APPENDIX 1

FOR

REQUEST FOR INFORMATION
REGARDING THE WEEKLY NOTES OF DR. WERNHER VON BRAUN

REFERENCE NUMBER: NNH09CAO002L

Frank Williams

OCT 11 –

NOTES 10/3/66 GEISSLER

B 10/8

10/3 Q

1. Mars Surface Sample and Return Probe (MSSR): During the recent Planetary JAG exercise, it was suggested that Manned Mars Flyby Missions would be more attractive if a technique could be devised whereby a Martian surface sample could be obtained. Bellcomm proposed a probe that upon approaching Mars, would be launched from the manned flyby spacecraft, descend to the Martian surface, pick up a surface sample, and then rendezvous with the manned spacecraft. Bellcomm worked on this probe idea for NASA Headquarters for about six months. Recently, Headquarters and MSC asked NAA to come up with a conceptual design for this probe. NAA conducted a concentrated study effort in three weeks, presented the results to Headquarters on September 20, and will submit an unsolicited proposal for further study about November 1. The Advanced Studies Office of Aero-Astrodynamics Laboratory, is coordinating a study effort to provide more insight into some of the major problem areas. RP, ASTR, and P&VE are participating.

E.V. I think it is pretty obvious that large portions of Mars are barren. If there are some forms of life, it is probably limited to locations that offer special advantages. For instance, volcanic activities resulting in locally increased temperatures plus water freed by eruptions. Conclusion: Surface samples should be useful only if they make a pinpoint landing at a spot (via Voyager?) found to be suitable for life. [Drop a sampler into the Sahara desert and you'll conclude that there's no life on earth!!] B 10/8

2. Control Theory Symposium and NASA Intercenter Meeting on Control System Theory: The Control Theory Symposium, held at MSFC September 19-21, sponsored jointly by Aero-Astrodynamics, Astrionics, and Computation Laboratory, was chaired by Mr. James C. Blair of our Astrodynamics and Guidance Theory Division. In the opening remarks, I stressed Marshall's interests in advanced control concepts in connection with AAP missions. 140 people from NASA Centers, industry, and educational institutions attended, twenty three technical papers were presented, and subsequent discussions and comments indicated that a beneficial information exchange was provided by the symposium.

The second NASA Intercenter Meeting on Control System Theory was held here September 22-23, chaired by Dr. John H. George of our Astrodynamics and Guidance Theory Division. The meeting formally covered many topics in control theory currently under consideration at NASA Centers. Various center representatives gave examples of problems arising in their current assignments which indicated the need for better methods of applying modern theory to practical problems. The meeting indicated that we are one of the stronger centers participating in the control theory area, along with Ames and Langley. A special session for NASA grantholders in the control theory area, linking the above two meetings, was held at the request of Mr. Carl Janow, OART - Headquarters, who is funding these grantholders. Papers presented and resultant comments, gave some idea of the interests of this particular funding group.

3. Results of September 19 PRB Meeting: The results, on the question of panel continuation for SAA activities at the PRB Meeting held in Washington September 19, 1966, were very disappointing. The panels all made recommendations on the necessity of moving out on work for 209 - 212 vehicles and also that the panel structure be maintained for future work on SAA interfaces. After hearing all the panels' recommendations, General Phillips indicated that he would recommend to Dr. Mueller against continuation of panels for SAA activities. We feel that further discussion on the role of panels in support of MPTF activities is required. I agree B

I heard just the opposite. Why should Phillips, who is not even responsible for the SAA program, want to abolish the panels for SAA, in the Centers and the panels I feel it is necessary to continue them?? B

Eberhard Rees

URGENT

NOTES 9/12/66 GEISSLER

1. Compression of Required Apollo/AAP Mission Change Lead Time: Of the areas contributing to lead time requirements in which our laboratory is involved, i.e. software for guidance, control, mission planning, and timelines, the first two, and related hardware problems, were discussed in a meeting called by Col. James on Sept. 8, 1966. It was concluded that an extension of the validity of a set of equations and data to relatively large varieties of similar missions, is one way of achieving the desired flexibility. However, particularly in the control area, and to a lesser degree in the guidance area, it appears that not all foreseeable AAP missions can be covered by broadened tolerances around one typical standardized profile. A first estimate is that in the control area up to six such profiles may be needed. Therefore, to supplement this broadening of tolerances, a parallel approach of several potential profiles for one flight has to be investigated. Limitations of manpower dictate that for the earlier missions, profiles presently in existence should be used as a baseline. Gradually, these will be supplemented, until the entire spectrum of missions is covered. The availability of manpower (primarily Chrysler and mission support contractors) is one of the most serious remaining problems.

2. High Reynolds Number Facility: Dr. Smelt, Lockheed's Chief Scientist, recently inquired about any new developments concerning our High Reynolds Number (Hi-Re-No) Facility proposal. His interest was stimulated by some experimental difficulties with Supersonic Transport Wind Tunnel experiments. Nature of these difficulties seems to verify the validity of our arguments for such a facility. While the Hi-Re-No Facility proposal is presently inactive as far as official channels are concerned, the concept and need for the facility are still under consideration in the NASA Research Advisory Committee on Space Vehicle Aerodynamics. I intend to follow up on this facility proposal at the next committee meeting in late October.

3. Orbital Wind and Micrometeoroid Velocities Detection: Since October 1964, we have been developing a laser heterodyne technique for measuring gas velocities. The instrument employed when using this technique, measures a selected component of the instantaneous gas velocity, by sending a laser beam through the flowing gas, and heterodyning the light scattered from tracer particles (dust, smoke, other natural tracers) with the original beam. Successful measurements have been made in a laboratory setup, and subsequently in our wind tunnel over a wide range of velocities using smoke as a tracer. A three-dimensional instrument is expected to be available by January 1967. Further in-house wind tunnel tests are in progress. Present equipment is being modified to handle flows with appreciable turbulence (e.g. turbulent jets, boundary layers, ground wind). Using this technique, we have initiated a five month program to prove the feasibility of measuring wind velocities. One experiment to be conducted, will be to measure wind velocity across a 20 mile wide valley. Long range potential of this program will be to measure wind velocities from satellites. Another potential application is in the detection of micrometeoroids. Studies are in progress to determine feasibility of measuring micrometeoroid velocities. Measurements will be made using existing hypervelocity facilities.

E.F. → I understand "Jule" Schuler in Test Lab has also played with Lasers as flow and velocity meters, but he has been disappointed with the results

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not distr.

JUL 5 1966

NOTES 6/27/66 GEISSLER

B 6/30

1. Reuseable Aerospace Passenger Transportation System (RAPT): In response to your question, raised at the June 13 Scramjet Technology Status presentation, concerning RAPT study funding, the following funding data, obtained from ASO, is furnished:

	FY 65	FY 66	FY 67	FY 68
Requested	?	$300,000	$250,000	$500,000
Approved	yes	no	no	no
Obligated	$378,100*	-	-	-

*Incremental systems study: $327,100; VTO vs. HTO study: $51,000

E.G. Still hope to get the 250K, since we obviously got nothing in FY 66 B

For FY-67, the RAPT study's objective will be to define options of a design and development plan of a RAPT system for progressive improvement of utility and effectiveness of earth to orbit shuttle transportation of personnel and cargo. On the basis of prior systems and development planning studies, the effort will include the following: (1) synthesize additional design concepts not considered in the previous incremental systems study; (2) put these systems in perspective with respect to previous incremental systems approaches and up-date systems selection; (3) establish design of the selected system in sufficient detail to provide subsystems planning data and requirements for supporting R&D work; and (4) up-date development plan and refine with respect to interfaces between incremental development steps.

2. Fifth U.S. National Congress of Applied Mechanics: A paper entitled "Nonlinear Dynamics of an Artificial Gravity Orbiting System," co-authored by Dr. McDonough and Mr. Worley of our Dynamics and Flight Mechanics Division, was presented at the Fifth U.S. National Congress of Applied Mechanics, at Minneapolis, Minnesota, during the week of June 13, 1966. This paper presented the dynamical aspects of providing an artificial gravity environment in an orbiting spent stage by use of a cable attached counterweight. This is part of a much more comprehensive in-house study which cannot be publicized externally because of the sensitive nature of our spent stage program.

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NOTE TO DR. VON BRAUN

SNAP-27 SAFETY EVALUATION: We are getting considerable static from NASA-HQ as result of the recent Management Council Meeting, at which you apparently quoted our Note on the subject item (NOTES 11/25/68 Geissler, copy attached). It appears that the surprised HQ-representatives at the Council Meeting had not been informed by their Nuclear Safety Office personnel of the recent findings of the Reentry Group, of which we informed you in NOTES 11/12/68 Geissler (copy attached). It appears also, that a mission groundrule for the second Apollo landing flight has been signed off by Dr. Mueller which had been proposed by Bellcomm and which did not account for the more recent findings of the Group pertaining to the LM abort problem. Somebody must have assumed prematurely that the Reentry Group was going to certify the SNAP-27 safe for reentry without qualifications. The Interagency Safety Panel meeting this week, which will be attended for us by Mr. von Puttkamer, will hopefully clear up everything and determine whether the presently existing groundrule is still acceptable or whether it will have to be modified in accordance with the Group's findings. Despite all the hue and cry in Washington, our Note to you reported nothing but the facts. The confusion and the embarrassment caused to you was probably again a result of lack of communication at HQ.

WEEKLY NOTES

R-AERO-D March 19, 1965

1. (Dr. Geissler) The Saturn V/Voyager Dilemma - On March 9, General Electric presented some results of a recent Voyager study, based on use of Saturn V for unmanned Mars landing missions. In general, the results again reflect the familiar dilemma of Lander vehicles of this large size: the payload capability of Saturn V cannot be fully utilized for such landing missions, since the necessary assumptions of the (worst) 11 mb G-atmosphere, state-of-the-art retardation systems and Saturn-type guidance accuracies dictate a ballistic coefficient (W/C_DA) of about 15 lbs/ft^2 or less, causing large structure area and high structure weight/payload ratio. Improvement of this situation requires increasing the ballistic coefficient, which may eventually be achieved by either one of these developments: (a) discovery of a "better" atmosphere on Mars (above the 11 mb model); (b) development of advanced retardation systems, such as hypersonic ballutes and impact-air bags; (c) improvement of the guidance accuracies, leading to relaxation of entry corridor constraints.

Additional facets of the dilemma, which exceed the present state-of-the-art are: (a) increased scientific payload requires on-board power in the order of 500 Watts and up, which calls for radioisotope thermo-electric generators (RTG), such as SNAP-10A; (b) increased scope of exploration requires data transmission rates of about 4000 bits/second and more, which is 500 times the data rate of Mariner 4; (c) sterilization of large size Landers appears hardly feasible at present; (d) increased duration of mission (in the order of 1 year and above) requires continuous operation of DSIF system and, thus, grounds other space missions; (e) if instead of one large Lander several smaller vehicles are packaged on one Saturn V, it appears doubtful, whether DSIF can accommodate more than two or three simultaneously. (R-AERO-DP)

2. (Dr. Geissler) Use of B-70 ("Valkyrie") as a Space Launch Vehicle - Messrs. Kostoch and Johnston of North American Aviation presented their recommendations on the use of the B-70 supersonic test plane as an airbreathing research space booster to a group of ROT people. A movie was viewed which showed Flight No. 7 of the XB-70A. During this flight Mach 1.85 was reached; retraction of the landing gear and folding-down of the wing tips was demonstrated. The test plane will eventually be turned over to NASA/FRC for SST tests of controlled sonic boom, cosmic radiation, etc.

NAA has investigated the following configurations to be launched from the B-70:

a. 3-stage solid booster (2000 lbs payload into a ~~new~~ low inclination 100 n.mi. orbit);

b. liquid booster with dual XLR-91 (Titan) engines (up to 5000 lbs in orbit);