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LUMINARY Memo #50

To: Distribution
From: C. Schulenberg
Date: 2 November 1968
Subject: LUMINARY Revisions 48-50

Major Changes Incorporated into Revision 49

Note: Rev. 49 was made to fix serious problems in Rev. 48.

- 1) The restart protection of P12, P70 and P71 was improved.
- 2) PCR 246 was implemented, thus giving the Descent guidance two distinct modes of operation (see LUMINARY Memo 43 and 44).
- 3) Extended verb 68 was created in connection with item 2. If the guidance is in the one-phase mode of operation, execution of verb 68 will force an immediate switching to P64.
- 4) A program bug was corrected in P68. It was necessary to initialize GSAV as well as YNBSAV and ZNBSAV for a subsequent P57.
- 5) The PINBALL routine was modified to automatically release the DSKY following the termination of a load in order to solve a priority display problem.
- 6) A bug was fixed in R61/R65 by insertion of a check on the TRACK flag prior to the R60 call. This prevents conflicts between an R60 called by P40, for example, and one called by P20 in the background. The R60 desired by P20 in this case will be suppressed.
- 7) The restart routines were modified so that the digital autopilot is forced to re-initialize on software restarts as well as hardware restarts. Thus a BAILOUT or a POODOO will cause the DAP to restart (a V37, however, will not cause a DAP restart). This solves a serious problem with BAILOUT and POODOO since these routines are capable of interrupting and terminating the DAP JASK without resetting DAPZRUP. The result of this was that a DAP 2000 abort could occur.
- 8) Restart protection (in group 4) was added to POODOO so that once the routine is entered it is for keeps (until the abort sequence is over). This is necessary since POODOO selectively inactivates restart groups.

- 9) A program error was corrected in DVMON that had had the effect of never allowing GTS control to be enabled.
- 10) A bug was corrected in the IMUZERO routine by the addition of a call to CAGETEST at IMUZERO2 and IMUZERO3. Formerly, if a call to IMUZERO by R47 or V40 N20 was interrupted by an IMU Turn-on sequence the result was a TC SWRETURN while on a task.
- 11) Coding was added to V41 N72 to revert the job from a VAC to a NOVAC prior to going to RADSTALL. This liberates a VAC area that is not needed.
- 12) A bug was corrected in R04 that had caused the RR CDU OK bit in RADMODES (bit 7) to be set to the state of bit 7 of channel 33 (LR position 2 inbit).
- 13) The IMU Performance Test Routine was modified to terminate itself if the overflow alarm (1600) is triggered.
- 14) Coding was added to the DOFSTART routine in order to keep the IMU in coarse align (if it had been in gimbal lock) through an inflight fresh start.
- 15) The GOODEND/BADEND routine was modified so as to honor only the first "END" request following the corresponding "STALL" request.

Major Changes Incorporated into Revision 50

- 1) An overflow problem was corrected in R59.
- 2) Verb 68 was modified so that it will turn on the operator error light unless the major mode is 63.
- 3) The treatment of the four flagbits CMOONFLG, LMOONFLG, SURFFLAG and REFSMFLAG was altered so that these bits are now unaltered by any type of Fresh Start. APSFLAG was already being handled in this manner. The reasoning behind this change was that these types of bits indicate the status of the AGC's environment and there is no way in a Fresh Start to determine what the correct settings should be -- hence, they are not altered.
- 4) A new core set was added. There are now eight core sets and five vac areas.
- 5) A bug was fixed in the coding added in Revision 49 to the GOODEND/BADEND routine (see item #15 for Rev. 49).
- 6) Coding was added to the Measurement Incorporation routine in order to improve the accuracy of state vector updates (through normalization operations) when the W-matrix is small.
- 7) Coding was added to P20/P22, at the point where the W-matrix is initialized, to check the Surface flag in order to load the proper pad-loaded initial variances.

- 8) The "Please-Perform" code 201 was hooked up for P22.
- 9) Four new padloads were defined for P20/P22: RANGEVAR, RATEVAR, RVARMIN and VVARMIN. LSR22.3 was modified to load and rescale the single-precision registers RVARMIN and VVARMIN.
- 10) PCR 541 was implemented by inserting a 2 second delay between successive marks of P22.
- 11) R22 was modified to load MARKTIME at the mid-point of the Range-rate reading.
- 12) A bug was fixed in R29's call to REMODE that occasionally had resulted in activating R21.
- 13) The restart routine was modified to set the engine-off outbit in channel 11 if ENGONFLG = 0. The routine had always set the engine-on outbit if ENGONFLG was 1. Now it does one or the other.
- 14) The fresh-start routine was modified to leave the status of the engine outbits in channel 11 unaltered if the fresh-start was initiated by the AGC automatically (without agreement of the astronaut). A commanded Fresh-Start will still turn the engine off.
- 15) Sundance anomaly Y45 was corrected by checking the delta-time required prior to turning off the engine and forcing it to be 10 ms if it turned out to be zero or negative.
- 16) The "mass-prediction" routine inserted into P63 as part of PCR 246 was deleted since it turned out to be unnecessary.
- 17) Coding was added to V37 in order to prevent either P20 or P25 from running in the background with P22, and also to prevent P22 from running in the background with anything.
- 18) PCR 542 was implemented by clearing the PULSES bit of DAPBOOLS at P63 ignition.
- 19) Coding was added to P63 to initialize DELTAH to a number that will display as +99999 feet in noun 68. This will give the astronaut a more certain indication that DELTAH has begun to be updated.
- 20) The method of determining the time at which the LR should be commanded to position 2 was implemented as required by PCR 246.