GROUND OPERATIONS MEETINGS AT MDAC AND NAR - On November 3, a meeting was held between MDAC, MSFC, and KSC to discuss ground operations and facilities pertaining to the Space Station Phase B Study. MDAC has progressed favorably at this stage of the Space Station study and no problems were apparent in this area. On November 4, the same MSFC and KSC people met with NAR to discuss the same subjects. Working relationships were established between KSC and the study contractors to insure KSC influences in the ground operations and facilities areas of the Phase B studies. ✓

B 11/21

NOTES 11-17-69 GRAU

78-11/17

No submission this week.

NOTES HAEUSSERMANN 11/17/69

NO NOTES THIS WEEK.

JK 11/17

B 11/21

NOTES 11-17-69 HEIMBURG

1. AS-507 S-II PROBLEM: ^{7/6/17} Preliminary quick look data review indicates that low frequency (POGO type) oscillations were experienced by the AS-507 S-II stage during the first 300 seconds of powered flight (prior to CECO). The oscillations blossomed during four time periods with maximum amplitude of + 3.6 g's occurring at approximately 140 seconds (S-II burn time) at the center engine beam. Corresponding but smaller responses were observed in bulkhead sump and outboard engine gimbal block accelerometers and pressure oscillations were noted in thrust chamber and sump measurements. All oscillations were in the 15-16 Hz frequency range, associated with the center engine beam, and were suppressed by CECO. We are working closely with NAR to evaluate the data and assess the problem to incorporate corrective action for AS-508. ✓

2. S-II LH₂ TANK PRECONDITIONING: A new S-II LH₂ tank chill procedure at KSC has been developed for S-II-8 and subs because the LH₂ tank sidewall insulation has been changed to spray-on foam. Current (AS-503 through AS-507) LH₂ tank chill procedure has "step" GH₂ flowrates beginning at liftoff minus 8 hours 10 minutes. This new LH₂ tank chill procedure for KSC will allow the chill to begin later in the countdown, result in significant GH₂ savings, and will simplify operating procedures. ✓

3. APOLLO APS TANKS: We were notified recently of a corrosion problem on a LEM titanium APS tank. Based on our latest information, this problem has been traced to a materials and processing incompatibility. Specifications called for the use of a 304L stainless steel fitting; 304 was actually used in the case of one lot of tubing. A subsequent etching operation etched out the 304 material. MSC has determined that there is a problem only if the 304 etching process combination occurred. The same type of tanks are used on LEM, CM, SM, and S-IVB APS systems. MDAC has contacted Bell Aerosystems, the tank fabricator, and has determined that such a situation does not exist on the S-IVB. We do not have information at this time on the tracing exercise to determine where this lot of tubing and the etching process was used in other Apollo tanks, but we understand that the etching process was only recently employed and no etched tanks are aboard Apollo 12. ✓

4. PERSONNEL ACTIVITIES: Mr. R. Ruff of our Materials Division presented a paper on our hypervelocity gun work at a meeting of the Aeroballistic Range Association at Wright-Patterson Air Force Base last week. The organization has requested that MSFC host the next meeting of the group in May 1970. ✓

NOTES 11-17-69 Heller

B 11/21

9/11/17

HUNTSVILLE SECTION, OPTICAL SOCIETY OF AMERICA: On Thursday of last week, the Huntsville Section of the Optical Society of America was officially installed by Dr. John Strong, Professor Emeritus of Johns Hopkins University and presently Professor of Physics and Astronomy at the University of Massachusetts, and Dr. Mary E. Warga, Executive Secretary of the Optical Society of America. Dr. Strong is internationally known for his work in optics and infrared astronomy. Mr. Charles Wyman of Astrionics, one of the prime organizers, became the first President of the local organization; and Dr. James Dozier of my staff became Vice-President and President-Elect. ✓

According to Dr. Warga, the Huntsville Section of OSA, now numbering 174 members, was organized in the record time of four months compared to the normal organization time of about two years. Drs. Strong and Warga toured labs in MSFC and UAH and expressed amazement at the magnitude and diversity of the optical activity indicated. The 174 local members represent optical activity in MSFC, AMC, UAH and various aerospace and military industrial organizations that make up the Huntsville research and development community. ✓

B 11/21

9/11/17

7010 COMPUTER SUPPORT TO A&TS-MA: This Laboratory's plan to switch computer support for personnel administration activities from the IBM 7010 to the UNIVAC 1108 on November 1, 1969, was not accomplished. The Manpower Office requested that 7010 support be continued since service from the 1108 is not yet acceptable for their purposes. Since it was necessary to extend the 7010 rental until December 31, 1969, due to a lag in converting the Technical Materials on-line supply application and payroll applications, the personnel application can also remain on the 7010. ✓

11/17

B 11/21

1. SPACE TUG: The MSF planning for FY-70 advanced studies has to date included only one study of the Space Tug (\$250K). In view of the strong interests at both MSFC and MSC in this potential new vehicle, a natural "tug-of-war" circumstance is created. As reported to you last week, the MSF advanced studies program as reviewed with Dr. Newell on 11-7-69 included assignment of this Tug study to MSFC. Reportedly as a result of reaction from MSC, Doug Lord has subsequently switched the study from MSFC to MSC. We are encouraging MSF to provide for parallel MSFC and MSC studies at this point, as has been found desirable to do in other major new systems such as the Space Station and Shuttle.

2. PLANETARY MISSION STUDIES: As you know, the manned planetary mission concepts under recent consideration are based on adaptation of major hardware elements developed previously for Earth Orbit and Lunar missions. This intent is being reflected in the current MDAC Space Station studies, to examine what should be done in the initial Space Station design and planning, to facilitate later adaptation of the Space Station module for use in manned planetary and other subsequent missions. These efforts are somewhat hampered, however, by the meager amount of data available on the planetary mission modes under recent discussion (return of mission module to Earth Orbit, etc.).

MSF has planned only one funded effort in this area in FY-70, a study of experiment requirements for manned planetary missions. Headquarters has planned that over-all mission and system requirements would be done by an in-house (NASA) study, assuming that most of the needed data are available from previous planetary mission studies. Since we believe that the previous studies do not contain adequate information on the mission modes under recent consideration, and in view of heavy commitments on the Centers for Space Station and Space Shuttle planning, we have requested reconsideration of funding for planetary mission and concept studies.

We are to participate in a meeting at Headquarters next week (November 20) on this subject; we hope to get some funding identified for this purpose, before all FY-70 funds are allocated for other studies.

NOTES 11/17/69 HUETER

9K 11/17

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No submission this week.

NOTES 11/17/69 JOHNSON

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B 11/21

Nothing of significance to report.

9/11/17

EARTH RESOURCES: A few weeks ago the University of Tennessee research plane (C-47) visited Marshall to demonstrate its capabilities in remote sensing. On that occasion a number of us were flown over the Brown's Ferry area. On these flights the four camera (Hasselblad) cluster and the thermal scanner equipment on the plane were used. Dr. Prochaska of the University has been good enough to furnish us several infrared slides. I also understand that the plane will conduct an overflight of Brevard County on the morning of the Apollo 12 launch. This flight will be used to support local planning in the area by the Brevard County Planning Commission through the recording of the impact of the thousands of tourists in the area at that time. Hereto the four camera Hasselblad cluster with four different films and film components will be used together with a thermal scanner (1 - 5.5 micron range detector). The University hopes not only to record tourist impact through these scans but also to develop data on water pollution in the Indian and Banana Rivers and also some problems of agriculture. It may well be that you would be interested in a briefing by Dr. Prochaska in the near future. ✓

Ed M.
Suggest
we
combine
this with
the briefing
I requested
on the
11/17/69
Downey
NOTES B

EARTH RESOURCES DATA EVALUATION: In recalling the recent review given you by Dr. Fritz Krause on the cross beam method, your interest in the sophisticated data conditioning and statistical analysis was noted. The extended discussion of these points with some heavy emphasis on applications to processing of earth resources data has led to a suggestion that university assistance might become involved. For example, through a work agreement with a university, young professionals (Ph.D. candidates) with appropriate backgrounds in geology, agriculture, bio-medicine, etc., could be provided to develop processing and evaluation techniques applicable to earth resources data. ✓ This has already been demonstrated at MSFC by AERO in its cross beam work in combining cooperative education with cooperative research. ✓ Ph.D. students on dissertation work have generated the sophisticated data conditioning and statistical analysis program for separating meaningful target signatures from unrelated noise. Should you desire further development of this use of the cooperative education program as an earth resources data evaluation service, I would be glad to make the necessary arrangements with AERO. ✓

Please do. B

NOTES 11/17/69 MOORE

B 11/21

9/11/17
1. GSFC ATM X-RAY TELESCOPE (S-056): Testing of ATM Experiment S-056 X-ray telescope is continuing with encouraging results. Two grazing incidence X-ray mirrors have been arranged so that one acts as a collimator to provide parallel X-rays, from a small area source, to the input of the other or primary mirror. One mirror was manufactured at MSFC and the other is a flight mirror manufactured at Perkin-Elmer.

The telescopes were assembled and aligned in a locally fabricated clean room in Building 4656 with the use of visible light. Photographs taken on Kodak high resolution plates showed a visible light resolution of 1 arc second. The assembly was transported to the Astrionics environmental test building where it was installed in the Optical Experiments Chamber, built by ME Lab, for vacuum X-ray image tests. After alignment was verified, the chamber domes were put in place and photographs were taken in visible light using a folded light path to gain entry to the chamber. The chamber was then sealed and resolution photographs taken every hour in visible light during pump-down.

After a vacuum of approximately 7×10^{-6} Torr was achieved with the X-ray source operating, the folded light path was removed and the X-ray source utilized to produce an image for mirror resolution tests in the 8.3 \AA region for determination of optimum exposure times when various filters were employed (0.25 mil aluminum, 3 mil beryllium and 0.086 mil titanium).

Good images were obtained and the data is now being analyzed. The vacuum chamber is now pumped down for studies of the depth of focus and position of best focus in the X-ray region. These first tests are the culmination of approximately three years of gratifying effort in large aperture X-ray optics work at MSFC of which we are most proud.

is no
X-ray
graph

9F.1/17

1. Flat Conductor Cable (FCC)

a. FCC For Power: Boeing, Seattle finds, besides weight, space and manufacturing time savings of FCC, additional advantages over round wire cables when used as power transmission line. A typical application is in the large Boeing 747 aircraft as power feeder line with the following data: 90 KVA, 400 Hz, 3 Phase, 120 Volt, 250 Amp, cable length 200 feet. The power factor can be corrected and therefore the electrical impedance can be minimized by compensating the self inductance with the capacitance within the (multilayer) FCC. This correction reduces the current, temperature rise, and voltage drop, and permits a weight savings of 23% as compared with round cables. ✓

b. FCC Application: Personnel from Boeing (LRV Program), Huntsville; MSC; ERC; and Wright-Patterson Air Force Base, Ohio visited us last week to discuss FCC use in their products. The presentations were favorably received and working relationships were established. ✓

c. FCC Mil-Spec: A draft for Military Specification for electrically shielded FCC has been completed and sent to the members of the Mil-Spec Committee (Army, Navy, and Air Force) for review. ✓

2. Russian Welding Experiment in Space: Reference your remarks on my NOTES 10-27-69*, relative to getting approval by NASA Hq, Office of International Affairs (Frutkin) for any correspondence with Russia concerning the welding experiment. The telephone conversation and proposed correspondence with the Russian welding experimenter Paton were approved and encouraged by NASA Office of International Affairs (Mr. Robinson). (Our Public Affairs Office worked with us.) We are presently analyzing the Russian report which was translated from a Pravda publication. We intend to make inquiries for more details and explanations and at his request will send copies of the correspondence to Mr. Robinson. All correspondence will be via MSFC PA and Hq. ✓

3. Biomedical: Fabrication of a Laboratory test model of the Lower Body Negative Pressure Device (LBNPD) is being completed this week. This unit will accompany the Biomedical Task Team to MSC for the PDR on November 18, 1969. This is the first deliverable piece of biomedical hardware to be fabricated by the ME Laboratory. There will be nine more LBNPD units (test training and flight) required in the program. This unit was totally fabricated and assembled in our shops. A polaroid shot is enclosed.* ✓ *Report DIR.*

4. S-II-14 Repair: The S-II-14 repair of the forward LH₂ bulkhead was completed on November 7, 1969, about one week ahead of schedule. The vehicle was then returned to pneumostat and successfully tested last week. From all test indications, the bolted-bonded patch is a successful repair technique. The final verdict must await the results of the biaxial test program which is scheduled to be completed this week. ✓

* DIR and S&E-DIR.

9F 11/17

1. Apollo 12: Quick look assessment of available data indicates a very good L/V flight performance. During the reported electrical disturbance beginning at 36 seconds after liftoff (1,860 m altitude) we saw some small deviations in the I. U. L/V flight control activities were nominal. The additional 270 sec. APS burn required for slingshot was commanded 2 min. 12 sec. after the preplanned APS burn. This was later than intended due to loss of data from the vehicle thru the omni antenna. MSC orbit determination indicates a successful slingshot with a closest approach of 3,091 nm at 85 hr. 48 min. The crew reported slight vibrations throughout the S-II burn, approximately 1 - 2 cps predominantly non-longitudinal. I. U. telemetry was lost at 12 hr. 38 min. after lift-off. ✓

2. Late AS-507 Mission Planning Changes: As a result of the spacecraft LH₂ tank problem, contingency plans were made on November 13 to permit extending the November 14 launch azimuth to 106 degrees. These plans included movement of the Insertion Ship (Vanguard), call-up of Antigua support, and provisions to adjust ARIA aircraft deployment to cover the wide azimuth span for 1st opportunity TLI at the expense of 2nd opportunity coverage. ✓

3. AAP Orbital Debris: Based on rough costs of S-II and S-IVB deorbit schemes, provided to AAP/HQ by PM-SAT, Schneider decided last week that we should not pursue deorbiting the S-II and S-IVB on AAP missions. Formal direction to MSFC to suspend further studies of AAP orbital debris disposal methods, but to continue studies of hazards from orbital debris is expected early in December, after PM-SAT furnishes firmer costs. ✓

4. AAP Operations Data Book Inputs: Following a meeting with MSC in October we have reached an agreement within MSFC on a mechanism to support MSFC inputs to and validation of the MSC Operations Data Book (ODB). The ODB is used within MSC to provide an official, accurate and timely source for systems data to all operations planning activities. We will manage this activity within MSFC through a Steering Committee composed of Mission Operations, Program Office, and Central Systems Engineering representatives. We will begin working this activity with MSC immediately. ✓

NOTES 11/17/69 STAMY

9F 11/17

B 11/21

The Metropolitan New Orleans Safety Council presented its annual Safety Award to NASA/MAF for maintaining an outstanding safety record during the period 1964 - 1969. During this period NASA/MAF has not had a disabling injury. The highest award presented by the Metropolitan New Orleans Safety Council is the E. V. Benjamin Memorial Award. To be eligible for this award, a company must yearly report at least 500,000 manhours of effort and must have a consistently superior safety performance record for five consecutive years with an accident frequency rate far below the national average. This coveted award was presented to Chrysler Corporation Space Division for the year 1968 and to The Boeing Company for the year 1969. ✓

NOTES 11-17-69 Stuhlinger

B 11/21

9F 11/17
1. ASTRONOMY MISSIONS BOARD: The AMB met at KSC after the Apollo 12 launch on 11/14. Les Meredith (GSFC) discussed the possible use of the shuttle for transportation and maintenance of OAO Follow-on spacecraft; he showed MSFC viewgraphs from PD-SA illustrating these functions. I gave a brief technical description of the shuttle and its expected performance. The Board, and the observers from OSSA, reacted very positively to these presentations. Dr. Goldberg will probably have a Board Resolution sent to NASA in which the joint MSFC-GSFC study of the shuttle-supported OAO Follow-on project is strongly endorsed. ✓

Dr. Friedman reported briefly about Space Science Board discussions of Biosatellite III (Bonnie's flight). Dr. Adey's report, and press reactions, were considered "exaggerated" by the SSB. Bio-medical results of DWS I will be more important, and more reliable; this project is expected to answer all questions opened by Biosatellite III. ✓

Dr. W. Fowler and Dr. Goldberg recommended that the large number of scientific groups presently advising NASA (SSB, AMB, PSAC, STAC, LPMB, and others, and their many subpanels) be reduced, hopefully to one board. The present situation leads to overlap, competition, controversy, and delay. ✓

The "dissatisfaction of scientists with NASA" was discussed by the Board. It became quite obvious that most of the real and imaginary problems would dissolve if one present shortcoming could be removed: the great scarcity of flight opportunities for scientific experiments. The solution, therefore, lies in the future. However, the situation can be eased now by more talking, explaining, discussing, and joint planning between engineers and scientists. ✓

Dr. Goldberg raised the question whether a change in emphasis on the stellar ATM-B should be expected after Dr. Mueller's resignation. (The question was not answered.) ✓

2. CONFERENCE ATTENDANCE: I will attend the Conference for Federal and Business Science Executives, arranged by the Brookings Institution in Williamsburg, Virginia, from November 16 to November 21. ✓

Nov. 24, 1969



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AND FIBER

NOTES 11/24/69 BALCH

B 11/24

S-IC-12 - Stage was removed from the test stand on 11/17/69 and shipped to Michoud on 11/19/69. ✓

S-IC-13 - Stage arrived at MTF on 11/20/69 and is scheduled to be installed in the test stand today, 11/24/69. ✓

S-II-9 - Stage is in the vertical position in the S-II Stage Checkout and Storage Building. Final modification period is scheduled for completion on 12/17/69. Shipment to KSC remains scheduled for 1/8/70. ✓

S-II-10 - Stage is in the horizontal position in the S-II Stage Checkout and Storage Building. Insulation repair is in progress and is scheduled for completion on 12/13/69. ✓

S-II-11 - Engine No. 5 leak checks were started on 11/19/69 to determine cause of temporary fire indication which occurred during static firing of stage on 11/14/69. LOX system leak checks have been completed, with no evidence of leaks noted. Fuel leakage was discovered at a loose plug in an unused instrumentation port in the Gas Generator fuel feed system for Engine No. 5, but no evidence of fire was found. Analysis of static firing data shows a slight thrust shift downward for Engine No. 5. Further evaluation has revealed a degradation in thrust on this engine, run to run. The Gas Generator LOX injector will be inspected to determine if blockage of holes has occurred. ✓

MTF Funding - The guidelines received from PM-DIR for MSF POP 69-2 call for a reduction of operating contract support of MTF to a level of 50 to 100 people after completion of static testing of S-II-15 in December 1970. MTF will then be placed in a preserved status with equipment in place. ✓

It is recognized that the guidelines are based on the Apollo program only and that no consideration was given to future utilization of MTF by assignments from NASA or other government agencies. An alternate POP is being submitted this week which will include planning for assignment of shuttle work at MTF in addition to maintaining facility capability of checkout or static firing of Saturn V Stages. ✓

9/11/29

GENERAL: Reference a general concern within our Center over the changes past and present being implemented and considered in AAP. We have initiated a Laboratory Director-Program Manager biweekly meeting. The first such meeting was with ASTN; however, subsequent meetings will include other labs, as required. (Determination by S&E Director) The intent of these informal meetings is to more timely and more clearly communicate the technical and programmatic aspects of the program that are of interest, concern and a need to the attendees. With the endorsement of Mr. Weidner and Mr. James to this approach, I feel considerable benefit can be gained. ✓

ZERO-G FECAL COLLECTOR UNIT: The fecal collector Zero-G flight tests are in progress, and preliminary reports indicate outstanding success, both for the equipment and the test subjects. On Wednesday, November 19, 1969, five good data points were obtained with the MSFC, MDAC-WD, and Fairchild Hiller test subjects, all within the 20-second Zero-G interval. On Thursday, November 20, 1969, four more data points were obtained--two by astronauts, one by an MSC representative, and a second defecation by the Fairchild Hiller test subject. In all cases, the equipment was reported to have functioned quite well. Subsequent to completion of these tests, the Zero-G fecal collector unit will be returned to MDAC-WD for incorporation of the prototype urine collection system for further development testing. ✓

Congrats!
B

EXPERIMENT LOCATIONS: Meetings were conducted this week at MSC and MSFC to finalize the location of experiments. Additional information outlining agreements, problems, and conflicts with recommended compromises or solutions will be supplied after these meetings are completed. ✓

PAYLOAD SHROUD/PLUMBROOK TEST: LeRC Director Bruce Lundin has given a verbal go-ahead to our use of the Plumbrook vacuum facility and personnel for the purpose of conducting full-scale Payload Shroud separation test. ✓ In addition, LeRC has agreed to perform the test, and to the extent possible, build all test fixtures required. MSFC will only be required to fund outside procurements. ✓

UNMANNED ATM OPERATION: In a meeting Friday (11/21/69), including Bill Schneider, Bob Thompson, Jesse Mitchell and this Center, it was apparent OSSA cannot support the unmanned ATM operation. ✓ Jesse Mitchell feels the cost associated with the unmanned operation, in terms of three months schedule impact and several million in direct hardware changes, cannot be supported from the relatively small scientific benefits. We hope to effect a final decision within the next two weeks. ✓

9/11/29

B 11/26

Conference Committee Asks Manned Lunar Policy - The House/Senate Conference Committee on Independent Offices Appropriations included in its November 17 Report a suggestion that NASA's manned lunar program policy be clarified. The committee expressed its pride in NASA's accomplishments, but then added the following:

"The committee favors a balanced program of space exploration for NASA, but considerable concern has been expressed about the future of funding for manned lunar programs because of budget constraints at this time and a question of national priorities. The majority of the conferees therefore suggest that the space committees of the House and Senate, NASA, and the Administration make a careful review of our policy of manned lunar programs for the future and decide and determine a policy, and that the Committees on Appropriations be advised of the policy determined at the earliest possible date."

NASA FY-71 Budget Status - The Agency FY-71 Reclama to the BOB "Mark" was submitted to the BOB on November 18. Dr. Paine met with Mr. Mayo on November 21 to review and discuss this reclama. A comparison of the various actions concerning the Budget follows:

	FY 1971				
	NASA Budget to BOB 11/8/69	Δ	BOB "Mark" 11/14/69	Δ	Agency Reclama 11/18/69
R&D					
OMSF	2,109.2	- 793.0	1,316.2	+ 793.0	2,109.2
OSSA	893.0	- 144.7	748.3	+ 144.7	893.0
OART	349.0	- 68.1	280.9	+ 68.1	349.0
OTDA	318.0	- 35.6	282.4	+ 35.6	318.0
OTU	5.0	- 1.0	4.0	+ 1.0	5.0
OUA	26.0	- 26.0	0	+ 26.0	26.0
Total R&D	3,700.2	-1,068.4	2,631.8	+1,068.4	3,700.2
C of F	90.2	- 50.3	39.9	+ 50.3	90.2
R&PM	707.0	- 29.0	678.0	+ 34.6	712.6
Total Agency	4,497.4	-1,147.7	3,349.7	+1,153.3	4,503.0

NOTES 11-24-69 BROWN

9/11/24

B 11/26

F-1 ENGINE - Reference is made to my notes of 11-10-69 and Dr. Rees' memo of 11-17-69 concerning the deviations from predicted thrust noted on the static firing of S-1C-12. A memo summarizing the findings of the investigation will be distributed this week. ✓

9/11/29

B 11/26

1. DUAL MODE ROVING VEHICLE PAYLOADS: Dr. Martin Molloy of Captain Scherer's Office has requested that MSFC be prepared to make a presentation on the Dual Mode Lunar Roving Vehicle at the December 12 and 13 meeting of the Lunar and Planetary Missions Board in Berkeley, California. ✓ Since this Board is a scientific advisory group, our presentation should emphasize the vehicle's scientific payload and its traverse capabilities. ✓ My Office will support the Lunar Mobility Task Team in preparing the presentation. The Dual Mode Lunar Roving Vehicle has consistently received enthusiastic endorsements from the scientific community, and I anticipate that the Lunar and Planetary Missions Board will endorse the proposed system. ✓

2. GRUMMAN PROPOSAL - MAN-ATTENDED OAO: As a result of a briefing by the Grumman Aerospace Corporation to you on the Orbital Astronomical Observatory (OAO) Program, Grumman submitted an unsolicited study proposal entitled "Man Associated Astronomy Study." The proposal contains a two-phase study objective. The first phase identifies specific modifications to OAO and operational techniques needed for an astronaut to service OAO-D from SWS II. Phase two extends the phase one results to evolve a more advanced spacecraft which would operate with the Space Shuttle. Although this proposal was submitted on Sept. 11, 1969, our Office has taken no positive action on it for the following reasons:

- a. Lack of available funds.
- b. Mr. Joe Purcell, the GSFC Program Manager for OAO, is not in favor of phase one of the study because in his opinion a total spacecraft redesign would be required. He also considers such a mission to be "dead ended."
- c. The man-attended OAO may directly compete with an ATM-B mission (solar or stellar). ✓

We are of the opinion that if the proposed study is undertaken, its primary value would be to provide input to the design of advanced astronomy modules, not the design of an SWS-II associated OAO. For this reason, we recommend that if funding should become available only phase two of the proposal be considered. Because of Grumman's OAO background, they could provide valuable input to our current effort to define advanced astronomy modules for operation with the Space Station and Space Shuttle. Grumman has contacted us a number of times about this proposal and may try to contact you regarding its status. ✓

NOTES 11/24/69 GEISSLER

B 11/26

7/24/24

1. AS-507 S-IVB SLINGSHOT: Present indications are that the S-IVB/IU did not achieve a heliocentric orbit but is in a geocentric orbit instead. This information is based on two tracking vectors received from MSC and GSFC. The vectors indicate a highly elliptic earth orbit with a period around 40 days. Perigee at first pass of earth is estimated to be between 150,000 km (GSFC) and 175,000 km (MSC) if the trajectory is not perturbed by lunar influence. The difference between perigee estimates is due to slightly different moon miss distances used by GSFC and MSC. The GSFC/MSFC vectors are in disagreement with the IU vector at TLI which was used to determine an additional APS burn in real time. Based on this vector, S-IVB should have passed near the center of the slingshot corridor. It was the only vector available in real time, and the decision reached was correct based on the available information. It now appears that the IU vector was in error and that an underspeed condition was experienced at TLI which would account for the differences noted between the IU and tracking vectors received. As additional information becomes available, this area will be investigated in more detail. Various elements at MSFC have been informed of this situation. ✓

2. IONOSPHERE MEASUREMENTS DURING AS-507 LAUNCH: Electron density measurements of the ionosphere ("ionograms") were taken during the recent Apollo 12 launch from the MSFC Atmospheric Research Facility with a C-4 sounder (a swept-frequency radio transmitter/receiver with directional antenna). The time vs. frequency plots thus obtained have been sent to ESSA in Boulder, Colorado, for reduction. The results will be analyzed here to determine if there is any indication of atmospheric coupling or other ionospheric disturbances at the time of launch, and afterward. ✓

3. SPACE SHUTTLE CONTROL SYSTEM PROPOSALS: Of the thirteen proposals received in response to our RFP on Shuttle Control System Requirements research, five were found by the evaluators to be technically acceptable. The results of the evaluation are being documented at present, to be forwarded to A&TS for contract negotiations. ✓

DEP-M Action

Info MR. COOK

NOTES 11/24/69 GODFREY

Saturn:

1. S-IC Cutoff Sensors: The LOX sensors from S-IC-8 and subsequent stages will be removed and processed through a special test at cryogenic temperatures. The testing will hopefully screen out any failures of the type which occurred on S-IC-7 during CDDT. Design has been initiated on a system to apply voting logic to the S-IC fuel cutoff sensors. The fuel sensors presently give cutoff with a single dry indication. The change is targeted for S-IC-8; however, the effectivity will not be firm until further details are available.
2. S-IC-12 Static Test Thrust Levels: Initial investigation of two F-1 engines with thrust levels 20 and 14K below predictions does not indicate a serious problem. The majority of F-1 engines show some degree of thrust degradation with successive firings at Edwards and MTF. The cause is not firmly established, but does not indicate any problem with the engine. The lower thrust on two engines will cause a payload loss of approximately 250 lbs, which can be tolerated on the presently assigned mission.
3. S-II-7 POGO Oscillations: The initial flight evaluation results show levels of 3.6 g's on the center engine prior to center engine cutoff. Although this level is only a third as great as that recorded on AS-504 prior to the center engine cutoff solution, it is higher than that recorded on the earlier flights during that portion of the S-II burn. Two prime courses of action are now underway. One, attempt to isolate the cause of the higher acceleration levels on S-II-7 and see if the limiting element will prevent the levels from going higher on later flights. Two, proceed with a high priority effort to have a center engine LOX accumulator system ready for S-II-8. It is already apparent that the center engine accumulator will be difficult to properly qualify and install on S-IC-8 on the present launch schedule. A meeting is scheduled on Wednesday, November 26, to review the progress with S&E and North American.

CORRECTED COPY

NOTES 11-24-69 GOERNER

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1. SPACE SHUTTLE GUIDANCE, NAVIGATION & CONTROL (GN&C): A baseline design of the GN&C system is about 90 percent complete. This system is defined in terms of functional requirements; that is, subsystem components are not identified, only the system functions which are necessary to perform mission objectives. The system is described by equations and flow diagrams and has been subjected to a limited amount of simulation for the reentry phase. The stability analysis and error analysis decks which have been used to establish the baseline system will be used extensively in its further development. A third deck, the digital simulation, is about 75 percent complete. It is now operating satisfactorily about the pitch axis of rotation and all three axes of translation. ✓

Study is continuing on radio frequency navigation aids, particularly in the area of automatic landing. Automatic landing does not seem feasible in the 1970 time span without specialized ground equipment at the landing site. All standard FAA-type navigation aids are being evaluated with respect to their interface with the data bus. ✓

9/11/29

SPACE SHUTTLE APS REVIEW: A review of the Space Shuttle APS requirements and configurations was held 11-18 and 11-19-69 at MSFC. Mr. E. Jacobs of MSFC, chairman of Auxiliary Propulsion Systems Technology Sub-Panel, conducted the meeting for NASA. Representatives from the USAF and NASA Centers attended. Industrial contractors (10 companies) gave briefings to the group during the two-day meeting. This review provides a good information base for NASA to initiate the forthcoming APS technology contracts. ✓

SPACE SHUTTLE AIR-BREATHING PROPULSION REVIEW: A review by the Propulsion Technology Sub-Panel on Air-Breathing Propulsion was held at Lewis Research Center 11-18, 19-69. This sub-panel is chaired by Warner Stewart of LeRC. The objective of this review was to hear industrial briefings from Pratt & Whitney, General Motors (Allison Div.) and General Electric Company to determine what technology needs to be initiated to assure the availability of engines for the Space Shuttle. MSFC representatives from PM and S&E attended. ✓

SCIENCE PACKAGE FOR LUNAR MOBILITY: A small MSFC group will visit MSC on 12-2-69 to firm-up a recommended announcement of Flight Opportunity which we will subsequently discuss with Headquarters for possible release in January to the scientific community. ✓

MEETING WITH GRUMMAN AND BENDIX ON DLRV: Meetings were held this past week with Grumman and Bendix to discuss the sustaining Phase B effort scope of work on the Dual Mode Lunar Roving Vehicle. Both contractors appear to be willing to continue a sustaining effort which will include the fabrication of mock-ups and working models, systems engineering, and special assigned tasks. ✓

MAIN SPACE SHUTTLE ENGINE SCHEDULE: The planned Phase B schedule for the main Space Shuttle engine has been revised in Washington to delay the Phase C/D contracts two months and to allow a later updating of Phase C/D requirements. The original plan scheduled a Phase C/D update at 4 months, proposal submittal at 5 1/2 months, and letter contract awards at 9 months. The new plan permits Phase C/D updates at 8 months and leaves 3 months for proposal submittal review and contract award. A letter defining these revisions is expected in the next few days. ✓

SPACE STATION QUARTERLY REVIEW: The agenda for the Quarterly Review has been established. MDAC will be at MSFC on 12-3-69 to prepare material with the Task Team for the Headquarters Review on 12-12-69. A Briefing to Center Management is scheduled prior to the Headquarters presentation. ✓

NOTES 11-24-69 GRAU

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No submission this week.

NOTES HAEUSSERMANN 11/24/69

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JK 11/24

Fecal and Urine Dryer Vent: Concern has been expressed for the potential optical contamination effects from venting the Fecal and Urine Dryer to space. In the primary mode of operation, this effluent is not vented directly to space, but is routed to the LOX tank (which is permanently vented) and from there goes to space.

Presently approximately 22-25 pounds per day of solids and liquids will be deposited in the LOX tank. The bulk of these materials will eventually be vented off. The liquids and gases from the Fecal and Urine Dryer are only a part of this, and therefore are not the only sources of concern.

The ATM people in SSL have been contacted; we are working with them to assess the optical contamination problem this may cause. This should be nailed down prior to the initiating of any corrective action. ✓

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1. LUNAR DRILL: Drill bit #20 - 23 was utilized to drill 116 feet in dresser basalt. This bit was modified slightly from the one which went 75 feet. A constant penetration rate was held at 3 in/min. The test was terminated when the penetration rate dropped to 2 in/min and the bit temperature increased. This test will be repeated with two identical bits to verify test results. We declined an invitation from Continental Oil Company (COC) to use the drill in frozen earth since we believe it is too early to attempt to put the drill into commercial operation. Apparently COC heard of our progress through Dr. Stuhlinger. We have encouraged COC to contact us in 9 - 12 months. ✓

2. SATURN V OWS: The current status of critical drawings required/ released for the dry workshop is shown below:

<u>Item</u>	<u>Dwgs Req'd</u>	<u>Dwgs Released</u>
Basic Stage	232	2
Electrical	223	13
Communications	2	0
Illumination	24	10
Crew Accommodations	198	13
Habitability Support	348	2
Data Acquisition	79	24
Atmosphere Control	341	31
Thruster Attitude Control	17	0
Corollary Experiment Accommodations	20	0
Solar Array System	3	0
TOTALS	1487	95

At the time we changed from wet to dry, approximately 60% of the drawings required had been released. Continued changes obviously jeopardize the proposed 1972 launch. ✓

3. J-2S, Inducer Failure: Personnel from the Dynamics Analysis Branch have attended several meetings concerning J-2S engine inducer failures. The inducer on engine 112 failed last March after 4300 seconds of run time. The inducer on engine 114 failed two weeks ago after 2200 seconds of run time. The Propulsion Engineering Branch has directed that J-2S hot firings be stopped until a failure mode analysis has been completed. After the failure mode analysis has been completed, it will be determined whether or not to continue restricted static firings of the J-2S engine until a new inducer can be designed and tested. ✓

JK 11/24

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1. APOLLO 12 LUNAR SOIL MECHANICS: Dr. Costes has been at MSC participating as a co-investigator with Dr. Eugene Shoemaker in the Apollo Lunar Geology Experiment for Apollo 12. Dr. Costes and the other scientists who comprised his Soil Mechanics Investigation Team for Apollo 11 are responsible again for soil mechanics on the current mission. The 5-day report covering their work has already been written. Dr. Costes will return to Houston to participate in astronaut debriefings and in writing the 45-day and 90-day scientific reports covering the soil mechanics results. ✓
2. ASTRONAUTS' VISORS: On November 19, Gary Arnett was contacted by Mr. Bob Hilberg of Bellcomm, Washington, D. C., at the suggestion of NASA Headquarters (OART) about some concern which had developed on the Apollo 12 astronauts' visors. Mr. Arnett believes this developed from some of their initial statements about not being able to see very well when they were working facing the sun. Mr. Hilberg was assisting Mr. Jerry Poradek, MSC, in finding someone capable of making measurements on visor material. The visor is primarily a "lexan" material with a gold overcoat. Mr. Arnett told him that we could run all types of UV and proton irradiation studies on the material quite easily and would be happy to assist them in any way. Headquarters will inform Mr. Poradek of this. Mr. Arnett will follow this up. ✓
3. APOLLO 12: The 2 1/2-year-old tan of Surveyor III is most interesting. This was probably caused primarily by solar UV and proton irradiation over the 31 months it has been exposed and, in places on the spacecraft, by a combination of contamination and irradiation. It would have been very desirable to have had our spectroreflectometer up there with them because with one or two measurements we could have differentiated between the reflection spectra of a contaminated surface and a severely irradiated surface. Observations of the camera case, when returned, will not be indicative of the total damage received because of the bleaching phenomena which takes place on these white coatings when exposed to an oxygen atmosphere. We will contact MSC and JPL about making some reflectance measurements on the camera case when it is returned and is out of quarantine. ✓

NOTES 11-24-69 HOELZER

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NEGATIVE REPORT.

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1. SPACE TUG: Our request for a Space Tug Study in the FY-70 Advanced Studies Program (981) has resulted in MSF calling a meeting for December 3 to resolve the issue of "who is going to study what" in the Tug area.

I have talked to Andy Meyer, MSC, to emphasize that we are not trying to take their study, but rather have a parallel study. We have agreed to get together prior to the meeting so that we have a common position. ✓

2. STG PROGRAM OPTION EVALUATION: We are continuing to evaluate the program options identified in the STG Report. Our analysis indicates that the Space Shuttle traffic for program Option II would not exceed 15 flights per year until 1981, primarily because of the delay in the lunar orbit station. This low traffic requirement in the late 70's and early 1980's is substantially less than the 150 flights per year required in the Integrated Program (Maximum pace option). ✓

In addition to the lower number of flights, the types and distribution of payloads to be carried by the Shuttle in the late 70's are materially different for Option II, e.g., only used to support Space Station and other low Earth orbital activities. Hydrogen delivery to orbit, which is a major part of Shuttle traffic in the "Maximum Pace" plan, is not required until 1981 under Option II. ✓

These factors could have a major impact on the definition of the Space Shuttle program. ✓ We plan to consider alternative missions for Option II which could increase the Shuttle utilization in the late 70's, within the same budget constraints. ✓

3. VISIT OF AUBURN PROFESSORS CONCERNING SPACE STATION/SPACE BASE: A delegation of the Department of Architecture, Auburn University, under the leadership of Dr. Richard G. Millman, Department Head, visited MSFC/PD on 11-18-69. This visit was the outgrowth of a number of discussions and presentations between Goerg von Tiesenhausen and Auburn faculty members in the area of habitability, based on total effects of environments on the inhabitants of space stations. This first official contact was well received by both the MSFC attendees and the faculty. Mr. Kent from the Office of University Affairs, Mr. Murphy (PD-DIR), Mr. H. Brown (PD-SS), and Messrs. Huber and von Tiesenhausen (PD-SA) discussed possible objectives and approaches which could result in a very useful cooperation between MSFC and Auburn University in the area of Space Station/Base habitability. ✓

NOTES 11/24/69 HUETER

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No submission this week.

NOTES 11/24/69 JOHNSON

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Status of FY-70 SRT Programs - Following comments pertain to the current status of ART/SRT and Advanced Development Programs for FY-70:

OMSF - Advanced Development - \$7M received represents total expected support for this year. Technical content of this program has undergone change due primarily to Shuttle Technology Committee deemphasis of Marshall's role in propulsion. By reorienting program content, we were able to retain the total \$7M.

OART-AST/SRT - We have received \$6,130k program authority of our current guideline of \$9,020. This guideline represents a \$3.5M reduction from the planning figure we were given by OART at the beginning of the fiscal year. Half the reduction appears to be simply an across-the-board percentage assessment due to fiscal austerity imposed by Congress. However, this Center has sustained disproportionate reductions in the following OART programs:

<u>Program</u>	\$ in Thousands	
	<u>Former Guideline</u>	<u>Present Guideline</u>
Space Power & Electrical Propulsion, SRT	400	120
Space Vehicle Systems, SRT	3,530	2,210
Human Factors Systems, SRT	700	125
Chemical Propulsion, SRT	1,975	750

A second factor contributing to these significant reductions is the emphasis being placed on Shuttle support with a large amount of this work being planned for the OART Centers. We are attempting to recover (or minimize) the guideline losses by submission of new RTOP's in some areas and reclamoring in others.

OSSA-SRT - Of our \$3M planning guideline given us by OSSA in July, we have received only \$406k to date. Our guidelines have been reduced to \$1.6M Approval of the Physics and Astronomy Supporting Research and Technology Program at MSFC was received on November 20, 1969. Approximately \$620k of the \$1,234k program guideline is for major system study activities. The remainder is for discrete tasks down to the \$5k level. The FY-70 program has been planned to utilize the special capabilities of S&E. ✓

NOTES 11/24/69 MOHLERE

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TAX FOR HUNTSVILLE SCHOOLS: On Wednesday, the 12th of November, I attended a meeting of the Education Committee of the Huntsville Chamber of Commerce. As it turned out, the principal purpose of the meeting was to develop support for Amendment #26 to the State Constitution. This Amendment provides special five mill school tax in Huntsville. This tax will provide an additional \$1 million per year to the local school system, providing the impetus for secondary school accreditation. Included in the requirements are such items as additional library books, teachers instructional materials and the like. Superintendent Joe Stowers had done his homework well. The committee passed a resolution recommending support by the entire Chamber of Commerce for what appears to be a rather worthy piece of legislation. It may, however, face heavy going across the state what with the heightening of social tensions resulting from recent Supreme Court rulings. ✓

NOTES 11/24/69 MOORE

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1. SOLID STATE TV CAMERA SYSTEM: Procurement action has been initiated with Westinghouse to fabricate and deliver an all solid-state TV camera system using the recently developed 200,000 element mosaic detector. This system will give a picture with 500 line horizontal resolution compared with 350 lines for the home TV set. This camera will complete a seven year effort to build an all solid-state TV camera having vidicon sensitivity plus low power consumption, small size, and high reliability. The expected camera size is 6 x 9 x 1 inch with weight of 2 pounds and power at 10 watts. It is planned to submit it for use on the shuttle and space station. ✓
2. BRUSHLESS DC CMG SPIN MOTOR: We have designed and wound a brushless dc motor and mounted it on one of our CMG engineering spin assembly wheels. It is now being run on breadboard electronics. The overall effort appears quite promising (no brushes, substantially less power) and will be pursued further in-house and on contract. ✓
3. HEADQUARTERS VISITORS: Mr. Jesse Mitchell and Dr. Harold Glaser of OSSA, Mr. Dick Forsythe of OMSF, and Mr. Ted White of MSC (Mission Operations), informally toured the Astrionics Laboratory last Friday afternoon. Their purpose was to view ATM hardware in its various states of activity. Areas visited included CMG test stations, ATM Simulation Facility, environmental test area, instrumentation labs, and the solar array deployment fixture. ATM areas in Astronautics and in Manufacturing Engineering were also toured. Their overall impression seems to be one of high interest and satisfaction with the progress being made on ATM at MSFC. ✓

NOTES 11-24-69 SIEBEL

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1. Low Thermal Expansion Printed Circuit (PC) Board: The very costly failure of solder joints on printed circuit boards during temperature cycling sparked the demand for a PC board material with a thermal expansion coefficient similar to that of the electrical lead wires and the electrical components. The principal technical responsibility for a contract initiated for this development was taken over by ASTN when Mr. Angele's operations were transferred to ME. The results are very encouraging. Sample boards made of glass fiber reinforced polyimide show thermal expansion coefficients in thickness 15 to 20 x 10⁻⁶/°C. This is one-third the expansion coefficient of epoxy-glass boards. The electrical properties are somewhat inferior to those of G10 or G11 (epoxy-glass boards). Drill smear is practically eliminated. Delamination and drill wear tests will be made next. The contract should produce, by June 1970, completed specification and Manufacturing Process Data for production. ✓

2. ATM Thermal Systems Unit (TSU): The schedule for the completion of this unit is driven not only by the program needs, but also by the availability of the MSC vacuum chamber. To get problems ironed out we have instituted weekly meetings in which the design labs, QUAL, and Program Management (AAP) participate. ✓

NOTES 11/24/69 SPEER

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1. AS-507 Flight: Two AS-507 flight deviations had particular significance for future operations: (1) Weather constraints must be reevaluated considering the "lightning" phenomenon experienced during launch. The AS-507 Launch Mission Rule, which requires that the vehicle not be launched through a cumulonimbus (thunderstorm) cloud formation, was not violated. A more restrictive rule may now be required. On the other hand, concern has been expressed for the impact of increased constraints on future Saturn launches with narrow launch windows, and for implications on the weather capability of the shuttle. (2) The slingshot maneuver did not achieve the planned heliocentric orbit, but placed the S-IVB/IU in a very high geocentric orbit in which neither moon nor earth impact is expected soon, if ever. This deviation was due to a small IU state vector error at Translunar Injection (TLI) of approximately 2 m/s equivalent energy, which is well within the 3σ guidance hardware error and had a negligible effect on TLI. Tracking results were not available in real time. This experience does not invalidate our plans for lunar impact on AS-508, since it is planned to use tracking data for the final adjustment on that mission. ✓

2. Wideband Communications Working Group: The second meeting of the Wideband Communications Working Group was held at NASA Headquarters last week. COMSAT Corporation explained the alternatives they are pricing in their proposed support of the three NASA networks (MSFN, STADAN and DSN). Both OTDA and GSFC seem to be firmly behind the implementation of an Intelsat terminal at each remote site, permitting relay of complete vehicle telemetry data streams. All data would be funneled back to one central point in the U.S., and then distributed in either raw or semi-processed form to the appropriate control center (MCC, GSFC or SFOF) or other users greatly increasing the volume of vehicle data available in real time. The proposal is technically feasible and shows great promise of large cost reductions in network operation. However, the management problems of the interfaces involved may overshadow the technical advantages. The OMSF response is quite wary. A recent decision to drop consideration of an Intelsat terminal onboard the second AAP orbital workshop was also recognized at the meeting. ✓

3. LIEF Tour by Dr. Piccard: Dr. Jacques Piccard toured the LIEF facility during the Apollo 12 lunar orbit prior to landing. Dr. Piccard monitored voice transmissions between the crew and Mission Control Center (MCC) and expressed interest in being at the MCC during a future Apollo lunar landing. ✓

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NOTES 11/24/69 STAMY

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Nothing of special significance to report.

NOTES 11-24-69 Stuhlinger

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EXECUTIVE LEADERSHIP CONFERENCE ON PUBLIC AFFAIRS FOR SCIENCE EXECUTIVES: For six days last week, I attended this conference at Williamsburg, arranged by the Brookings Institution. Ten presentations concerning decision making in government, science and public policy, political dynamics, science and social change, the meaning of a free society, and other timely subjects were given by renowned speakers, among them Henry Margenau of Yale University. Attendees had come from AEC, HUD, HEW, AF, Army, NRL, BOB, Department of Agriculture, NASA (2), Duke University, MIT, IBM, Kodak. It became painfully clear to us that our government is more complex, decision making is more involved, pressure groups are more influential, opinions are more divided, passing a law is more difficult, expediency is more absent, parochialism is more present, committees are more sterile, the dangers of pollution and poisoning are more imminent, and the fact that "it still works" is more surprising than all of us had thought before. The Kennedy way ("get American astronauts to the moon and back in this decade") seems to be the only way in which significant progress in important fields can be achieved.

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