

LUMINARY Development Note #53

To: Distribution  
From: D. Moore  
Date: 6 July 1970  
Subject: Paths in P66

Summary:

It has been seen that every coding path in P66 has been accessed with no cases in which a wrong path was taken in the coding.

History:

Prior to Luminary 1D release it was necessary to exercise all options to access all coding paths in P66. A digital simulation accomplishing this was submitted, run, and analysed on marsrot no. 16706202.

Purpose of Test:

Examine all paths possible in P66 with addition of overflow and ATTHOLD in P64. Integrity of the P66 coding is to be upheld so that confidence in P66 is had by everyone involved with the program.

Paths:

- I. P64 - Approach Phase Program
  - A. Overflow (1410 Alarm)
  - B. SCSMODE ATTHOLD
- II. P66 - Landing Phase Program (R. O. D.)
  - A. Overflow (1410 alarm)
  - B. SCSMODE ATTHOLD
  - C. ROD (+, -)
  - D. Auto throttle
  - E. ACA maneuvers (pitch, roll, yaw)
  - F. Manual throttle
  - G. SCSMODE AUTO
  - H. Restarts

- I. P66 omissions
  - 1) without 1466 alarm
  - 2) with 1466 alarm
- J. ENGARM - ASTROPRO FLAG
  - 1) ENGARM ON - ASTROPRO FLAG set
  - 2) ENGARM ON - ASTROPRO FLAG reset
  - 3) ENGARM OFF - ASTROPRO FLAG set
  - 4) ENGARM OFF - ASTROPRO FLAG reset

Test of Paths:

- I. P64 - Approach Phase Program
  - A. Set OVFFIND to 1 at STARTP64, see if OVFFDESC accessed, trace OVFFDESC routine for correct coding
  - B. Place SCSMODE in ATTHOLD, note no commands changing attitude (CDU's remain constant)
- II. P66 - Landing Phase Program
  - A. Set OVFFIND to 1 at STARTP66, see if OVFFDESC accessed, trace OVFFDESC to see if coding done correctly
  - B. SCSMODE set in ATTHOLD configuration; note CDU's remain constant
  - C. Activate ROD (+, -), trace RODCOUNT and RODCOMP to see incorporation of ROD inputs.
  - D. Place throttle in Auto mode so total thrust = Manual setting + LGC setting. See LGC contribution (%), trace throttle commands to check for excessive changes in throttle or oscillatory action
  - E. Maneuver LM via ACA doing 10% pitches, rolls, and yaws during P66
  - F. Set throttle to manual and use LEMHCTRL to set percentages of thrust (26, 22, 20, 10), trace throttle commands to check output with desired commands
  - G. Place SCSMODE in Auto, note commands in FINDCDUW & horizontal velocity nulling
  - H. Cause restarts via GOSEQ and TLOSS simulator special requests
  - I. P66 omissions - trace coding to see correct incorporation of input data to check for criteria setting
    - 1) without 1466 alarm - note no 1466 alarm 2nd exit of P66 to Displays.
    - 2) with 1466 alarm - note 1466 alarm, setting of CNTTHROT, STOPRATE, RODFLAG reset, and exit to Displays.

J. ENGARM - ASTROPRO FLAG (ASTROPRO FLAG reset = no FINDCDUW commands)

- 1) Note FINDCDUW commands being given, trace output for credibility of commands
- 2) Note issuance of commands from FINDCDUW
- 3) Note issuance of commands from FINDCDUW
- 4) Note clock of ASTROPRO and cessation of FINDCDUW commands

Results:

Data (including clocks, traces, dumps) indicates all paths taken as advertised in coding design. There were odd messages printed at unseemly times, however, and these are being investigated thoroughly. A further note (LUMINARY Development Note) will be forthcoming as to result of that investigation and analysis.

Conclusion:

The paths of P66 were accessed properly as advertised. No strange guidance commands were issued.

Note: Luminary Development Note #54 explains the odd messages fully so that the conclusion is accurate.