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UNITED STATES GOVERNMENT

Memorandum

TO : See list attached DATE: DEC 2 1968

FROM : HA/Manager, Advanced Missions Program

SUBJECT: Request for task support - "G" environment for future space systems

A general analysis of the NASA long-range planning schedule indicates that all future long-duration manned space flight systems will be designed for zero-G environment. This approach is based upon two major assumptions: Man can endure long exposure to zero-G without detrimental effects, and zero-G is the correct environment for large habitable space systems with science and technology development objectives. This memorandum postulates that artificial G is the right approach and requests your comments.

The inclusion of an artificial G experiment has been discussed as an objective to be met as part of the AAP; however, such experience or experiments are not included in the long-range planning schedule. Also, if such experiments were conducted as part of the AAP, the results would be concurrent with the Phase D implementation of the nine-man space station (EOSS)-- too late to influence the design.

You are requested to review and analyze artificial-G versus zero-G as the design approach for future space stations. It is suggested that your analysis address the aspects of "how it can be done" as well as "why it can't be done."

Some of the aspects of the subject which might be considered in your analysis include but are not necessarily limited to the following:

Why not base future orbital programs upon an artificial-G approach with zero-G experiments?

To what extent today can we assure that man can endure long duration (2 years) in a zero-G environment; would an artificial-G environment (0.2 - 1.0 G at 2-1/2 - 6 rpm) obviate the necessity for the extensive biomedical instrumentation presently associated with the zero-G programs; are there any obviating detrimental medical effects of artificial G; would an artificial-G environment be more conducive or necessary for "passengers" (scientists and engineers as opposed to highly trained astronauts); etc.?

To what extent do experiments demand a zero-G environment; can the majority of experiments be conducted in an artificial-G environment; etc.?

Are there any obviating engineering problems associated with an artificial-G space station; how can a zero-G field be made available in an artificial-G space station for experiment and technology purposes; how can special references for guidance and navigation be maintained; how can axial orientation for pointing experiments be maintained; how can project costs for an artificial-G station in the mid-1970's be supported in the nominal NASA budget; etc.?

Can the launch, insertion, and orbital readiness be accomplished; how can rendezvous and docking be accomplished; how might crew rotation be influenced; how could EVA be accommodated or avoided; etc.?

The usefulness of this data would be enhanced if results were provided in a manner that would allow a direct comparison between zero-G and artificial-G environments, using zero-G as a base, in such areas as development and operational cost requirements, development problems, schedule planning to encompass test support and component/subsystem developments, etc., reliability and safety comparisons, etc.

Your thoughts and opinions on this matter are requested by January 31, 1969, and may, with your further concurrence, be used to influence the forthcoming definition study on the EOSS.

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