[redacted]

1 JUL 1963

MEMORANDUM FOR THE RECORD

SUBJECT : [redacted] Briefing on 25 June 63 on AMOS Program

Attendance List

[redacted]

1. [redacted] was asked to come in and comment on the status of their work on data reduction for the [redacted] system. All of the enumeration equipment manufactured under [redacted] contracts has been delivered to [redacted] is performing only consulting work with AMS at the present time.

2. [redacted] had film from only two flights to work with. The first flight was not usable in this system because of lack of stellar photography. Stellar format was obscured by earth flare. Subsequent design change to the vehicle system reduced the flare so that usable stellar photography was obtained. [redacted] considered the stellar photography only "fair." They examined about 30 objects on each frame ... most of these are stars but they have no way of telling, in the normal routine, which images will be rejected as being non-stellar. The degrading effects in the stellar photography noted were primarily vignetting by the baffle installed to reduce earth flare and an apparent occasional rapid motion of the vehicle. This motion was estimated at 6° per minute although there was considerable uncertainty in this figure. It was stated as much larger than the normal pitch motion (½° per minute). The terrain photography was considered generally good. Of the total mission (2500 frames) approximately 1800 usable frames were obtained. The criteria for selection was the appearance of land mass within the terrain frame, accompanied by usable stellar photography, (all frames of the terrain which would have been otherwise usable did have stellar photography). Intermittent camera operation caused loss of coverage in the denied area. The

problem causing this intermittent operation has been investigated and corrected in component redesign. Of the 1000 frames analyzed, approximately 300 frames were over surveyed territory where map accuracy was 1500 feet or better. (Reference datum for this accuracy was not discussed). [redacted] expressed interest in getting the plot of the map holdings used by [redacted]

3. On the measurements on the 1000 stellar frames, data rejection criteria was established after measurement, frames were rejected if the standard deviation of the measurements was greater than 10 microns, with respect to the charted position of the stars. All of these rejected frames were remeasured or suitably corrected by rejection of images. The final modal value of the standard deviation was approximately 5 microns (corresponding to a 50 foot pointing error of the terrain camera at 300 miles altitude). The measurements on the terrain camera were based on a map matching technique at approximately 1:1,000,000 scale -- 4 to 5 points per frame. Rejection criterion was a standard deviation of greater than 100 microns. Frequently the strength of the space resection from the terrain photography was poor because of the distribution within the frame of the identifiable points. The 100 micron uncertainty corresponded to a few hundred feet on the ground.

4. In the final steps of the data processing, difficulties showed up in the computer program: Using the data from the 300 surveyed frames to improve the orbit calculations, errors up to 3000 meters in the location of the surveyed points resulted. Most of the errors were in the region of 1000 meters, the major component of the error being along the flight track. [redacted] is currently working on improving the program hoping to remove a large fraction of this error. Difficulties in the program arise partly because of the effect of segment of project and in the drag model and the way in which it is introduced in the computer program. It was noted by [redacted] that the Smithsonian BE Program represented a state of the art in 1958 and 1959 of generalized orbital improvement programs. The program was designed to accept a wide range of types of input data but was not specifically designed for using ARGON type data. Much has been learned in the past four years about near earth satellite orbits, including drag factors, gravitational perimeters, etc., as well as computing techniques. Follow-on work will undoubtedly require rework of the computer program.

5. A meeting is being set up with [redacted] of the Corps of Engineers to present the Army's briefing on the ARGON program. This meeting is currently scheduled for 0930, 5 July in the OSA Conference Room.

6. The following comments represent my understanding of the state of the [redacted] and additional work that might be desirable on the part of [redacted] for application to the overall satellite reconnaissance program. First, it would appear that considerable useful information on the accuracy of interpolation and extrapolation of position of a satellite could be gained by comparison of satellite position determined from ground photography with the position based on various ephemerides generated by the satellite's tracking center. Second, the inflected vehicle motions should be analyzed and this input given to the vehicle guidance people. This observation of rapid motion may be particularly important with regard to the use of a stellar index camera on the [redacted] program and on the [redacted] program. Considerable work is underway at ACIC and Lockheed on the orbital ephemerides accuracy problem. Comparisons should be made between the programs being generated at Lockheed and [redacted] with the Smithsonian program. Deficiencies noted in the Smithsonian program may be applicable elsewhere.

7. A determination should be made on the question of uncertainty in the various orbital parameters; e.g., how well is the orbital plane determined. Some of these factors can be analyzed by convolutions of error components. The vehicle motion and gyro compassing errors may be determinable from the time history of vehicle inertial attitude and actual yaw.

SIGNED

[redacted]
Development Division
(Special Activities)

[redacted] (27 June 63)

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