

RECEIVED

SEP 27 1970

Note of Interest - Apollo 14 LM Impact

OCT 5 1970

The LM ascent stage will be targeted to impact the lunar surface at 19.27°W and 3.5°S, about 29 n.m. west of the Apollo 14 landing site. After docking, the ground will uplink to the LM P-99 (RCS maneuver program), LM SV, and XAV loads, and will voice a P-30 pad and S-Band steerable angles. Prior to egress, the crew will execute P-30 and leave the LGC in P-00, PNGS SEL to AUTO, ENG ARM to OFF, and UPDATA UPLINK to ENABLE.

The CSM will maneuver the LM to burn attitude and jettison the LM at GET 146:23:30.5. The CSM jettisons the LM radially outward and does not station keep with the LM ascent stage. Jettison occurs approximately three-fourths of a revolution prior to the LM impact maneuver. CSM gimbal angles and LM jettison time will be voiced by the ground to the CSM.

A CSM SEP maneuver will be executed 5 minutes after jettison. It will be 1 fps retrograde using the +Z axis thrusters. The ground will voice the SEP attitude to the crew.

After the separation maneuver, the ground will call P-99 and wait for lunar impact TIG which occurs at GET 147:52:58.9 at approximately 67°E longitude. The total ΔV is 183.7 fps which requires a 77-second, 4-jet +X RCS burn. The horizontal ΔV component is 180 fps retrograde and the out-of-plane component is 36.5 fps to the north. Impact velocity is 5500 fps horizontal and 365 fps down, and the impact angle is 4.0°.

The three uplink loads required to load the LGC with P-99, the sequence of events leading up to LM impact, and figure 1 (which shows the terminator and relative sun position at both CSM jettison and separation, and relative motion after LM impact maneuver to lunar impact) are enclosed as an attachment.



William E. Fenner

CBP
CBP

NOTE:

THIS ALL ASSUMES VERIFICATION/CHECKOUT OF NEW
LM P-99 DISCLOSES NO ANOMALIES. IF
CONFIDENCE IN P-99 CAN'T BE GAINED, APOLLO
13 PROCEDURES WILL BE USED.

Apollo 14 LM Impact

1. CSM/LM docking GET 144:10:00.00
2. Voice CSM gimbal angles and time of LM jettison
GET Jet 146:23:30.5 HGA

P 355.2 P = -32
Y 348.6 Y = 156
R 300

 $\lambda = 21^{\circ}W$
3. LM check DAP
4. Ground U/L CSM and LM S.V. to CMC
5. Ground U/L LM with S.V., XΔV, and P-99 loads
6. Ground voice CSM separation attitude and time
 $T_{IG\ SEP} = 146:28:30.5$

P 342.2
Y 0
R 180

 $P_{LV} = 90$
 $Y_{LV} = 0$
 $R_{LV} = 180$
7. Voice LM P-30 PAD
8. LM run P-30, leave in POO and U/D, and configure AGS
9. CSM maneuver to jettison attitude
10. LM jettison GET 146:23:30.5

 $P_{LV} = 90^{\circ}$
 $Y_{LV} = -14$

LM Steerable: P = 88.7
 Y = -6
11. CSM separation maneuver

Range $\approx$ 150 ft at T_{IG}
GET 146:28:30.5

 $\Delta V = 1$ fps (Z-axis thrusters retrograde) $\Delta T = 6.7$ sec

attachment

$$\begin{aligned} P_{LV} &= 90 \\ Y &= 0 \\ R_{LV} &= 180 \\ \lambda &= 36^{\circ}W \end{aligned}$$

12. Ground U/L

Call P-99 (V30E)

13. IM impact burn

GET 147:52:58.9 ($H_A = 58.4$, $H_P = -63.9$)

14. Impact GET

$$\phi = 3.5^{\circ}S$$

$$\lambda = 19.27^{\circ}W$$

$$\begin{aligned} V_{HORIZONTAL} &= 5500 \text{ fps} \\ V_{DOWN} &= 365 \text{ fps} \\ \gamma &= 4 \end{aligned}$$

P99 uplink

Load 1	Load 2	Load 3
V71E	V71E	V72E
24E	12E	21E
3404E	3734E	3426E
1450 E	26E	77650E
12324E	30605E	3427E
5527E	151 E	75202E
161E	5214E	3455E
5272E	0E	1404E
12150 E	0E	1250E
5656E	15400E	0E
3667E	0E	3515E
74066E	V33E	4E
12404 E		1044E
12433E		13001 E
1406E		1045E
5322E		1420E
143E		1046E
6042E		12067E
77634E		V33E
10607 E		
56246 E		
V33E		

LOS 146:52

ROS 147:38

TERMINATOR

IMPACT
19.27°W
3.5°S

LM IMPACT
147:52:58.9 ± 67°E
V_x = -180.0
V_y = +36.5
V_z = 0
ΔV_T = 183.7

CSM SEP
146:28:30.5
1 FPS RETROGRADE
USING +Z THRUSTERS

LM JETT
146:23:30.5

LM GIMBAL &
Y = 0
P = 175.2
R = 11.4

LV LH
Y = 168.5
P = 2
R = 0

