

National Aeronautics and
Space Administration
Lyndon B. Johnson Space Center
Houston, Texas
77058

DA8-88-91 (FT)

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TO: Distribution

FROM: DA8/Chairman, Ascent/Entry Flight Techniques Panel

SUBJECT: Ascent/Entry Flight Techniques Panel Meeting #51 Minutes

The 51st Ascent/Entry Flight Techniques Panel (FTP) meeting was held at JSC on November 10, 1988. Rockwell-Downey and KSC participated via teleconference. Any questions or comments should be directed to DA8/R. D. Dittemore at 713-483-5417 or FTS 525-5417. The following items were discussed with the decisions made and actions assigned as noted.

Overall Summary:

a. Delaying the keyboard selection of "ATO" in order to inhibit the abort dump OMS/RCS interconnect is acceptable. The time delay to inhibit the interconnect has little or no affect on the resultant MECO underspeed.

b. The forward RCS delta V contribution will be Included in future onboard crew "zone target graphs" if the format can be developed to be acceptable to the crew. Addition of the forward RCS to the crew charts updates the "no comm" decision process to be identical to the MCC philosophy of committing the FRCS for 0h5-2 in order to avoid an AOA.

Detailed Minutes:

1. Action item 88/09/09-001: Jet Flowrate Capability from FRCS Lower Compartment (with/without gas ingestion)

Deferred.

2. Nominal On-Orbit FCS Checkout Usina Circ Pump Instead of Starting an APU - DF6/M. J. Ferring

DF6/J. M. Webb briefed the FTP on the additional flight control systems checkout that can be performed when an APU is started versus only using a circ pump. Although the circ pump option is acceptable in determining whether or not an ASA null driver failure is present, Mr. Webb recommended maintaining the "APU start" option because this option provides a full check of the driver and fault detection circuitry for all surfaces plus may expose/clear any silting that may have occurred while on orbit.

From an APU point of view, using the circ pump is preferable to starting an

APU. The most likely time for an APU to experience anomalies is when the APU is running. Eliminating the requirement to start an APU on-orbit reduces the exposure to failures that could result in loss of the APU for entry.

Because advantages and disadvantages exist for both options, the FTP asked Rockwell, the Systems Division, the Astronaut Office, and Orbiter Engineering to provide an integrated systems recommendation as to which option is preferable.

Action: 8B/11/10-001: Rockwell-Downey/FB81/R. F. Zach, DF/J. Knight, CB/J. O. Creighton, VF3/D. W. Camp - Provide an Integrated systems recommendation on the options to either start an APO or use a circ pump to determine if an ASA null driver failure has occurred. Provide results to the FTP in December 1988.

3. STS-29 - DM12/P. E. Collector

An overview of the STS-29 mission was presented. Items of Interest follow (see enclosure 1):

- a. Launch window protects 2 deorbit opportunities on the nominal EQN day, EOM + 1, and EOM + 2 (2-2-2).
- b. Two TAL sites are available, Ben Guerir and Noron.
- c. Touchdown weight is predicted to be less than 195,000 lbs.
- d. The alternate elevation schedule ("generic mid") will be used for the nominal EOM and for TAL. The nominal ("aft") schedule will be used for RTLS and AOA.
- e. The abort OMS/RCS interconnect will be enabled at launch for RTLS and TAL but inhibited for ATO.
- f. Overview of DTO's and DSO's (enclosure 2).

4. "Press Boundary" Abort Interconnect Enable/Inhibit Management - DM3/J. V. Turner

Mr. Turner reviewed the groundrules and constraints associated with determining whether or not the abort OMS/RCS interconnect should be enabled or inhibited (i.e., as long as the dump can be completed prior to MECO without the interconnect, the dump can be inhibited). In general, for OMS loads greater than 15,000 lbs an interconnected dump is required in order to satisfy TAL dump requirements prior to MECO. If RTLS were the only dump consideration, only those loads greater than 20,000 lbs would require enabling the interconnect.

Performing the ATO dump using only the OMS engines results in a propulsive contribution that, if assumed in the ARD's calculation of performance, can result in the press boundary occurring 3-8 seconds earlier than if an interconnected dump were performed. Because of this gain in press-to-MECO capability, it is desirable to inhibit the ATO interconnect. Additionally, because the interconnect configuration is established immediately after selecting the ATO abort, it is desirable to inhibit the interconnect prior to

abort selection In order to preclude any valve movement. This latter desire is not required but does eliminate the possibility of configuration problems that may arise should valve failures occur during establishment of the interconnect or interconnect return prior to MECO.

Data was presented that showed delaying the selection of the ATO abort approximately 20-30 seconds had little or no affect on the resultant ATO underspeed. As a result, Mr. Turner recommended that the abort Interconnect be inhibited (when OMS loads permit) prior to the ATO abort selection. The FTP concurred.

For flights where the ATO dump was planned to be enabled in order to complete the dump prior to MECO, It was not clear whether this option was the best choice considering performing the dump using only the OMS engines to achieve the propulsive contribution may satisfy the design MECO underspeed without having to dump as much OMS propellant. Mr. Turner accepted an action to investigate the tradeoffs between completing the dump interconnected versus achieving the propulsive contribution associated with the OMS only option.

Action: 88/11/10-002: DM3/J. V. Turner - Determine the impact of performing the ATO dump with the interconnect inhibited in order to achieve the OMS dump propulsive contribution even though a full dump may not be able to be completed.

5. Use of FRCS to Avoid AOA - DM3/M. R. Grabois

Mr. Grabois briefed the FTP on the proposal to include the FRCS delta V contribution on the onboard crew "zone target" charts for use during OMS-2 in order to avoid an AOA. Addition of the FRCS to the crew charts will result in the charts being identical to the NCC philosophy of committing the FRCS for OMS-2 in order to achieve ATO capability (provided the FRCS can support the entire OMS-2 burn to at least a safe perigee).

The FTP agreed to add the FRCS contribution to the crew charts contingent upon Astronaut Office review of the format and readability considering the other information that is already present on the cards (see enclosure 3 for sample preliminary card).

6. Definition of Minimum Tank Pressure at SSE Shutdown for Non-isolatable Helium Leakage - Rockwell-Downey/AE70/T. I. Lack

Rockwell-Downey reviewed the concerns associated with protecting SSME shutdown capability and identified shutdown helium requirements, pre-MECO and post-MECO, to protect against large helium leaks (Rocketdyne maintains that if helium requirements are not met a safe engine shutdown cannot be guaranteed). Helium is required during a nominal zero g shutdown to pressurize the POGO accumulator and thereby satisfy NPSP shutdown requirements. Pre-MECO shutdown requirements also exist in order to satisfy POGO flow and pre-burner purge flow requirements (note that if the auto shutdown function is enabled and hydraulic shutdown capability remains, the engine will be safely shutdown when the intermediate seal purge redline limit is violated without manual intervention).

To protect the minimum helium tank pressure requirements, Rockwell has developed a set of curves relating different leak rates to the amount of

helium required to support both the leak rate and safe engine shutdown as a function of pneumatic or hydraulic shutdown capability (enclosure 4). The data presented only included leak rates less than or equal to 0.3 lbs/sec and did not include use of the pneumatics helium supply. Worst case leak location (engine interface) and dual regulator capability were also assumed. The FTP agreed with the above assumptions with the exception of asking Rockwell to include use of the pneumatics helium supply in the development of the data for use on STS-27 and subsequent flights. Higher leakage flowrates up to 0.6 lbs/sec will also be analyzed, providing more data points and a more representative minimum tank pressure curve".

Ronald D. Dittimore

4 Enclosures