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(A) Data Cntrl
Office
L. Herman
3 May 1967
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From: MOL Systems Program Office
Los Angeles Air Force Station, California

To: Douglas Aircraft Company
Space Systems Center
5301 Bolsa Avenue
Huntington Beach, California

Info: AFPRO, Douglas Aircraft Company
Huntington Beach, California

Subject: Request for Engineering Change Proposal (RFECP)
SAFSL-5C Control No. DB-1
Contract AF 18(600)-2956

1. Purpose

The purpose of this RFECP is to identify the impact of incorporation of an additional Attitude Control and Translation System (ACTS) requirement into the baseline system.

2. Background

In depth analysis of the mission payload has indicated that a new capability may be required of the ACTS.

3. Direction

DAC is requested to submit a formal ECP with two copies of a firm price proposal in DD 633 Summary for Eight Task Level Breakdown within 30 days of receipt of this letter for the addition of the capability to provide a roll axis rate bias during inhibit operation mode as specified in 3.1.4.2 of Enclosure 1.

Enclosure 1 is the up-to-date version of the proposed ACTS/ Payload Interface Specification (IFS-MOL-707003) and is to be utilized as the basis for this ECP unless potential changes which will result in significant system improvements are discovered. These changes shall be brought to the attention of the SPO as soon as feasible. Changes which do not appear to lead to significant system improvements should not be pursued.

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3. Direction (Continued)

The ECP shall include the complete impact of this change including:

- a. Cost
- b. Dry weight
- c. Propellant weight estimate and the analysis upon which the estimate is based.
- d. A description of the proposed mechanization including block diagram and basic hardware characteristics; including analysis of IOM performance in any local vertical or attitude hold mode.

4. Effectivity for this change shall be Flight No. 3 and subsequent.

5. Requests for further technical information concerning this change should be referred to Lt. Col. Bretting and L. K. Herman.


JAMES E. COLEMAN

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ENCLOSURE 1

ACTS PAYLOAD INTERFACE REQUIREMENTS

This document contains the up-to-date ACTS/ Payload portion of IFS-MOL-707003. It is to be utilized to establish a common interface for contractor design efforts until proposed changes have been approved by the SPO.

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3.1.4 Control Dynamics Interface

The control dynamics interface is the relation between performance requirements on the ACTS, the mission profiles, mirror-drive dynamics and dynamics response of the controlled vehicle. There is no direct hardware interface except for the preflight alignment and/or calibration. All data transmitted between systems will be through the airborne digital computer.

3.1.4.1 Control During Photographic Operation

The ACTS shall be in the INHIBIT OPERATION MODE (IOM) during photographic operations. In IOM, a sequence of inhibit and enable periods will be generated by GE-AVE in the DCSG. Reaction jet firing shall be inhibited during the inhibit period and the jets shall operate as required during the enable period. IOM shall be operable with the ACTS attitude reference in any local vertical or attitude hold mode. The enable periods shall not occur during, or within 0.20 sec after completion of, a roll axis Tracking Mirror slew.

The inhibit period shall not be longer than 60 sec or less than 5 sec. The enable period will not be less than 1.0 sec or longer than 30 min.

The total number of cycles (a cycle includes an enable and inhibit period) shall not exceed 3000.

IOM sequence operation shall not exceed 30 min. per rev.

A maximum of 25 IOM sequences may be initiated in a twenty-four hour period.

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3.1.4.2 Roll Rate Bias

Prior to enable, GE-AVE will determine, in the DCSG, if undesirable TM gimbal drive characteristics will exist during the next inhibit period. If the condition will exist, GE-AVE will provide a discrete signal to the ACTS, through the LDAU, requiring a positive or negative roll rate bias. The roll rate bias requirements are:

Magnitude ($\Delta \dot{\phi}$): >0.054 deg/sec

Maximum number per 30 days: 700

3.1.4.3 DRV Launch Operations

For DRV ejection, the LV shall be brought to a nominal 30° pitch-down attitude and stabilized until the DRV has been launched.

The following requirements apply:

- a. The time to bring the LV from normal attitude to a nominal 30° pitch-down attitude shall not exceed 100 seconds.
- b. At time of DRV launch the LV stabilization requirements (3σ) referenced to LV/OP) are:

$$\theta = -30 \pm 2^\circ$$

$$\phi = 0 \pm 2^\circ$$

$$\psi = 0 \pm 5^\circ$$

$$\dot{\theta} = 0 \pm 0.2 \text{ deg/sec}$$

$$\dot{\phi} = 0 \pm 0.2 \text{ deg/sec}$$

$$\dot{\psi} = 0 \pm 0.2 \text{ deg/sec}$$

- c. This attitude shall be held for a period of time not to exceed that specified in Paragraph 3.3.2.2.7.4.3 of SS-MOL-1A.

3.1.4.4 Data Interface

3.1.4.4.1 Inhibit

GE-AVE will generate the inhibit signals.

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3.1.4.4.2 Roll Rate Bias

GE-AVE will provide discrete commands indicating the polarity of the required vehicle roll rate biases. The selected polarity shall result in rates which minimize the OV attitude deviations at the end of the inhibit period.

4.1.4.4.3 Vehicle Rate and Attitude Data

ACTS will provide vehicle rate and attitude data as per section 3.3.2.2.7.4.1 in SS-MOL-1A.

3.1.4.4.4 Data and Command Transmission

All data and commands between GE-AVE and the ACTS will go through the computer via the LDAU and MDAU.

3.1.4.5 OV Transients

3.1.4.5.1 Disturbances

Vehicle attitude and attitude rate disturbances, due to starting or stopping of rotating or translating machinery within the OV shall be limited as given in Table 3.1.4.5.1.

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3.1.4.5.2 OV Attitude and Rate Response

These requirements apply only with the attitude reference in the LV/RVV mode.

3.1.4.5.2.1 OV Attitude Response

The OV attitude excursions (3σ) from the Local Vertical/Relative Velocity Vector (LV/RVV) orientation during IOM shall not exceed:

- + 1.5 degrees about the pitch axis
- + 1.5 degrees about the yaw axis
- 5.0 degrees about the roll axis

3.1.4.5.2.2 OV Rate Response

The OV rates relative to the LV/RVV orientation during the tracking portion of the IOM shall not exceed (3σ):

- + .02 deg/sec about the pitch axis
- + .02 deg/sec about the yaw axis
- + .03 deg/sec about the roll axis

The OV rates relative to the LV/RVV orientation during the slew portion of the IOM shall have 3σ values of less than:

- + .1 deg/sec about the pitch axis
- + 0.1 deg/sec about the yaw axis
- + 0.4 deg/sec about the roll axis

3.1.4.6 Control Logic

The ACTS control logic for IOM shall be designed to achieve the minimum practical propellant expenditure during a sequence of cycles.

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3.1.4.7 Interface Definition

3.1.4.7.1 ACTS Control Logic

This section contains a description of the ACTS control logic (phase plane diagrams and block diagrams) associated with IOM.

3.1.4.7.2 GE-AVE Computer Logic

This section contains a description of the GE-AVE (computer flow charts and block diagrams) associated with IOM.

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Xp = 250,000 SIGS FT²
 Yp = 240,000 SIGS FT²
 Zp = 13,000 SIGS FT²

| | | MODE | | | | | |
|--------------|-------|--------|----------|----|----------|----|----------|
| | | ENABLE | | | SLEW | | |
| AXIS | | IM | MPSS-AVE | IM | MPSS-AVE | IM | MPSS-AVE |
| MAX. ANGULAR | PITCH | | | | | | |
| RATE CHANGE | YAW | | | | | | |
| DEG/SEC | ROLL | | | | | | |
| MAX. ANGULAR | PITCH | | | | | | |
| CHANGE | YAW | | | | | | |
| DEG | ROLL | | | | | | |

TABLE 3.1.4.5.1

VEHICLE DISTURBANCE ATTITUDE AND ALTITUDE RATES DUE TO VEHICLE EQUIPMENT AND MPSS-AVE

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