W O R K I N G P A P E R

~~TOP SECRET~~

10 September 1968

MEMORANDUM to William BOENNING, SAFSS

I. Additional development work necessary for GGS systems for Mission 7106 because:

A. Increased demands for stabilization performance to

(1) Support the [redacted] of payloads in flight and

(2) Station keeping (controlled flight spacing) of payloads

(3) Collection systems have operational mode where opposite quadrants of collection antenna system are used so this demands the capability of ascertaining the instantaneous payload attitude and heading.

(4) Collection antenna systems have in some cases greater directivity requiring improved Yaw, Pitch and Roll attitude characteristics so the signal intercept is not modulated by payload attitude.

B. Difficulty with Mission 7105 flight systems has shown their characteristics to be inadequate for use in Mission 7106

(1) Attitude changes are not predictable

(2) Nor controllable for periods where thrusting is needed to adjust [redacted]

(3) Performance of data collection systems have been severely degraded on the occasions when the payload was changing attitude in Pitch and Roll axis. But even greater loss was encountered when the payload was inverted for periods as long as 5 weeks (April, May 1968). On this occassion those collection bands in the spectrum from 4 GHZs upward were faced with an antenna system which aimed upward at an angle of about 60 degrees above the earth out into space. Only on large roll or pitch deviations did these bands intercept data at all. This situation is

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Handle via Talent-Keyhole Control System Only

intolerable in any Design to be used in the future.

C. Aspects of the Gravity Gradient Stabilization Difficulty:

(1) The early portion of the flight was priviledged to have predictable performance from the GGS systems.

(a) They both captured inverted and were inverted to right-side-up.

(b) They both had sufficient small changes in Yaw so that the thruster systems could be utilized [redacted]

(2) Only one payload had a memory system to observe the attitude (relative to the local vertical, the Earth Magnetic Field and the solar direction) over periods of up to 12 hours. This system allowed detection of the degradation of the stabilization system on this particular payload (7105 Delta) as the duration of the flight progressed on toward the end of the first year.

(3) Analysis of the memory aspect-data ultimately disclosed that the GGS disturbances were somewhat associated with the rate which the payload was first illuminated and then shaded during the orbit, and analysis further disclosed the tendency of the long booms to flex under thermal stress thus suggesting that mechanical oscillatory conditions would occur when the booms moved so that the combined effect of several booms was to reinforce the total displacement of the payload in Yaw motion.