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Rough Draft to J. Chalmers

From: R. S. Gaylord

Quick History of Aerospace Affects on MOL Payload

1. An early decision was required to resolve the pointing control configuration of such a large aperture optical system and, so Aerospace led a study to select the In line Configuration where a tracking mirror is utilized rather than the direct pointing of the entire optical barrel (called "Dump Truck").
2. Aerospace selected a tracking mirror drive configuration utilizing direct drive d.c. torquers and ball bearings and recommended GE for the task (of the Associates in the program).
3. Aerospace orbital dynamics studies led to removal of the tracking mirror from attachment on the optics barrel and recommended a Beryllium tripod gimbal supported from the Laboratory Module structure.
4. Further orbital dynamic analyses have required that Aerospace derive the complex optical element's vibration sensitivity matrix and obtain all associate contractor's approval to utilize this matrix on all future studies to determine the significant stiffness requirements and major sources of perturbation on the orbiting vehicle.
5. Derived the original system performance error analyses which led to definitions showing:
  - a. Need for IVS in automatic version
  - b. Need for Star Tracker in automatic version
  - c. No need for GE proposed extra platforms and gyros
  - d. No need for GE proposed gyros on COA
  - e. Need for Alignment monitor set
  - f. Need for digital computer

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Page 2

- g. Establish need for backup with Low G —?
- h. Establish need for other methods of better ephemeris —
6. Derived and published original ground target rate tracking equations to produce nominal ground target tracking rate outputs from airborne digital computer.
7. Derived pointing equations.
8. Aerospace derived the soft, slew logic required to prevent undue perturbations of the tracking dynamics.
9. Aerospace designed the required navigation equations and software methods to be utilized.
10. Field Break was Aerospace recommendation saving a great deal in ground facilities, especially at Philadelphia.
11. "No single failure" concept and redundancy was Aerospace recommended.
12. Single most important development tool was recommended by Aerospace, namely the Brassboard of Tracking Mirror Drive, which has uncovered many problems requiring early attention.
13. Aerospace wrote the black mission portions of the SP/DR.
14. Aerospace wrote the GE-AVE CEI Specification.

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10/24/67

SLIDING MASK DESIGN

1. A decision was made in January 1967 to convert the thermal door design from one actuated in roll to a linear sliding mask moving in the longitudinal direction. The rolling design was a GE design and would not provide adequate thermal protection of the tracking mirror. View factor data was obtained on the rolling design and was used with an Aerospace computer program providing temperature distribution and resultant <sup>MIRROR</sup> distortion to determine that excessive distortion resulted from the rolling design. A decision was then made to use the sliding mask design with <sup>louvers</sup> ~~lunars~~ on the tracking mirror.
2. GE is using a ball bearing design for the tracking mirror drive system. Concern whether the bearings would create excessive noise in the tracking mirror drive loop was expressed to GE in January 1967. Suggestions were made to expand <sup>their</sup> the bearing test program, particularly to obtain power spectral density data on bearing noise. The resulting expanded test program is leading to a better understanding of the factors that lead to degraded tracking mirror drive performance. In addition, suggestions were made to GE on the installation and bearing preload design which lead to an improved design for tracking mirror drive performance.
3. A study was made of the capability of the flight alignment monitor system to be used for ground alignment of the camera optical assembly with respect to the tracking mirror drive reference. It was determined <sup>from this study</sup> that a seismic-mass was not required at Huntington Beach for alignments.
4. A decision was made to provide a high resolution acquisition and tracking system for active target assessment by the crew. A decision to use an all optical system rather than TV was made.

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