

MIT/DL PROGRAM CHANGE ROUTING SLIP

~~PCN~~ / PCN # 1041

ANOMALY # _____

- | | |
|-------------------------------------------------|--------------------------------------|
| <input type="checkbox"/> COLOSSUS 2D | <input type="checkbox"/> LUMINARY 1C |
| <input checked="" type="checkbox"/> COLOSSUS 2E | <input type="checkbox"/> LUMINARY 1D |
| <input type="checkbox"/> COLOSSUS 3 | <input type="checkbox"/> LUMINARY 1E |
| <input type="checkbox"/> COLOSSUS | <input type="checkbox"/> LUMINARY |

- | | | |
|-------------------------------------------|-------------------------------------------------------|---------------------------------------------------------|
| <input type="checkbox"/> MIT Approved PCN | <input type="checkbox"/> NASA Approved PCR | <input type="checkbox"/> NASA Approved Software Anomaly |
| | <input checked="" type="checkbox"/> NASA Approved PCN | <input type="checkbox"/> MIT Approved Software Anomaly |

A. Coding

- Begin coding immediately

ACTION: Al Engel

Program Supervisor's Approval: Margaret Hamilton

- Do not code until new GSOP material has been approved by the Mission Design Review Board (MDRB) and distributed.

B. GSOP Preparation

- Prepare GSOP revisions for MDRB consideration

ACTION: J. KLAWNSNIK

Technical Committee Meeting not required

Technical Committee Meeting(s) held on _____
Attendees: _____

C. KSC Testing and Checkout

- Review for possible impact on KSC testing and checkout

ACTION: _____

D. Other Programs Affected

- Review for corresponding changes in _____

ACTION: _____

Special Instructions

Project Manager Stephen L. Cuff

Date 5/19/70

APOLLO SPACECRAFT SOFTWARE CONFIGURATION CONTROL BOARD PROGRAM CHANGE REQUEST

NUMBER (Completed by FSB)

1041

1.0 COMPLETED BY ORIGINATOR

1.1 ORIGINATOR S. Copps	DATE 5/6/70	1.2 ORGANIZATION MIT	APPROVAL	DATE
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1.3 EFFECTIVITY COLOSSUS 2E	1.4 TITLE OF CHANGE Add AVEGFLAG check in Implementation of PCR 984.
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1.5 REASON(S) FOR CHANGE
No need to bypass in coast

1.6 DESCRIPTION OF CHANGE
Add AVEGFLAG check in implementation of PCR 984 - Avoid coarse align during SATURN, if AVEG is running.

2.0 SOFTWARE CONTROL BOARD OR FLIGHT SOFTWARE BRANCH DECISION FOR VISIBILITY IMPACT ESTIMATE BY MIT

2.1 <input type="checkbox"/> APPROVED <input type="checkbox"/> DISAPPROVED	2.2 REMARKS:
2.3 SOFTWARE CONTROL BOARD OR FLIGHT SOFTWARE BRANCH SIGN OFF	
DATE	

3.0 MIT VISIBILITY IMPACT EVALUATION:

3.1 SCHEDULE IMPACT 0	3.2 IMPACT OF PROVIDING DETAILED EVALUATION
3.3 STORAGE IMPACT 0	3.4 REMARKS:
3.5 MIT COORDINATOR <i>Stephen L. Copps</i>	
DATE 5/11/70	

4.0 SOFTWARE CONTROL BOARD ACTION

4.1 <input checked="" type="checkbox"/> IMPLEMENT AND PROVIDE DETAILED CHANGE EVAL. <input type="checkbox"/> PROVIDE DETAILED CHANGE EVALUATION <input type="checkbox"/> DIS-APPROVED	4.2 REMARKS
4.3 SOFTWARE CONTROL BOARD SIGN OFF	
DATE 5/14/70	

5.0 MIT DETAILED PROGRAM CHANGE EVALUATION

5.1 MIT COORDINATOR	5.2 MIT EVALUATION
DATE	

6.0 SOFTWARE CONTROL BOARD DECISION ON MIT DETAILED PROGRAM CHANGE EVALUATION

6.1 <input type="checkbox"/> START OR CONTINUE IMPLEMENTATION <input type="checkbox"/> DISAPPROVED OR STOP IMPLEMENTATION	6.2 REMARKS:
6.3 SOFTWARE CONTROL BOARD SIGN OFF	
DATE	

3.5.2 Manual Mode

The Manual (Stick) Mode of CMC - SATURN IU takeover provides the crew with a capability of issuing RHC commands, through the CMC, to the SATURN IU autopilot. To initiate the SATURN manual function, the crew must first set to "3" the CONFIG octal window of Noun 46 R1. This is done by means of Verb 48 (R03). The crew then executes Verb 46. The routine is disabled by setting the CONFIG window to "0" and repeating Verb 46.

Keying VERB 46 ENTR (with CONFIG = 3) during P11 terminates the attitude-error subroutine (automatic mode) and leaves only the RHC for issuing control signals to the IU. The RHC out of detent provides constant maneuver rates based upon stored erasable parameters.

The manual takeover mode is entered once each 100 ms by means of the TIMES clock and interrupt mechanism. During each cycle, the RHC bits are sampled, and rate commands are generated that remain in force until updated by the next cycle. The commands are communicated to the SATURN IU autopilot by means of the IMU error-counter digital-to-analog converters.

Since the IMU error counters also drive the FDAI attitude-error needles, these needles will be driven by stick commands. Because the stick commands are implied rate commands, and the needles are designed to indicate attitude errors, the magnitude of the needle deflection is not meaningful; the sign of the needle deflection will be the opposite sense of the stick deflection.

3.5.3 Coarse Align Avoidance during SATURN Steering

If gimbal lock is detected ($CDUZ > 85^\circ$ magnitude, either real or due to $CDUZ$ transients) ^{and if AVEG is running} during SATURN ~~(CONFIG = 3)~~, coarse aligning of the IMU is bypassed in order to preserve the integrity of the CMC/SATURN IU interface for possible use by the manual SATSTICK mode discussed in section 3.5.2 above. Coarse align CDU moding uses the same error counters and digital-to-analog converters used by SATSTICK, so it is necessary to avoid this conflict. Stick capability is mandatory; therefore, coarse aligning must be avoided.

3.5.4 Restarts

Restarts in either Automatic or Manual Mode will

- (1) Disable SATURN TAKEOVER relay,
- (2) Return command values to zero,
- (3) Re-enable SATURN TAKEOVER relay.

In the Automatic Mode, the computation of attitude error resumes and a new attitude-error bias is stored at each restart.