

Massachusetts Institute of Technology
Instrumentation Laboratory
Cambridge, Massachusetts

LUMINARY Memo #29

To: Distribution
From: C. Schulenberg
Date: 4 June 1968
Subject: LUMINARY Revisions 17 and 18

Major Changes Incorporated into Revision 17

- 1) Coding was added to V37 to initialize LRSTAT to octal 40000.
- 2) An Inhint was added to MR.KLEAN for the benefit of the new ABORT routine.
- 3) GOPROG2 was modified to clear only bits 7 and 14 of RASFLAG (now equal to FLGWRD10).
- 4) A missing INHINT was added to the ABORT routine.
- 5) NEWPHASE was deleted from LUMINARY. It will continue to exist in COLOSSUS where FIXED-FIXED is more plentiful.
- 6) A usage of NEWPHASE in the UPDATE program was replaced by equivalent coding in order to permit deletion of NEWPHASE.
- 7) Alarm logic for Landing Radar repositioning failure was added to SERVICER.
- 8) Logic was added to SETTRKF to light the Tracker Fail Lamp in case of unreasonable Landing Radar data.
- 9) The ignition point for P12 and P71 was coded to set the flag SWANDISP, thus allowing operation of R10 (Landing Analog Displays). This is in violation of the current GSOP and was done for testing purposes only. A PCR is being written that would allow R10 operation during P12, P70, and P71.
- 10) Coding was added to P70 to inhibit a P71 after the waitlist call for ENGINOF2 had been set up. This is in violation of the current GSOP and must be resolved.
- 11) Coding was added to AVGEND (the SERVICER termination routine) to clear SWANDISP, thus shutting off R10.

- 12) The AGS Initialization Routine was brought up to date with SUNDANCE.
- 13) The Landing Radar parameter HANGLE was moved from erasable to fixed memory.
- 14) The two R29 flags NOR29FLG and READRFLG were moved from FLGWRD10 to FLAGWRD0.
- 15) RASFLAG was equated to FLAGWRD10.
- 16) Six Landing Radar parameters were defined as pad-loads. These are: LRHMAX, LRVMAX, LRWH, LRWVZ, LRWVY, and LRWVX.
- 17) Major changes were made to the Ascent and Descent erasables.
- 18) Minor changes were made to R10 for the purpose of simplification. In addition, R11 was attached to the R10 task and hence now operates at a frequency of 4 times per second.
- 19) R13 was de-subroutinized and placed in the main-line Descent guidance loop.
- 20) Sign agreement was added to the force computation in the THROTTLE routine.
- 21) P31 was completely rewritten.
- 22) P47 was modified to use the MIDTOAVE routine. A PCN that will justify this is pending.
- 23) MIDTOAVE was added to BURNBABY and hence is now being used by P40, P41, P42, P63, and P12. PCR's must be written to justify this for P12 and P63 since Section 4 of the GSOP does not specify MIDTOAVE.
- 24) A coding error was corrected in P57.
- 25) R10 was modified to examine the RRCDUZRO, RRREMODE, and DESIGNATE-IN-PROGRESS bits. R10 is suppressed if any of these bits are set. In addition, coding was added to inhibit R25 (RR Gimbal Monitor) during R10 operation.
- 26) A word of FIXED-FIXED was saved in the WAITLIST routine.
- 27) Corrections were made to the S-BAND ANTENNA Routine.
- 28) A change was made to the software restart logic in connection with the recent modifications to the ALARM and ABORT routines. In case a continuous ABORT loop occurs, a simultaneous pressing of the MARK REJECT button and the ERROR RESET button by the astronaut will cause a Fresh Start to occur.
- 29) A coding change was made in the DAP to eliminate short jet firings about the P-axis when in the manual docked configuration.
- 30) An error was corrected in R61.

- 31) 1.7SPOT was deleted from the restart tables since R11 is now attached to R10 and does not need its own restart protection.
- 32) The setting-up of R11 was deleted from the P63 ignition sequence.
- 33) The attitude-rate correction computation for R10 was corrected.
- 34) The entire lead-in structure for P70 and P71 was rewritten.
- 35) Protection was added to the V37 entry to P70 and P71 to prevent multiple selections of either program.
- 36) Alarm codes for P10, P11, and the old R40 routine were deleted.
- 37) The DOWNLINK lists were added to LUMINARY as per GSOP Section 2.
- 38) P30 was modified to make use of some existing subroutines thereby saving considerable fixed storage.

Major Changes Incorporated into Revision 18

- 1) PIPASR was modified to calculate the delta-time since the preceding PIPASR. This value, usually 2 seconds, is stored in the erasable PGUIDE for use by the AVERAGE-G routines.
- 2) V49 was changed to use a normal display so that the following R60 normal displays would not be locked out.
- 3) A P00 restart problem was corrected.
- 4) Servicer was modified so that the check for 30,000 ft. altitude is bypassed during the Ascent. This check was intended for use by the Landing only.
- 5) CALCGRAV was modified to use RTX2 (initialized by MIDTOAVE to 0 for earth sphere, and 2 for moon sphere) instead of LMOONFLG.
- 6) A coding error was corrected in R40.
- 7) Cusses were corrected in the abort programs P70 and P71.
- 8) The loading of TIG(AS) into TIG was deleted from P12.
- 9) Major modifications were made to R12 (Landing Radar program) to bring it into agreement with the GSOP.
- 10) P57 was recoded in order to resolve an erasable conflict. The interface with the now non-existent P10 and P11 was deleted and replaced by logic that must be documented by a PCN.
- 11) The upper-half of ZOOMTIME, ZOOMTDP, was deleted and P63 was modified to use this pad-load in single precision.
- 12) RTX1 and RTX2 were moved in with the SERVICER erasables in E7.
- 13) Alarm code 1212 was added for R29.

- 14) Flagbits were defined in FLGWRD11 in anticipation of LRSTAT later being equated to FLGWRD11.
- 15) TLAND was moved into the W-matrix. TLAND is the desired landing time and is a pad-load.
- 16) TALIGN was defined as a permanent erasable instead of a temporary cell.
- 17) More shuffling was done to the Ascent and Descent erasables in E7.
- 18) Cusses were corrected in the new downlink lists.
- 19) Modifications were made to R29. In particular a BAILOUT with alarm code 1212 was added in case the DODES loop failed to finish on time.
- 20) P30 was modified so that it would function in both earth and lunar orbit.
- 21) BURNBABY was modified to calculate ABVEL for P63 following the MIDTOAVE call.
- 22) P63 was modified to use ZOOMTIME instead of ZOOMTDP.
- 23) The THROTTLE program was modified to load FC for the downlink program.
- 24) Coding was added to SERVICER to restore the EBANK after the call to 1/ACCS and prior to the call to R29.
- 25) R77 was deleted.
- 26) R63 was modified to use NORMUNIT.
- 27) The Landing Radar repositioning alarm logic was removed from LRPOS2 since it is done in R14.
- 28) A clearing of bit 10 of RADMODES was added to STARTSB2. This will cause R29 to start from the beginning in case a restart occurs.
- 29) Coding was added to RRAUTCHK to clear the Continuous Designate, Remode, Reposition, CDUZERO, and TURNON bits in RADMODES whenever the RR changes state. This was done primarily to protect R10 in case R29 was running and was then terminated.
- 30) S40.9 was modified to work in both earth and lunar orbit. This involved making use of RTX1 and RTX2 and bypassing the gravity-oblateness computation for the lunar case.

Statistical Summary of Revisions 17 and 18

1) Number of modification forms	84
2) Number of DAP changes	1
3) Changes for storage reduction	11
4) Changes for execution time reduction	0
5) Developmental changes	26
6) Mandatory changes	32
7) Non-program changes	14
8) Total fixed memory change	-73