

June 2, 1969



25% COTTON
ADD FREE

Nancy - for NOTES file?
7/23
7/24

GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

Memorandum

TO Dr. von Braun, DIR ~~7/23~~ **B** 7/24 DATE JUL 18 1969

FROM Director, Administration and Technical Services
A&TS-DIR

SUBJECT Lost Procurement Requests

In Brooks Moore's notes of June 2, 1969 (copy attached), he reported that nine ATM procurement requests had been lost in the process cycle.

After a detailed analysis of the matter, it has been determined that the requests were lost after receipt in Technical Materials Division, TSO, and before fund certification in Accounting Division, FMO. It has not been possible to determine specifically how the loss occurred; however, one of two things could have happened. Either (1) incomplete distribution was made by someone in Technical Materials Division, or (2) the Accounting Division returned the original copies to Astrionics for some reason such as lack of funds, and the requests either were lost in route to or after reaching Astrionics.

The review of the matter revealed no weakness in the system but concluded that the loss was due to human error. We have deliberately avoided detailed logging of purchase requests at each step in the process in an effort to keep the procurement lead time as short as possible. Furthermore, it should be noted that approximately 20,000 such requests are processed annually, and this is the first known case where a request was completely lost.

I have cautioned A&TS personnel involved in the process to be particularly careful that the system is followed religiously and asked Center Plans and Resources to update our local management instruction on routing of purchase requests so that it portrays the document flow as clearly as possible. In a memo, dated July 9, 1969, S&E has asked the labs to review internal controls and procedures for tracking and expediting procurement requests and to take any action necessary to assure that controls are adequate and functional.

David H. Newby
David H. Newby

Enclosure
a/s



cc:

DEP-T, Dr. Rees

DEP-M, Mr. Gorman

S&E-DIR, Dr. Weidner

AST-P, Mr. Davis

1. Material Buys: Last week we were notified by Technical Services that nine ATM emergency piece part procurement requests had been lost in the process cycle. These procurements had been issued by Astrionics in late January, totaling approximately \$180,000, in connection with inhouse fabrication of ATM flight hardware. They apparently went astray between Technical Services and Financial Management Office. Unlike contract actions, material procurements are not tracked through the cycle once they leave the Laboratory, rather the "system" is relied upon to function properly. This is a vulnerable position which we are taking steps to correct in Astrionics; however, since the problem may not be unique to Astrionics, it possibly should be examined from a Center viewpoint. We understand Manufacturing Engineering recently had a similar experience involving material procurement in excess of \$400,000. The impact to ATM of this loss has not yet been fully analyzed. It is certain to cause a major problem to inhouse fabrication schedules.

Can we
do this?
Please do!
B

Can we
close the
loop?

2. ATM Tape Recorder: A prototype unit of the ATM Tape Recorder being manufactured by Borg-Warner has been received for performance testing prior to fabrication of flight articles. Two such units are to be flown on ATM for data storage and subsequent data "dump" to ground stations.

3. Symposia: The restrictive policy on attendance of symposia continues to impede the ability of our engineers to keep abreast of the technology in their fields of responsibility. The rapidly changing and expanding technical requirements associated with such programs as the space station make close association with the technical community extremely important. Any relief which might be afforded in this area would be highly welcome.

Harvey G.

I think
we
should
relax

this policy now
we can afford it.

B

Sheet 1/3

7/6/9 (NOTES file)

1/6-9

B 6/5

1. Aircraft Trailing Vortices: As a "spin off" from current launch vehicle related atmospheric measuring programs, the laser doppler heterodyne technique looks promising for detecting the turbulent wake or trailing vortex that rolls up downstream of an aircraft in flight. Prior to developing a ground based system that would detect such environment in airport traffic areas, it is desirable to determine experimentally the feasibility of employing such a device. We have made, under Raytheon contract, some preliminary measurements at Hanscom AFB, Boston, Massachusetts. Now, in order to provide more flexibility in the control and frequency of aircraft fly-bys, we are making arrangements with Col. Bayne, Redstone Airfield operations officer, to have the existing laser instrumentation operational for experiments to be conducted at the Redstone Airfield. USAF aircraft use, quite extensively, the Redstone radar facilities for simulated foul weather approaches, and Commander Martin (TS-TA) has indicated willingness to make passes with the Gulfstream and "Gooney Bird", so we feel we are in fair shape for having access to a good selection of aircraft fly-bys to begin in August or September 1969.

E.F.
The real problem for aviation is of course, the trailing vortex generated by heavy aircraft during take offs and landings and their possible effects on light aircraft.

2. CMG Steering Law Presentation: Mr. Steve Winder of S&E-AERO-DOA made a presentation on a new concept developed by the Aero-Astrodynamic Laboratory for controlling the gimbal angles of Control Moment Gyros (CMG's). This meeting was attended by Mr. Ludie Richard and key personnel from Central Systems Engineering, Aero-Astrodynamic, and Astrionics Laboratories. This concept was applied to the Apollo Telescope Mount (ATM) mission and to future missions. The proposed law is much simpler than current designs and also provides superior momentum handling characteristics. As opposed to current concepts that require a digital computer for implementation, our scheme only requires analog circuitry. It was also noted that the new concept is not dependent on the number or orientation of CMG's operative and is thus compatible with CMG additions or deletions. The recommendation was made that serious consideration be given this concept in future space missions, such as the dry workshop, and space station.

3. Space Relativity Committee: At the fifth meeting of the Space Relativity Committee of the International Academy of Astronautics of the International Astronautical Federation, Dr. Helmut G. L. Krause of this laboratory, delivered a lecture entitled: "The Relativistic Motion of Mercury's Perihelion and Node Compared to Mercury's Motion Due to Solar Oblateness." The meeting took place in New York in October 1968. The presentation was very well received and can be considered a confirmation of Einstein's Theory of Relativity, which predicts 43" per century for the relativistic advance of the longitude of the perihelion of Mercury. Dr. Krause was able to disprove the objections of Dr. R. H. Dicke, who proposes a modified theory of relativity which he claims gives a better explanation of the observed data in view of disturbances caused by the oblateness of the sun. Further details concerning Dr. Krause's presentation will be furnished you under separate cover.

cleared into (or out of) the runway. Boeing 747 problem more serious than ever. Quantitative

4. Support to Weather Bureau: The local ESSA Weather Bureau and FAA requested that MSFC support their activities on May 18 by use of our CPS-9 Radar. The request was honored, because of the severe thunderstorms and tornadoes in and around the Huntsville area during this period. This service was performed as an aid to the community on behalf of MSFC, because the local airport radar was out of order.

data required, to make vortex detector a really useful operational device. B

INVITED BRIEF PRESENTATION FOR DISCUSSION IN THE SPECIALIST'S MEETING
OF THE SPACE RELATIVITY COMMITTEE OF THE INTERNATIONAL ACADEMY
OF ASTRONAUTICS, INTERNATIONAL ASTRONAUTICAL FEDERATION

THE RELATIVISTIC MOTION OF MERCURY'S PERIHELION AND NODE
COMPARED TO MERCURY'S MOTION DUE TO SOLAR OBLATENESS

by

Helmut G. L. Krause

Sci. Advisor to Director, Aero-Astrodynamic Laboratory
George C. Marshall Space Flight Center (NASA), Huntsville, Alabama

Since the times of Leverrier, there has been an unexplained advance of Mercury's perihelion, a serious discrepancy of 43" in a century between observation and prediction based on Newton's law. It was a great success for Einstein's¹ theory of general relativity, his theory of gravitation, when he obtained for the relativistic advance of the longitude of the perihelion $\dot{\pi} = n \cdot (3m/p) = 42.98''/\text{century}$ in complete agreement with observation. In the meantime, the agreement between theory and observation has become always better for all three inner planets, as the following table, which has been compiled from several sources, shows:

$\dot{\pi}$	Theoretical Value (Clemence, 1947)	OBSERVED VALUE		
		Newcomb (1895)	(Clemence (1947)	Duncombe (1956)
Mercury	43.03" \pm 0.03"	41.24" \pm 2.09"	42.56" \pm 0.94"	43.11" \pm 0.45"
Venus	8.63	7.36	-	8.4 \pm 4.8
Earth	3.84	5.98	4.6 \pm 2.7	5.0 \pm 1.2

In several papers R. H. Dicke² (1964/65) has shown that his tensor-scalar theory of relativity gives 39.0"/century for Mercury's advance of the perihelion, while the rest of 4.0"/century can be explained as just the effect due to solar oblateness with a solar flattening of $f = \Delta R/R \sim 5 \times 10^{-5}$ caused by internal rotation in the sun. This value corresponds to a difference between the solar equatorial and polar radius of $\Delta R = R \cdot f = 696000 \times 5 \times 10^{-5} = 34.8$ km. Ambronn and Schur³ found no oblateness from their heliometer observations between 1890 and 1902 within the error limit of 0.007". Also Chevalier (1912) and Hayn (1912) could not find any oblateness, as W. Schaub⁴ (1938) has shown. Thus M. Waldmeier,⁵ in his monography: "Results and Problems of Solar Research," Leipzig, 1955, comes to the conclusion that the difference between equatorial and polar diameter must be smaller than 0.01" or 7 km.

In this paper, a more accurate way is undertaken to calculate the flattening and the moments of inertia of the sun from the internal density constitution. These data are then applied to the correct formulas for oblateness perturbations of the central body, which were already developed and published in 1952 by the author.⁶ It is important to use the coefficient, J_2 , of the second zonal harmonics in the solar potential instead of the flattening, f , in the two equations for the advance of the perihelion and the regression of the nodes. For a nearly homogeneous body, both coefficients do not differ very much from each other; however, for the highly compressed sun, J_2 is more than 2 orders of magnitude smaller than f , as will be shown later. The contribution due to the solar oblateness is thus negligible for Mercury and also for small planets and that is in favor to Einstein's theory of general relativity.

This paper gives a more accurate numerical calculation of the relativistic effects than the previous papers, based on the author's investigation⁷ (1964) on the relativistic motion of a satellite in an arbitrary orbit around a rotating oblated, inhomogeneous spheroid as the central body. Einstein's theory refers to the relativistic motion around a mass point. It is shown that the relativistic terms due to oblateness and the square of the angular velocity, Ω , can be neglected but that the terms due to Ω , the sun's rotation, are still important.

With the new radar parallax of the sun, the following constants for the sun can be obtained:

$$R = 695995 \pm 42 \text{ km}; \quad M = (1.9897 \pm 0.0015) \times 10^{30} \text{ kg}$$

$$\mu = GM = (1.3271 \pm 0.0010) \times 10^{11} \text{ km}^3/\text{sec}^2; \quad m = \frac{GM}{c^2} = \frac{\mu}{c^2} = 1.4767 \text{ km},$$

using $c = 299792.5 \text{ km/sec}$. The angular velocity of the sun's rotation is, according to Jeans,⁸

$$\begin{aligned} \Omega &= \left[11.61 + 2.77 (r/R)^2 \cos^2\phi \right] \text{ o/d} = \\ &= \left[2.3453 + 0.5595 (r/R)^2 \cos^2\phi \right] \times 10^{-6} \text{ rad/sec}, \end{aligned}$$

and therefore, the ratio of the centrifugal acceleration to the gravity acceleration at the equator $\tilde{\omega}_e = \Omega_e^2 R^3 / \mu = 2.14354 \times 10^{-5} = 1/46652$. From the many existing models of the sun's internal constitution, one of the best, which will be selected here, is the solar proton-proton model of Epstein-Motz⁹ (1954), roughly corresponding to a polytrope with the index $n \approx 3.30$. For this model, $\Gamma = s_2 = C/MR^2 = 0.062229$ and $f/\tilde{\omega}_e = 0.507285$, a quantity for which $1/2 \leq f/\tilde{\omega}_e \leq 5/4$ according to Clairaut. From $\tilde{\omega}_e$ and $f/\tilde{\omega}_e$ follows the flattening of the sun: $f = 1.087386 \times 10^{-5} = 1/91964$ corresponding to $\Delta R = R_e - R_p = fR = 695995/91964 = 7.6 \text{ km}$. Because the sun's surface is essentially an equipotential surface for gravity

$$J_2 \equiv (C - A)/MR^2 = \frac{2}{3}(f - \frac{1}{2} \tilde{\omega}_e) = \frac{2}{3} \times 1.562 \times 10^{-5} = 1.0413 \times 10^{-7}.$$

From J_2 and s_2 with the known values of M and R , the following values for the moments of inertia are obtained:

$$C = s_2 MR^2 = 5.99790 \times 10^{46} \text{ kg m}^2; \quad C - A = J_2 MR^2 = 0.00001_{004} \times 10^{46} \text{ kg m}^2;$$

$$A = 5.99789 \times 10^{46} \text{ kg m}^2 \quad \text{and} \quad (C-A)/C = J_2/s_2 = 1.67333 \times 10^{-6} = 1/597610.$$

Before the relativistic and the oblateness perturbations can be calculated, it is still necessary to calculate the inclination, j , of Mercury's orbit with respect to the solar equator. The position of the solar equator with respect to the ecliptic is given for 1960.0 by the longitude of the node $N = 75.2021^\circ$ and the inclination $I = 7.25^\circ$. The position of Mercury's orbit to the ecliptic is given for 1960 by $\Omega = 47.8571^\circ$ and $i = 7.0040^\circ$. From the spherical triangle formed by the ecliptic, the solar equator, and Mercury's orbit follows $\cos j = \cos i \cos I + \sin i \sin I \cos (N - \Omega)$ and thus $j = 3.37^\circ$. Taking for Mercury a mean orbital motion of $n = 538101630.90''/\text{century}$, $p = a(1 - e^2) = 55460830 \text{ km}$, $\Omega R^2/h = \sqrt{\omega_e R/p} = 5.186484 \times 10^{-4}$, a restriction to the main terms here gives, for the advance of Mercury's perihelion,

$$\dot{\pi} = n \left[\frac{3}{2} J_2 (R/p)^2 (1 - \frac{3}{2} \sin^2 j) + (m/p) [3 - 4\Gamma(\Omega R^2/h) \cos j] \right]$$

$$= 0.0132 + 42.9825 - 0.0018 = 42.9939''/\text{century}$$

and, for the regression of Mercury's node,

$$\dot{\alpha}_\Omega = -n \left[\frac{3}{2} J_2 (R/p)^2 \cos j - \frac{m}{p} 2\Gamma(\Omega R^2/h) \right] = -0.0132 + 0.0009 = -0.0123''/\text{century}.$$

The first terms are due to solar oblateness, while the other terms are due to Einstein's theory of general relativity.

The conclusion is that Einstein's theory is in full agreement with observations and that the influence of the solar oblateness is practically negligible.

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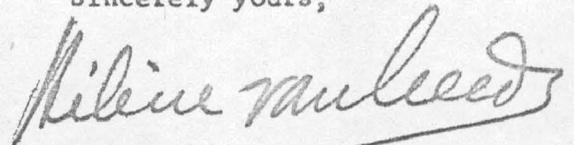
7 May 1969

Dr. Helmut G.L. Krause
1308 Locust Avenue
Huntsville, Alabama 35801
U.S.A.

Dear Dr. Krause,

I enclose a draft of the report of the meeting of the Space Relativity Committee at New York. I would appreciate your checking the text in so far as it concerns your presentation, and letting me have your comments and/or corrections before the end of this month.

Sincerely yours,



H. van Gelder
Secretary

Encl.

SPACE RELATIVITY COMMITTEE

Report of the Fifth Meeting
New York, 16 October 1968

Present: Prof. J.M.J. Kooy, Chairman of the meeting
Dr. R.H. Dicke
Dr. C.S. Draper
Dr. C.W.F. Everitt
Dr. H.G. Krause
Prof. S.F. Singer
Prof. F. Zwicky

As Prof. Boneff could not come to New York, Prof. Kooy presided at the meeting.

Three lectures were on the provisional Agenda. The third one was not delivered due to lack of time.

The first lecture was given by Dr. C.W.F. Everitt (Stanford University, Stanford, California) and was entitled: "Application of low temperature techniques to a satellite test of general relativity". According to the general theory of relativity, a gyroscope in orbit around a celestial body -- such as the earth -- will show a relativistic precession in relation to a non-rotating system of reference e.g. a background of fixed stars. According to calculations of L.I. Schiff, two effects are predicted. The first is due solely to orbital motion and yields a predicted precession of 7 arc-sec/year in a 500 mile orbit. The

second is due to the rotation of the earth and amounts to approximately 0.05 arc-sec/year. According to other theories of gravitation, other values of the precessions are anticipated, so that an experiment is needed to ^{verify} ~~decide~~ ~~between~~ the theories. Dr. Everitt and Dr. W.M. Fairbank (Stanford University) have designed a gyroscope suitable for such an experiment, using low temperature techniques.

The experiment involves a comparison of the orientation of one or more gyroscopes with the line of sight from a telescope to a fixed star. Dr. Everitt described the construction of the gyroscope. The gyro-rotor consists of a sphere of quartz, coated with superconductor and supported electrostatically by three mutually perpendicular pairs of electrodes. The sphere is spun by a system of gas jets at a rate of about 200 cycles per second. The greatest difficulty lies in keeping the electric torques acting on the rotor down to the relativistic drift rates. The low temperature control is very difficult to achieve, and needs great care, but affords high accuracy. Also the magnetic shielding gives much trouble.

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The second lecture delivered by Dr. G.H. Krause (George C. Marshall Space Flight Center, NASA - Huntsville) was entitled: "The relativistic motion of Mercury's perihelion and node compared to Mercury's motion due to solar oblateness". It was a great success for Einstein's Theory of Relativity when he obtained 43" per century for the relativistic advance of the longitude of the perihelion of Mercury. In the meantime, by a possible oblateness of the Sun, which also contributes to the advance of the perihelion of Mercury, the agreement between Einstein's theory of

↓
gravitation and observation becomes less convincing.

In several papers Dr. R.H. Dicke has shown that his tensor-scalar theory of relativity gives 39.0"/century for Mercury's advance of the perihelion, while the remaining 4.0"/century can be explained as the effect of solar oblateness with a solar flattening of about 5×10^{-5} caused by internal rotation of the Sun.

Dr. Krause used a more accurate way to calculate the flattening and the moments of inertia of the Sun from the internal density constitution. These data were applied to correct the formulae for the oblateness perturbations of the central body, which were already developed and published in 1952 by the author. It is important to use the coefficient, J_2 , of the second zonal harmonics in the solar potential instead of the flattening, f , in the two equations for the advance of the perihelion and the regression of the nodes. Prof. Dicke raised objections to Dr. Krause's paper on the ground that it neglected the rapid rotation of the Sun's core. However, Dr. Krause was of the opinion that the rapid rotation generates a higher centrifugal acceleration and can make the coefficient J_2 even smaller than the value given in his paper. Therefore Dr. Krause considered his results to be correct.



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

IN REPLY REFER TO: Dr. Helmut G. Krause
1308 Locust Avenue, S.E.
Huntsville, Alabama 35801, U.S.A.

International Academy of Astronautics
of the International Astronautical Federation,
Attn: Hilène van Gelder, Secretary,
No. 6267 A. 7.7 (7 May 1969)

Dear Mrs. van Gelder:

I thank you very much for the draft of the report of the fifth meeting of the Space Relativity Committee at New York, N.Y., 16 October 1968. This paper is written in a very clear and objective manner. I agree with the complete draft report except for two minor corrections. In the last paragraph on page 3, the word "correct" in line 3 should be omitted. In line 4 from the bottom an inclusion is necessary between the words: rotation and generates, thus "that the rapid rotation, instead of the slow rotation of the Sun as a whole, generates a ...". It would be better to type J_2 . I am sorry that my comments came so late due to my obligations to some astronomical societies and committees.

Sincerely yours,

Helmut G. L. Krause

Dr. Helmut G. L. Krause

NOTES - 6/2/69 - BALCH

B6/2

S-II-8 - Stage is undergoing post-static checkout and modifications. Removal from the test stand is scheduled for 6/11/69, and shipment is planned to meet the on-dock RSC date of 6/30/69. ✓

S-II-9 - Static firing has been rescheduled from 6/6/69 to 6/20/69 because of requirement to install new honeycomb insulation prior to static firing so that it may be tested under cryogenic conditions before installing it on the S-II-10 and subsequent stages. No impact to the RSC delivery date of 8/30/69 is expected. ✓

S-1C-11 - Stage is undergoing pre-static checkout. Static firing remains scheduled for 6/25/69. ✓

BOMEX - We understand ESSA is experiencing major difficulty with regard to the shipborne instrumentation systems. This is particularly the case with the "Scanwell" radars used to determine wind direction and velocity.

According to ESSA, the "quick-look" data was not as good as expected, further accenting the problem mentioned above. Digitizing of data for regular reduction started on 5/28/69. ✓

University Affairs - Final preparations are complete for the Louisiana State University personnel to come on board at NTP this week. It is anticipated that 18 to 23 personnel will be at NTP full-time and that approximately 15 additional personnel will be here from 3 to 4 days a week. ✓

B 9/7

1. Space Station Study: The Phase B Space Station Definition proposals from the contractors are expected in Headquarters by 6-9-69.

MSC personnel visited here last week to finalize the Scope of Work for the two supporting contracts on the initial logistics systems to be used in connection with early Space Station activities. A contract scope to be "sole sourced" to McDonnell Douglas will be devoted to the requirements of a system evolving from the Gemini B. An addendum to an existing North American Rockwell contract will allow analysis of the utilization of the CSM system with a three man crew for logistics and manned rotation purposes in connection with Space Station operations. Both Centers prepared a jointly agreed upon Statement of Work which will be presented to Chuck Mathews on 6-4-69 for concurrence and obtainment of contract funds.

During the same MSC visit, the interfaces between the Phase B Space Station contract and the 15 supporting contracts which are referenced in the Work Statement were discussed. A presentation to Chuck Mathews is scheduled for 6-4-69 in which methods for the adequate considerations for interfaces will be presented.

2. Heat Pipe Technology and Applications: Seventy persons attended last week's technical interchange at MSFC on Heat Pipe Technology and Manned Space Station Applications. Some forty-five of these were visitors representing private industry, national laboratories, universities, NASA Headquarters, and NASA Centers. They were afforded a good understanding of the Space Station/Space Base Program and some insight into requirements for thermal control and thermal conditioning. Immediate results include the identification of several research tasks which ought to be pursued as early as practicable. Joint arrangements with the Los Alamos Scientific Laboratory for some of these are being discussed.

3. Thermionic Conversion Reactor Power: In response to a request by Dr. Grover (LASL) a forum was arranged, as a spinoff to the meeting on Heat Pipe Technology for the Los Alamos (LASL) representatives to present their views on reactor systems for space power. MSFC personnel from the Space Station Task Team, Preliminary Design, Central Systems Engineering, Astrionics, and Space Sciences Laboratory appeared favorably impressed by LASL results thus far and by prospects for thermionic power on the Space Base schedules. Constructive, cooperative actions were informally agreed to in terms of related studies and, also, in terms of further discussions of action necessary to insure that a satisfactory power system could indeed be available for the Space Base.

4. NASA-DOD Meeting on Engine Selection for Space Shuttle Held at Aerospace Corp. on 5-27-69: The following points were agreed upon at the subject meeting:

- 1.) The present Pratt & Whitney efforts on the 250K demonstration engine should continue at the funding level of \$16 M for FY-70, \$12 M for FY-71, and \$2 M for FY-72.
- 2.) Study contracts should be started in Oct. 1969, leading to preliminary design on 1000K thrust high-pressure Bell engine.
- 3.) Three contractors should be funded at \$3M per contractor for these design studies.
- 4.) Procurement for long-lead items would be initiated during the design phase for all three contractors.
- 5.) \$21M per contractor(3) would be budgeted during the first part of FY-71.
- 6.) Two contractors will be selected for engine development.
- 7.) \$20M per contractor(2) would be budgeted during the latter part of FY-71.
- 8.) The earliest PFERT date would be mid 1975.

Bill Lewis
Are these
funds in
the 1970
budget?
How much
is DOD
and
is NASA?

AIRLOCK MODULE TELEPRINTER: An informal discussion was held at MSFC on May 20, on efforts to date by MDAC-ED on the teleprinter. MDAC-ED presented the different approaches they have been investigating along with advantages/disadvantages of each, and approximate costs. The comments made by MSFC will be incorporated into their study results to be forwarded to MSFC this week. This information will be used in preparing the presentation requested by Mr. Schneider. ✓

TRAINER REQUIREMENTS MEETING: The second MSC/MSFC Trainer Requirements Meeting was held at MSFC on May 22. This meeting was held to review the status of the action items identified at the joint Trainer Requirements Meeting of April 2-3, and to discuss the impact of the MSC trainer operational requirements documents in relationship to existing MSFC engineering simulation hardware. A trip is planned June 3, in which a group from Program Management and Science and Engineering will visit MSC for the purpose of studying their trainers which were used in the Apollo Program. It is felt that this information will be beneficial to the MSFC personnel who will be involved in the design of AAP trainers. ✓

MEASUREMENTS: We are currently reducing the AAP measurement list to minimum requirements. The goal is to complete this effort by June 30, 1969. Last week, after sessions with design, MSFC operations and CSE personnel, the ATM measurements were reduced by over 50 percent. This proposed ATM reduction will be discussed with MSC on June 3, 1969. The other modules will be subjected to similar reductions and are scheduled for discussion with MSC during the last two weeks in June, for their flight control requirements. ✓

HARVARD COLLEGE OBSERVATORY (HCO) OBTAINING DATA FROM THE ATM: A meeting was held between representatives of MSFC and MSC to discuss the HCO request to obtain data from the ATM after the astronauts leave. Three levels of effort were defined ranging from 24 hours per day coverage to one orbit per day coverage. MSC will determine the impacts for each of these cases and a working meeting with the Principal Investigators to discuss the results will be held in about one month. ✓

NOTES 6-2-69 BROWN

B 6/7

No report.

CONSTAN 6-2-69 NOTES

B 6/7

Nothing of significance to report.

1. ATM-B (SOLAR): We met with Mr. Aucremanne and Dr. Glaser of OSSA to discuss the ATM-B mission. The principal experiment being considered for this payload is the photoheliograph proposed by Dr. Zirin of CIT. Mr. Aucremanne and Dr. Glaser are anxious to see MSFC become more active in defining ATM-B. They visualize the proposed "B" mission to be very similar to the "A" mission as far as the overall system is concerned. The "B" mission could use much of the backup hardware from the "A" mission, but would incorporate new experiments, e.g. the photoheliograph. We plan to meet with Dr. Zirin on the 17th and 18th of this month, along with representatives of OSSA, to discuss the photoheliograph development and the ATM-B mission in general. ✓

The Solar Physics Subcommittee will meet here this week and I have been informed that they may discuss the ATM-B payload and the manned solar astronomy program in general. Perhaps this meeting will provide us a guide on how to proceed with the definition of the ATM-B payload. ✓

2. ASTRONOMY SUBCOMMITTEE: Dr. Stuhlinger advises that I have been appointed as an official member of the Astronomy Subcommittee. (I have served as an observer over the past year.) It would be desirable, for this appointment, if I were an astronomer. However, few of the Committee's deliberations require an in-depth knowledge of astronomy. I have found these meetings to be very informative, and I believe I will be able to make some worthwhile contributions. ✓

3. GULF STREAM DRIFT MISSION: The mission dive is now scheduled for the week of June 16th, but an additional slip in the schedule is likely. I am informed that dives of progressively increasing depth are being accomplished down to a maximum depth of 2000 feet. Hopefully the Mini-Drift mission (3-5 days with full complement of experiments and crew) will be initiated during the week of June 2. (Mr. Shepherd may have more up-to-date information on the status; my last contact with Mr. May was a brief conversation on May 28.) ✓

4. EXPERIMENT MODULE DEFINITION STUDY: Proposals for the Experiment Module Definition Study are in the process of being evaluated. Representatives from OSSA, OMSF, OART, LaRC and MSC are assisting us in this evaluation. ✓

B 6/7

HOUSE COMMITTEE'S COMMENTS REGARDING THE NASA FY-70 AUTHORIZATION

As you know, the House Committee's Bill proposed a total of \$3,966.4M; \$250.8M higher than the Nixon budget. The following comments were extracted from the Committee's report:

Chairman Teague and Mr. Fulton: "The net effect of denying the funds for the Saturn V production and space operations... would be to increase the cost in the future of attempting to accomplish these same objectives and push further out in time our ability to reap the economic, technological, and scientific potential of space."

Mr. Kock (D-N.Y.): "I strongly favor an increased effort in the relatively less expensive unmanned program and a reduced effort in the extremely costly manned space flight program." "...I have grave reservations as to whether the NERVA project is justified at all. The NERVA engine has no mission and none in prospect." "...support increases to the earth resources technology satellite (ERTS)."

Mr. Pelly (R-Wash.): "...would have reduced the NASA authorization level to that proposed by the Nixon budget."

Mr. Wydler (R-N.Y.): "...the essential direction for this specific program (Air Force MOL and NASA AAP) should be given to the military, but the equipment used should be that developed by NASA, since it is greatly superior in nature."

"...the expenditure of \$52.5M for Saturn V vehicle long lead production items at this time is unnecessary expense." "...no more than \$36.5M (Proposed \$50M) should be authorized for NERVA."

Mr. Frey (R-Fla.): "...a strong space program is needed and to this point this country has received its money's worth." "More emphasis must be placed on benefits..." "Three efforts are indicated:

1. NASA ensure a "payoff" orientation in all future NASA planning,
2. Greater efforts by NASA to transfer technology to other phases of life,
3. Show taxpayers by example and through non-technical language they are receiving their money's worth."

OSSA POP 69-1 - We have received the OSSA POP 69-1 submitted to the A/Administrator on May 7. This POP has been structured within the \$517.8M FY-70 OSSA limitation established in the revised FY-70 budget request. MSFC's FY-70 funding plan has been reduced from \$1,452M to \$1,025M. The \$427K reduction consists of: \$300K, Saturn S-IVB/Centaur Integration Study; \$77K, Physics and Astronomy Program; \$50K, Space Applications Program.

✓

B 6/7

1. Aircraft Trailing Vortices: As a "spin off" from current launch vehicle related atmospheric measuring programs, the laser doppler heterodyne technique looks promising for detecting the turbulent wake or trailing vortex that rolls up downstream of an aircraft in flight. Prior to developing a ground based system that would detect such environment in airport traffic areas, it is desirable to determine experimentally the feasibility of employing such a device. We have made, under Raytheon contract, some preliminary measurements at Hanscom AFB, Boston, Massachusetts. Now, in order to provide more flexibility in the control and frequency of aircraft fly-bys, we are making arrangements with Col. Bayne, Redstone Airfield operations officer, to have the existing laser instrumentation operational for experiments to be conducted at the Redstone Airfield. USAF aircraft use, quite extensively, the Redstone radar facilities for simulated foul weather approaches, and Commander Martin (TS-TA) has indicated willingness to make passes with the Gulfstream and "Gooney Bird," so we feel we are in fair shape for having access to a good selection of aircraft fly-bys to begin in August or September 1969.
2. CMG Steering Law Presentation: Mr. Steve Winder of S&E-AERO-DOA made a presentation on a new concept developed by the Aero-Astroynamics Laboratory for controlling the gimbal angles of Control Moment Gyros (CMG's). This meeting was attended by Mr. Ludie Richard and key personnel from Central Systems Engineering, Aero-Astroynamics, and Astrionics Laboratories. This concept was applied to the Apollo Telescope Mount (ATM) mission and to future missions. The proposed law is much simpler than current designs and also provides superior momentum handling characteristics. As opposed to current concepts that require a digital computer for implementation, our scheme only requires analog circuitry. It was also noted that the new concept is not dependent on the number or orientation of CMG's operative and is thus compatible with CMG additions or deletions. The recommendation was made that serious consideration be given this concept in future space missions, such as the dry workshop and space station.
3. Space Relativity Committee: At the fifth meeting of the Space Relativity Committee of the International Academy of Astronautics of the International Astronautical Federation, Dr. Helmut G. L. Krause of this laboratory, delivered a lecture entitled: "The Relativistic Motion of Mercury's Perihelion and Node Compared to Mercury's Motion Due to Solar Oblateness." The meeting took place in New York in October 1968. The presentation was very well received and can be considered a confirmation of Einstein's Theory of Relativity, which predicts 43" per century for the relativistic advance of the longitude of the perihelion of Mercury. Dr. Krause was able to disprove the objections of Dr. R. H. Dicke, who proposes a modified theory of relativity which he claims gives a better explanation of the observed data in view of disturbances caused by the oblateness of the sun. Further details concerning Dr. Krause's presentation will be furnished you under separate cover.
4. Support to Weather Bureau: The local ESSA Weather Bureau and FAA requested that MSFC support their activities on May 18 by use of our CPS-9 Radar. The request was honored, because of the severe thunderstorms and tornadoes in and around the Huntsville area during this period. This service was performed as an aid to the community on behalf of MSFC, because the local airport radar was out of order.

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NOTES 6-2-69 GOERNER

MOBILITY TEST ARTICLE (MTA): On 5-27-69, Mr. Leo Anthony of Channel 31 TV, and Mr. Jim Taylor of the Huntsville News, accompanied by a representative from Public Affairs, were present at the simulated lunar test course and interviewed Mr. Love of this Office. A five-minute film clip of the interview and test was shown on the 6 p.m. and 10 p.m. news on TV on 5-27-69, and a short article appeared in the Huntsville News on Wednesday. ✓

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6/7

1. S-IC ELECTRO MAGNETIC COMPATIBILITY (EMC) TESTING: EMC test results on S-IC-7, -8, -9, and -10 have detected little or no transient activity. An agreement has, therefore, been reached with Michoud that EMC would be maintained in the End Item Test Plan but may be waived on a stage-by-stage basis. Since the test data show "clean" stages, it is being recommended that this test be waived on remaining S-IC stages. Considerable savings would result.

2. SCIENTIFIC AND TECHNICAL BREAKTHROUGHS AND/OR DEVELOPMENTS:

The paper "A Survey of Leak Detection for Aerospace Hardware" has just been published in the May issue of "Materials Evaluation", an official journal of the American Society of Nondestructive Testing. This article was written by F. E. Wells, Chief of our Test Research Section, and presented at the National Conference of ASNT in Detroit October 1968. The paper discusses the why and wherefores of leak detection, compares various techniques and equipments, and makes recommendations for leak detection practices in the aerospace industry.

3. SA-506 CERTIFICATE OF COMPONENT QUALIFICATION STATUS:

<u>Stage</u>	<u>Required</u>	<u>Signed</u>	<u>Open</u>
IU	72	72	0
S-IVB	212	205	7
S-II	264	249	15
S-IC	146	53	93

NOTES HAEUSSERMANN 6/2/69

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6/7

No submission this week as all pertinent problems have been presented to you in meetings last week.

1. S-11 LOX LINE ACCUMULATOR FOR POGO SUPPRESSION: This laboratory held a meeting May 27 to determine the direction that should be pursued for accumulator development. As a result of the meeting, a memo is being prepared stating that the Center Engine Cutoff is considered a permanent fix for POGO and that the accumulator is considered only a backup in event that the finalized stability analysis indicates the vehicle is marginal.
2. PHOTO ANALYSIS APOLLO 10: The quick-look review camera coverage report for Apollo 10 was completed. The overall camera coverage was good. One electrical umbilical panel cover on the S-11 forward umbilical connection did not secure after disconnection and was observed flapping at lift-off. A GSE control panel on the 60-foot level east side of the LUT was observed burning and the panel doors open after S-1C flame impingement. Camera coverage was the only source of information to determine "FIRST MOTION" of the Apollo 10 vehicle. KSC's telemetry on first motion was lost.
3. NEW AAP ASTRONAUT: Tuesday morning and afternoon Mr. Bill Lenoir, one of the new AAP Astronauts, visited MSFC. Astronaut Lenoir has recently completed jet pilot school and is slated to replace Astronaut Weitz in the AAP program. During his informal visit, Lenoir inspected the SIW and MDA mockups in building 4755 in addition to the static test articles and the MDA zero-g mockup in building 4619.
4. SCALE MODEL OF THE ATM: A 1/10 scale model of the ATM in the MSFC shroud was hurriedly fabricated for the ATM Preliminary Design Review (PDR) on May 13 and 14, 1969. This model pointed out the need for a more sophisticated model which will show all the access holes in the shroud, access platforms and outrigger supports. Work has been progressing on sketches of this model and a work order for its fabrication will be written.
5. LUNAR ROVING VEHICLE MOTORS: We have discussed the use of a samarium-cobalt magnets for torque motor fields with a representative of the Inland Motor Company. There appears to be reason to believe that the weight of the present LRV motors could be reduced by 50% and efficiency increased considerably through the use of such magnets.
6. AAP EXPERIMENT, LOWER BODY NEGATIVE PRESSURE DEVICE (LBNPD): A trip to the U.S. Naval Aviation Medical Center to observe their LBNPD was very beneficial to the MSFC program. The primary objective was to investigate the LBNPD seal leakage rate. A value of 2 CFM at a ΔP of 40 mmHg was measured, and corresponded to previous LBNPD leakage rate estimates. Considerable information was also gained in hardware application, test procedure, safety precautions, subject comfort, and thermal conditions which can aid the MSFC effort.

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NOTES 6-2-69 Heller

1. REAL TIME SOLAR MAGNETOGRAPH: We appreciate your time and interest in our magnetograph activity which we presented to you on May 26. We will address ourselves to the points which you made in the discussion: emphasize our scientific publications jointly with NRL, start to orient the work toward general benefits to mankind in addition to the Apollo and AAP support, and plan a flight experiment. ✓
2. UAH RESEARCH TASKS: In the selection of tasks for the Research Institute of the UAH, I emphasized the applicability to Marshall's projects and the scientific competence and productivity of both our SSL people and the University investigators. We have a total of five tasks which have the desired characteristics. ✓
3. VISIT BY DR. PETER MEYER: I am glad you selected Dr. Meyer as your consultant. I had a very fruitful discussion with him and showed him the laboratory area of the Nuclear and Plasma Physics Division. He showed a very active interest, especially in the proton spectrometer and cosmic particle experiments since these are close to his own field of scientific activity. ✓
4. PROTON SPECTROMETER: I, together with other personnel of SSL, had a discussion with Bill Horton and other members of Astrionics to jointly determine the best approach to procure the proton spectrometer for AAP-2. (Responsible scientists: SSL, Tom Parnell, and UAH, Godehard Guenther.) The contractor, Space and Tactical Systems, Inc., will be made fully responsible for delivering a complete flight-hardened experiment package. SSL will continue to work in-house on the measuring head jointly with the UAH. The results of advances of this in-house work will be made known to the contractor on a continuous basis. Tom Parnell, as alternate COR, will work closely with Troy Ponder of ASTR to assure that the contractor delivers a workable unit for this Saturn measurement. Final pre-flight calibration for AAP-2 will be done by SSL. ✓

B6/7

CONFIGURATION MANAGEMENT COMPUTER SYSTEM AT MSFC: The Configuration Management Computer System at MSFC is composed of two computer applications, Saturn V Configuration Integration and Tracking (SCIT) and Configuration Management Accounting (CMA), and are under sponsorship of the Saturn V Program Office and the Configuration Management Office, respectively. ✓

The SCIT system provides effective tracking of all documents relative to hardware, software, and documentation changes to any Saturn Vehicle Configuration. The system traces the progression of every engineering change through the various recording and approval phases, including action by the various levels of Configuration Control Boards and contractor notification of action taken. ✓

The CMA system identifies the current configuration of each end item within a program, including all approved engineering changes. This system also tracks the status of modification kits scheduled for incorporation on MSFC items at KSC through installation and validation. ✓

Since its implementation in October 1968, the system has directly contributed to reducing contractor support personnel responsible for processing engineering change data at MSFC by 46 people. Although currently operating in a batch mode, the system is being upgraded to an on-line basis that will utilize remote terminals for direct input of data to, and retrieval of information from, the Computer Data Bank. Operations under this concept will allow the terminal user, by utilization of a unique flexible inquiry computer program, to retrieve only those items of particular interest from the Data Bank. This eliminates much of the current volume of scheduled computer reports. Future plans for the system provide for terminals at contractor remote sites including IBM and General Electric in Huntsville; North American Rockwell in Seal Beach, California; Douglas in Huntington Beach, California; Boeing in Michoud, Louisiana, and KSC, Florida. ✓

Due to the ease of adaptability of this Configuration Management System to similar type projects, it is anticipated that it will be utilized in future requirements at MSFC. ✓

B 6/7

1. INTEGRATED TEN YEAR PLAN: As a result of the review with Dr. Mueller last week at MSC and his letter dated May 27, 1969, we have underway with PD, PM and A&TS the following:

- o Appraise ability to meet program objectives within target manpower and dollar resources.
- o Assess technical feasibility of each major hardware element (e. g., space shuttle, space station, dry workshop, etc.).
- o Conduct cost analysis through FY-75 (Note: We plan to use MSF cost figures for MSC and KSC activities).
- o Compare MSFC cost against MSF target costs and reconcile differences (Note: Adjustments to MSF Integrated Program Plan may be required.)
- o Analyze Institutional Base, including MAF and MTF.
- o Project activity and funding level through FY-82, to include a manned planetary flight in the post-1980 time period.

We are also looking at alternative programs which could be accomplished for the target budget and still keep the basic intent and major program elements of the Integrated Plan. Our analysis to date indicates that an alternate plan can be proposed that meets the basic intent of the original plan and stay within the target budget.

2. FUTURE MSF FILM: A pre-production meeting was held on May 28, 1969, with Capt. Freitag on a new MSF movie. This film will cover space station, space shuttle, lunar exploration, and space science and applications. It will be produced by the AV Corporation in Houston, a contractor to MSC. Presently planned MSFC contributions are: simulated space station operations in a full size mockup, animated space station and space base model operations, astronomy module animations, and lunar surface mobility operations. The film is planned to be available after the lunar landing mission in July.

Stees

I think we should appoint someone to see that MSFC's inputs are properly used and that this doesn't come out as a completely MSC-styled pitch.

B

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6/7

1. S-IVB Lunar Impact Study: A telecon with Dr. Yates (Bellcom) and elements of CSE, S&E and PM was held Wednesday, May 28, to discuss the feasibility study of S-IVB lunar impact. If sufficient accuracy is possible, geological data can be obtained using ALSEP seigraphic landed on Apollo 11 or 12. It appears that with minimum hardware modifications an acceptable S-IVB impact point can be provided. Headquarters appears pleased with the results to date. A response to the Stoney letter is in preparation and will transmit the results of the S&E analysis and will request further direction from Headquarters. In addition, we will present the status on this subject at the June MCM. ✓

2. Rescheduling of Apollo 13 Launch Readiness: The Apollo Program Office has verbally notified us that the Apollo 13 LM is behind schedule to such an extent that the launch readiness date for the mission will be rescheduled from November to December. Accordingly, the AS-508 stage deliveries will be rescheduled to the end of July or early August. This will permit the stages to be stored at the contractors' facilities pending evaluation of Apollo 11 lunar landing. ✓

3. Procurement Plan for Low Cost Saturn Follow-on Vehicles: On Friday, May 23, a presentation was given to the Headquarters operating level personnel on the status of our procurement planning and prime contractor reviews for Saturn follow-on vehicles. A broad representation of NASA Headquarters offices participated in the meeting. On Monday, May 26, we had a full day meeting here with all prime contractors presenting the status of their Low Cost Saturn Launch Vehicle data package preparation. Progress indicates we should meet our July 21 milestone for completion of the data packages. A meeting with personnel from Lewis Research Center is planned for the week of June 2 to discuss the Agena and Centaur programs as background for Saturn follow-on contracting. ✓

4. S-II-9 Static Firing Rescheduling: An inspection of S-II-9 after cryo-proof pressure test revealed several areas of apparent debonding of the cork over spray-on foam insulation. The major portion of debonding occurred around feedline numbers 5, 3 and 1. This debonding was observed during a visual inspection made as soon as access to test stand was granted. Inspection to verify the condition of S-II-9 was begun on May 28 by MSFC and NR/SD personnel by cutting inspection holes to determine extent of debonding. As soon as inspection is complete the areas will be repaired using the new installation procedures now being used on S-II-10 and subsequent. As a result the static firing of S-II-9 has been rescheduled from June 6, 1969 to June 20, 1969. S-II-8 shipment will be held after S-II-9 static firing. The S-II-8 spray-on foam defects covered in Mr. Heimburg's 5/26 notes were minor and the foam insulation overall looked good. ✓

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NOTES 6/2/69 JOHNSON

B 6/7

MSFC SEMI-ANNUAL CHEMICAL PROPULSION REVIEW (OART). -
Mr. A. O. Tischler (RP) and members of his staff reviewed the MSFC
Chemical Propulsion Technology Program on 27-28 May 1969. Status
and progress reports were made by ASTN and AERO personnel. An
overview of propulsion requirements - MSFC, NASA, and OART - was
obtained from presentations by Program Development (Mr. Orillion),
OART-RP (Mr. Tischler), and ASTN (Mr. Paul). This information
will be helpful in implementing the RTOP Program, FY-70, though it
is obvious that technology requirements will probably not be firmed up
until FY-71. The effort at implementing the FY-70 RTOP Program
must be considered an interim one. ✓

NOTES 6/2/69 MOHLERE

Nothing of special significance.

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1. Material Buys: Last week we were notified by Technical Services that nine ATM emergency piece part procurement requests had been lost in the process cycle. These procurements had been issued by Astrionics in late January, totaling approximately \$180,000, in connection with inhouse fabrication of ATM flight hardware. They apparently went astray between Technical Services and Financial Management Office. Unlike contract actions, material procurements are not tracked through the cycle once they leave the Laboratory, rather the "system" is relied upon to function properly. This is a vulnerable position which we are taking steps to correct in Astrionics; however, since the problem may not be unique to Astrionics, it possibly should be examined from a Center viewpoint. We understand Manufacturing Engineering recently had a similar experience involving material procurement in excess of \$400,000. The impact to ATM of this loss has not yet been fully analyzed. It is certain to cause a major problem to inhouse fabrication schedules.

Harry Jordan
Please do!
B

Can we close the loop?

2. ATM Tape Recorder: A prototype unit of the ATM Tape Recorder being manufactured by Borg-Warner has been received for performance testing prior to fabrication of flight articles. Two such units are to be flown on ATM for data storage and subsequent data "dump" to ground stations.

3. Symposia: The restrictive policy on attendance of symposia continues to impede the ability of our engineers to keep abreast of the technology in their fields of responsibility. The rapidly changing and expanding technical requirements associated with such programs as the space station make close association with the technical community extremely important. Any relief which might be afforded in this area would be highly welcome.

Harry J.
I think we should relax this policy now - can afford it.
B

NOTES 6-2-69 MURPHY

Bef-7

Certification of the Ben Franklin: On May 19 and 20, 1969, the Navy Ship Systems Command, Deep Submergence Program and their Oceanographic Office personnel met with Grumman to provide 30 specific questions to Grumman toward certification of the Ben Franklin. Of the 30 questions, 22 have now been answered satisfactorily. However, the remaining 8 questions have not been answered and the Navy has taken a position that until these 8 questions are answered their personnel will not go on the mission. This position was further substantiated last Thursday, May 29, 1969, during a test dive to a 2,000-foot depth. This test had to be aborted at 1800 feet due to loss of power. We will keep you advised of the progress concerning the satisfactory solution to the 8 outstanding questions and the certification. ✓

1. Flat Cable Technology: During the week of May 19-23, the University of Alabama, Huntsville, held its fourth Short Course on Flat Cable Technology. The participants of the class of 24 came mainly from the aerospace industry. Through the participation of MSFC employees, Marshall developed flat cable conductor (FCC) technology is transferred to industry. The fifth course is planned for this fall.
2. Optical Alignment Training: Retraining of personnel engaged in optical alignment within ME has been started to update qualifications of all personnel in the use of line scopes, optical flats, etc., prior to start of ATM alignment.
3. KSC Support: Work is proceeding on both projects for KSC: Manufacturing two 6-million pound load cells and assistance for the qualification testing of a regulator valve for on-stand and deflector water.
4. Alabama Space and Rocket Center: Plans have been completed for off-loading transporters and associated hardware necessary to the movement of stages to the Alabama Space and Rocket Center.
5. Intense Magnetic Fields: Mr. Basil Leftheris of Grumman Aircraft has developed an electromagnetic riveter that uses the NASA 18,000 joule capacitor bank as the power source and a coil similar to the hammer coil for driving a stress wave amplifier that upsets the rivet. Mr. Leftheris has demonstrated that the electromagnetic riveter will cause a 1/4" stainless steel rivet to expand in a uniform manner even when the rivet is free formed. The dynamic plastic deformation of the rivet using this method has an axial velocity of approximately 600 in./sec. and a radial velocity of about 200 in./sec. The uniformity of rivet expansion accounts for the distortion free riveting that has been demonstrated. Two immediate advantages of the electromagnetic riveter are: (a) it can be adapted to existing automatic riveting machines and thus increase the applied force from 18,000 pounds force to an equivalent of 35,000 pounds and (b) a portable tool can be designed for repair work and other riveting applications.
6. Neutral Buoyancy: A two-suited astronaut test run was completed this week with Astronauts Brand and Garriott participating as test subjects and Astronaut Parker observing. The test was established to evaluate a crew-suggested approach for utilizing a device similar to a "grocery man's pole" for film transfer. The concept is considered feasible. The results of this test will be considered in finalizing a film transfer system. Preliminary testing was completed on body and foot restraints for use with the bicycle ergometer received from Astronautics Laboratory. A seat belt and velcro on the shoes and pedals appear promising.

NOTES 6/2/69 SPEER

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8/7

Automated Operation of the Apollo Telescope Mount Experiments:
During the past year various correspondence between Dr. E. M. Reeves of Harvard College Observatory, NASA Headquarters, and MSFC has addressed the question of operating the SO55A HCO instrument in the absence of the crewmen. The primary programmatic and ATM system considerations for a continued operation after termination of the manned mission were identified. Minor ATM system modifications were implemented to accommodate automatic operation. However, in addition to system design, ground operations and support (control center, network, data management, etc.) constitute a very critical and pacing input for the final disposition of this request from Dr. Reeves. We have requested (thru L. Belew) such an operations assessment from MSC and this is currently in progress. ✓

Apollo 11 Range Safety: Due to an extraordinary effort by S&E-AERO and Boeing, all special range safety data recently requested by Dr. Debus are at KSC today, one day ahead of schedule. ✓

NOTES 6-2-69 Stuhlinger

B6/7

1. NEW SCIENTIFIC CONSULTANT: Dr. Peter Meyer, Associate Professor of Physics at the Enrico Fermi Institute of the University of Chicago, who has become Scientific Consultant for MSFC a few months ago, paid a full day visit to our Center on May 27. Besides being a very experienced and well-known scientist, Dr. Meyer has accumulated great experience in the launching of balloon and rocket cosmic ray experiments. He was greatly impressed by the activities underway at this Center, and he will certainly be of great help to us in our effort to improve and extend our relations with outside scientists. ✓

 2. VISIT TO JPL: Dr. Bucher and I visited JPL on May 28 to discuss current projects at JPL and at MSFC which are of interest to both Centers. On May 29, we visited U. S. Divers Corporation in Santa Anna where oxygen candles, survival equipment, and diving equipment are being developed. We also had an opportunity of visiting Captain Cousteau's "Calypso" boat where we saw diving and rescue equipment.
- A Trip Report is available; please call 453-3081 to request a copy. ✓

JUNE 9. 1969

1. ATM-B (PHOTOHELIOGRAPH PROJECT): We met with Dr. Zirin of the California Institute of Technology and Mr. Glaser of OSSA, who were at MSFC in connection with the Solar Physics Subcommittee Meeting (June 3 and 4). Dr. Glaser seems anxious to see MSFC take a more active role in defining ATM-B. Dr. Zirin desires MSFC to provide engineering support in specific areas. OSSA has not provided us any funding (as yet) to define ATM-B. Mr. Nein sat in on the Solar Physics Subcommittee Meeting as an observer. No significant discussion developed regarding ATM-B during the meeting.

2. ASTRONOMY PLANNING: The so-called MAST concept (40" non-diffraction limited, man attended, stellar telescope) proposed by Dr. Ken Hallum of GSFC for incorporation on a dry workshop or early Space Station has been dropped by OSSA. The ASTRA concept also seems to be fading from attention, primarily because OSSA has decided to extend OAO to include a 40" diffraction limited system. The next big step in the stellar optical astronomy area is a proposed 120" non-diffraction limited telescope to be flown in association with the Space Station in the 1976-1978 time frame. This telescope would be for technology and scientific purposes and would constitute the major step toward the development of the 120" diffraction limited space telescope planned for the 1980's. MSFC's present OTES program is a natural to lead to this intermediate step. (There is still an open question as to whether the precursor to the 120" diffraction limited telescope should be a non-diffraction limited 120" telescope or a diffraction limited telescope of smaller aperture.)

3. GULF STREAM DRIFT MISSION: The following schedule was provided by Mr. May on June 3: Dive - June 4; Dock - June 5; Dive - June 6-8; Dock - June 9-15; Mini-Drift - June 16-20; Drift Mission - June 25. We were not able to contact Mr. May on June 6, but learned from a Grumman representative that a "motor failure" had occurred and the dive scheduled for June 6-8 did not take place. The effect of this failure on the rest of the schedule is not known.*

4. BIOSCIENCES: Dr. Orr Reynolds extended you a personal invitation (through Dr. Hilchey) to attend the upcoming launch of the Biosatellite and a concurrent meeting of OSSA's Space Biology Subcommittee on June 21-23. We learned from Mrs. Holmes that you would not be able to attend this meeting and Dr. Reynolds Office has been informed of this.

*Later communication with Mr. May indicates that the failure was minor and the scheduled dates for the Mini-Drift and Drift Mission will not change.

Dr. Stuklinger

Ernst - As your time permits, it would be worthwhile for you to coordinate a scientific review of our (MSFC) involvement in astronomy (regardless of funding) to determine if we are on the right track - it

ATM-B, 120" test - 6/15

S-11-8 - The modifications transferred from KSC to MTF have been completed. Removal from the test stand has been rescheduled from 6/11/69 to 6/17/69 due to priority of S-11-9 insulation modifications for use of manpower. No impact to KSC delivery date of 6/30/69 is expected. ✓

S-11-9 - The honeycomb insulation modifications are progressing on schedule. As a result of finding a washer in the feed duct screens after the cryogenic proof pressure test of this stage, a LOX tank entry was made this past week for inspection of the interior. Nothing irregular was found. Static firing is currently scheduled for 6/20/69. ✓

S-10-11 - Stage processing is progressing satisfactorily toward the planned 6/25/69 firing date. ✓

BOMEX - The Air Force made an "air snatch" of data on 6/3/69 and delivered the data to Gulfport on 6/4/69. By the evening of 6/5/69, the data had been picked up and a two-hour time slice had been processed for each of the five ships. The quality of the data appears to be considerably improved. ✓

University Affairs - Louisiana State University personnel have arrived at MTF as planned. Mississippi State University personnel were also on site this past week and will return today. ✓

Edgewood Arsenal Project - Funds for additional work in the amount of \$50,000.00 have now been transferred from Edgewood Arsenal to MTF. ✓

NOTES 6-9-69 BECKER

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6/9

1. SATURN V WORKSHOP/Bo TASK TEAM: Mr. Charles W. Mathews, NASA/MD, has asked for a quick look at the feasibility of adding an artificial "g" operating mode in a second Saturn V launch dry workshop, using the spent S-II stage as a cable connected counterweight. Mr. Mathews is requesting MSFC to provide an engineering look at the systems and operating implications with a first cut answer by 6-11-69. This request followed a trip by Joe Schwartz, Program Development, to NASA Headquarters to supply data on concepts that we have already studied. We expect to respond to Chuck Mathews on time. ✓

2. WASHINGTON SPACE SHUTTLE TASK TEAM ACTIVITIES: A large number of Task Team members are still in Washington writing the joint NASA/DOD Space Shuttle reports. The joint reports will be reviewed by Dr. Mueller and Mr. Hanson, DOD, in a meeting at SAMSO on 6-9-69. Dr. Mrazek and Mr. Becker will attend this meeting. ✓

NOTES 6/9/69 BELEW

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6/9

TRAINER REQUIREMENTS: A trip was made to MSC on June 3, 1969, to study the MSC Apollo Trainers. Twelve engineers from MSFC (S&E and PM) and two GAEC engineers were available to study the MSC Trainers. The main accomplishment was a better understanding of MSC fidelity requirements for building the AAP Trainers. ✓

GRUMMAN NAME CHANGE: Grumman Aircraft Engineering Corp. has announced that; effective July 1, 1969, their name will be changed to the "Grumman Corporation". The Grumman Corporation will be the main holding company, and Department of Defense, NASA Activities, Commercial Aircraft Activities, and other special projects will be conducted by the "Grumman Aerospace Corporation". Also to operate as a subsidiary of the Grumman Corporation will be Grumman Allied Industries, Inc., which produces pleasure boats and truck bodies. Lew Evans remains as President of Grumman Corporation and the Grumman Aerospace Corp. and a Director of the subsidiary. ✓

TRANSFER OF LM-2 TO AAP: The Apollo LM-2 was transferred from MSC to Grumman on Thurs., May 29, 1969, concurrent with the signing of the joint MSC/MSFC agreement on LM-2 transfer. Grumman will be given the authority to inspect and evaluate subsystems of the LM-2 vehicle for use on the first Flight Article and in the development program. MSC has agreed to update the Primary Guidance System to make them flight-worthy for AAP. ✓

LM-A FEE NEGOTIATIONS: Some progress was made this week toward resolving the fee on the subject contract. Grumman reduced their fee offer based on certain groundrules to be implemented in the award fee criteria. ✓

HABITABILITY SUPPORT SYSTEM (HSS): Mr. Fred Toerge of Loewy/Snaith visited MDAC-WD on June 3 and 4, 1969. Purpose was to complete the color requirements definition. Agreement was reached on the remaining items. Basically, the HSS equipment will be colored an off-white, with other color accents being incorporated on portions of the equipment. ✓

B
6/9

NOTES 6-9-69 BROWN

F-1 Engine - Approximately one gallon of fuel was found in the thrust chamber cover of F-1 engine 047 in position 3 on S-IC-7 when the stage was rotated to the vertical position at KSC on May 13. Excessive leakage was also noted from the overboard drain line of the same engine. S-IC-7 was the first stage shipped with RP-1 in the engine hydraulic systems. Preliminary investigation indicates that allowable leakages from various engine components can back up through the drain system. An investigation is continuing. ✓

J-2 Engine -

AS-505 Flight - Data from the no-chilldown start sequence experiment on S-IVB 505 shows that the engine was in the start box using the 8' second LOX lead, 100 second coast, and normal fuel lead sequence; however since conditions were not in the middle of the start box, Rocketdyne is recommending that the sequence be changed to 11 seconds LOX lead, 100 seconds coast, and 11 seconds fuel lead for optimum start box conditions. This change will be requested effective with a future launch that will not perturbate the software. ✓

NOTES CONSTAN 6-9-69

Nothing of special significance.

B
6/9

NOTES 6-9-69 DOWNEY

B6/2

1. ATM-B (PHOTOHELIOGRAPH PROJECT): We met with Dr. Zirin of the California Institute of Technology and Mr. Glaser of OSSA, who were at MSFC in connection with the Solar Physics Subcommittee Meeting (June 3 and 4). Dr. Glaser seems anxious to see MSFC take a more active role in defining ATM-B. Dr. Zirin desires MSFC to provide engineering support in specific areas. OSSA has not provided us any funding (as yet) to define ATM-B. Mr. Nein sat in on the Solar Physics Subcommittee Meeting as an observer. No significant discussion developed regarding ATM-B during the meeting. ✓
2. ASTRONOMY PLANNING: The so-called MAST concept (40" non-diffraction limited, man attended, stellar telescope) proposed by Dr. Ken Hallum of GSFC for incorporation on a dry workshop or early Space Station has been dropped by OSSA. The ASTRA concept also seems to be fading from attention, primarily because OSSA has decided to extend OAO to include a 40" diffraction limited system. The next big step in the stellar optical astronomy area is a proposed 120" non-diffraction limited telescope to be flown in association with the Space Station in the 1976-1978 time frame. This telescope would be for technology and scientific purposes and would constitute the major step toward the development of the 120" diffraction limited space telescope planned for the 1980's. MSFC's present OTES program is a natural to lead to this intermediate step. (There is still an open question as to whether the precursor to the 120" diffraction limited telescope should be a non-diffraction limited 120" telescope or a diffraction limited telescope of smaller aperture.) ✓
3. GULF STREAM DRIFT MISSION: The following schedule was provided by Mr. May on June 3: Dive - June 4; Dock - June 5; Dive - June 6-8; Dock - June 9-15; Mini-Drift - June 16-20; Drift Mission - June 25. We were not able to contact Mr. May on June 6, but learned from a Grumman representative that a "motor failure" had occurred and the dive scheduled for June 6-8 did not take place. The effect of this failure on the rest of the schedule is not known.* ✓
4. BIOSCIENCES: Dr. Orr Reynolds extended you a personal invitation (through Dr. Hilchey) to attend the upcoming launch of the Biosatellite and a concurrent meeting of OSSA's Space Biology Subcommittee on June 21-23. We learned from Mrs. Holmes that you would not be able to attend this meeting and Dr. Reynolds Office has been informed of this. ✓

*Later communication with Mr. May indicates that the failure was minor and the scheduled dates for the Mini-Drift and Drift Mission will not change. ✓

B
6/9

STATUS OF BUDGET ACTIONS IN THE CONGRESS - The NASA FY-70 Authorization Bill is scheduled for debate on the House floor June 10. This action will give the first clear indication of the budgetary mood of Congress. The Senate Space Committee will not make its report on the Authorization Bill until action is completed in the House. House Appropriation Hearings have been completed, but this report also awaits completion of House action on the Authorization. NASA Senate Appropriation Hearings are scheduled for July 9 and usually involve only NASA Headquarters personnel.

NASA's FY-70 budgetary outlook is considered generally favorable. The Apollo successes have brought great praise from Congressmen and the news media, but these successes have also brought greater public awareness of their large cost and a feeling that our costly vehicles should be put to more rewarding use than a follow-on program of exploration of an apparently barren lunar surface.

It appears that a non-programmatic consideration is one of the keys to the FY-70 budgetary level of agencies such as NASA and DOD. There is great public pressure on the Congress to reject President Nixon's requested extension of the income tax surcharge. There is little chance that it can be extended prior to its June 30 expiration date, but if extension is denied altogether, there will be strong Congressional action to reach budgetary balance through larger budgetary cuts than are now contemplated. ✓

D. Geissler

NOTES 6/9/69 GEISSLER

*B
6/9*

1. Proposed AIAA Specialist Conference: Dr. Leonard DeVries, Deputy Chief of our Aerospace Environment Division, has submitted a proposal for a Specialist Conference on "Observing and Predicting Solar Activity," to AIAA Headquarters, to be held in Huntsville in October 1970. The general chairman of the conference will be Dr. Leonard DeVries, and the proposed Technical Chairman is Mr. Gerhard Heller. The Alabama Chapter of AIAA is giving its full support to this proposed conference, since it would be the only national AIAA meeting scheduled for Huntsville during 1970. The conference will emphasize primarily ground and orbital based solar observatories, and short and long range predictions of solar activity. Although conference planning is only in preliminary stages, considerable national level interest has been shown. Air Force and ESSA representatives have expressed interest, and AIAA's Space and Atmospheric Physics Technical Committee, of which Dr. DeVries is a member, has endorsed the conference. We shall keep you and Dr. Stuhlinger informed on the progress of conference plans. ✓
2. AAP Range Safety & Flight Limits (RS&FL) Subpanel Meeting: The fifth RS&FL Subpanel Meeting was held at MSFC on June 4, 1969. The primary purpose of the meeting was to review the range safety activities to support a presentation to KSC/ETR in August 1969. The presentation will be to request ETR preliminary flight plan approval for AAP for the Northerly launch azimuth. All preparatory activities are on schedule with most of the analyses completed. ✓
3. Helium Vent Tests: (Reference Notes 3/24/69 Geissler) Tests were recently conducted in the MSFC 14-inch Trisonic Wind Tunnel to measure orifice efficiencies (discharge coefficients) of helium and air venting perpendicular to an external stream. These data are required to predict the payload compartment pressure histories for the AAP-2 and AAP-4 vehicles. These compartments will be purged with helium just prior to liftoff. Three significant findings have resulted from these tests. First, the discharge coefficients for helium when plotted as a function of jet-to-free-stream mass flow ratio are considerably higher than anticipated, which will in effect reduce the burst loads on the nose cone shroud previously estimated. Secondly, it has been found that the discharge coefficient when plotted as a function of jet-to-free-stream momentum ratio is seemingly independent of the type of gas being vented. Therefore, the orifice flow data obtained from the Ames Research Center tests in which air was used exclusively can now be used together with the MSFC data to define the orifice efficiencies for the AAP vehicle. Finally, as was hoped, the MSFC tests have, in general, produced data in good agreement with the more sophisticated Ames tests. Thus, if additional tests are required, our own tunnel will be able to provide the necessary data without the large expense and long waiting period characteristic of the larger facilities. ✓

B
4/9

1. FILL-IN MATERIAL FOR APOLLO 11 TV COVERAGE: A short film of the General Motors Mobility Test Article test activities at MSFC has been assembled from excerpts from previous footage, showing aerial views of the test site, the vehicle being driven through craters - with both a hard-suited and a shirt-sleeved driver and the vehicle being driven up a six and one-half-foot step obstacle. The film was sent to NASA Headquarters where it will be combined with films from other lunar surface vehicle test activities at Bendix Corporation and Grumman Aircraft Engineering Corporation. A commercial film-making company will edit the combined footage for use as fill-in material during the Apollo 11 TV coverage. ✓

2. NUCLEAR FERRY/NERVA ENGINE ASSESSMENT: Our Office participated in an assessment of the proposal to use a nuclear-powered stage as a lunar ferry during the late 1970's, as outlined in Dr. Mueller's "Ten-Year Plan." Since the requirements for eight hours of operation with 40 restarts exceed the current Nerva specifications of 50 minutes of operation with ten restarts, the question was raised as to the feasibility of incorporating the nuclear stage into the plan. In this regard, Mr. Carl Schwenk of Space Nuclear Propulsion Office was contacted, and several methods of increasing engine burn time were discussed: (1) increasing the thickness of the coatings of the fuel element propellant channels, (2) replacing the niobium coating with a material that is less permeable to hydrogen, e.g., zirconium, (3) changing the graphite core to a composite core consisting of a mixture of carbon and a carbide solid solution, and (4) doping the hydrogen propellant with a suitable hydrocarbon, e.g., methane. Mr. Schwenk concluded that a Nerva engine meeting the requirements of the "Ten-Year Plan" could be available by 1977, provided that the decision to incorporate the appropriate design changes was made in a timely manner. He also stated that it would be possible to demonstrate by 1972-1973 an operating time of four to five hours (reactor test) if proper emphasis was placed on this development. ✓

B
9/2

1. SATURN V BATTERIES: We completed a study and review of all battery problems, operations, and past failures. With the minor correction of some battery activation and inspection procedures at KSC, we have greater confidence in satisfactory battery operation. ✓

2. ATM CLEAN ROOM: We have not received funding approval from NASA Headquarters for the ATM Checkout Clean Room planned for Building 4708. The request for approval was forwarded to Headquarters in early March. We were repeatedly advised that approval would be forthcoming in time not to delay our request for bids on the construction phase. We have been prepared since May 1 to request bids, but we cannot move until we have the funding approval. The delay is now impacting our ATM checkout schedule on a day-for-day basis. ✓

3. AUXILIARY HYDRAULIC PUMP: The failure which occurred on S-IVB-505 has been duplicated by MDAC in special tests. It was previously reported that spring guides have been located that did not meet specification requirements. Therefore, we felt confident about the next flight because the spring guide was exchanged with a known good item. Since we have been unable to locate a spring guide with serious out-of-specification conditions, the AS-506 spring guide exchange loses its significance. We have no reason to believe that the AS-505 spring guide was incorrectly made. ✓

NOTES 6/9/69 HAEUSSERMANN

B 6/9

Automation of Redlines: On July 22 CSE will present to Center Management the feasibility of automatic redline monitoring during launch countdown and terminal count sequencing of Saturn launch vehicles. The concept is being prepared for a passive mode trial on AS-507. This meeting is already on your calendar, and we are now preparing a memo to other invitees. ✓

B6/9

1. S-11 INSULATION PROBLEM: The S-11-509 honeycomb rails were totally debonded in areas around feedline 5. As in the case of S-11-508, there was a very marginal bond with some debonding at the "heel" where the adhesive overlaps the primer, and the debonds tended to propagate further past the primed area. The vertical rails of S-11-509 exhibited large areas of debond. It is believed that the circumferential tank contraction does, in effect produce a squeezing action. A ten foot section of systems tunnel rail has apparently been successfully replaced on S-11-509. We have been monitoring this activity quite closely.

Obviously!
B

2. S-IVB STAGE AUXILIARY PUMP COMPENSATOR: Analysis is continuing on the S-IVB auxiliary pump compensator. The stress analysis of the moving parts indicates that the compensator guide spring is more highly stressed than the guide or valve pilot, and its failure is more probable than failure of the guide or valve pilot. As you remember, this component is suspect for failure during the Apollo 10 flight. So far we have been unsuccessful in getting the spring on SA-506 changed.

3. EXPERIMENTAL AEROSPIKE SEGMENT CASTINGS SUCCESSFULLY DEMONSTRATED Additional aerospike segment chamber liners have been successfully fabricated by the investment (lost wax) casting process. In summary, two casting samples have been poured at each of two vendors. Textron in Los Angeles and Hitchiner Manufacturing Company in New Hampshire, using beryllium-copper and silver-copper alloys. Inspection of the castings has indicated absence of voids and inclusions. These were the first attempts to cast full size liners having wall thicknesses of .060 inch and lengths of 8-9 inches. This work is part of the MSFC contract NAS8-30182, "Cast Segment Evaluation."

4. SPACE MATERIALS SCIENCE ACTIVITY: A joint evaluation effort between Research Planning Office, Space Sciences Laboratory, Manufacturing Engineering, and Materials Division has resulted in a favorable consensus on the Westinghouse proposal for Zero "G" crystal growth investigation. In the interim, the Materials Division is proceeding with preparations for complementary crystal growing experimentation. As a result of an earlier request by the Space Station Task Team Manager, we are beginning a comprehensive investigation of the feasibility and problems associated with soldering in Zero "G". We believe this relatively simple, but extremely useful process has been overlooked in the preoccupation with more sophisticated processes. We plan to begin with a hard look at the surface physics of soldering and probably will eventually require a KC-135 Keplerian trajectory flight to test the theory.

5. BIOASTRONAUTICS ACTIVITIES: The Lower Body Negative Pressure device studies of overboard dump vs. vacuum pump to provide the required 40 mm of mercury vacuum are beginning to point up the tremendous advantages to adoption of the overboard dump approach. With due regard for the appreciable analytical and testing effort preceding this conclusion, it must be pointed out that the numerous iterations and negotiations with MSC have effected a change in the end item specification and in certain other constraints. We plan now to employ an overboard dump system. This will probably cost no more than 20 to 30 pounds of consumables for the 28 day mission.

NOTES 6-9-69 Heller

B
6/9

1. SOLAR PHYSICS SUBCOMMITTEE: MSFC was the host for the June 3-4 meeting of the Solar Physics Subcommittee which was held in the SSL conference room. The committee is headed by Dr. Harold Glaser. Dr. Henry Smith, who is Dr. Naugle's deputy for Science, attended the second day of the meeting. The members of the committee were well impressed with the Saturn vehicle and especially with the ATM experiment hardware they saw during their tour through ASTR, ME and ASTN. The solar physicists were quite interested in our joint NRL/MSFC solar magnetograph which we discussed informally with some of them. The observatory tower was not included in the tour because we do not have yet much scientific equipment to show; however, we intend to include it when they come again to MSFC. However, Dr. H. Smith saw our magnetograph tower and was favorably impressed with our plans. The business of the Subcommittee was highlighted by a presentation by Henry Smith about the status of the national planning activities of the various committees such as STAC, AMB and the NASA study under Newell. The solar astronomers were pleased with the concept of a "balanced program" and with the concept of a "minimum viable program." Projects of special interest for the solar physicists are the OSO follow-on's, ATM follow-on's and a continued rocket program. ✓

2. T-027 OPTICAL CONTAMINATION EXPERIMENT: Dr. Paine has signed off on the D&F document to include two scientific experiments in the T-027 hardware package. These are (a) S-073, Zodiactal Light/Gegenschein, Dr. Weinberg of Dudley Observatory as PI, and (b) S-149, Meteoroid Particle Collector, Dr. Hemenway of Dudley Observatory as PI. All three experiments will be mounted on the extendable boom designed for T-027. Negotiations were held last week with Martin-Marietta to cover incorporation of the two scientific experiments and also to procure certain items of hardware not previously provided for under the contract. The cost attributable to the S-073 and S-149 requirements is on the order of one-half the total of approximately \$1.3M increase to the basic contract. Dr. Weinberg and his co-worker Mr. Mann visited SSL last week in order to advise our project team during the negotiations with Martin. A contract for \$50K was initiated with Dudley Observatory to cover their expenses in support of S-073 and S-149. ✓

NOTES 06-09-69 HOELZER

B
4/2

MANAGEMENT AUTOMATED INFORMATION DISPLAY SYSTEM (MAIDS) PRESENTATION AND DEMONSTRATION

General Electric Company gave a presentation at their Daytona Beach facilities on May 22, 1969, to inform NASA Headquarters and MSFC Computation Laboratory personnel on the capability of MAIDS to meet certain MSFC engineering information storage and retrieval requirements. ✓

MAIDS is a subsystem of a generalized data management system using a Cathod Ray Tube and Teletype remote terminal on-line to a third generation computer system (GE-635) designed for storage, analysis, retrieval and presentation of management data in graphic, numeric, and narrative modes. This system was developed by General Electric under contract to NASA Headquarters. ✓

The presentation included a general description of MAIDS including its operation and capabilities. Some of its project management capability was demonstrated utilizing a NASA Headquarters cost and schedule data base. ✓

Specific capability of MAIDS to meet Quality Laboratory's Automated System for Status Information and System Test Planning (ASSIST) requirements was demonstrated. Additional capability required by the ASSIST application is presently being added to MAIDS and will be demonstrated at MSFC during the third week of June 1969. Plans now are underway to put MAIDS on the MSFC third generation computer system (UNIVAC 1108) to meet the total ASSIST requirements. ✓

NOTES 6/9/69 HUBER

B
6/9

1. PRESSURE-FED LAUNCH VEHICLE STUDIES: Rocket Propulsion Laboratory (Air Force) has RFP's out for bids on (a) design and fabrication of the 18-foot-diameter, 42-foot-high, HY-140 steel, cylindrical tank to be used for main tank injection pressurization system testing, and (b) design and delivery of alternate pressurization systems to be tested in the 18-foot-diameter tanks. (In addition, RPL will receive six 100-gallon maraging steel tanks from Martin this month for use in storability testing.)

SAMSO has an RFP out for bids on a launch vehicle configuration and conceptual design study which will enable credible recurring costs to be established. ✓

2. SPACE STATION DISPLAY: An exhibition of space station configurations covering a time span of forty years has been set up in the corridor of the tenth floor. ✓

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B
6/9

1. AS-506 Status: The Flight Readiness Test was completed on Friday, June 6, as scheduled with no significant problems occurring on either the launch vehicle or spacecraft. ✓

I held my readiness reviews with each of the launch vehicle contractors last week. No significant problems were identified in these reviews and all indicated they were ready to fly. McDonnell-Douglas has a good explanation of the 45 Hz vibrations in the second burn, correlating them with LH₂ tank venting. The progress is good on the new LH₂ feed duct with liners in the bellows. We will attempt to work out a replacement plan with KSC this week in order to get the duct in prior to CDDT. ✓

2. Rescheduling of AS-508 Stage Deliveries: In our June 2 notes we indicated that the Apollo Program Office had rescheduled the AS-508 stage deliveries to the end of July or early August because the Apollo 13 LM was behind schedule. This is now changed and our launch vehicle stages will be delivered as follows:

S-IC - June 16
 S-II - June 30
 S-IVB - June 13
 S-IU - July 7 ✓

This change resulted from the decision to deliver the LM on schedule and to accomplish the outstanding work at KSC through utilization of a large Grumman Task Group. ✓

3. Targeting Objectives for October and November Apollo Launch Readiness: I alerted George Low by TWX last week that their failure to provide the subject objectives jeopardizes our ability to furnish the flight tapes to KSC per the launch readiness schedule. Our schedule commitment to KSC required the target objectives by the following schedule:

<u>LV</u>	<u>MISSION</u>	<u>LAUNCH</u>	<u>NEED DATE</u>
507	G-2	October	May 13
508	G-3	November	June 9
507	H-1	November	June 9 ✓

At the current time we are expending a large amount of effort to meet the 507 G-1 September mission. The situation with the October and November missions could become critical if MSC does not supply the subject target objectives immediately. ✓

NOTES 6/9/69 JOHNSON

B 6/9

Nothing of significance to report.

NOTES 6/9/69 MOHLERE

B
6/9

Nothing special to report.

NOTES 6/9/69 MOORE

B 6/9

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1. LRV Navigation: Astrionics Laboratory established the need for and purchased a land navigation system from Aviation Limited of Canada (through Bendix - Ann Arbor) during the period 1965 to 1966. This set and some periscopic sextants were subsequently field tested at MSFC/Astrionics in a panel truck and furnished to the U.S. Geological Survey (USGS) at Flagstaff, Arizona, for use in the development of their Lunar Survey Program. Astrionics participated at a low level as did astronauts Joe Engle and H. H. Schmitt. The system was then brought back to MSFC for use in S&E-COMP simulations of lunar mobility studies. In mid 1968, NASA Hq requested that the system be returned to Flagstaff for further use. It is still there. USGS has issued a report covering its performance. A color movie with sound produced by the USGS featuring this set is also available for showing at your convenience. This set consisted of a gyro compass (not applicable for lunar work), inverter, coordinate resolution, distance computer, and plotter. It operates within an error of 1% of the distance traveled. Due to the recurrence of interest in this subject regarding the various LRV projects, an RFP was issued by Astrionics recently for a system applicable to lunar scientific surveys. Responses should be received by the end of the month. ✓

2. Slush Hydrogen Instrumentation: Astrionics I&C Division participated with Astronautics Laboratory in a presentation May 27 to the OART Chemical Propulsion Office on the status of slush hydrogen research at MSFC. Data and results of tests conducted at the National Bureau of Standards Cryogenic Lab for our I&C Division were given for beta attenuation, gamma attenuation, capacitance, and microwave interferometry techniques used for measuring hydrogen slush density. A discussion was given for utilization of electromagnetic and microwave doppler shift techniques for measurement of slush flow. OART personnel expressed a desire to continue this program but at a somewhat reduced funding level due to budget limitations for FY-70. An OART representative expressed an opinion that future programs will require transfer of large amounts of propellants in space and that the flow techniques developed in this program should be applicable since they do not require moving parts thereby increasing reliability for long term mission application. Future meetings will be held to discuss the joint utilization of unique MSFC inhouse Slush Hydrogen Research Facilities. ✓

3. Biomedical Experiment M-171: Last week Mr. Ed Michel from MSC, Principal Investigator for Biomedical Experiment M-171, visited MSFC. The bicycle ergometer and electronics were demonstrated using varying work loads. He was favorably impressed with the demonstration. We hope to take the breadboard to MSC the latter part of this month. ✓

4. Advanced Lightweight Solar Cell Modules: Engineering evaluation models of three promising designs for advanced lightweight solar cell modules have been received from TRW under our development contract and are now under lunar environment test. These modules, utilizing conventional silicon solar cells, seek to minimize the weight of the substrate on which the cells are mounted. One module mounts the cells on a pretensioned fiberglass lattice (tennis racket); another uses honeycomb with graphite filament/fiberglass epoxy face sheets; and the third uses a kapton flexible substrate. Power to weight ratios of up to 14-18 watts/pound are indicated which compares to 8-11 watts/pound on current ATM and OWS designs. These figures do not include deployment/mounting structure weights. Development problems include excessive cell debonding and manufacturing process control which appear to be solvable. ✓

NOTES 6-9-69 MURPHY

B
6/9

Nothing of significance to report.

NOTES 6/9/69 SIEBEL

B
6/9

Nothing significant to report.

1. AS-506 Launch Mission Rules: Since the AS-506 PFR has been cancelled, I would like to make you aware of two new single mandatory for launch items. AS-506 is the first vehicle to carry operational instrumentation on the S-IC and S-II stages. In this configuration essentially all ($>95\%$) S-IC and S-II stage telemetry is transmitted over one link on each stage. We have taken the position that we must maintain a minimum malfunction identification capability, since the cause of any major vehicle malfunction would have to be identified quickly and accurately. ✓ This is perhaps especially true with the public attention given this flight. Therefore, it is mandatory for launch that the S-IC link AP-1 and S-II link BP-1 be operative. ✓ These and the LVDC data stream (similar to past flights) are the only single mandatory launch vehicle instrumentation items. I have called this to the attention of George Hage also to insure this policy is recognized prior to the FRR and launch. ✓
2. MSFC/MSC AAP Operations Agreement: We have prepared, with the Program Office, a proposed scope for an "AAP Operations Interface Agreement" to be entered by MSFC and MSC. The proposal is patterned after our present operating agreement with KSC on Apollo. Principal items which are to be included in the agreement are: how MSC inputs operational requirements to MSFC's hardware development; how MSFC will input to MSC's flight operations development; and the definition of the onsite support to MSC for both the planning and flight phases. ✓
3. ATM Flight Control Measurements: Mission Operations, along with the Apollo Applications Program Office, Central Systems Engineering, Astrionics and the ATM system designers, has been closely scrutinizing the ATM systems measuring program from all aspects - flight control, flight evaluation and redlines. In summary, in the flight control area we achieved a reduction of approximately 50%. MSC flight operations personnel essentially agreed with our new measurement program. However, there is one discrepancy in the inflight power management. MSC feels that they need three additional parameters on each of 18 charger battery regulator modules (54 measurements) to adequately perform this function. We are carefully reviewing their requirement and will meet with them again to resolve this disagreement. We intend to start this week with a similar reduction exercise on the OWS and AM. ✓

NOTES 6-9-69 Stuhlinger

B
6/9

No submission this week.

June 16, 1969



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OFFICE OF DEPUTY DIRECTOR,
TECHNICAL

/	Dr. Rees		R 6/16
	Mr. Neubert		
	Mrs. Day		
	Miss Spaulding		
<p><i>Jim Shepherd attached are this week's notes with my comments. I concentrated mainly on Apollo and especially with respect to our upcoming 506 / Apollo 11 flight</i></p>			
	FILE		
	DESTROY		<i>Shepherd</i>

①

June 19

Review of Proposed artificial
gravity experiment
Leiland Bellew meeting
with Schneider in
washington

Notes - 6/23/69 - Becker -

P. 6/16

NOTES - 6/16/69 - BALCH

Jack Balch, see notes Bill Brown

S-II-8 - Due to extensive insulation modifications, removal from the test stand has been rescheduled from 6/17/69 to 6/19/69. No impact to the KSC delivery date of 6/30/69 is expected.

S-II-9 - All work is on schedule to meet the static firing date of 6/20/69.

S-1C-10 - During the past week, the Pressure-Volume Compensation (PVC) duct for Engine No. 2 was replaced because of malfunction during gimballing of the engine. The malfunction consisted of short, jerky motions accompanied by loud, scraping sounds. The new duct checked out satisfactorily. A problem of early indication of igniter ignition has also been corrected by making circuitry changes and reducing the sensitivity of the circuits by using higher capacity fuses. Although the test program has fallen somewhat behind schedule, it appears now that the planned static firing date of 6/25/69 will be met.

BOMEX - Phase II of field operations was completed on 6/11/69 as scheduled. Schedule calls for refurbishment and replenishment to be completed today and for ships to depart for Phase III operations 6/17/69.

Finance - 99.4% of the \$27,069,701 total FY 1969 Saturn V Vehicle Support Funds authorized for MTF have now been obligated. PR-SAT-PR has been advised to withdraw \$144,337 of the \$156,362 balance. The remaining \$12,025 is required and will be obligated prior to 6/30/69.

Lee James, one contractor seem to turn out more and more sloppy work. It is about time that we call on their higher management.

a) This PVC deficiency should have been detected before shipment to MTF. If we would not have a static firing any more, it would have been detected only at KSC

b) See my comments on Constant's notes.

c) " also S-II-8 insulation above

Rs

NOTES 6/16/69 BECKER

B6/66

LUNAR ROVING VEHICLE

Manned - A meeting was held at NASA Headquarters with MSC, KSC, and Bellcomm on June 6 to discuss engineering interface data for the work statement and appendices. Data were to be submitted by June 16. The RFP is scheduled for release on June 23 and an SEB is currently being formed. The Procurement Plan has been submitted to Headquarters. The second version of the statement of work was distributed for comments on June 13. Meetings are scheduled for the first part of this week to prepare a final draft. Headquarters, MSC, and KSC have been invited.

Dual Mode - Bendix and Grumman were at MSFC last week to present status and recommend a baseline configuration. Material was critiqued at the meeting and a baseline selected. This will be followed with written direction to the contractors this week. Technology efforts currently underway will directly apply to the above manned vehicle procurement.

SPACE SHUTTLE

The joint DOD/NASA summary report was reviewed by Dr. Mueller and Secretary Hansen, and final discrepancies reworked at SAMSO/Aerospace Corp. on June 9. Dr. Mrazek and I participated in this meeting, and the document was signed by Mueller and Hansen in Washington on June 13 after final review. MSC will present its concept to our people on June 24, and Langley will discuss application of the HL-10 lifting body to the Space Shuttle on June 30.

ARTIFICIAL "G" EXPERIMENT (Saturn V Workshop)

A meeting was held with the AAP office on June 13 to discuss the request from Mathews for an assessment of an artificial "g" experiment using the second/backup workshop with the S-II as a counterweight. (See notes of 6/9.) The June 11 due date was postponed by Headquarters. The AAP office is scheduling a meeting (June 19) with Headquarters (Schneider/Culbertson) to better determine the thinking regarding implementation of this experiment. We desire to clarify program schedule and potential contractual efforts, in addition to engineering requirements, with Headquarters before providing an MSFC position. In any event, we believe it will require several weeks of in-house activity to provide the type of backup to support an MSFC position. It is also planned to clarify this point at the June 19 discussion.

B6/16

EXPERIMENT M508, EVA HARDWARE EVALUATION: A meeting was conducted 6/11/69, at MSC on Exp. M508 Task Panel. Reps. from NASA Hq., MSC, MSFC, Martin/Denver, University of Houston, and GE attended. Through the discussion on the task panel it was determined that the experiment M171, Metabolic Activity, task panel requirements could be integrated into the M508 task panel. The Principal Investigators (PI's) for both experiments were at the meeting. The PI for M171 indicated concern that the specific requirement for the metabolic analyzer provided by M171 for use on M508 had not been specifically requested. The MSC AAPO, M508 PI and M171 PI will discuss this.

MSFC has an action item from the 6/11/69, meeting to look at the possibility of mounting the M508 task panel in the OWS crew quarters for use with the metabolic analyzer.

AAP FLIGHT MEASUREMENTS REDUCTION MEETING: During the week MSC and MSFC met and discussed the reduction of OWS and AM flight measurements. Recommendations forthcoming to Centers' Mgt. are:

1. A 50 percent reduction of flight control measurements.
2. Non-flight control measurements, i. e., engineering evaluation, should not be considered for flight except in those instances where the measurements are considered essential to accomplishing a primary mission objective.

"HOLDING" STATUS OF LM-A PROJECT: Grumman was asked to freeze their manpower level as of 6/12/69, in view of the current AAP studies. We have authorized Grumman to continue on a level of 640 equivalent men, which consists of 615 which were on board on Friday, June 6, plus those who were assigned to the program through the 12th of June, and those to whom commitments had been made.

INTER-CENTER AGREEMENT: The KSC inputs to the Inter-Center Agreement have been received. We are now working to have the final document ready for joint signature by July 1, 1969.

ATM CONTROL COMPUTER CDR: The ATM Control Computer CDR was conducted on 6/10/69. A delta CDR is planned for 8/15/69, to cover Failure Mode Effect Critical Analysis and Quality Test Plan Procedures which were not available for this review.

B6/16

NOTES 6-16-69 BROWN

F-1 Engine - Reference my notes of 5-12-69 concerning apparent early breaking of F-1 Engine pyrotechnic igniter linkages during static testing of S-1C-9 and 10 at MTF. The discrepancies have been traced to a facility circuitry error which allowed a crossfeed between the 500 volt firing circuit and the 28 volt link circuit on engine positions 2 and 3. The circuits were corrected and subsequent igniter tests proved satisfactory.

J-2 Engine - Planning is underway to conduct a S-IVB LH₂ vent valve test at AEDC to confirm the analysis of 46 Hz oscillations experienced on AS-505. The test will be conducted with a J-2S engine and should be completed within two weeks.

Lack Balch, I find it strange that we, all of a sudden, detect facility circuitry error after we have tested S-1C-4 thru S-1C-8 at MTF.
How come?

Rec.

B6/16

ENGINE CONTAMINATION ON VEHICLE S-IC-10

!!

Routine checks of the engine thrust chambers and injectors during post static checkout of vehicle S-IC-10 revealed fuel emanating from the thrust chamber injector of engine F-6066. Further investigation revealed that the hydraulic system check valve at the #1 fuel high pressure duct had excessive back-flow leakage. Fuel leaking through this valve accumulated in the fuel injector manifold and subsequently drained through the injector fuel orifices. Quantities were such that contamination of the LOX system is highly suspected.

Corrective action is to replace engine F-6066 with spare engine F-6088. It should be noted that this is a problem associated only with the stage in the horizontal position and primarily limited to engine position #1 due to the orientation of the engines on the stage.

Failure analysis and future corrective action will be made by The Boeing Company as soon as possible.

Lee James, if I am not mistaken this happened also to S-IC-7 at KSC. Is it possible that we have contaminated the LOX system on other stages?
How about 506?

Rees

NOTES 6-16-69 DOWNEY

201

BG/16

1. ATM-B PHOTOHELIOGRAPH: Mr. Chase of OSSA discussed with members of PD and S&E our interests in the development of California Institute of Technology's Photoheliograph which currently is considered the most important instrument for a follow-on solar ATM mission. It was pointed out that MSFC considers the Photoheliograph development as a logical, important continuation of our involvement in the ATM Program. We are now considering possible actions that should be initiated to further the definition of ATM-B.

2. SPACE BIOLOGY SUMMER STUDY: Dr. John Hilchey and Mr. Jerry Johnson have been requested by OSSA to participate in the National Academy of Sciences' Space Biology Summer Study to be held at the University of California, Santa Cruz, July 14-19. As members of the Executive Panel for technical support their task will be to act as liaison in obtaining information not available at Santa Cruz and to keep abreast of developments during the study. We are very pleased that MSFC has been asked to provide more than the usual single representative.

3. GULF STREAM DRIFT MISSION: The Navy's Certification Team is now at West Palm Beach to work out the remaining certification questions with Grumman. Sleep monitoring data from Mr. Chester May has been sent to MSC and Dr. De Lucchi has termed the last run excellent and states that Mr. May has acclimated to the equipment. We have not received any changes to the scheduled drifts submitted in last week's Notes.

4. HIGH ENERGY SATELLITE PROGRAM: Mr. Halpern, OSSA, met with various Office members to review the status of effort on the High Energy Satellite Program (formerly Super Explorer). Mr. Halpern suggested several types of documentation he wanted us to initiate, and also asked for a complete analysis of SRT and facility requirements for the High Energy Astronomy effort for all four potential missions.

D 6/16

HOUSE PASSAGE OF NASA AUTHORIZATION BILL - A NASA FY-70 Authorization of \$3.966B was passed in the House June 10 by a vote of 328 to 52. In comparison, the FY-69 Authorization was passed in the House on May 2, 1968 by a vote of 262 to 105. The Senate Space Committee is expected to report its version of the Authorization within the next two weeks, although no specific date has been set.

Representatives Teague and Fulton led the defense of the bill, and a larger than usual number of representatives spoke in favor of the measure. Some members voiced concern about the unfairness of Congress setting an overall budget expenditure ceiling, and then voting \$250.8M more for space than the President requested. There was also discussion regarding study of priorities to stress those programs giving most promise of earth benefits, but a proposal by Rep. Koch (D-N.Y.) to cut \$205M from Apollo and Space Flight Operations was easily defeated, as was Rep. Ryan's (D-N.Y.) amendment to reduce NERVA from \$50M to the \$36.5M requested by the President.

Passage was helped by the sudden MOL cancellation which eliminated the usual charges of program duplication from the debate. DOD Secretary Laird, in testimony before the Senate Appropriations Committee on the morning of June 10, announced the cancellation, although the printed statement prepared for his testimony called for continuation of MOL test launches.

OBLIGATIONAL STATUS OF ALL APPROPRIATED FUNDS AS OF MAY 31 AND PROJECTED THROUGH JUNE 30, 1969 - As of May 31, we had initiated \$824M (93%) and obligated \$780M (88%) of the FY-69 \$886M authorized MSFC for all appropriations.

MSFC must obligate \$106M in June, which is approximately \$35M greater than an average month of \$71M. A review of all planned and in process procurement actions indicates that we will obligate all but about \$2.5M of available R&D funds if the current AAP MSFC proposed reprogramming plan is approved by Headquarters. If not, our unobligated position will more closely approximate \$25M. However, in view of Headquarters desire to achieve total obligations, we expect concurrence. Assuming concurrence, the overall picture as of June 30, 1969 should approximate the following:

<u>Appropriation</u>	<u>Authorized</u>	<u>Obligations</u>	<u>Carryover</u>
AO	116.4	116.4	0
R&D	768.0	765.5	2.5
C of F	<u>1.6</u>	<u>1.3</u>	<u>.3</u>
TOTAL	886.0	883.2	2.8*

(In millions of dollars)

* ,3%

1
B6/16

1. S-IVB Vibrations - 505 Astronauts' Debriefing: Bob Ryan, of our Dynamics and Flight Mechanics Division, attended the astronauts' debriefing at MSC on June 5. The oscillations reported on the S-IVB were of a low level type. The astronauts said that several reasons were apparent for their sensitivity to the oscillations: (1) The couch holddown was not released prior to the launch; this increased the transmissibility from launch vehicle to couch. (2) The astronauts are more sensitive to low-level vibrations since the vehicle acceleration is low. For example, a 0.1 g oscillation is 1/3 of the total felt during S-IVB burn but would be only 1/40 of the total near the end of S-IC burn. (3) The preconditioning to expect POGO near the end of S-IVB burn had them looking for oscillations. There seems to be no need for concern relative to the S-IVB oscillations for future flights. The S-IC shutdown transient was as predicted. The astronauts were expecting the negative 1/2 g but not the oscillating portion of the transient which gave them some concern. Future astronauts will be briefed on what to expect.
2. NASA Planetary Atmospheres Subcommittee: Dr. Leonard L. DeVries, of our Aerospace Environment Division, was invited by Dr. Robert Fellows, Chairman of the NASA Planetary Atmospheres Subcommittee, to attend a meeting of the subcommittee at Boulder, Colorado, June 8-11, 1969. This invitation resulted from Dr. Stuhlinger's discussions with OSSA management. The agenda for this meeting included the recommendation of an Imaging Science Team for the Mariner Venus-Mercury Flyby Mission, a technical review of proposals for lunar atmospheric and planetology experiments to be flown on Apollo 16-20, a technical review of proposals for experiments to be flown on the Mariner Venus-Mercury Flyby Mission, a briefing on the Small Astronomy Satellite (SAS) Program, and a technical evaluation of a proposal for an ultraviolet spectrometer and telescope to be flown on the SAS Program. Many of the members of the Planetary Atmospheres Subcommittee are active experimenters with proposals for the subcommittee to evaluate. Although these members were not permitted to vote on the technical merits of their own experiments, the advantages of their positions on the subcommittee were quite obvious. The discussion of proposed experiments to be flown on Apollo 16-20 was especially interesting. The request for these proposals went out only a few months ago. With a scheduled launch date of June 1971 for Apollo 16, the latest delivery date of an experiment for that flight would be about December 1970. During the discussion of these experiments, there were doubts by representatives of the subcommittee as to whether a contract could be negotiated and the experiment built and mated to the Apollo or CSM flight with that short a lead time. Dr. Henry Smith, OSSA Chief Scientist who was present for nearly all of the meeting, indicated that this program would be given a very high priority. Most of the other NASA Centers have representatives on the Planetary Atmosphere Subcommittee. This is a very influential subcommittee since one of its functions is to recommend to program management the scientific merits of all flight experiments designated to measure planetary atmospheres. Minutes of the meetings of the Planetary Atmospheres Subcommittee are not usually published until several months subsequent to the meetings. Dr. DeVries would be pleased to brief you, Dr. Stuhlinger, and Dr. Lucas on this meeting if you desire such a briefing.

Yes, by all means, but wait until Dr. v. Braun is back (July 4) and contact Bonnie!
Rs

R 6/16

1. NUCLEAR POWER SUPPLY: Final briefing on the MSFC/AEC cooperative study of the reactor-thermoelectric/space station (R_x-TE/SS) has been postponed from June 24 to July 8, 1969, because of the absence of some key attendees. The AEC is apparently well pleased with results of the past year's effort. They are providing FY70 funds to Atomics International (AI) for continuing support to us on the R_x-TE system. They are also initiating a similar but lower level effort on a reactor thermionic power system for Space Base application. Mr. Price of the AEC will spend one or two weeks here in late July or early August to work out arrangements. The reactor thermionic contractors, GE and General Atomics (GA), could begin AEC-funded support to us after August. A limited amount of inhouse effort will be required to provide proper input data to these contractors.

NOTES 6-16-69 GRAU

No submission this week.

B 6/16

NOTES 6/16/69 HAEUSSERMANN

B6/16

Flight Mechanics Status of the Dry Workshop Mission: A Flight Mechanics Status of the Dry Workshop Mission was presented to CSE by AERO on June 11. Some of the items of interest and some potential problem areas are summarized below:

a. Saturn IB Performance: Estimates of Saturn IB performance were shown assuming flight into a 50° or 35° inclination orbit, with an on-time launch, and no allowances for yaw steering. The minimum capability exists when the S-IVB stage is used to insert the CSM directly into an 81×120 n. mi. orbit with a 50° inclination. The CSM would then be burned into a 260 n. mi. orbit for rendezvous. In this case, the Saturn IB has the capability of inserting 31.2 K pounds. Lower inclinations and/or the use of the 2-1/2 stage configuration increases the payload capability to as much as 38.1 K. Some degradation will be required for yaw steering capability to provide a suitable launch window. (To obtain a five-minute launch window for the IB launch, approximately 325 pounds of payload capability is required for a 50° launch; only 20 pounds required for a 35° launch.)

b. Pad Dwell Time: Due to the fact that the Dry Workshop vehicle is flying to higher orbital altitude, the optimum first stage boost profile is somewhat steeper than those presently flown in the Apollo Program. This will increase the dwell time (time the vehicle is in the near proximity of the launch site) by approximately 10%. This is presently a concern at the Cape due to potential hazards from debris if a vehicle destruct should ever be necessary.

c. Deorbit Velocity Requirement: In order to deorbit the S-II stage from an altitude of 260 n. mi., a retrograde velocity of approximately 120 meters/second must be employed. This capability is not presently available in the S-II stage. In order to provide deorbit capability for the S-II stage, a guidance system, reaction control system and deorbit motors would be required. It is estimated that such a system would require a weight of approximately 8500 pounds.

d. Crew Recovery: Due to constraints imposed for rendezvous, docking, daylight launch and daylight recovery, the first 28-day mission may likely present problems for crew recovery between 0 and +40 degrees north latitude to obtain a daylight recovery. Regression rate for 50° inclination is 5.7° per day and produces a recovery compatible orbit for 56-day mission, but not for 28-day mission; whereas 37° is compatible for a recovery for 28 and 56-day missions.)

B6116

1. S-IVB STAGE LH₂ FEEDLINE: Hard mount development vibration testing of an LH₂ feedline bellows with liner has been completed. The bellows was subjected to vibration levels 6 dB higher than maximum expected flight levels for 12 minutes in the transverse and axial directions. Strain data from these tests indicate that stresses in the liner weld during all periods of flight are well below the endurance limit.

2. TESTING OF S-IVB VENT VALVES AND DUCTS: As a result of the S-IVB-505 vibrations during flight, a test program is being investigated for S-IVB Battleship. Testing is feasible at AEDC, however, there is some concern for prospects to get "real meaningful data" since we have not been able to duplicate the forward skirt stiffness. AEDC personnel think they can complete the first phase by June 26, however, any loss of hardware would delay this for at least one month since there are no spare valves available or scheduled.

K. H. Gould
This is no significant in that it might explain our S-IC's deficient in performance
 3. F-1 ENGINE PERFORMANCE: In support of studies to investigate the vibrations in the F-1 engine thrust, we have discussed the subject of RP-1 fuel chemistry with Rocketdyne technical personnel. There is a considerable difference in the chemistry of RP-1 as purchased on the West Coast and that in the East, although the fuel still meets the applicable specification. Some full scale tests are in progress at Rocketdyne and analyses are being made on the fuel used to attempt to define any difference in performance. Based on these tests and previous data, we may find it profitable to us to investigate the fuel chemistry in much more detail. Lox purity has been shown also to have a significant effect, but this is much easier to control.

B
 4. EXPLOSIVE BONDING OF COMPOSITES PROGRESS: Continuing investigation of explosive bonding, particularly of composites in the Metallic Materials Branch has attracted the attention of Aviation Week. Mr. Pikeler of that publication has taken photographs of the process in action, and we expect suitable recognition of this pioneering effort in that publication in the near future.

5. EMPLOYEE TRAINING: Our employee training program has produced the following results: Dr. Kenneth E. McCoy received his PhD in Mechanical Engineering from Purdue University. Dr. Jerrol W. Littles has completed the requirements for the degree, PhD in Mechanical Engineering at the University of Texas. Mr. John Key was awarded a Master of Science in Engineering from the University of Alabama. Mr. John Admire was awarded the degree of PhD by the University of Alabama, June 1, 1969. Mr. Ronald Young received a Master of Science in Industrial Management from the University of Tennessee, June 10, 1969. Mr. Young's thesis subject was "Analysis of Position of In-Line Assistant within a Government Organization." Dr. Billy Grant McKinney received his PhD in Mechanical Engineering from the University of Alabama, June 1, 1969.

NOTES 6-16-69 Heller

R 6/16

1. SSL ASTRONOMY ACTIVITY: A summary of SSL's astronomy activity will be forwarded on a separate sheet for suggested inclusion in the Notes to Dr. Naugle.

2. H-ALPHA TELESCOPE: The first good quality H-alpha photos were made this past week from our new Solar Tower. (This tower will also house the magnetograph.) Results were obtained using both a Spectrolab hybrid filter (see attached photo) and a Spectrolab Type U filter (0.7 Å Fabry-Perot type filter on mica substrate). The hybrid filter is a combination of an interference filter (similar to the Type U) and a birefringent filter. Photos taken from both filters were of good quality. A simple visual comparison of the best prints from each of two sets of 35mm negatives indicates the Type U filter gives slightly greater plage signal. This is the start of research on hydrogen alpha filters related to ATM and later on for correlation with magnetographs of the sun.

3. VISIT OF DR. WEIDNER AND MR. RICHARD TO SSL: An unannounced visit of the Director and Deputy Director of S&E last week was greatly appreciated by the members of SSL. Most of the time was spent in our experimental labs. Our scientists were very pleased with the great interest shown by our "bosses" and were anxious to demonstrate their scientific work in support of Apollo and the AAP. Our people are very busy in meeting the scientific and technological requirements that come along with such projects as AAP, and especially ATM.

4. SUMMER PROFESSORS: We are very pleased with the summer professors who have come in under two programs: 9 under the ASEE Faculty Summer Program organized by ASTN (Dr. Head), and 5 under the regular MSFC summer program. This adds significantly to our scientific strength to build up our capability in support of Marshall projects.

NOTES 06-16-69 HOELZER

R
6/16

SIX DEGREE OF FREEDOM MOTION SIMULATOR:

The in-plant checkout of the Six Degree of Freedom Motion System was completed on June 6, 1969. The system met or exceeded specifications in all areas tested. Installation in the Computation Laboratory is scheduled to begin July 14, 1969.

OPERATIONAL TRAJECTORY FOR AS-506:

The Digital Projects Branch of the Computation Laboratory has performed the calculations associated with the Operational Trajectory for AS-506.

Heretofore, these calculations have been performed by the Boeing Simulation Center. However, with our development of a digital General Operational Vehicle (GOV) simulation system, and with the rapidity by which computations can be executed on the UNIVAC 1108, we can now perform these calculations in-house.

The GOV system is an advancement in the state-of-the-art of computer programming. The system utilizes the programming concepts available with third generation equipment.

During years of development, dating back to the "Redstone" days, separate computer programs have evolved for providing trajectory simulations of boost to orbit, earth parking orbit, and translunar insertion. The GOV system contains all of these capabilities, but with the computer, rather than man, making all the necessary connecting linkage.

B 6/16

1. FUTURE PROJECT FILM STATUS: (Reference Weekly Note dated 6-2-69 with your comments). Mr. von Tiesenhausen was assigned to coordinate this film for MSFC. Six available films on future projects produced by MSFC contractors and fifteen color photos of models and artwork by MSFC were reviewed here and submitted to date to the producer (A-V Corporation, Mr. Jay Sharp) who was very pleased with this input. First draft of the script is expected by the 14th. The OMSF audio visual production officer, Mr. Kenneth Grimm, is aware of the importance to provide proper coverage for MSFC's contributions to future programs. Past movies (Quarterly Reviews, "Year of Fulfillment") made under Mr. Grimm's direction, do not seem to be slanted in any particular direction.

The only possible problem could be whose space base concepts will appear, MSFC's or MSC's. Efforts will be made to show both.

2. ATLAS/CENTAUR SELECTED FOR INTELSAT: The Titan launch vehicle program was dealt another blow when the Atlas/Centaur launch vehicle was selected (based on cost and performance) over the Titan IIIB/ Agena for the next series of launches of the INTELSAT (formerly COMSAT) satellites.

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B6116

SATURN

1. AS-505 S-IVB Second Burn Oscillations: As reported last week, the 45 Hz vibrations during the AS-505 S-IVB second burn have been correlated with LH₂ tank venting. A ground test program has been initiated in an attempt to prove this correlation prior to the AS-506 launch. On AS-506 and future flights, the settings of the two vent valves will be farther apart and probably only one of the valves will be open. No additional fixes are currently planned.
2. S-IVB Stage LH₂ Pressure Feed Duct: The redesigned duct with liners in the bellows has been installed and leak checked on S-IVB-506. Qualification of the new duct is scheduled to be completed prior to AS-506 CDDT.
3. Procurement Planning for Saturn Vehicle Follow-on Production: For Saturn vehicle follow-on production, current planning calls for submission of the procurement plan to NASA Headquarters in early July. In an attempt to eliminate the need for separate long lead time contracts, we are also considering a plan to complete negotiation of the production contracts early in calendar year 1970; however, this plan needs considerable attention before we can commit to it. We had a very worthwhile meeting with Tom Norris from OSSA Launch Vehicle Office, Russ Dunbar, Lewis Research Center Project Manager for Centaur, and some of his people to discuss their experience in converting the Centaur Project from a CPFF to a fixed price contract. About 25 MSFC people were present and received a good insight into how Lewis handles the Centaur Project.

L.J. can
we make
learn
something
from this
R

LRV

A review of the Statement of Work was held today with members from PD, the Source Evaluation Board, Contracts Office, and S&E in attendance. A great deal of effort is being expended to have the Statement of Work as firm as possible by the release date of the RFQ, planned for the week of June 23. There are a number of sections which are awaiting inputs from MSC, particularly in regards to the LM interface, astronaut interface and scientific interface. MSC has the action as a result of a meeting in Washington with Ben Milwitsky last Friday to have these inputs to MSFC no later than June 16 for incorporation into the RFQ. In the interim, MSC has established a point of contact to work directly with our people in the interface definition for the RFQ. A tentative date of July 8 has been established for the Bidders Conference at MAF. A task force organization under the LRV Project Manager will be utilized pending finalization of the organization. This task force will start operating in a central location today. As a matter of interest, MSFC has corresponded with MSC regarding questions we would like to ask the Apollo 11 crew on their return concerning their experience on the Lunar surface as applicable to the Lunar Roving Vehicle design.

L.J. What questions did we ask MSC?
R

NOTES 6/19/69 JOHNSON

B 6/16

FY-70 Advanced Systems Development Program (908) - A Planning Proposal Submission was made to OMSF on 10 June. Copies have been distributed internally for review and comment. This submission will serve as a basis for OART technical approval of the contemplated work and as a basis for final program approval by OMSF. The document reflecting the approved program will not be developed until after the beginning of the fiscal year. A copy is attached for your information. (DIR and S&E-DIR, only).

NOTES 6/16/69 MOHLERE

R 6/16

A&M Computer Center. The Center has received from Dr. Morrison of Alabama A&M a rather comprehensive progress report covering the computer center at A&M. This report shows some significant accomplishment both in the conversion of many onerous administrative tasks to computer application and in the employment of the center for purely educational operations. Currently, for example, a class of some 40 is completing the course in basic fundamentals. The center would not be possible without the diligent efforts and dedicated application of Clyde Foster of Comp Lab. In addition to conducting courses and designing a curriculum on 4 year basis, Clyde has also accomplished some limited recruitment badly needed by the college.

Wage scales have interfered seriously with the college's efforts. It is to be hoped that the Governor's education bill will provide some relief. In the meantime the college has asked that Clyde be extended. On the basis that the Computer Science Center would be seriously handicapped were he to leave, it has been agreed that he may stay for a maximum of 6 months. College authorities have also been informed that they must provide from the science/technical faculty a candidate who can become familiar under the guidance of Clyde Foster within the stipulated period.

ASEE Program. The NASA/American Society of Engineering Education Program has been launched and promises to proceed vigorously. There are on the design side of the program 21 faculty fellows who will operate under the guidance of Dr. Vachon of Auburn University and Mr. Herman Hamby. On the research side there are 37 members which represents the largest program to date. This program is administered by the University of Alabama, more specifically Dr. Barfield. The NASA representative is Dr. Head. The administrative aspects of the program have, in my opinion, been established in excellent fashion.

NOTES 6/16/69 MOORE

R
6/16

1. ATM Manual Pointing Controller (MPC): A concept Design Review for the MPC was held June 10, 1969, at Bendix, Teterboro, N.J. The material discussed at the review consisted of preliminary design drawings, development test plan, program schedule, and the MPC Component Detail Specification.
2. ATM: Advanced Release drawings were processed for the manufacture of qualification units of the ATM Main Power, Auxiliary Power, Transfer, and Control & Display Distributors. These distributors are being manufactured inhouse. Fully released drawings will be processed for ATM flight units.
3. AAP Instrumentation & Communication Panel: The AAP I&C Panel met at MSFC on June 10 for its first meeting under the new co-chairmanship resulting from S&E reorganization. Mr. John Cox of our Systems Division replaces Mr. J. T. Powell as MSFC co-chairman. Nineteen agenda items were covered. Significant items included discussions as to whether MSC has requirements for real-time central timing for data and/or gas analysis measurements for the orbital assembly. Headquarters reiterated their interest in the AAP teleprinter uplink study being performed by MSFC and MSC. These are being worked as action items.
4. ATM Checkout at KSC: A meeting on ATM checkout was held with the operations personnel at KSC. Our present designs and plans were defined and discussed with the several KSC organizations present. The more significant topics of interest were the number, size, and required environment of the ESE racks. The MSFC vs MSC philosophy on use of fuses was discussed. MSC minimizes use of fuses between spacecraft and support equipment. Past practice of ASTR and QUAL has been to fuse liberally. It was agreed that MSFC would provide the required fuse panels for the Ground Equipment Test Set and for the test connector interface and that KSC fuses would be utilized for the umbilical interface. The areas within the Manned Spacecraft Operations Building (MSOB) clean room where the ESE may be located and the possible cable routing within these areas were viewed. There appears to be plenty of space for the ESE within the MSOB, but rack weight and electrical distance are critical constraints at the pad for some of the equipment. These areas are being worked.
5. OWS Contract Awards: Contract NAS8-24394, for the design, fabrication, test, and delivery of four flight qualified Attitude Control Sun Sensor Systems and seven flight qualified Solar Panel Sun Sensor Systems for the Orbital Workshop, was awarded to the Adcole Corp., Waltham, Mass., at a cost of \$164,599. Contract NAS8-30177, for the design, development, test, and delivery of two prototype and six flight units of a Rotary Electromechanical Actuator for the Orbital Workshop, was awarded to the Kearfott Products Division of Singer-General Precision, Inc., Little Falls, New Jersey, at a cost of \$405,275. This actuator will position the S-IVB Orbital Workshop Solar Array and will employ a triple redundancy concept for all major electrical components.

NOTES 6/16/69 MURPHY

Nothing of significance to report.

R 6/16

NOTES 6-16-69 SIEBEL

Lee Kramer
I hope
this does
not hurt
us too
badly!
Rs.

Rs 6/16

1. S-II: (a) Mr. George Lewis will be leaving the S-II program on approximately June 15 and return to the Los Angeles Division. (b) Messrs. Franklin and Bryan participated in a review at NR/Tulsa on June 9. This review was concerned with the proposed relocation of S-II structural tooling from Tulsa to Seal Beach. We concur with such a move.
2. ATM Alignment: Following the recent OAO team's visit to ME, one of our planners was at Grumman last week to discuss the work that was accomplished on the OAO relative to startracker alignment and to observe the optical setup used to align the five startrackers to a 10 arc sec tolerance with a primary reference. The review with Grumman will serve to help us in our efforts to align the ATM experiments and to point out potential problem areas that can be resolved prior to the actual alignment operation.
3. ATM Hardware Modification: The ATM cannister section has been removed from the Neutral Buoyancy Simulator for modification to the sun end work station. A new concept of the translation chute has been installed on the mockup along with some of the handrail sections. The remaining hardware is being installed as it becomes available.
4. Single Crystal Growth: Contract negotiations with Westinghouse for the development of the Single Crystal Growth Flight Experiment are complete. The contract has been prepared and was sent to Westinghouse for their signature. They are expected to start on the project early this week. Westinghouse will complete the final report and submit a preliminary copy within 11 weeks. They will deliver one laboratory test module and one flight configuration module at the end of 26 weeks.
5. Alabama Space Science Center: The dummy engines have been removed from S-IC-D, and the stage has been loaded and moved to a holding area in preparation for the June 28 move to the museum. The S-IVB and S-II stages will be removed from the S-IC dynamic test stand early next week and loaded for movement. We have transported the S-IV stage from the river storage area to our shops for modifications. Plans to load the S-IB may be delayed due to painting of the stage now being accomplished. This will have no effect on the overall schedule. Other hardware necessary to this June 28 move is also on schedule.
6. Payload Shrouds: MDA shroud test cylinders have been assembled and shimmed. No decision has been made yet whether or not an additional access door should be added. The decision on access doors in the ATM shrouds is lagging similarly.
7. Personnel: Mr. Littlefield from our West Coast field operations is being released to NASA Hq. He will work in Mr. Freitag's operation. We will sorely miss Mr. Littlefield's services at MSFC and in the field but look forward to his representing MSFC's concerns and opinions at Hq.

NOTES 6/16/69 SPEER

B 6/16

1. Apollo 11 Flight Mission Rule Criteria: In a meeting with MSC last week to define AS-506 Flight Mission Rule Criteria, MSC personnel defined primary AS-506 alternate mission objectives as LM system testing and lunar orbit observation of additional science (landing) sites. On this basis, we would attempt S-IVB restart as long as we can still achieve an LOI with the LM Descent Propulsion System. This permits as much as 400 fps S-IVB velocity deficit at cutoff which is substantially more than ever agreed to before. There was a very productive interchange between our S&E personnel and MSC which should lead to more realistic restart GO-NO GO mission rules. We are formalizing the criteria agreed to, which still require additional management confirmation, and S&E is analyzing the specific failure cases affected.
2. AS-506 Post Flight Data: In working with GSFC we have reached agreement that S-IVB second burn data will be shipped to MSFC within less than 48 hours after launch. This was confirmed during last week's Mission Support Review at KSC.
3. Apollo 11 Timeline: I am planning to publish a condensed nominal Timeline of this entire historical mission shortly before launch. Distribution will be made to all MSFC employees.
4. AAP Flight Control Measurements: As previously on the ATM, we have closely scrutinized the OWS/AM measurement programs (with the exception of the WACS and SAS). Flight Control Measurement reductions were approximately 50% on the OWS and 28% on the AM. MSC flight operations personnel directly participated in these work sessions and concurred with the results. This effort is being continued since it will be meaningful for dry workshop configuration.

NOTES 6-16-69 Stuhlinger

R 6/16

NASA POSTDOCTORAL RESIDENT RESEARCH ASSOCIATESHIP PROGRAM:

There are 12 NASA Postdoctoral Resident Research Associates on tenure at MSFC at the present time. In contrast to earlier years, we now find that we have more applicants than our ceiling will permit us to accommodate. MSFC's ceiling, as well as the ceilings for other NASA Centers, is set by the amount of funding that NASA Headquarters gives to the National Research Council. The National Research Council (NRC), which is affiliated with the National Academy of Sciences and the National Academy of Engineering, manages this program for NASA. All applicants are evaluated by NRC Evaluation Panels on a quarterly basis, and appointments are made to the applicants who are rated highest. The number of appointments which can be offered by NRC is limited by the number of dollars from the Office of University Affairs in NASA Headquarters. Colonel Mohlere, in cooperation with AD-S, is negotiating with Headquarters to attempt to increase the MSFC ceiling for the forthcoming year.

June 23 1969



NOTES - 6/23/69 - BALCH

B
6/25

S-II-8 - Stage was removed from the A-2 Test Stand on 6/19/69 and installed in the horizontal position in the S-II Stage Checkout and Storage Building for completion of insulation work and preparation for shipment. Shipment to RSC is scheduled for 6/25/69.

S-II-9 - Static firing was successfully accomplished on 6/20/69, and post-static inspection of insulation modifications has begun. Removal of stage from the test stand is scheduled for 8/8/69.

S-IC-11 - Stage processing is again on schedule for static firing on 6/25/69.

BOMEX - Ships are proceeding with Phase III observations as planned and are scheduled to leave their ocean stations on 7/2/69 for refurbishment and replenishment at Bridgetown, Barbados. All ships have now lost their deep-sea mooring devices and are in a drift/station-keeping mode.

Apparently, not enough useable data was obtained from Phase I observations to permit its use for scientific computations. However, several modifications to shipboard instrumentation and operating procedures were made after quick-look analysis of Phase I data, and Phase II data was greatly improved.

University Affairs - Preparations are under way for observations to be performed by Mississippi State University personnel during the S-IC-11 static firing on 6/25/69 in connection with their NSFC Grant Task No. 10 on particle dynamics.

Edgewood Arsenal Project - Edgewood Arsenal is currently processing documents for the transfer of funds in the approximate amount of \$239,000 for additional work on this project.

B36/25

SPACE SHUTTLE TASK TEAM

The Washington effort of the Space Shuttle Task Team is continuing. The Task Team is presently preparing a Technology Program Plan. The effort started on June 18, 1969, and is to be completed by June 27, 1969. The following specific areas will be treated and MSFC personnel in Washington supporting this effort are: Aerodynamics/Configuration Verification - E. L. Linsley, S&E-AERO-AD, C. M. Akridge, PD-RV; Thermal Protection System - R. R. Fisher, S&E-ASTN-P, E. C. McKannan, S&E-ASTN-M, J. A. Forney, S&E-AERO-A; Expendable Tank Construction - J. H. Laue, PD-D, S. J. Denton, PD-D; Integrated Electronics System - F. Digesu, PD-D, O. C. Green, PD-D; Propulsion - J. Thompson, PD-RV, R. Brown, PM-E. The plan developed by this group will be forwarded to the OMSF and OART Centers, who will be asked to generate in greater detail programs they would propose to undertake in accordance with the overall technology plan. It is planned to review these plans around July 20, 1969.

SATURN V WORKSHOP/B₀ TASK TEAM

A meeting was held Thursday, June 19, in Mr. L. Belew's office with NASA Headquarters (Mr. Schneider) and Bellcomm personnel to discuss the artificial gravity experiment concept proposed by Mr. C. Mathews. The general conclusion was that the present workshop configuration would probably require extensive modification to adapt it for an artificial gravity experiment at the specified study guidelines and biomedical limits ($g = 0.6$ g's, $R = 150$ feet). Both Mr. Schneider and Mr. L. Belew agreed that the data as presented was sufficient to satisfy the intent of the NASA Headquarters' request.

Rs 6/26

F-1 Engine - Reference my notes of 6-9-69 concerning the fuel found in the thrust chamber and drain lines of the engine in position 3 on S-IC-7. A similar condition was encountered with the engine in position 2 on S-IC-8 when the stage was rotated from the horizontal to the vertical at KSC. The problem centers around the fact that the engine control system is shipped and stored "wet." As a result, when the stage is in the horizontal position, fuel collects in the drain system as a result of normal leakage and cycling of the valves during checkout. However, because of the orientation of the engines in positions 2 and 3, this leakage can flow back into turbopump seal cavities. Potential drainage paths for all engines on the stage and resulting contamination modes have been evaluated and identified. To correct the problem, revised procedures are being studied.

Two other potential contamination problems have occurred recently. First, on S-IC-7 a plastic bag installed over the LOX overboard drain line on engine F-6047 was found to contain hydrocarbon fluid subsequent to a gimbal actuator seal failure which sprayed fuel on the engine. Extensive analysis of the drain system has shown that the fluid entered the bag externally and no engine contamination is present. Second, on S-IC-10, engine F-6066 was found to have approximately one-half gallon of fuel in the combustion chamber. The fuel was deep enough to cover the lower rows of the LOX ports. The source was found to be a leaking check valve in the gimbal actuator hydraulic filter manifold. The contaminated engine has been replaced with a spare engine.

H-1 Engine - The Delta Project Manager at Goddard Space Flight Center has indicated an interest in using unallocated H-1 Engines in the Thor vehicles which are being procured for the Delta Project. Goddard has initiated an effort at Douglas to review an H-1 Engine/Thor vehicles installation study that was made several years ago. We have offered Goddard any assistance they may require.

In the meantime I'll have to get a letter to the President of the Rocketdyne Co. regarding the H-1 engine contamination.

Bill Brown, I don't like this F-1 engine contamination. Who is to blame, Rocketdyne or Boeing or who? It is not only a dangerous thing (because it might be overlooked some time), but it costs us also money. May be it is time to call somebody on the carpet.

** How many H-1 engines are unallocated. Before we give engines away, we should discuss it. May be after the MOL and possibly TITAN III cancellation more SAT I D's are needed. Rs*

CONSTAN NOTES 6-23-69

R6/26

Thirty-seven representatives of the American Society for Engineering Education / NASA Summer Faculty Fellowship Group toured the Michoud Assembly Facility on Wednesday, June 18, 1969. It is planned that a similar group will visit this facility on June 25, 1969.

Rs 6/26

1. ASTRONOMY SUBCOMMITTEE MEETING - I attended a meeting of OSSA's Astronomy Subcommittee in Washington on June 12 and 13. The principal agenda item concerned evaluation of proposals submitted in response to NASA's solicitation of proposals from the scientific community for (1) Mercury/Venus flyby mission and (2) CSM in lunar orbit. The response from the scientific community was rather broad and about forty proposals were reviewed by the Subcommittee. In the case of the Mercury/Venus flyby mission, a number of scientific teams are being formed to establish scientific objectives and instrumentation requirements in various discipline areas. The Mercury/Venus mission is proposed for 1973 to 1975, but has not yet been authorized by Congress. It is included in NASA's FY-70 budget package. JPL is the responsible Center for the project. The CSM proposals included a solicitation for experiments for both the presently scheduled and approved Apollo missions and potential future missions.

*Bill Lucas,
this is
interesting.
Rs*

Dr. Stone of GSFC made a proposal to the Committee recommending that the presently approved RAE-B (Radio Astronomy Explorer) be placed in orbit around the moon rather than in earth synchronous orbit. RAE-A is presently functioning in high earth orbit but apparently is hampered by ionospheric effects and other earth noise. The desirability of a lunar orbit location for RAE-B seemed rather evident, but additional discussions will be required before any final decisions are made by OSSA and the RAE project group.

The Astronomy Subcommittee is a companion committee to the Planetary Atmospheres Subcommittee discussed in Dr. Geissler's Notes of last week. Dr. L. Devries of AERO attended the most recent meeting of the Planetary Atmospheres Subcommittee. Dr. Devries and I will meet this week to "compare notes" on these closely related committee activities.

*Jim Downey,
has this now
taken place?
Rs
6/26*

2. GULF STREAM DRIFT MISSION: The Ben Franklin is out of the water to rebuild one of the motors. Grumman has now answered all of the remaining questions for Navy certification. Approval of these answers and a dive to 600 feet by the Navy will clear the certification process. The Mini-Drift mission is now tentatively scheduled for June 24 and the Drift mission for a start from July 7-14.

R-6/26

HOUSE APPROPRIATIONS COMMITTEE MARK ON FY-70 BUDGET - The House Subcommittee on Independent Offices, Chairman Evins (D-Tenn.), finalized its markup of NASA's FY-70 Appropriation Bill on June 19 at \$3,696,950,000. This mark is \$269M less than the House Authorization, but only \$18.6M less than the Nixon budget request. Comparison of the Nixon budget with Congressional actions to date is as follows:

	Nixon Budget Request	House Auth.	Change from Request	House Approp. Mark	Change from Request
R&D	\$3,006.4	\$3,264.4	+\$258.0	\$3,000.0	\$- 6.4
C of F	58.2	58.2	-0-	53.2	- 5.0
R&PM	<u>650.9</u>	<u>643.7</u>	<u>- 7.2</u>	<u>643.7</u>	<u>- 7.2</u>
	\$3,715.5	\$3,966.3	+\$250.8	\$3,696.9	\$-18.6

The \$6.4M cut in R&D is general rather than specific to line item, and, within C of F, a \$200,000 High Pressure Gas facility at KSC is the only MSF item recommended for deletion by the Committee.

The official Committee report is to be issued to the Congress today, and House floor action on the Appropriation is scheduled for Tuesday, June 24. The Senate Space Committee's markup of the Authorization Bill is also planned for June 24.

PROPOSED APOLLO AWARDS - Based on Dr. Mueller's original approach of allocating and requesting nominees from seven of our top management people, including yourself, 114 candidates were proposed for possible Apollo Awards. Following the Lake Logan discussions on this subject, determination to use a coordinated Center approach, and latest ground rules from General Bowman, we have submitted a listing of 333 candidates. These names may be used for different types of awards; however, the initial request was made for the "Who's Who in Apollo" publication.

BOB PRESENTATION - NASA Headquarters has asked that we make a presentation to Don Crabill and his staff (BOB) on the Apollo Cost Study procedures, logic and computer program during the latter part of this week. They have also asked that the MSFC efforts pertaining to the low cost Saturn follow-on be discussed. We will invite Col. Tier to make the latter presentation.

NOTES 6/23/69 GEISSLER

B6/26

1. Backyard Wind Tunnel for MSC? We hear that MSC is again urgently searching for a small surplus wind tunnel to be installed at Houston for preliminary configuration work on new projects (space shuttle). They strive to obtain the experimental backyard facility that we, by lucky fortune, brought with us from our Army days. Evidently, the theory of "use outside facilities" fails for such needs in the real world (as we always knew), even for MSC with its good connections to its parent LaRC. Let us cherish and maintain our asset.

NOTES 6-23-69 GOERNER

B 6/26

Nothing of Significance to Report.

NOTES 6-23-69 GRAU

B.6/26

ENGINE PROGRAM: Representatives of this Laboratory recently attended a meeting at Rocketdyne in which various low cost engine study presentations were made. Many of the proposals involve significant configuration changes and extreme changes to the way we presently test and checkout engines. From a cursory look, the number of design changes seem to be excessive for the amount of verification tests which could be performed prior to implementation. Further, net savings could be questionable due to the considerable test reverification required by such changes. One proposal involved direct shipment of the engines from Canoga Park to KSC for installation by the stage contractor. This would eliminate much of our test and checkout activity, as well as curtail the second E&M significantly at Canoga Park. Rocketdyne did not discuss the quality control or manufacturing areas, but it is understood they will present their proposals in these areas at a later date. It would seem that MSFC should exercise considerable caution in shaping the test and checkout requirements for the low cost programs.

I agree! R

Bill Brown / Bill Lucas

Would this mean that stage assembly is proposed to be done at KSC? What program are they talking about? R

Integrated Dry Workshop/ATM Report to Management Council, July 8: A written report is being prepared this week which defines the MSFC Saturn V Dry Workshop concept (integrated ATM, forward mounted) and gives results of trade studies and a preliminary design. The status of this report and associated activities was presented by us to Bill Schneider last week, and the approach and format was approved by him at that time. Our schedule calls for submission of this report to Center Management on July 1; at any time thereafter, we will be prepared to make in-depth presentations as required. Presently we are preparing for a presentation to the Management Council on or about July 8. The report outline, which parallels the presentation, is as follows:



Jim Shepherd: There is no time for this during the weeks of June 30. If it has to be done before MCM the only day would be July 4 with Mr. Braun then present. Please, take into his calendar. Ps

- I Introduction
- II Configuration Definition
- III Mission Definition
- IV Systems Definition
- V Verification
- VI Module Impacts
- VII Facilities Impacts
- VIII Summary

I think we should have had an MCFC internal meeting before going to the MCM.

The introduction explains the ground rules and design goals upon which the study is based and the reasoning behind them. Configuration Definition is primarily layout drawings with supporting words for clarification to show launch facility layouts, flight configuration and orbital configuration. Mission Definition covers all flight mechanics aspects, experiment timelines, range safety, etc., to define the launch and operational phases of the mission. Systems Definition includes descriptions of each major system such as electrical power, thermal, mechanical, attitude control, etc., in sufficient detail to identify all hardware involved, particularly modifications arising from the change to the new configuration. The Verification section is based on our plans to integrate the hardware at MSFC and shows scheduled hardware flows from manufacture to launch. The two impacts sections show the consequences by module of changing from the wet to dry workshop, as well as on facilities at MSFC, KSC, MSC and the contractors' plants; this includes GSE and transportation. Finally, the summary describes aspects not covered elsewhere, such as contamination, and indicates the firmness of various aspects of the design and schedule as well as directions of future activity.

Both Martin and MDAC are heavily involved in support of preparation of this report, and the design laboratories have been intimately involved throughout the study and are assisting in the report preparation.

NOTES 6-23-69 HEIMBURG

R6/27

See James
I am all for
elimination of
this material
but I doubt
the cost sa-
vings, because
the change
means new
documentation
RS

1. S-II STRESS CORROSION SUSCEPTIBLE MATERIALS: At the request of this laboratory Mr. Bill Long of NR/SD has completed a survey and advised us that elimination of certain stress corrosion susceptible materials in S-II-14 and -15 and all susceptible materials in S-II-16 and subs would result in a cost savings to the program because of the elimination of current inspection requirements. S-II-14 and -15 have no stress corrosion susceptible materials in the LH₂ tank. There are 14 items in the lox tank. Elimination of such materials to the extent that no inspection scaffolding would be required would reduce inspection time and costs considerably, plus providing greater confidence in the structure through the elimination of such materials.
2. MGSE STORAGE STANDARD: KSC awarded a contract to Martin Company to study how KSC could reduce operating costs after Apollo 11. The basic result of the study was to place an LUT in storage, etc. The Martin study then became a close parallel to our effort of determining adequate storage requirements. Mr. Poppel (KSC) brought the Martin people to MSFC June 16 to share what had been done to date in hopes that our MGSE Storage Standard and the Martin recommendations might be compatible. It was gratifying to see how closely the requirements were. Martin is making a study of using desiccants; we have asked for their results.
3. DRY WORKSHOP: The vehicle configuration for the dry workshop was updated and prints have been made available to KSC for their impact. Prints were also distributed to various MSFC organizations who are looking into mounting of the life support (oxygen/nitrogen) pressure vessels, the ATM deployment and the shroud separation system. Further layouts are being made to determine the ATM star tracker view and angle restriction with the ATM deployed closer to the MDA during clustering. Layouts are also being made to determine the compatibility of the configuration with the existing platforms in the Vehicle Assembly Building (VAB) and the Mobile Service Structure.
4. INTEGRATED EXPERIMENT TASK BOARD: Personnel from this laboratory participated in an integrated experiment task board meeting at MSC June 11. The meeting was conducted by Apollo Applications Program Office (AAPO) of MSC with participation by the principle investigators for M508, EVA Hardware Evaluation, and for M171, Metabolic Activity, personnel from MSFC and representatives from General Electric and Martin Marietta. The result of the meeting was the acceptance of the GE task board for both experiments. It was noted that unofficially D020, Alternate Restraints, no longer had a valid requirement for a task board as it is being dropped due to the cancellation of the MOL program. A new tool kit will have to be furnished for operation of the task board. MSFC accepted the action item to investigate the feasibility and impact of performing M508 in the crew quarters.
5. PERSONNEL: At the Fifth Annual Joint Propulsion Specialist Conference in Colorado Springs, June 9-14, 1969, Mr. Keith Chandler of our Propulsion and Thermodynamics Division was elected chairman of the National AIAA Liquid Rocket Technical Committee. He will assume this responsibility January 1, 1970.

NOTES 6-23-69 Heller

Rs 6/24

1. REAL TIME SOLAR MAGNETOGRAPH: We had a two-day review of the Real Time Solar Magnetograph, together with the Principal Investigator, Dr. Brueckner of NRL. Discussions were held in SSL and Comp Lab. Dr. Brueckner specifically discussed the status of the electronics as a follow-on of his visit to EMR, Inc., Sarasota, the NRL contractor for the SEC tube and corresponding electronics. Other aspects are the interface to the 1108 computer and the software for the scientific evaluation and interpretation of the data which determine the requirements for data display.

2. THERMOPHYSICS SPECIALIST CONFERENCE: Members of SSL presented three papers at the 4th Thermophysics Specialist Conference of the AIAA. This meeting has evolved into an annual event of the AIAA. The interest for MSFC is especially in the areas of the electromagnetic space environment and its effect on thermal control coatings and contamination of optical surfaces, and thermal radiation properties of the lunar surface and subsurface.

3. METEOROID PHYSICS: The MSFC Research Achievements Review on Meteoroid Physics will be held on June 26 in the Morris Auditorium from 9 to 12 a. m.

4. BALLOON OPERATION: The neutron albedo experiment was launched on a balloon in Palestine, Texas, Tuesday, June 17, at 2:30 a. m. The flight was successfully terminated at 6 p. m., having stayed within signal range of the base station at all times. The data obtained appeared normal as monitored during the flight. The experimental analysis will be performed later by the Principal Investigator, Dr. F. Maienschein of Oak Ridge National Laboratory. Certain equipment recovered from the neutron experiment launch is being installed on the gamma-ray experiment gondola, for which Dr. Gibbons of Oak Ridge National Laboratory is the Principal Investigator. The estimated weight of this balloon and experiment is 5000 pounds. The earliest anticipated flight date will be Saturday, June 28.

R 6/24

APPLICATION OF NASA HEADQUARTERS' MANAGEMENT INFORMATION NETWORK EXTENSION (MINE) SYSTEM TO MSFC TEST PLANNING (ASSIST) REQUIREMENTS:

In a continuing search for a generalized data management system for MSFC's use which allows user-oriented, on-line storing, retrieving, and manipulation of engineering data, the Systems Analysis Branch of Computation Laboratory has held further meetings with Computation Laboratory personnel, A&TS-CP-A personnel, and Mr. Tuey, NASA Headquarters.

After reviewing the Test Planning (ASSIST) requirements and the MINE capabilities, it was decided to have the General Electric Company demonstrate to MSFC a portion of the MINE capability. This is being accomplished by implementing MSFC's Test Planning Application into the MAIDS module of the MINE system.

The success of this implementation will be demonstrated to MSFC in late June 1969. Should MSFC be able to adapt the MINE system to our needs, substantial savings in software costs can be realized.

NOTES 6/23/69 HUBER

R
6/24

1. MSEC INTEGRATED PLAN: Some advance information has been obtained regarding MSF submissions to Mr. Lilly, subsequent to the 6-11-69 discussions of the MSF "Integrated Plan". It is understood that the budget submittal for MSF was \$21.577B, through FY-75 (in lieu of the \$17B figure, discussed previously). This includes \$19.615B for R&D, and \$1.962B for A.O. It does not include allowances for program adjustments or inflation. It is also understood that Dr. Mueller will send a letter to the Centers, requesting further efforts to reduce the \$19.615B R&D cost, without changing program content (expected to arrive at Centers early in week of 6/23/69).

The FY-71 R&D portion of this submission (\$1.838B) included \$216M for the Shuttle, \$90M for Space Station, and \$64M for Dry Work-Shop No. 2.

It is understood that this submission did not include the 1974 Dry Work Shop in Lunar Orbit Mission. This deletion would allow the Space Tug and Saturn VC (four Stage Saturn V) to slip to late 1975.

NOTES 6/23/69 JAMES

Ps 6/27

SATURN

1. AS-506 Status: Wet CDDT is scheduled to start the night of June 25 with T-0 scheduled for 8:32 a.m. CDT, July 1. Dry CDDT will be conducted on July 2. This schedule may be affected by problems encountered with spacecraft hypergol loading. Due to these problems the S-IC RP-1 loading will be accomplished tomorrow instead of today. S-IVB hypergol loading started this morning.
2. S-II-9 Static Firing: Static firing of the S-II-9 was successfully accomplished Friday, June 20, for a duration of approximately 350 seconds.
3. ST-124M Azimuth Alignment: We are currently evaluating a change to preclude any appreciable loss of azimuth alignment accuracy in the event theodolite lock is lost after final platform alignment. The current system, such as will be used on 506 and the associated mission rule, could allow up to 0.5° inaccuracy with loss of lock. The system we plan to implement on 507 will maintain an accuracy of approximately 20 arc seconds under similar conditions. A modified ESE panel is currently at KSC undergoing tests. An ECP will be processed at conclusion of the test.
4. Procurement Planning for Saturn Vehicle Follow-on Production: Reference your question on my 6/16 notes concerning whether we can really learn something from the Centaur Project experience. We haven't obtained any significant new ideas in this area but feel that we can benefit from their actual implementation experience of the fixed-price contracts.
5. S-IVB Static Firing Deletion: We are issuing the necessary contractual direction to MDAC to terminate the static test operations on S-IVB stages 512 through 515, 210 and 211. The establishment of a S-IVB stage firing capability at MSFC will depend on the decision to implement J-2S or proceed with the wet workshop.

See James
 Do we really need this high accuracy?
 If it's all right for 506, why not for 507?
 and following?
 Ps

LRV

A June 20 review of the LRV Request for Proposal with NASA Hq (Mr. Milwitsky, Mr. Stoney and others), KSC, MSC, and MSFC was held, in preparation for a June 24 LDX conference with Gen. Phillips and the three Centers. However, it became clear during the review that the time schedule of the contracting phase of this project was so compressed that a less than adequate job on the RFP was being done. The RFP contained too many duplicate requirements and called for series type tests and work which, if implemented, would not allow us to meet the delivery requirements. Mr. Stoney was asked to discuss cancellation of the LDX with Gen. Phillips and to set up, instead, a "face-to-face" meeting with top management of NASA Hq, and the three Centers to review the various concerns associated with such a tight schedule and the need for "togetherness" on this venture. Another working review of the RFP is planned for the week of June 30.

NOTES 6/23/69 Johnson

Rs 6/24

FY69 Advanced Systems Development Program (908) - Mr. Peil and Mr. Saunders of OMSF visited S&E-R and the Purchasing Office to determine the dollar value of the 908 Purchase Requests that, it now appears, will not be obligated before June 30th. This figure, adjusted as of today, is approximately \$800K. Of this amount approximately \$550K was originally designated for LRV. When the original allocation of a portion of the 908 money was made to LRV, it was with the understanding that unobligated funds on June 15th would be withdrawn and applied to other items in the 908 program. We are presently making plans to obligate the total \$800K of '69 funds against our 908 Advanced Systems Development (formerly known as Supporting Development) FY70 RTOP Plan. The subjects taking priority are: Aero-Thermodynamics & Propulsion. This late in the fiscal year these monies will have to be obligated through the inter-agency MIIPR technique or as add-ons to existing contracts or suballotted to other NASA Centers. We are proceeding to do this on a crash basis.

NOTES 6/23/69 MOHLERE

Nothing special to report.

B. M. / 27

Rs 6/27

1. ATM Television Camera for NRL: Sperry personnel began a three shift operation today in a last ditch effort to meet our commitment to NRL to provide an ATM television camera for use in their flight prototype experiment by July 14. The TV camera is the pacing item in the NRL schedule. Delays of approximately two weeks were incurred in getting piece parts through screening tests and the three shift operation is designed to make up this delay in the final assembly and checkout operation.

2. ATM Solar Array: The air bearing runways for the ATM solar array deployment test fixture have been cast with epoxy which has proven to provide an excellent level surface. The maximum out-of-level measurements obtained on a plane 50 by 20 feet is ± 0.02 inches, which is well within tolerances desired. The data from vibration and acoustic tests of the ATM solar array structural model provides good agreement with analysis data as to natural frequencies experienced. Full scale deployment tests using the deployment test fixture are scheduled for September 1969.

3. ATM Fine Sun Sensor: A 56 day test of the wedge drive in the Fine Sun Sensor has been started in Astronautics Laboratory. This drive is mission critical to ATM in that it implements offsets (read in increments of 1.25 arc seconds) from sun center for pointing ATM experiments. Although redundant, the drive life is of concern especially for the extended lifetime of up to eight months for the Dry Workshop configuration.

4. ATM Status Review: The monthly two day status review of ATM was completed last week. Many Astrionics milestones are being achieved approximately on schedule; however, there are a significant number of milestones this calendar year which are coming into jeopardy and will require special attention. Release of detailed documentation is overtaxing our Sperry support in this area even though we have recently reduced our drawing standards radically and have supplemented our Sperry personnel in this area. Receipt of piece parts continues as a major constraint to schedules. Each instance is being worked appropriately. In special instances where vendors are not anxious to commit to orders for our peculiar low-volume piece part needs, may we call upon you for a well placed telephone call of encouragement to them?

B. M.

*Please,
do this.*

It has been

proven helpful in the past.

Rs

5. Savings Bond Drive: During the 1969 Saving Bond Drive, we have been able to increase the Laboratory participation by approximately four per cent. To date our results are:

New "E" Bond buyers	-----	20
New Bond/Share buyers	-----	6
Increased Allotments	-----	25

Laboratory participation is now 67 per cent after a fairly comprehensive campaign.

6. ATM VHF Transmitter: Conic Corporation of San Diego has submitted their proposal to manufacture ten-watt VHF transmitters for ATM which we were not successful in obtaining under prior contract with Giannini-Voltex. The Conic proposal, currently being technically evaluated, seems to vindicate as to costs our decision to abandon Giannini-Voltex in deference to a source more well founded in the RF field. The Conic schedule is tight but appears achievable.

NOTES 6/23/69 MURPHY

B6/27

1. NASA-OMSF Safety Survey: The OMSF Survey Team will arrive Monday, June 23, 1969. An entrance briefing is scheduled at 1:00 p.m. in the Tenth Floor Conference Room, Building 4200.

Survey activities will be carried out by the Team on June 24 and 25, 1969. An exit briefing is tentatively scheduled for Wednesday, June 25, 1969, at 2:00 p.m., in the Tenth Floor Conference Room. Notification of the briefing has been sent to the appropriate Directors.

2. Ben Franklin Certification Progress: Certification of the Ben Franklin by the Navy is progressing satisfactorily. We expect all open items to be cleared today, June 23, 1969. With the sign-off of the last of the open items, the Navy will establish that no unsafe condition is present. The Navy participants will be allowed to dive in the test on June 24, 1969. The start of the Drift Mission is tentatively set for July 14, 1969.

NOTES 6-23-69 SIEBEL

B6/27

1. Alabama Space Science Center: The preparation of stages for movement to the museum continues and no problems large enough to effect the movement date have arisen. The following actions have been taken this week: (a) A meeting of Marshall, TVA, City of Huntsville, and State of Alabama personnel was held and final details of stage movements from Gate 9 to the museum were made. (b) A meeting of Marshall, Post Engineer, and Provost Marshall personnel was held and all work details assigned to accomplish the move from Marshall Center to Gate 9. We now feel that this entire operation should go very smoothly if weather conditions are favorable.

2. Technical Evaluation Committee - Langley: At the request of Langley Research Center, Mr. Fred Beyerle served on a panel to evaluate proposals they received on a Planetary Quarantine Analysis Program for Viking Project.

NOTES 6/23/69 SPEER

RS 6/24

1. Apollo 11 Flight Mission Rules Review: The Apollo 11 Flight Rules were formally reviewed with the Mission Director (Hage) and Flight Director (Charlesworth) by a telecon last Friday. There were no launch vehicle problem items.
2. AS-506 TM Link Categorization: George Hage has decided that the S-IC and S-II PCM links (each carrying more than 95% of their respective stage telemetry information) be classified Highly Desirable. Although we recommended "Mandatory", I feel this is a legitimate management position accepting the risk that we could not identify the cause of a stage malfunction.
3. Operations Management Meeting: Gen. Stevenson conducted an informal exchange of ideas between NASA and DOD (Gen. Jones) on 6/18 at Patrick AFB on how to reduce ground support to manned missions in the future. Since DOD is attempting to unload an ever increasing share of their operating cost on NASA, they were predictably concerned about the outlook. However, no commitments were made.
4. Lunar Site Planning: This is in answer to the question why we are not using lunar landing site #1: (a) recovery would have to be performed at night, (b) lunar terrain is of less interest than site #2, (c) launch recycle relationship from site #2 to site #3 (2 day interval) is preferred. It appears unlikely that we will attempt to land on site #1 in any of the follow-on missions presently being planned.

R 6/24

NOTES 6-23-69 Stuhlinger

No submission this week.

JUNE 30, 1969

RF

dated 7/9 JLS

Reply attached.

NOTES 6/30/69 MOORE

B
7/4

ATM DIGITAL COMPUTER (ATMDC): A meeting was held June 25 with Mr. Clint Grace of IBM Huntsville to examine in detail the causes of a overrun of approximately \$1.4 million reported by IBM in June on contract NAS8-20899 for ATM digital computers. This contract was negotiated CPIF in January 1969 at a figure of \$1,954,999. Subsequently, two contract changes have been processed. One deletes flight software from the contract (to be done inhouse by MSFC) and the other was a minor schedule change for convenience of all concerned. The net effect of these two changes is a contract cost reduction.

Mr. Grace and his people elaborated in detail upon the reasons for the projected increases which can be categorized in three groups: (1) Power supply inadequate output in the MOL 4 II computer which is a part of the ATMDC. (MOL reduced the specs to work around the problem but the work-around is not applicable to ATMDC therefore a redesign is required). (2) Large increases in vendor prices for piece parts, and (3) underestimates by IBM of the effort necessary to do the job in almost all areas. Principal areas are design, which is 90% complete, and manufacturing, which has just been initiated.

Duly impressed with the seriousness of the situation, Mr. Grace stated that IBM management is not yet satisfied that they have reduced the estimated overrun to its minimum, that they are working all aspects of reducing it, and that he would like until July 22 to further work the problem and report his results at that time to MSFC.

Representatives of Purchasing and of Program Management attended the meeting and are aware of the situation.

Brooks Moore, as you know cost overruns of that magnitude are a very serious matter. Please, send me some more information on this thru Sec Belows' Office. I will then decide whether I should talk to Art Cooper about it. Are we in the clear or do we also contribute to this overrun?

Brooks Moore

I couldn't agree more!!

B
7/11

B

Memorandum

TO Dr. E. Rees, DEP-T DATE July 9, 1969

FROM Director, Astrionics Laboratory,
S&E-ASTR-DIR

SUBJECT ATM Computer contract cost overrun

Reference your request for additional information per my weekly notes of June 30, 1969, Enclosure No. 1.

Overrun was detailed in a presentation made by IBM's Mr. C. Grace on June 24, 1969, to representatives of S&E, PM, and A&TS-PR. Enclosure No. 2, extracted from the IBM presentation, indicates the magnitude and trend of the projected overrun. Enclosure No. 3 shows the original IBM proposal price and final negotiated price, by task. Enclosure No. 4 shows a comparison of negotiated values versus the contractor's June 1969 estimated cost at completion; with contractor's expenditures to date. All computers are yet to be delivered. Approximately \$350K of the overrun can be contributed to increased overhead and G&A rates. This is no doubt influenced by the MOL cancellation. To fully understand the details of the problems encountered by IBM may require explanation by the technical COR, who is available upon request.

Two contract changes have been implemented to date:

- a. Deletion of flight software, now to be done in-house MSFC. This action decreased the contract cost by approximately \$66K.
- b. Relaxation of delivery date for vibration dummy to permit development testing of IBM. This is a no-cost change.

An action to increase field support by 20 man-months is in process of negotiation. This will increase the contract cost by approximately \$62K.

The above changes are the only ones implemented or inferred. IBM acknowledges that MSFC actions, contractually and/or technically, have

not contributed to the overrun situation. I am satisfied also that our COR has not informally or otherwise contributed to the overrun. We are in the clear.

We have scheduled a presentation by Mr. Grace for August 5, 1969, to further define and justify a final overrun position on this contract.


F. B. Moore

4 Encs:

As stated

cc:

DIR, Mr. J. T. Shepherd ✓
PM-AA, Mr. L. F. Belew
S&E-ASTR-BA, Mr. J. Rowell
S&E-ASTR-C, Mr. J. Swearingen/Mr. H. Garrett
S&E-P-ATM, Mr. E. Cagle
A&TS-PR-M, Mr. W. McKinney
S&E-ASTR-DIR, Record Copy
S&E-ASTR-Z

Added by Astrionics Laboratory on July 8, 1969:

Summary of technical design review dates:

Contract go-ahead to incur cost was January 7, 1969

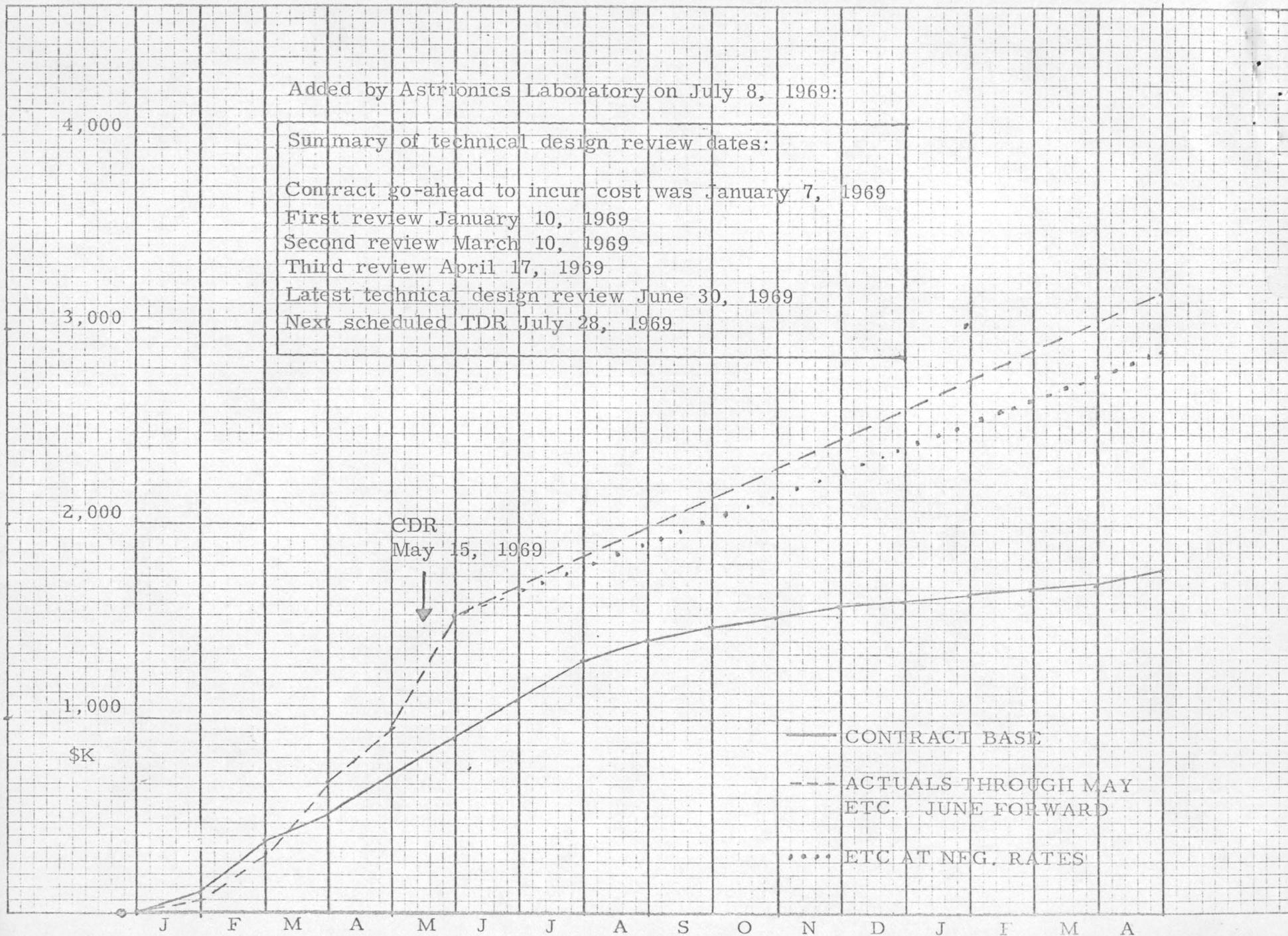
First review January 10, 1969

Second review March 10, 1969

Third review April 17, 1969

Latest technical design review June 30, 1969

Next scheduled TDR July 28, 1969



ENCLOSURE NO. 2

ATM DIGITAL COMPUTERS

SUMMARY OF NEGOTIATIONS WITH IBM, FEDERAL SYSTEMS DIVISION

BASIC CONTRACT

TASK NO.	DESCRIPTION	PROPOSED	AMOUNTS	
			NEGOTIATED (11/19 thru 22, '68)	DECREASE (INCREASE)
1	Program Management	\$ 157,858	\$ 149,965	\$ 7,893
2	Design	418,488	368,165	50,323
3	ATMDC Programing	185,884	184,433	1,451
4	Fabrication and Assembly	897,082	776,203	120,879
5	Development Testing	9,707	8,450	1,257
6	Parts and Materials Selection	5,289	4,600	689
7	Qualification Tests	36,153	31,479	4,674
8	Quality	76,155	73,628	2,527
9	Reliability	45,805	39,839	5,966
10	Spare Parts Study	None	6,431	(6,431)
11	Documentation	119,138	103,717	15,421
12	Engineering Field Support	54,593	43,999	10,594
13	Post Flight Evaluations	20,998	18,285	2,713
14	Shipping Containers	13,692	9,410	4,282
	Totals-Target Cost	<u>\$2,040,842</u>	<u>\$1,818,604</u>	<u>\$222,238</u>
	Target Fee	163,158 (8%)	136,395 (7 1/2%)	26,763
	Total Target Cost and Target Fee	<u><u>\$2,204,000</u></u>	<u><u>\$1,954,999</u></u>	<u><u>\$249,001</u></u>

ANALYSIS OF REDUCTIONS

Burdened Labor	\$118,870
Purchases, Subcontracts, etc.	19,823
Travel	2,576
G&A, IR&D	80,969
Target Fee	26,763
Total	<u><u>\$249,001</u></u>

CURRENT FINANCIAL STATUS AND ESTIMATE TO COMPLETE ATM DIGITAL COMPUTER

<u>TASK NO.</u>	<u>DESCRIPTION</u>	<u>**NEGOTIATED</u>	<u>*CTD</u>	<u>*ETC</u>	<u>DIFF</u>
(All figures are in thousands)					
1	Program Management	150	114	198	48
2	Design	368	688	865	497
3	ATMDC Programing	184	59	135	(49)
4	Fabrication and Assembly	776	447	1402	626
5	Development Testing	8	32	41	33
6	Parts and Materials Selection	5	70	109	104
7	Qualification Tests	31	4	50	19
8	Quality	74	64	203	129
9	Reliability	40	35	44	4
10	Spare Parts Study	6	0	0	(6)
11	Documentation	104	36	69	(35)
12	Engineering Field Support	44	25	97	53
13	Post Flight Evaluations	18	0	0	(18)
14	Shipping Containers	9	3	15	6
	Total Cost	<u>1819</u>	<u>1577</u>	<u>3228</u>	<u>1411</u>
	Target Fee	<u>136</u>	<u>29</u>	<u>131</u>	
	Total	1955	1606	3359	

* Taken from 533 report for period ending June 27, 1969, and is cumulative from cost incurrence date of January 7, 1969.

** November 19 through 22, 1968

CTD (Costs to Date)

ETC (Estimated to Completion)

DIFF (Difference)

1. ~~Mr. Stuyvesant~~
2. ~~Commodore~~
3. ~~Missy~~ ~~Mrp~~
4. ~~Nancy~~ ~~file~~
R
H/4

NOTES - 6/30/69 - BALCH

S-10-11 - Static firing on 6/26/69, which was scheduled for 125 seconds, was automatically terminated at approximately 96 seconds after ignition when the gas generator turbine torus temperature indicator exceeded redline. It was later determined that the high temperature indication resulted when the indicator circuit wiring was severed by a fire above Engine No. 3 which occurred during the firing and continued after the firing was terminated. First inspection of the engine area after the firing indicated substantial damage, and boards of investigation were convened by both NASA and the stage contractor. Detailed investigation by these boards has been in progress since the evening of 6/26/69. It has now been determined that the fire was caused by leakage of a flange fitting in a high-pressure hydraulic line running to the gimbal filter manifold. Disassembly of this flange fitting revealed that a polyethylene disc used only for protection of mating surfaces in the fitting during shipping had not been removed when the fitting was assembled during engine buildup. The fire caused major damage to Engine No. 3. Other major damage to engines and adjacent areas was as follows: a hole in the cooling tube of Engine No. 5; a fuel leak in the fuel balance cavity tube for Engine No. 2; a broken LOX interconnect duct between Engines No. 2 and No. 5; and broken "Nitolok" bolts in Engine No. 2 compartment. Both stage and engine contractors have recommended that Engines No. 3 and No. 5 be replaced. GSE damage was limited to drag-in cables. There was no facility damage. The stage contractor is in process of firming up a recovery schedule. There is no impact or constraint to Apollo 11 (S-10-6) known at this time.

S-11-8 - Stage was shipped to RSC on 6/25/69 as previously planned.

S-11-9 - Stage is in the A-1 Test Stand undergoing post-static checkout. Removal of stage from the test stand is currently scheduled for 8/8/69.

BONEX - Phase III observations are now expected to be complete on 7/3/69. After extensive repairs and modifications performed while ships were last in port, performance of instrumentation systems, including the Scanwell radar system, has improved considerably. Phase-out of field operations is expected to be complete by 8/10/69.

B
4/4

SPACE STATION

Dr. Graybiel, Director of the Research Department, Naval Aerospace Medical Institute, has agreed to provide training in rotating environments for MSFC personnel. Approximately 25 design and systems engineers will be scheduled in groups of four or five between now and October. During the second week in October, Dr. Graybiel will visit MSFC to present his views on rotating environments.

Following discussions last January with representatives from the National Communicable Disease Center (NCDC), a briefing on the Space Station Program was given at the NCDC on June 23. During related discussions, Dr. Kokko, Director of the Laboratory Division at NCDC, expressed a desire for an exchange of information among national experts in matters related to possible effects of null gravity on pathogens, their pathogenicity, and immunogenicity. He prefers a meeting in the Huntsville area in late August 1969. Such a meeting sponsored by MSFC has been discussed with Dr. Vinograd (Space Medicine) and Mr. L. G. Goff (Bio-Science Programs) with favorable responses. On the surface, this range of activities seem beyond the usual MSFC role. It relates directly, however, to health and habitation of a manned Space Station as well as to the fundamental sciences involved.

DUAL-MODE LUNAR ROVING VEHICLE

The remaining members of the Dual-Mode Lunar Roving Vehicle (DMLRV) Task Team are supporting the Manned Vehicle with statement of work inputs, exhibit updating, backup data, etc. We are also establishing requirements to reconstitute the DMLRV Task Team.

SHUTTLE TASK FORCE: O'Keefe Sullivan of the Program Planning Office was at MSC last week working with Hum Mandell, who is the leader of the Space Shuttle Task Team Program Plans Group. An effort is being made to determine the difference between the development cost of an ILRV vehicle which will deliver 25,000 lbs of payload versus the development cost of a vehicle which will deliver 50,000 lbs of payload.

Bill Lucas, I do not understand this. Are we doing here something reasonable? What will we learn from it? What decision does Dr. Graybiel see?

Rs
4/4

SYSTEMS ENGINEERING & INTEGRATION CONTRACT EFFORT:

Meeting were held last week with Martin and MDAC to discuss potential impact of the dry workshop on their Systems Engineering and Integration contracts. Each were given guidelines on the proposed split of this activity and asked to provide a cost estimate based on these guidelines. These preliminary guidelines essentially established Martin with the responsibility for experiment integration, mission-oriented activities, ATM hardware, and MDAC responsible for hardware-related integration tasks. This results in a transfer of some hardware integration tasks from Martin to MDAC.

DSM/4

We have the estimate from MDAC in hand and expect to receive Martin's today (6/30/69).

FY-69 AAP PROGRAM AUTHORITY: It is estimated that all except \$400,000 of the \$169.4M FY-69 AAP program authority will be obligated by today (6/30/69).

AIRLOCK SCOPE OF WORK REASSESSMENT: Discussions were held last week with MDAC-ED on delta changes to the AM work scope resulting from the impact of changing from "wet" OWS to "dry" OWS. MDAC-ED presented delta costs to approximately 30 items that are being considered under the "dry" OWS program.

AM/MDA STATIC TEST: The static test MDA was mated to the structural AM last week. Approximately one week of structural set-up remains on the AM. The new test plan and requirements documentation drafts, which will include the Payload Shroud, have not been prepared to date.

MDAC PERSONNEL CHANGES IN WORKSHOP PROGRAM: MDAC personnel changes have been made within the Workshop Program. Bill Button has been assigned as the Systems Development Director. Bob Prentice, who was the Acting Director, will be Bill's Deputy. Tony Puglisi has been assigned as Deputy to Sam Yarchin. Habitability Support Systems (HSS) has been removed from the Workshop engineering activity and made a separate activity. Al German will be responsible for the HSS activity. Hal Meyers will be responsible for all other Workshop engineering effort. Al German also has the responsibility to aid the Saturn Office, as necessary, in the resolution of any major launch perturbations affecting the S-IVB stage.

OWS ENGINEERING MOCKUP: Disassembly of the OWS Engineering Mockup at MSFC has started in preparation for Habitability Support Systems Preliminary Design Review (PDR) presently scheduled for August 26, 1969.

NOTES 6-30-69 BROWN

Bs
7/4

F-1 ENGINE - The static test of S-1C-11 at MTF on Thursday, June 26, 1969, was terminated at approximately 96 seconds due to a fire around engine #3 (F-6072). Preliminary investigations indicate that the gimbal hydraulic supply filter manifold installed by the stage contractor began to leak at T+35 seconds at the manifold to supply duct flange, spraying fuel over the engine. The fuel was ignited in the turbine exhaust area at T +46 seconds and spread to envelop the engine until automatic cutoff was initiated at T +96 seconds. Considerable burning of lines, brackets, and electrical harnesses were found on this engine. In addition, two holes, one 1/2-inch in diameter and the other 1/8-inch by 1/2 inch, was found on two different external tubes of the thrust chamber of engine #5 (F-6070). The tubes were located 8 tubes apart behind the heat exchanger. Opposite these tubes and inside the chamber, tube separation was found over an area approximately 14 x 10 inches. Engine F-6087 presently allocated to S-1C-14 will be prepared to replace engine F-6072, and it will probably be necessary to remove engine F-6070 for refurbishment. The remaining engines apparently require only minor repairs, such as electrical connector boots, and these repairs can be accomplished in place pending more detailed evaluation.

Bill Brown
How can
this be
explained?
Is there
evidence that
it happened
after a shut-off?
Does it
look like
explosion or
implosion?
Is there any
possibility
that the
whole
damage on
tubes is not
connected
with the fire?
Bs.

J-2 ENGINE - Reference my notes of 6-16-69 concerning plans to conduct an S-IVB Stage vent system test at AEDC to confirm the analysis of 46 Hz oscillations experienced on AS-505. All components required have now been received and the test is scheduled for July 2, 1969. Current plans are to initiate one air-on period to satisfy the vent system test requirements and to begin a regular J-2S engine test immediately.

B. Br.
What came
out of the
test?
Bs 7/4

NOTES CONSTAN 6/30/69

B
7/4

Nothing of special significance.

P24/4

1. HIGH ENERGY SATELLITE PROGRAM: The name, Super Explorer, has been changed by OSSA to High Energy Satellite. We have been informed by OSSA that Dr. Naugle desires to release an Announcement of Flight Opportunities (AFO) to the science community about August 1. Dr. Naugle will require a briefing on the project prior to release of the AFO.

Dr. Mueller has not yet responded to Dr. Naugle's letter of May 12; subject, NASA Program of High Energy Astronomy. We understand that Chuck Mathews has the action to prepare Dr. Mueller's reply to Dr. Naugle and that Mr. Mathews will not use the draft version of the reply that we had prepared. MSF is querying us on the feasibility of putting the survey type (early) High Energy Satellite experiments on a workshop mission, e.g. DWS #2, rather than on a spin stabilized satellite. Such an approach is certainly feasible. The most significant complexity (from a technical standpoint) is to provide the necessary orientable platforms to permit a total sky coverage capability for survey type experiments mounted on a Workshop, that must maintain a fixed orientation toward the sun.

2. ORBITING RESEARCH & APPLICATIONS LABORATORY - SUMMER FACULTY STUDY: The Auburn/Alabama - MSFC Summer Faculty Study (June 9 - August 22, 1969) under the co-direction of Dr. R. J. Vachon (Auburn University) and Mr. H. G. Hamby (PD-MP) is now well established. Twenty-one faculty participants (15 from engineering disciplines; 5 from physical sciences; and 1 from mathematics) are doing an independent study of a manned orbiting research and applications laboratory with emphasis on the rationale of experiments. Dr. Vachon did not establish a preconceived work statement but is requiring the participants to generate sets of constraints and objectives. The faculty participants are encouraged to be creative in every consideration, not to accept prior decisions without question, and not to prejudge solutions. Persons from various organizations throughout the Center have provided orientation to this activity through presentations and furnishing of reports and other data.

3. GULF STREAM DRIFT MISSION: The Ben Franklin is presently at sea undergoing compliance dives. A dive to 1,800 feet under Navy auspices has been completed and all systems were in compliance except demonstration of fire extinguishers, oxygen breathing apparatus, and calibration of depth/pressure gages. As a result of this dive, Navy clearance for NASA personnel to dive is expected in the near future. Two additional dives to 600 feet may be required for instrument calibration purposes, but the Navy will probably permit Mr. May (PD-MP) and/or Mr. Heckman (S&E-ASTN-V) to participate in these dives.

The Mini-Drift is now scheduled for the week of July 7, and the Drift Mission is planned to start about 10 days later.

Rs
7/4

POSSIBLE ASSIGNMENT OF AIR FORCE MOL PROGRAM OFFICERS TO NASA

Action is in process by Headquarters to request selective assignments to NASA of USAF middle grade officers who are now pending reassignment from the terminated MOL Program. Many of these officers had a previous tour of duty with Flight Operations at MSC prior to their assignment to the MOL. MSFC requirements have been provided to General Bogart as follows:

J.P., do we have any "feeling" how many we would get?
Rs

Program Development	6 engineers
Science & Engineering	20 engineers
Program Management	15 engineers
Administration & Technical Services	<u>1</u> engineer
	<u>42</u>

STATUS OF FY-69 OBLIGATIONS

2

The Fiscal Year 1969 obligation picture is encouraging. In the Research and Development appropriation we will carry over in the SRT program approximately \$2,500,000 to \$3,000,000. We expect to be fully obligated in the OMSF programs with the exception of a carryover in the Space Station project of \$465,000 and \$190,000 in Supporting Development. We could have a small carryover in the AAP program due to shuffling of AAP authority between MSFC program offices.

We continue to estimate some \$4.5 million FY 1969 fund availability for forward funding FY 1970 effort in the Research and Program Management appropriation. These funds will be obligated prior to June 30, 1969.

Say Foster, are we losing these funds or can they be carried over. I never got a clear answer.

What shuffling of AAP authority between MSFC program offices has taken place which prevented us from obligating all funds?

Rs

NOTES 6/30/69 GEISSLER

Nothing of significance to report.

R
M/4

R
M/4

SPACE SHUTTLE TECHNOLOGY PLANNING: Messrs. J. Laue and S. Denton, PD-DO-M, and Messrs. F. Digesu and O. Green, PD-DO-E, participated in the Space Shuttle Task Group technology planning activities at NASA Headquarters. Messrs. Laue and Denton were responsible for the formulation of a technology plan to develop and evaluate low-cost expendable tankage for the one-and-one-half-stage shuttle concept. The technology plans are to be submitted to the appropriate OMSF and OART Centers who will be asked to generate, in greater detail, proposed programs for implementation of the overall technology plan. Major points emphasized in the technology plan for the expendable tankage were the need for construction and test of a full-scale prototype tank for evaluation of the fabrication process, and the need for systems trade-off analyses to support the design of the prototype tank. In developing a schedule for the technology plan, a requirement was imposed for obtaining conclusive results from the technology work for input to the Space Shuttle concept comparison and selection process which would begin in the second quarter of FY-1971. Although not discussed in the technology plan, it was felt that the schedule is extremely constraining and may offer no alternative but to pursue the LMSC proposed method of fabrication of the tanks.

Ps
4/4

1. DEVELOPMENT OF NEUTRON RADIOGRAPHY FOR SPACE VEHICLE COMPONENTS, NAS8-30070: Members of this Laboratory witnessed the first tests of the Neutron Radiographic Direct Viewing Television System at Zenith Radio Corporation and Argonne National Laboratories. Tests showed that the high resolution version could resolve a 0.002 inch hole in a penetrometer, at a flux level of 2.0×10^3 neutrons/sq cm/second, with time exposure of 1/2 minute. Dr. J. Barton, a recognized neutron radiography expert, stated that he had never before seen the 0.002 inch hole resolved; and that this low flux level had never been successfully used for precision imaging before. Performance of the breadboard tests exceeded minimum contract performance requirements by a considerable margin. The tests are proof that production, high-quality neutron radiography with generators and small sources is practical and attractive.

2. PARTICIPATION IN PRESS FORUM, "NONDESTRUCTIVE TESTING (NDT) AND SPACE VEHICLES": Messrs. Neuschaefer and Beal of S&E-QUAL participated as panelists in an NDT forum for members of the press in New York City on June 18, 1969. NDT applications on the Saturn vehicle were covered by Mr. Neuschaefer. Mr. Beal presented and discussed potential NDT applications in the outer space environment. Mr. Larson, Chairman of the Board for the American Society for Non-destructive Testing, served as moderator. Approximately 25 members of the press, representing newspapers, television, engineering journals, management publications, and popular periodicals, were present. The presentation was well received by those present, and the discussion period afterward helped clarify any lack of understanding on statements made.

3. INVENTION AWARD: Mr. R. L. Brown, Sr., S&E-QUAL, was presented an Invention Award June 12, 1969, for his discovery, "Cascaded Solid-State Image Amplifier Panels." This discovery allows the development of imaging systems having combinations of desirable characteristics, such as high gain combined with image storage, not previously attainable with solid-state devices.

D. Grau, what is the highest resolution on X-rays?
 Could we with this neutron method even better find critical flaws on this S-II. As you know, we intend later on to eliminate the S-II cryo-proof test. Could we introduce neutron radiography there? How expensive is production equipment when available? Is any particular shielding necessary?
 Ps

NOTES 6/30/69 HAEUSSERMANN

NO NOTES THIS WEEK.

R34/4

Rs 7/4

1. FUEL EFFECTS ON F-1 ENGINE PERFORMANCE: Regarding Dr. Rees' question on the possibility of fuel difference accounting for performance variations in the S-1C, Rocketdyne does attribute some performance variation to fuel differences; this was reported by Rocketdyne in the 25th F-1 Engine Quarterly Review. We simply do not have sufficient quantitative data to properly assess the true magnitude of this effect at this time. Tests are underway at Edwards Air Force Base involving two different lots of fuel, and we expect these tests to give quantitative data regarding the relative performance differences of these two lots of fuel. We will report the results of this test series as soon as we have the information.

2. S-11 INSULATION: S-11-9 successful static firing proved, finally, the successful techniques for field repair of the cryogenic insulation. This is a significant step in overcoming the S-11 insulation problems which have plagued us since the inception of the spray foam insulation process.

3. CRYOGENIC ENGINEERING CONFERENCE INSULATION SEMINAR: Charles Wood of our Propulsion and Thermodynamics Division was requested to organize and conduct a technical seminar on high performance insulation for the Cryogenic Engineering Conference held at the University of California at Los Angeles on June 16-18, 1969. The seminar was successful, and was highly beneficial to approximately 125 specialists attending. Government, Industry and University personnel formally participated in presentations and discussions which covered the broad spectrum from calorimeter evaluations through complete system application and testing including meteoroid protection. General conclusions from the meeting were that technologies are adequately advanced for satisfactory application of high performance insulation to most non-cryogenic applications and for cryogenic applications of modest durations. A continuing aggressive technology effort is required for applications utilizing cryogenics for long durations (3 months to a year).

4. S-1C-11 STATIC FIRING: A major fire occurred in engine 3 during static firing of S-1C-11. An investigation by personnel from this laboratory, assisted by R-QUAL, revealed the cause of the fire was the failure of the contractor work crew to remove some polyurethane packaging material used to protect flanges during stage shipping. A check of the same hardware on S-1C-6 has been initiated at KSC.

5. RICKOVER PRESS CONFERENCE: Vice Adm. Hyman G. Rickover has told Congress overmanagement is crippling the Pentagon. And he predicted that unless it is ended there will be "more Pueblos, more thousands of sheep killed by nerve gas, more airplanes improperly designed, more inefficiency, more cost overruns."

"We have now reached the stage in the Defense Department where there are more and more 'managers' and fewer people left to do the work," Rickover recently told the Joint Committee on Atomic Energy. He stressed what he called the need to "go back to basic principles and realize that people not systems, will solve our problems." A declassified version of his April 23 testimony was released Sunday night.

*K. H. 19
heard Rickover testi-
mony with
great enjoy-
ment. He is
100% right,
although he
is also a
manager,
so am I and
so are you.*

Rs

Rs 7/4

1. METEOROID PHYSICS REVIEW: The MSFC Research Achievements Review on Meteoroid Physics Research was held on June 26. The OART program manager, members of other NASA Centers, universities and industrial research labs were in attendance, in addition to our own MSFC employees and support contractors. Despite this, the total number of people was regrettably small, especially none of the key management people were present. I found this review very interesting and exciting. According to an agreement with Dr. Johnson, it was conducted more like a session of a scientific symposium. Our friends from OART and several outside visitors congratulated Bob Naumann for such an excellent series of presentations. If you could spare three hours sometime after Apollo 11, you might want to have a repeat performance for you and possibly other key people of MSFC. This could also help to introduce Bob Naumann as the Chief of our Physics and Astrophysics Division.

*Bronie
put it
on w. Bronie
calendar
and let
Jesse know
too.*

Rs

2. SUPPORT FOR MANUFACTURING-IN-SPACE: Mr. Gary Arnett of this laboratory has been assigned to give scientific support to ME for their Manufacturing-in-Space effort. Last week he participated in the technical evaluation of proposals on "Processes for Space Manufacturing." Other participants in this were from ME and ASTN Labs. Members of SSL's Space Thermophysics Division are working jointly with the ASTN Materials Division on the growth of crystals by the use of ASTN's Czochralski crystal growing apparatus. The crystals will be evaluated in SSL. Mr. Tom Bannister of this laboratory is the alternate COR on ME's crystal growing experiment for AAP-2 which has been contracted to Westinghouse.

3. SOLAR PHYSICS SUBCOMMITTEE: I received an invitation from John Naugle to serve on the Solar Physics Subcommittee for the coming year, starting July 1, 1969.

NOTES 06-30-69 HOELZER

B₃ H/4

Nothing of significance to report.

R₃
4/4

FUTURE PROJECTS FILM:

A second production meeting took place at NASA Headquarters on June 24, 1969, and was attended by Mr. von Tiesenhausen, PD-SA-O. The first draft of the movie script was reviewed by OMSF representatives together with the MSFC representative and the producers. Previously, the first draft was reviewed by Dr. Lucas, Mr. Hobbs, and Mr. von Tiesenhausen and written comments had been submitted to Mr. Grimm, Audio Visual Director, NASA Headquarters. The basic theme of the film, which was essentially hardware oriented, will be changed to place major emphasis on the why of earth orbital and lunar programs and less emphasis on the how. The controversy about whose space base configuration would be shown was resolved after a rather lengthy discussion. Both the MSC and the MSFC versions will appear in the movie in a well-balanced way. The result of the script change will probably be a four to six week delay of the original scheduled completion date which was in early August. Daily contact with A-V Corporation, the producer, is being maintained.

Bill Huber, we are very much interested in this movie.
Please, let us know when we can see it.
We in: Dr. v. Braun, myself, Gorman, Weidner, Lucas
and our whole internal staff and the Staff and
Board Meeting.

R₃

SATURN

NOTES 6/30/69 JAMES

Ps 4/4

1. AS-506 Status: Wet CDDT started the night of June 26, one day later than projected due to problems encountered with spacecraft hypergol loading. T-0 of the wet CDDT is now scheduled for 8:32 a.m. CDT July 2. Dry CDDT will be conducted on July 3.

See James.

After S-IC-11 is reworked again, could we arrange how good it is? What special can we do to arrive at that we can without other means to it? Would it be as good as 505 and hope fully 506?

2. S-IC-11 Fire: The S-IC-11 fire has been traced to a leak on the No. 3 engine high pressure fuel supply line to the actuators. Film records show the leak starting at T+35 seconds and the fire igniting at T+46 seconds. After automatic cutoff at T+96 seconds, extensive use of firex and purge was required to extinguish the fire and the No. 3 engine was extensively damaged. During emergency fuel and LOX drain, geysering occurred in the LOX interconnect and No. 5 engine suction line due to the heat input from the fire. The resulting LOX slugging ruptured the No. 2 to No. 5 engine LOX interconnect line at about T+375 seconds and dumped a large amount of LOX above the heat shield. Fortunately, the LOX did not contribute to the fire. The fuel leak on engine No. 3 was found to be due to a shipping cover being left in a flange on the high pressure fuel line when it was installed by Boeing at Michoud. S-IC-6 and all other S-IC stages will be cleared by a special inspection to insure that no other shipping covers have been left in place.

it must be many millions!!

3. S-IC-11 Pressure Volume Compensation (PVC) Duct Malfunction:

Failure analysis of the PVC duct which malfunctioned during the prestatic checkout at MTF during the week of June 9 indicates the problem was associated with deformed struts in the PVC. Arrowhead did some repair work on the struts of this PVC after pressure and gimbal tests. The only component testing performed after the repair was a pressure test. Because of the repair work, the struts became deformed and created an internal interference, thus the problem at MTF. Plans are to rework this PVC and return to operational use. We do not have any ducts on any other stages which have a similar repair.

LRV

A June 27th teleconference involving NASA Headquarters (Dr. Mueller and General Phillips), MSFC, KSC, and MSC reviewed the status of the RFP for the LRV. The extremely tight contracting schedules and critical LM/LRV interfaces were recognized as areas which will require close monitoring; however, a go-ahead was given to proceed toward a July 3 release date for the RFP.

→ Lee, I would very much like to know what this fire costs the Government (the Taxpayer). I would appreciate to get a good breakdown of everything such as time lost, new engine, report of status

Ps

NOTES 6/30/69 JOHNSON

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Reprogramming of FY-69 Supporting Development Funds - As a result of a review of outstanding purchase requests which were unlikely to result in obligations prior to 1 July, Headquarters withdrew \$539k of FY-69 funds in the 908-20 (Lunar) account. However, we were able to recover \$500k of the withdrawn funds through reprogramming into the 908-10 (Orbital) account to cover Aerodynamics Research originally planned for FY-70 in support of the Shuttle. These funds are being used to secure Wind Tunnel support at other government facilities and can be obligated this fiscal year.

The \$539k withdrawn will be reinstated in the FY-70 Program.

Research Achievements Review - The eighth Research Achievements Review of the third series was held on June 26 in Morris Auditorium. The presentations reviewed the Meteoroid Physics Research at MSFC. Space Sciences Laboratory and Astronautics Laboratory participated. It was an exceptionally well done and well received review.

Revision of Galactic X-Ray Mapping Experiment - At the last meeting of the MSFEB, a proposal to revise and update Dr. Kraushaar's Galactic X-Ray Mapping Experiment was rejected because of the cost involved -- \$400k. At the request of OSSA, Dr. Kraushaar has revised the revision in an attempt to reduce the cost to about half that figure. The less expensive version of the equipment does not give quite the results which the more complete equipment would have given, but still seems to be a scientifically meaningful experiment. It is, therefore, being repropoed for MSFEB consideration.

NOTES 6/30/69 MOHLERE

Nothing of special significance.

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ATM DIGITAL COMPUTER (ATMDC): A meeting was held June 25 with Mr. Clint Grace of IBM Huntsville to examine in detail the causes of a overrun of approximately \$1.4 million reported by IBM in June on contract NAS8-20899 for ATM digital computers. This contract was negotiated CPIF in January 1969 at a figure of \$1,954,999. Subsequently, two contract changes have been processed. One deletes flight software from the contract (to be done inhouse by MSFC) and the other was a minor schedule change for convenience of all concerned. The net effect of these two changes is a contract cost reduction.

Mr. Grace and his people elaborated in detail upon the reasons for the projected increases which can be categorized in three groups: (1) Power supply inadequate output in the MOL 4 II computer which is a part of the ATMDC. (MOL reduced the specs to work around the problem but the work-around is not applicable to ATMDC therefore a redesign is required). (2) Large increases in vendor prices for piece parts, and (3) underestimates by IBM of the effort necessary to do the job in almost all areas. Principal areas are design, which is 90% complete, and manufacturing, which has just been initiated.

Duly impressed with the seriousness of the situation, Mr. Grace stated that IBM management is not yet satisfied that they have reduced the estimated overrun to its minimum, that they are working all aspects of reducing it, and that he would like until July 22 to further work the problem and report his results at that time to MSFC.

Representatives of Purchasing and of Program Management attended the meeting and are aware of the situation.

Brooks Moore, as you know cost overruns of that magnitude are a very serious matter. Please, send me some more information on this thru Sec Belows' Office. I will then decide whether I should talk to Art Cooper about it. Are we in the clear or do we also contribute to this overrun?²

B

NOTES 6/30/69 MURPHY

S-IC-11 Static Firing Incident: The S-IC-11 static firing incident which occurred at MTF on June 26, 1969, was immediately investigated by a group of MSFC personnel headed up by Mr. Karl Heimburg. We had a representative on this team. An MSFC Board of Investigation has now been appointed with Dan Driscoll as Chairman. The Board will provide you a summary of the findings and recommendations to send to OMSF and NASA Headquarters. They will need time to verify the current early conclusions of Boeing, MTF and MSFC people. Most important, of course, is to insure no immediate impact on the Apollo 11 flight and then to prevent similar future occurrences.

NASA-OMSF Safety Survey: As scheduled, the OMSF Safety Survey was concluded on Wednesday, June 25, 1969, with an Exit Briefing presented to Mr. Neubert.

The Team was impressed with the greatly increased safety awareness and activity at MSFC; in fact, Jerry Lederer gave us an "A grade" in comparison to other NASA Centers. They had some recommendations that we can correct at an early time. Team members were concerned that AAP systems safety implementation keep pace with the development of the AAP Program. The Team will forward their report in the near future.

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1. Alabama Space Science Center: All S-I and Saturn V stages were moved to the museum on Saturday, June 28. The move went without a hitch. The Post Engineers, the TVA, the City of Huntsville, the Huntsville Police, and the Alabama Highway Patrol all cooperated very willingly and competently (as did the weather!).

2. S-II-9 Insulation Debonding: After cryogenic proof pressure test, it was found that several rails (Hot Spot Protection System) surrounding the feed lines (FL) were debonded. All rails surrounding FL #3 and #5 were removed and replaced using the normally specified Lefkowied 109 adhesive system. Particular care was taken to maintain a bond line thickness less than 0.015-inch. Thicker bond lines had been found on the debonded rails. After static firing, removal and inspection of section of the replaced rails revealed Lefkowied bond line thicknesses of from 0.009 to 0.014-inch and a hammer and plastic chisel were required to remove the sections of rail. The rails bonded with 7343 adhesive were inspected and likewise required a hammer and chisel for removal of the rails. The problem of rail debonding appears to be solved by careful application of the adhesive during the rail bonding. Numerous debonds were encountered between the cork cover sheet and the foam. This problem has not yet been resolved, but is being worked.

*How to clean
long. We
obviously have
not solved
all the
problems!*

3. ATM Radiators and Cold Plates: Both the above thermal control components are made up of elaborately machined elements joined by resistance seam welding. After an extensive development program we have established the criteria for the seam welds. One of the criteria is that the welds have to be completed within about 72 hours of cleaning the parts. We have only one machine on which these parts can be welded. We have obtained another welder from "surplus" but have been unable to get the funds to refurbish it. The existing machine broke down during welding last week. This has led to the scrapping of expensive parts (\$1800). Such delays not only cost money and labor but may even have severe impacts on an already tight ATM schedule. We consider it necessary to have available two machines on which such critical parts can be made -- particularly when the cost of a spare machine is relatively low (\$30,000).

*H. Weidner
What can
be done
to solve
this money
problem?*

4. Safety Review: The NASA OMSF Safety Team performed a review of the Laboratory on June 24 and 25. Several minor areas with regard to safety were noted in the preliminary debriefing held Wednesday afternoon. The overall housekeeping of the Manufacturing Engineering Laboratory complex was noted as good.

P₂

NOTES 6/30/69 SPEER

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MSFC Input to AAP Flight Operations: The degree and mode of formal MSFC engineering inputs to AAP Flight Operations is still a fundamental unresolved question, which has considerable significance also for future programs. The basic issue is maintenance of the "cradle-to-grave" hardware responsibility which has always been an essential factor in the MSFC design, development, and integration capabilities. This responsibility requires an appropriate recognized MSFC role in analyzing in-flight system operations and establishing system operating limits and procedures, similar to our input and cognizance in KSC launch operations. It also requires the commitment of appropriate MSFC engineering resources to this area. I believe MSFC should make this commitment and systematically provide MSC with validated systems data for their operations planning and training; nominal and contingency operating specifications to be observed in utilizing our hardware (modules and experiments); and operating requirements to satisfy engineering and scientific objectives for which we are responsible. Although we are doing some of this, there are large gaps and I do not believe this Center has full internal agreement yet on the mode and degree of engineering inputs to the flight operations area. If we do not soon support this area more strongly, MSC may preempt it entirely with their on-site supplemental contracts which are now being arranged. My office is preparing a proposal as a basis for discussion internally and with MSC, directed at a relationship with MSC in flight operations that is essentially symmetrical to our relationship with KSC in launch operations.

F. S.

When you are ready to talk about this proposal I would like to participate. Is this a very serious matter? I don't have any feel for it.

R

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MSFC MEMBERSHIP ON OSSA SUBCOMMITTEES: One of our goals to strengthen the ties between OSSA and MSFC is to establish Marshall people as members of the subcommittees of the OSSA Space Science and Applications Steering Committee. In FY 1969, MSFC did not have a single full-fledged member on any of the subcommittees, but did have an observer on one. When I talked to Dr. John Naugle about this several months ago, he encouraged me to contact individual chairmen of the subcommittees and suggest qualified people from Marshall for membership. Following internal meetings to select the most appropriate candidates from MSFC, I contacted several subcommittee chairmen. For FY 1970 we will have at least the following representation:

Subcommittee

Marshall Participant

Astronomy

Mr. Jim Downey, PD, Member

Solar Physics

Mr. Gerhard Heller, SSL, Member

Planetary Atmospheres

Dr. Leonard DeVries, AERO,
Observer

Particles and Fields

Dr. Thomas Parnell, SSL,
Observer

There are still several chairmen that I have not yet contacted, so our representation may very well increase. For those persons who are observers this year, it is quite possible that they will be named as full members next years. Members are named on the basis of their individual expertise in a given field, and not on the basis of the organization they come from.