BELLCOMM, INC.

SUBJECT: ~~Trip Report~~ - Martin Marietta Corporation Presentation on AAP-1A Study, MSC, September 25, 1967 ~~Case 600-2~~

DATE: September 29, 1967

FROM: J. J. Gabrik

ABSTRACT

Martin presented the results of a two month study of AAP-1A using an experiment carrier. The discussions included mission definition, experiment intergration, trade studies, hardware definition, CSM impact, schedule and cost. The carrier configuration presented weights approximately 5000 lbs, is basicly independent of CSM support, mounts in the SLA and is to be extracted and activated by the CSM.

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MEMORANDUM FOR FILE

Martin Study Effort

The material presented by Martin personnel at MSC on September 25 was the result of a two month study to define a hardware configuration and an approach for intergrating NASA designated experiments into AAP mission 1A. The Martin study effort is to continue until November 30 with task assignments reviewed and approved by MSC.

The basic study criteria imposed, along with coordination effort with MSC, resulted in guidelines stipulating a 14 day mission that could be flown as early as possible at an inclination of 50 degrees and at altitude of 140 nm. A single uprated Saturn 1B launch vehicle is to be used in conjunction with a basic Block II CSM with minimum change. Crew safety and minimum cost were to be prime considerations.

Mission Description

The mission goal as presented is to conduct meteorology, earth resources, bio-scientific and astronomy experiments in a low altitude high inclination earth orbit flight for as long as 14 days. The 50° inclination and 140 nm orbit produces an average of six daytime passes over the United States each 24 hours.

The launch vehicle constraint of 36,500 lbs in an 87 x 140 nm orbit allows 5,883 lbs for the carrier and experiments. A 5,000 lb limit was set on the carrier and experiments resulting in a 883 lb margin.

A nose down orientation of the carrier in orbit was selected based on visibility, sensor contamination, and environmental control. This results in a CM heat shield up configuration.

After transposing, docking and extracting the carrier from the SLA, the SM SPS will circularize the orbit at 140 nm. Pressurization of the carrier will be accomplished from the CM

and the docking hatch will be opened. The experiments operation is designed to require crew entry only for data retrieval and equipment transfer. It was recommended that entry be done in a soft suit with umbilical connections although a shirt sleeve environment is possible. No EVA is planned for the mission.

Experiment Intergration

Twenty-three (23) experiments were analyzed for intergration into the carrier. Eleven (11) were early A&B application experiments and twelve (12) were scientific experiments from the Apollo program. It was determined that eleven (11) experiment days were available in the mission. The first three (3) days for frog otolith (T004), five (5) days for Applications experiments and three (3) days for astronomy and navigation. The shorter experiments are interspaced in available time slots.

Two (2) scientific airlocks are located in the carrier to accomodate the experiments requiring ambient exposure.

The optimum launch period was determined to be from mid-April to mid-October based on the seasonal requirements of some experiments.

Configuration

The recommended carrier configuration consists of a welded aluminum truncated cone enclosure 84 inches in diameter at the experiment mounting end and 110 inches long. A LM type docking ring is on the smaller end. A truss supports the cone in the SLA and provides mounting for equipment not requiring pressurization or access.

Power for the carrier experiments and subsystems is provided by silver-zinc batteries. Environmental control is accomplished primarily by an active thermal system using freon 21 coolant circulated through equipment cold plates and external radiators. The data system consits of 1 S-Band and 3 VHF transmitters with a PCM encoder and a tape recorder/reproducer. The tape recorder used for the frog otolith experiment will be time shared with other wideband experiments.

A partial backup system for local vertical control, primarily for earth resources experiments, is proposed utilizing a horizon scanner and gyrocompass. Displays in the CM, driven by the carrier system, will be used by the crew for manual control.

CSM Impact

The major defined changes required to the CSM to accomplish the 1A carrier mission were the integration of experiments designed to be flown in the CM; providing storage space for data return; installation of a carrier experiment control panel in the CM; extension of the crew suit umbilicals; routing of the up data signals to the carrier; and providing CSM consumables for the added attitude control requirements, extra G&C power and oxygen for carrier support.

Schedule

The minimum schedule presented shows a flight readiness in 16 months from Go-Ahead. This minimum program does not allow for availability of S034 (day/night camera) and S040 (dielectric tape camera). The normal time span allows 20 months from Go-Ahead. Both schedules include a 4 month checkout at KSC.

Cost

The 16 month schedule budgetary cost was given at 35.3 million dollars. The 20 month program was estimated to be 36.3 million dollars. The cost estimates do not include experiment peculiar GSE, non-metallics criteria effect, spares, and experiments furnished GFP.

Available References

Data is available from the Martin Study in the form of a synopsis "AAP 1A Mission Study final report PR 29-81" and is also contained in more detail in "Technical Data AAP 1A 60 Day Study, PR 29-82" and "Compilation of Trade Studies PR 29-83."

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