

Massachusetts Institute of Technology
Instrumentation Laboratory
Cambridge, Massachusetts

LUMINARY Memo #22

To: Distribution
From: C. Schulenberg
Date: 15 April 1968
Subject: LUMINARY Revisions 4, 5, and 6

Revisions 4 through 6 were bad. From Revision 5 onwards FRESH START will initialize the six autopilot rate estimator gains and hence it will no longer be necessary to pad load these parameters for simulations.

Major Changes Incorporated into Revision 4

- 1) P57 was rewritten to include the Preferred Orientation Option.
- 2) Several unused erasables were deleted and a section of R10 erasables were shifted so that they do not overlay Ascent Guidance. The latter change resulted in a saving of fixed memory in Servicer and made it possible for R10 to run during the ascent or the aborts if that should ever prove desirable.
- 3) A T4RUPT problem was corrected.
- 4) P63 was altered to enable R10 at IGNITION rather than at TIG -30.
- 5) MUNRVG was modified to use the same variable time logic as CALCRVG and its gravity computation subroutine was rewritten in fixed-point arithmetic in order to gain more accuracy while reducing execution time.
- 6) The GENTRAN in Servicer's Copycycle was replaced by a loop which considerably reduced the amount of time spent under INHINT.
- 7) The R10 computations in Servicer were rewritten with a net saving of 15 ms. in execution time.
- 8) Preread and Readaccs were rewritten to decrease execution time.
- 9) The Extended Verb logic was altered so that keyboard instigated moding change requests at improper times do not cause restarts.
- 10) SETTRKF was modified so that the tracker fail light (in the case of the landing radar) is turned on if and only if the data is not good for the data being read.

Major Changes Incorporated into Revision 5

- 1) Manipulations of the NOR29FLG were added to SERVICER, P63, and the ascent programs.
- 2) Fresh Start was modified to initialize FLGWRD10 and FLGWRD11: NOR29FLG (Bit 14 of FLGWORD 10) is set. Initialization of LRSTAT was also added.
- 3) A new powered-flight-subroutine CDU*SMNB was added for use by the P40s.
- 4) PREREAD was modified to set DVCNTR to 4 instead of 3. The result of this is that DVMON will wait 8-10 seconds instead of 6-8 before proceeding to ENGFAIL. (PCN 144. 2)
- 5) The P40s were rewritten in order to improve restart protection.
- 6) Ullage overlap was changed to a fixed .5 second interval following ignition in accordance with PCN 144. 2.
- 7) DVMON threshold values were changed in accordance with DANCE Memo #56. (PCN 144. 2)
- 8) A bug was fixed in DSPOUTSB.
- 9) V37 was modified to preset the group 4 restart priority enabling simplifications to group 4 phase changes.
- 10) R29 was modified and a program description was added.
- 11) The landing radar program was changed to make use of QUICTRIG in order to save execution time.
- 12) T4RUPT was modified to initialize 1/PIPADT and set DRIFTFLG following a Fresh Start.
- 13) R65 (Z-axis tracking) was incorporated into the P20s in accordance with PCR #39.
- 14) Coding was added to issue alarm 514 during P20 if the RR leaves the auto mode when the TRACK FLAG is set.
- 15) The scaling of the Attitude Error Display was changed from $16 \frac{7}{8}$ degrees to $42 \frac{3}{16}$ degrees.
- 16) CALCRVG was modified to use UNITZ instead of UNITW. In LUMINARY UNITW +4 need no longer be initialized, only AXO (= UNITW) and -AYO (= UNITW +2).
- 17) The program bug in LASTBIAS was corrected.
- 18) Noun 6 was changed to a 3-component noun.
- 19) P64 was modified to use the new single-precision routine SPARCSIN for the Look-Angle computation instead of the Interpretive ARCSIN routine which is considerably slower.
- 20) Coding was added to disable the RR Gimbal Monitor (R25) in the continuous designate option of V41 N72. V44 was modified to re-enable R25. (PCR 96)

- 21) Fresh Start was modified to load the DAP filter gains to nominal values.
- 22) New coding was added to P57.

Major Changes Incorporated into Revision 6

- 1) A bug in the IGNITION ALGORITHM of P63 was corrected.
- 2) R61 was modified to eliminate cusses due to EBANK problems.
- 3) A modification was added to the autopilot to insure that WRITEU and WRITEP are done with interrupts inhibited.
- 4) PREREAD was modified to call NORMLIZE with higher priority than LASTBIAS.
- 5) 5.6SPOT was deleted from the restart tables since it is no longer used.
- 6) NORMBIAS was deleted since it is unused. The call to PIPUSE in LASTBIAS was altered to PIPUSE +5 which avoids re-zeroing the PIPAS.
- 7) PIPUSE was modified so that the PIPAS are zeroed prior to the check for cageing in order to allow LASTBIAS to avoid the PIPA zeroing.
- 8) Cusses were corrected in P57.

Statistical Summary of Revisions 4, 5, and 6

Number of Changes:

Total modification forms	73
DAP modification forms	4
Fixed memory change	+243

Types of Changes:

Mandatory	54
Storage	2
Speed	8
Development	6
Non-program	4

Unused Erasable Memory in Revision 6

Unswitched	0
E3	2
E4	11
E5	3
E6	9
E7	0