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ABORT RESET POINTS FOR AN APOLLO 8 MISSION LAUNCHED DECEMBER 21, 1968

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MISSION PLANNING AND ANALYSIS DIVISION

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HOUSTON, TEXAS

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PROJECT APOLLO

ABORT RESET POINTS FOR AN APOLLO 8 MISSION LAUNCHED DECEMBER 21, 1968

By Contingency Analysis Section
Flight Analysis Branch

November 14, 1968

MISSION PLANNING AND ANALYSIS DIVISION
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

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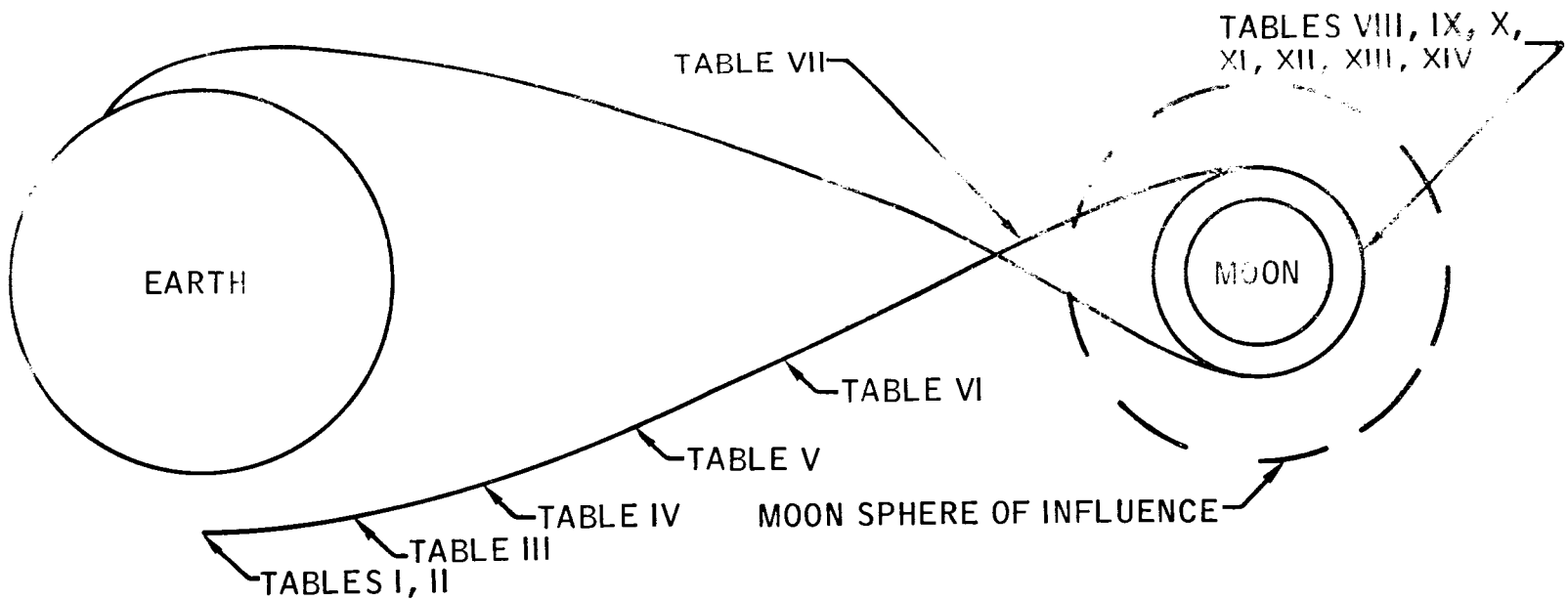
FOREWORD

This internal note provides simulation reset points (i.e., state vectors) for Apollo 8 to enable the ground controllers and the flight crew to initialize their respective computers and simulate the events surrounding an abort maneuver performed in a cislunar or lunar environment. The reset points are for a mission launched December 21, 1968 at $12^h50^m59.7^s$ G.m.t. on a launch azimuth of 72°. Translunar injection occurs at the first opportunity. The data are consistent with the mission techniques described in reference 1 and the operational trajectory presented in reference 2.

Besides the reset points, sufficient postabort trajectory information is given to evaluate how well the crew performed the abort maneuver (open loop) or how well the guidance system performed the maneuver (closed loop).

As shown on the following figure, reset points have been selected to provide convenient times for simulations by both the crew and ground controllers or by the crew alone.



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NOTATION

Symbols

γ_{EI}	inertial flight-path angle at entry interface (400 000-ft altitude)
γ_i	inertial flight-path angle (geocentric or selenocentric)
ΔT_B	SPS engine off-time minus SPS engine on-time
ΔV_T	total velocity change along thrust vector including ullage and tailoff
ΔV_X, ΔV_Y, ΔV_Z	impulsive components of the velocity change at GETI in the local vertical coordinate system
ε	eccentricity
θ	true anomaly
θ_{pre}	preabort true anomaly
θ_{post}	postabort true anomaly
λ	longitude (geocentric or selenocentric)
λ_A	longitude at abort (earth or moon)
λ_L	longitude at landing (earth)
τ	period
ϕ	latitude (geocentric or selenocentric)
ϕ_A	latitude at abort (earth or moon)
ϕ_L	latitude at landing (earth)

Ψ_i	inertial flight azimuth from north
Ψ_L	launch azimuth
GET	ground elapsed time from lift-off
GETI	ground elapsed time from lift-off at SPS ignition
GMT	Greenwich mean time
GMTLO	Greenwich mean time of lift-off
h	altitude
IGA	inner gimbal angle
MGA	middle gimbal angle
OGA	outer gimbal angle
P	pitch gimbal angle (IGA)
$P_{c.g.}$, $Y_{c.g.}$	SPS pitch and yaw from the longitudinal axis to the thrust vector
P_{trim}, Y_{trim}	SPS pitch and yaw from the null SPS gimbal set position to the thrust vector
R	roll gimbal angle (OGA)
r	radius, distance from S/C to center of central body
TFI	time from GETI
Track	USB sites with elevation angle > 5° at GET or GETI
Y	yaw gimbal angle (MGA)
V_C	velocity change along X-body axis including ullage (no tailoff)
V_{EI}	inertial velocity at entry interface (400 000-ft altitude)

X_R, Y_R, Z_R, $\dot{X}_R$, $\dot{Y}_R$, $\dot{Z}_R$	position and velocity of S/C at GET expressed in earth radii and earth radii per hour for NMBY; geocentric when earth is central body and NMBY selenocentric when moon is central body
X_F, Y_F, Z_F, $\dot{X}_F$, $\dot{Y}_F$, $\dot{Z}_F$	position and velocity of S/C at GET expressed in feet and feet per second for either geocentric NMBY or selenocentric NMBY

Tracking Stations

ACN	Ascension
ANG	Antigua
BDA	Bermuda
CRO	Carnarvon
CYI	Canary Island
GBM	Grand Bahamas
GDS	Goldstone
GWM	Guam
GYM	Guaymas
HAW	Hawaii
HSK	Honeysuckle Creek (Australia)
MAD	Madrid
MIL	Merritt Island
TEX	Corpus Christi

TABLE I.- MANEUVER RESET POINT FOR AN ABORT AT 3^h03^m g.e.t.

(a) Maneuver description

Launch Date 1 2 / 2 1 / 6 8 (mo/da/yr)

GMTLO 1 2 : 5 0 : 5 9 : 7 0 (hr:min:sec:cs)

Ψ_L 0 7 2 . 0 0 (deg)

Opportunity FIRST

Local Horizontal - Local Vertical
REFSMMAT at GETI

. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _
. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _
. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _
OGA	MGA	IGA
_ _ _ . _ _	_ _ _ . _ _	_ _ _ . _ _

Reference REFSMMAT LAUNCH PAD

. 4 9 7 7 5 2 0 5	- . 8 2 3 7 9 8 9 0	. 2 7 1 2 8 9 9 0
- . 3 0 4 0 8 5 4 3	- . 4 5 8 6 9 3 4 5	- . 8 3 4 9 4 4 5 2
. 8 1 2 2 6 5 3 0	. 3 3 3 1 0 0 0 4	- . 4 7 8 8 2 0 8 8
OGA	MGA	IGA
1 8 0 . 0 0	0 0 0 . 0 0	1 9 9 . 0 0

Entry Target Line CONTINGENCY

V_{EI}, γ_{EI} at 400K ft

Entry Range Functions CONSTANT G

[a]Time from SPS Off to 400K 01:27:36 (h:m:s)

[a]ϕ_L -1 1 . 2 5 (deg)

[a]λ_L 1 3 6 . 0 0 (deg)

Maneuver Description: A fixed attitude horizon reference abort performed 10 minutes after early S-IVB shutdown

[a] These data read from charts.

TABLE I.- MANEUVER RESET POINT FOR AN ABORT AT 3^h03^m g.e.t. - Continued

(b) Reset point at 2^h53^m g.e.t.

Central Body EARTH

GET 002 : 53 : 00 (hr:min:sec)

X_R -.9790099 (radii)

Y_R .2021001 (radii)

Z_R .2570182 6 (radii)

$\dot{X}_R$ -.3994860 2 (radii/hr)

$\dot{Y}_R$ - 4.3992538 6 (radii/hr)

$\dot{Z}_R$ 2.4065927 (radii/hr)

X_F -.2048650 6 E+08 (ft)

Y_F -.4229093 9 E+07 (ft)

Z_F -.5378296 8 E+07 (ft)

$\dot{X}_F$ -.2322094 4 E+04 (fps)

$\dot{Y}_F$ -.2557321 9 E+05 (fps)

$\dot{Z}_F$ -.1398881 3 E+05 (fps)

S/C Weight 63741.0 (lbs)

GMT 015 : 43 : 59 : 70 (hr:min:sec:cs)

θ 005.6 (deg)

ϵ 0.3128 (n.d.)

τ 002.59 (hr)

r 003554.7 (n.mi.)

T_{FI} 010 : 00 : 00 (min:sec:cs)

φ 14.51 (deg)

λ 202.07 (deg)

h 000110.8 (n.mi.)

V_i 29241.6 (fps)

γ 01.33 (deg)

ψ_i 060.8 (deg)

Track:

TABLE I.- MANEUVER RESET POINT FOR AN ABORT AT 3^h03^m g.e.t. - Concluded

(c) SPS abort maneuver data

Guidance SCS

GETI 003 : 03 : 00 : 00 (hr:min:sec:cs)

ΔV_X ____ . __ (fps)

ΔV_Y ____ . __ (fps)

ΔV_Z ____ . __ (fps)

ΔV_T ____ . __ (fps)

[a] ΔT_B 01 : 08 . 0 (min:sec:tenth-main engine)

[a] V_C 2175 . 0 (fps)

R	180 (deg)	Reference REFSMMAT
P	199 (deg)	
Y	000 (deg)	
R	___ (deg)	LV/LH REFSMMAT
P	___ (deg)	
Y	___ (deg)	

$P_{c.g.}$ 3 . 80 (deg)

$Y_{c.g.}$ 2 . 22 (deg)

P_{TRIM} - 1 . 65 (deg)

Y_{TRIM} 1 . 27 (deg)

φ_A ___ . __ (deg)

λ_A ___ . __ (deg)

[a] h 004150 . 0 (n.mi.)

θ_{pre} ___ . __ (deg)

θ_{post} ___ . __ (deg)

Track:

Comments: [a] These data read from charts.

TABLE II.- MANEUVER RESET POINT FOR AN ABORT AT 3^h05^m g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)

GMTLO 12:50:59:70 (hr:min:sec:cs)

Ψ_L 072.00 (deg)

Opportunity FIRST

Local Horizontal - Local Vertical
REFSMMAT at GETI

. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _
. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _
. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _	. _ _ _ _ _ _ _ _
OGA	MGA	IGA
_ _ _ . _ _	_ _ _ . _ _	_ _ _ . _ _

Reference REFSMMAT LAUNCH PAD

.49775205	-.82379890	.27128990
-.30408543	-.45869345	-.83494452
.81226530	.33310004	-.47882088
OGA	MGA	IGA
180.00	000.00	199.00

Entry Target Line CONTINGENCY

V_{EI}, γ_{EI} at 400K ft

Entry Range Functions CONSTANT G

[a] Time from SPS Off to 400K 03:15:00 (h:m:s)

[a] ϕ_L 04.03 (deg)

[a] λ_L 132.00 (deg)

Maneuver Description: A fixed attitude horizon reference abort performed 10 minutes after early S-IVB shutdown

[a] These data read from charts.

TABLE II.- MANEUVER RESET POINT FOR AN ABORT AT 3^h05^m g.e.t. - Continued

(b) Reset point at 2^h55^m g.e.t.

Central Body EARTH

GET 002 : 55 : 00 (hr:min:sec)

X_R -.98409353 (radii)

Y_R .43187150 (radii)

Z_R .33853703 (radii)

$\dot{X}_R$ .09385597 (radii/hr)

$\dot{Y}_R$ - 5.16063552 (radii/hr)

$\dot{Z}_R$ 2.47539700 (radii/hr)

X_F -.20592883 E+08 (ft)

Y_F -.90372301 E+06 (ft)

Z_F -.70841372 E+07 (ft)

$\dot{X}_F$ -.54555704 E+03 (fps)

$\dot{Y}_F$ -.29997250 E+05 (fps)

$\dot{Z}_F$ -.14388753 E+05 (fps)

S/C Weight 63741.0 (lbs)

GMT 015 : 45 : 59 : 70 (hr:min:sec:cs)

θ 012.1 (deg)

ϵ 0.7170 (n.d.)

τ 009.80 (hr)

r 003587.2 (n.mi.)

T_{FI} 010 : 00 : 00 (min:sec:cs)

φ 19.09 (deg)

λ 210.72 (deg)

h 00014 3.3 (n.mi.)

V_i 33274.1 (fps)

γ 05.03 (deg)

ψ_i 064.6 (deg)

Track:

TABLE II.- MANEUVER RESET POINT FOR AN ABORT AT 3^h05^m g.e.t. - Concluded

(c) SPS abort maneuver data

Guidance SCS

GETI 0 0 3 : 0 5 : 0 0 : 0 0 (hr:min:sec:cs)

ΔV_X _ _ _ _ . _ (fps)

ΔV_Y _ _ _ _ . _ (fps)

ΔV_Z _ _ _ _ . _ (fps)

ΔV_T _ _ _ _ . _ (fps)

[a] ΔT_B 0 4 : 4 8 . 0 (min:sec:tenth-main engine)

[a] V_C 3 6 5 0 . 0 (fps)

R 1 8 0 (deg)		
P 1 9 9 (deg)		Reference REFSMMAT
Y 0 0 0 (deg)		
R _ _ _ (deg)		
P _ _ _ (deg)		LV/LH REFSMMAT
Y _ _ _ (deg)		

$P_{c.g.}$ 3 . 8 0 (deg)

$Y_{c.g.}$ 2 . 2 2 (deg)

P_{TRIM} − 1 . 6 5 (deg)

Y_{TRIM} 1 . 2 7 (deg)

φ_A _ _ . _ _ (deg)

λ_A _ _ _ . _ _ (deg)

* h 0 0 8 6 5 0 . 0 (n.mi.)

θ_{pre} _ _ _ . _ (deg)

θ_{post} _ _ _ . _ (deg)

Track:

Comments: [a] These data read from charts.

TABLE III.- MANEUVER RESET POINTS FOR AN ABORT AT $4^h22^m12^s21^{cs}$ g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)

GMTLO 12:50:59:70 (hr:min:sec:cs)

Ψ_L 072.00 (deg)

Opportunity FIRST

Local Horizontal - Local Vertical
REFSMMAT at GETI

.80170478	.37492260	-.46551315
-.31463195	-.39747283	-.86198499
-.50820880	.83752280	-.20069724
OGA	MGA	IGA
180.15	002.22	260.43

Reference REFSMMAT LAUNCH PAD @ L.O.

.49775205	-.82379890	.27128990
-.30408543	-.45869345	-.83494452
.81226530	.33310004	-.47882088
OGA	MGA	IGA
178.03	358.96	168.33

Entry Target Line CONTINGENCY

V_{EI}, γ_{EI} at 400K ft 34376.95 -6.27

Entry Range Functions CONSTANT G

Time from SPS Off to 400K 12:53:53 (h:m:s)

ϕ_L 07.14 (deg)

λ_L 330.96 (deg)

Maneuver Description: A CMC MANEUVER PAD FOR THIS ABORT will be provided IN EARTH PARKING ORBIT. The SPS ignition TIME for this MANEUVER will be AT TLI CUTOFF PLUS 90 MINUTES MINUS A backup TIME EQUAL TO APPROXIMATELY half The SPS BURN TIME.

TABLE III.- MANEUVER RESET POINTS FOR AN ABORT AT $4^h22^m12^s21^{cs}$ g.e.t. - Continued

(b) Reset point at 3^h22^m g.e.t.

Central Body EARTH

GET 003 : 22 : 00 (hr:min:sec)

X_R -.03611048 (radii)

Y_R -1.96176553 (radii)

Z_R .91773427 (radii)

$\dot{X}_R$ 2.74100899 (radii/hr)

$\dot{Y}_R$ -3.19135311 (radii/hr)

$\dot{Z}_R$ .47133281 (radii/hr)

X_F -0.75563845 E +06 (ft)

Y_F -0.41051386 E +08 (ft)

Z_F 0.19204266 E +08 (ft)

$\dot{X}_F$ 0.15932676 E +05 (fps)

$\dot{Y}_F$ -0.18550394 E +05 (fps)

$\dot{Z}_F$ 0.22397186 E +04 (fps)

S/C Weight 63741.0 (lbs)

GMT 016 : 12 : 59 : 64 (hr:min:sec:cs)

θ 093.4 (deg)

ϵ 0.9760 (n.d.)

τ 397.63 (hr)

r 007460.1 (n.mi.)

T_{FI} 060 : 12 : 21 (min:sec:cs)

φ 25.21 (deg)

λ 295.41 (deg)

h 004017.1 (n.mi.)

V_i 24606.4 (fps)

γ 45.98 (deg)

ψ_i 107.9 (deg)

Track:

TABLE III.- MANEUVER RESET POINTS FOR AN ABORT AT $4^h22^m12^s21^{cs}$ g.e.t. - Continued

(c) Reset point at 4^h10^m g.e.t.

Central Body EARTH

GET 009 : 10 : 00 (hr:min:sec)

X_R 2.0237464 (radii)

Y_R -3.7819583 (radii)

Z_R 1.0052478 (radii)

$\dot{X}_R$ 2.3710108 (radii/hr)

$\dot{Y}_R$ -1.7169125 (radii/hr)

$\dot{Z}_R$ -.0732629 (radii/hr)

X_F 0.42348386 E +08 (ft)

Y_F -0.79140268 E +08 (ft)

Z_F 0.21035552 E +08 (ft)

$\dot{X}_F$ 0.13781986 E +05 (fps)

$\dot{Y}_F$ -0.99799345 E +04 (fps)

$\dot{Z}_F$ 0.42855205 E +03 (fps)

S/C Weight 63741.0 (lbs)

GMT 017 : 00 : 59 : 64 (hr:min:sec:cs)

θ 123.4 (deg)

ϵ 0.9760 (n.d.)

τ 396.68 (hr)

r 015122.9 (n.mi.)

T_{FI} 012 : 12 : 21 (min:sec:cs)

φ 13.28 (deg)

λ 312.58 (deg)

h 11729.0 (n.mi.)

V_i 12021.3 (fps)

γ 60.40 (deg)

ψ_i 117.7 (deg)

Track:

TABLE III.- MANEUVER RESET POINTS FOR AN ABORT AT $4^h22^m12^s21^{cs}$ g.e.t. - Concluded

(d) SPS abort maneuver data

Guidance EXTERNAL ΔV

GETI 004:22:12:21 (hr:min:sec:cs)

ΔV_X -0422.3 (fps)

ΔV_Y -0000.0 (fps)

ΔV_Z 5102.2 (fps)

ΔV_T 5125.0 (fps)

ΔT_B 06:28.4 (min:sec:tenth-main engine)

V_C 5100.9 (fps)

R 178 (deg)
P 168 (deg)
Y 359 (deg)
} Reference REFSMMAT

R 180 (deg)
P 260 (deg)
Y 002 (deg)
} LV/LH REFSMMAT

$P_{c.g.}$ -3.80 (deg)

$Y_{c.g.}$ 2.22 (deg)

P_{TRIM} -1.65 (deg)

Y_{TRIM} 1.27 (deg)

φ_A 11.59 (deg)

λ_A 312.62 (deg)

h 013475.1 (n.mi.)

θ_{pre} 126.8 (deg)

θ_{post} 145.0 (deg)

Track: ACN, ANG, BDA, CYI, GBM, GDS, GYM, MAD, MIL, TEX

Comments:

FOR P-37 SIMULATION OF THIS MANEUVER THE Tig IS 04:25:43 (H:M:S) ABORT ΔV IS 5125.

TABLE IV.- MANEUVER RESET POINTS FOR AN ABORT AT 7^h0^m g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)

GMTLO 12:50:59:70 (hr:min:sec:cs)

Ψ_L 072.00 (deg)

Opportunity FIRST

Local Horizontal - Local Vertical
REFSMMAT at GETI

.60128206	.61915886	-.50507644
-.31468850	-.39752409	-.86194301
-.73445970	.67721262	-.04418194

OGA	MGA	IGA
180.15	002.22	264.38

Reference REFSMMAT LAUNCH PAD @ L.O.

.49775205	-.82379890	.27128990
-.30408543	-.45869345	-.83494452
.81226530	.33310004	-.47882088

OGA	MGA	IGA
172.29	359.59	153.99

Entry Target Line CONTIGENCY

V_{EI}, γ_{EI} at 400K ft 34973.11 -6.35

Entry Range Functions CONSTANT G

Time from SPS Off to 400K 19:14:19 (h:m:s)

ϕ_L 06.62 (deg)

λ_L 194.99 (deg)

Maneuver Description: A CMC MANEUVER PAD FOR THIS ABORT MANEUVER WOULD BE PROVIDED IN EARTH PARKING ORBIT TO BE USED IN THE EVENT GROUND-TO-AIR COMMUNICATIONS WERE LOST SUBSEQUENT TO TLI.

TABLE IV.- MANEUVER RESET POINTS FOR AN ABORT AT 7^h0^m g.e.t. - Continued

(b) Reset point at 4^h30^m g.e.t.

Central Body EARTH

GET 004 : 30 : 00 (hr:min:sec)

X_R 2.789491 9 (radii)

Y_R -4.311308 4 (radii)

Z_R .9698381 6 (radii)

$\dot{X}_R$ 2.228035 4 (radii/hr)

$\dot{Y}_R$ -1.474567 3 (radii/hr)

$\dot{Z}_R$ -.1333054 0 (radii/hr)

X_F 0.583221 7 7 E +08 (ft)

Y_F -0.902173 1 0 E +08 (ft)

Z_F 0.202945 7 9 E +08 (ft)

$\dot{X}_F$ 0.129509 1 3 E +05 (fps)

$\dot{Y}_F$ -0.857122 4 8 E +04 (fps)

$\dot{Z}_F$ -0.774864 9 9 E +03 (fps)

S/C Weight 63741.0 (lbs)

GMT 017 : 20 : 59 : 64 (hr:min:sec:cs)

θ 128.7 (deg)

ϵ 0.9760 (n.d.)

τ 396.60 (hr)

r 012992.4 (n.mi.)

T_{FI} 150 : 00 : 00 (min:sec:cs)

φ 10.77 (deg)

λ 312.32 (deg)

h 014554.4 (n.mi.)

V_i 15549.7 (fps)

γ 62.88 (deg)

ψ_i 118.7 (deg)

Track:

ACN, ANG, BDA, CYI, GBM, GDS, GYM, MAD, MIL, TEX

TABLE IV.- MANEUVER RESET POINTS FOR AN ABORT AT 7^h0^m g.e.t. - Continued

(c) Reset point at 6^h0^m g.e.t.

Central Body EARTH

GET 006 : 00 : 00 (hr:min:sec)

X_R 5.78854655 (radii)

Y_R -6.06467992 (radii)

Z_R .68363246 (radii)

$\dot{X}_R$ 1.8183406 (radii/hr)

$\dot{Y}_R$ -.95624737 (radii/hr)

$\dot{Z}_R$ -.22281152 (radii/hr)

X_F 0.12112961 E +09 (ft)

Y_F -0.12690789 E +09 (ft)

Z_F 0.14305514 E +08 (ft)

$\dot{X}_F$ 0.10569477 E +05 (fps)

$\dot{Y}_F$ -0.55558338 E +04 (fps)

$\dot{Z}_F$ -0.12951376 E +04 (fps)

S/C Weight 63741.0 (lbs)

GMT 018 : 50 : 59 : 64 (hr:min:sec:cs)

θ 140.9 (deg)

ϵ 0.9760 (n.d.)

τ 396.57 (hr)

r 028969.0 (n.mi.)

T_{FI} 060 : 00 : 00 (min:sec:cs)

φ 04.69 (deg)

λ 300.52 (deg)

h 025526.0 (n.mi.)

V_i 12011.9 (fps)

γ 68.50 (deg)

ψ_i 120.1 (deg)

Track:

ACN, ANG, BDA, CYI, GBM, GOS, GYM, MAD, MIL, TEX

TABLE IV.- MANEUVER RESET POINTS FOR AN ABORT AT 7^h0^m g.e.t. - Continued

(d) Reset point at 6^h48^m g.e.t.

Central Body EARTH

GET 006 : 48 : 00 (hr:min:sec)

X_R 7.186702 (radii)

Y_R -1.417212 (radii)

Z_R .499686 (radii)

$\dot{X}_R$ 1.683102 (radii/hr)

$\dot{Y}_R$ -.821891 08 (radii/hr)

$\dot{Z}_R$ -.235427 71 (radii/hr)

X_F 0.150387 06 E +09 (ft)

Y_F -0.141721 28 E +09 (ft)

Z_F 0.104560 65 E +08 (ft)

$\dot{X}_F$ 0.978337 84 E +04 (fps)

$\dot{Y}_F$ -0.472241 03 E +04 (fps)

$\dot{Z}_F$ -0.136847 18 E +04 (fps)

S/C Weight 63741.0 (lbs)

GMT 019 : 38 : 59 : 64 (hr:min:sec:cs)

θ 144.4 (deg)

ϵ 0.9760 (n.d.)

τ 396.62 (hr)

r 034052.5 (n.mi.)

T_{FI} 012 : 00 : 00 (min:sec:cs)

φ 02.92 (deg)

λ 291.52 (deg)

h 030609.5 (n.mi.)

V_i 10923.2 (fps)

γ 70.04 (deg)

ψ_i 120.3 (deg)

Track:

ACN, ANG, BDA, CYI, GBM, GDS, GYM, MAD, MIK, TEX

TABLE IV.- MANEUVER RESET POINTS FOR AN ABORT AT 7^h0^m g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXTERNAL ΔV

GETI 007 : 00 : 00 : 00 (hr:min:seconds)

ΔV_X -0150.8 (fps)

ΔV_Y 0000.0 (fps)

ΔV_Z 5541.4 (fps)

ΔV_T 5543.4 (fps)

ΔT_B 06 : 52 . 2 (min:sec:tenth-main engine)

V_C 5517.6 (fps)

R 177 (deg)
P 154 (deg)
Y 360 (deg)
} Reference REFSMMAT

R 180 (deg)
P 264 (deg)
Y 002 (deg)
} LV/LH REFSMMAT

$P_{c.g.}$ -3.80 (deg)

$Y_{c.g.}$ 2.22 (deg)

P_{TRIM} -1.65 (deg)

Y_{TRIM} 1.27 (deg)

φ_A 02.53 (deg)

λ_A 289.13 (deg)

h 031819.9 (n.mi.)

θ_{pre} 145.1 (deg)

θ_{post} 163.9 (deg)

Track: ACN, ANG, ADA, CYI, GBM, GDS, GWM, GYM, MAD, MIL, TEX

Comments:

FOR P 37 SIMULATION USE:
T_{ig} = $07^h 03^m 26^s$
ΔV = 5543. fps

TABLE V.- MANEUVER RESET POINTS FOR AN ABORT AT 14^h00^m g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)
GMTLO 12:50:59:70 (hr:min:sec:cs)
Ψ_L 072.00 (deg)
Opportunity FIRST

Local Horizontal - Local Vertical
REFSMMAT at GETI

.43674102	.74504231	-.50415200
-.31514587	-.39819562	-.86146581
-.84257960	.53511888	.06088864

OGA	MGA	IGA
180.15	002.22	265.59

Reference REFSMMAT LAUNCH PAD @ L.O.

.49225205	-.82379890	.27128990
-.30408543	-.45869345	-.83494452
.81226530	.33310004	-.47882088

OGA	MGA	IGA
176.91	000.16	143.33

Entry Target Line CONTINGENCY
V_{EI}, γ_{EI} at 400K ft 35523.11 -6.42
Entry Range Functions CONSTANT G
Time from SPS Off to 400K 36:23:03 (h:m:s)
ϕ_L 08.28 (deg)
λ_L 194.96 (deg)

Maneuver Description:
ABORT MANEUVER OCCURS APPROXIMATELY 11 HRS FOLLOWING TLI.

TABLE V.- MANEUVER RESET POINTS FOR AN ABORT AT 14^h00^m g.e.t. - Continued

(b) Reset point at 11^h30^m g.e.t.

Central Body EARTH

GET 011 : 30 : 00 (hr:min:sec)

X_R 13.950985 (radii)

Y_R -9.6673442 (radii)

Z_R -.63533411 (radii)

$\dot{X}_R$ 1.26204775 (radii/hr)

$\dot{Y}_R$ -.48099495 (radii/hr)

$\dot{Z}_R$ -.23916436 (radii/hr)

X_F 0.29193465 E +09 (ft)

Y_F -0.20229631 E +09 (ft)

Z_F -0.13294835 E +08 (ft)

$\dot{X}_F$ 0.73359100 E +04 (fps)

$\dot{Y}_F$ -0.27958817 E +04 (fps)

$\dot{Z}_F$ -0.13901918 E +04 (fps)

S/C Weight 63741.0 (lbs)

GMT 024 : 20 : 59 : 64 (hr:min:sec:cs)

θ 154.4 (deg)

ϵ 0.9760 (n.d.)

τ 397.03 (hr)

r 058495.3 (n.mi.)

T_{FI} 150 : 00 : 00 (min:sec:cs)

φ -02.16 (deg)

λ 229.41 (deg)

h 055052.3 (n.mi.)

V_i 07972.8 (fps)

γ 74.13 (deg)

ψ_i 120.4 (deg)

Track:

ANG, BDA, GBM, GDS, GYM, HAW, HSK, MIL, TEX

TABLE V.- MANEUVER RESET POINTS FOR AN ABORT AT 14^h00^m g.e.t. - Continued

(c) Reset point at 13^h00^m g.e.t.

Central Body EARTH

GET 013 : 00 : 00 (hr:min:sec)

X_R 15.784437 (radii)

Y_R -10.348349 (radii)

Z_R -.991065 84 (radii)

$\dot{X}_R$ 1.185082 5 (radii/hr)

$\dot{Y}_R$ .429195 83 (radii/hr)

$\dot{Z}_R$ .235062 30 (radii/hr)

X_F 0.330300 99 E +09 (ft)

Y_F -0.216546 83 E +09 (ft)

Z_F 0.207387 83 E +08 (ft)

$\dot{X}_F$ 0.688853 48 E +04 (fps)

$\dot{Y}_F$ -0.249478 82 E +04 (fps)

$\dot{Z}_F$ -0.136634 77 E +04 (fps)

S/C Weight 63741.0 (lbs)

GMT 025 : 50 : 59 : 64 (hr:min:sec:cs)

θ 156.1 (deg)

ϵ 0.9760 (n.d.)

τ 392.19 (hr)

r 065091.2 (n.mi.)

T_{FI} 060 : 00 : 00 (min:sec:cs)

φ -03.03 (deg)

λ 208.32 (deg)

h 061648.2 (n.mi.)

V_i 02452.7 (fps)

γ 74.76 (deg)

ψ_i 120.4 (deg)

Track:

GBM, GDS, GWM, GYM, HAW, HSK, MIL, TEX

TABLE V.- MANEUVER RESET POINTS FOR AN ABORT AT 14^h00^m g.e.t. - Continued

(d) Reset point at 13^h48^m g.e.t.

Central Body EARTH

GET 013 : 48 : 00 (hr:min:sec)

X_R 16.7180720 (radii)

Y_R -10.6823455 (radii)

Z_R -1.1781889 (radii)

$\dot{X}_R$ 1.1495537 (radii/hr)

$\dot{Y}_R$ -.4062508 (radii/hr)

$\dot{Z}_R$ -.2322709 (radii/hr)

X_F 0.3498397 E +09 (ft)

Y_F -0.2235359 E +09 (ft)

Z_F -0.2465471 E +08 (ft)

$\dot{X}_F$ 0.6682016 E +04 (fps)

$\dot{Y}_F$ -0.2361414 E +04 (fps)

$\dot{Z}_F$ -0.1352832 E +04 (fps)

S/C Weight 63741.0 (lbs)

GMT 026 : 38 : 59 : 64 (hr:min:sec:cs)

θ 156.9 (deg)

ϵ 0.9760 (n.d.)

τ 392.28 (hr)

r 068446.3 (n.mi.)

T_{FI} 012 : 02 : 00 (min:sec:cs)

φ -03.42 (deg)

λ 196.95 (deg)

h 065003.3 (n.mi.)

V_i 02215.0 (fps)

γ 75.03 (deg)

ψ_i 120.3 (deg)

Track:

GDS, GWM, GYM, HAW, HSK, TEX

TABLE V.- MANEUVER RESET POINTS FOR AN ABORT AT 14^h00^m g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXTERNAL ΔV

GETI 014 : 00 : 00 : 00 (hr:min:sec:cs)

ΔV_X -0456.3 (fps)

ΔV_Y 0000.0 (fps)

ΔV_Z 4759.0 (fps)

ΔV_T 4759.2 (fps)

ΔT_B 06 : 06 . 7 (min:sec:tenth-main engine)

V_C 4236.3 (fps)

R	177 (deg)	Reference REFSMMAT
P	143 (deg)	
Y	000 (deg)	
R	180 (deg)	LV/LH REFSMMAT
P	266 (deg)	
Y	002 (deg)	

$P_{c.g.}$ -3.80 (deg)

$Y_{c.g.}$ 2.22 (deg)

P_{TRIM} -1.65 (deg)

Y_{TRIM} 1.27 (deg)

φ_A -03.49 (deg)

λ_A 194.10 (deg)

h 065825.3 (n.mi.)

θ_{pre} 157.0 (deg)

θ_{post} 172.8 (deg)

Track: CRO, GDS, GWM, GYM, HAW, HSK, TEX

Comments:

FOR P 37 SIMULATION USE:

T_{ig} = $14^h 03^m 03^s$

ΔV = 4759. fps

TABLE VI.- MANEUVER RESET POINTS FOR AN ABORT AT 28^h00^m g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)

GMTLO 12:50:59:70 (hr:min:sec:cs)

ψ_L 072.00 (deg)

Opportunity FIRST

Local Horizontal - Local Vertical
REFSMMAT at GETI

.32394439	.80359131	-.49930054
-.31804383	-.40454445	-.85743332
-.89101525	.43656017	.12452736

OGA	MGA	IGA
180.15	002.22	266.09

Reference REFSMMAT LAUNCH PAD @ L.O.

.49775205	-.82379890	.27128990
-.30408543	-.45869345	-.83494452
.81226530	.33310004	-.47882088

OGA	MGA	IGA
177.15	000.51	136.55

Entry Target Line CONTINGENCY

V_{EI}, γ_{EI} at 400K ft 35809.36 -6.46

Entry Range Functions CONSTANT G

Time from SPS Off to 400K 46:14:21 (h:m:s)

ϕ_L 07.67 (deg)

λ_L 194.86 (deg)

Maneuver Description:

ABORT MANEUVER OCCURS
APPROXIMATELY 25 HRS FROM TLI.

TABLE VI.- MANEUVER RESET POINTS FOR AN ABORT AT 28^h00^m g.e.t. - Continued

(b) Reset point at 25^h30^m g.e.t.

Central Body EARTH

GET 025 : 30 : 00 (hr:min:sec)

X_R 28.027686 (radii)

Y_R -14.209219 (radii)

Z_R -3.711372 1 (radii)

$\dot{X}_R$ .83676287 (radii/hr)

$\dot{Y}_R$ -.22951353 (radii/hr)

$\dot{Z}_R$ -.20190179 (radii/hr)

X_F 0.587546 30 E +09 (ft)

Y_F -0.297338 40 E +09 (ft)

Z_F -0.776631 99 E +08 (ft)

$\dot{X}_F$ 0.486917 42 E +04 (fps)

$\dot{Y}_F$ -0.133409 44 E +04 (fps)

$\dot{Z}_F$ -0.117359 55 E +04 (fps)

S/C Weight 63741.0 (lbs)

GMT 038 : 20 : 59 : 64 (hr:min:sec:cs)

θ 163.5 (deg)

ϵ 0.9762 (n.d.)

τ 399.00 (hr)

r 109126.1 (n.mi.)

T_{FI} 150 : 00 : 00 (min:sec:cs)

φ -06.77 (deg)

λ 026.71 (deg)

h 105683.1 (n.mi.)

V_i 05183.2 (fps)

γ 77.00 (deg)

ψ_i 120.2 (deg)

Track:

ACN, CYI, MAD

TABLE VI.- MANEUVER RESET POINTS FOR AN ABORT AT 28^h00^m g.e.t. - Continued

(c) Reset point at 27^h00^m g.e.t.

Central Body EARTH

GET 027 : 00 : 00 (hr:min:sec)

X_R 29.314949 (radii)

Y_R -14.543993 (radii)

Z_R -4.011790 6 (radii)

$\dot{X}_R$ .81232906 (radii/hr)

$\dot{Y}_R$ -.21705788 (radii/hr)

$\dot{Z}_R$ -.19868281 (radii/hr)

X_F 0.61343695 E +09 (ft)

Y_F -0.30434377 E +09 (ft)

Z_F -0.83949679 E +08 (ft)

$\dot{X}_F$ 0.47218291 E +04 (fps)

$\dot{Y}_F$ 0.12616934 E +04 (fps)

$\dot{Z}_F$ 0.11548845 E +04 (fps)

S/C Weight 63741.0 (lbs)

GMT 039 : 50 : 59 : 64 (hr:min:sec:cs)

θ 164.0 (deg)

ϵ 0.9762 (n.d.)

τ 399.29 (hr)

r 113544.8 (n.mi.)

T_{FI} 060 : 00 : 00 (min:sec:cs)

φ -07.04 (deg)

λ 004.60 (deg)

h 110101.8 (n.mi.)

V_i 05022.1 (fps)

γ 77.11 (deg)

ψ_i 120.2 (deg)

Track:

ACN, ANG, BDA, CYI, MAD

TABLE VI.- MANEUVER RESET POINTS FOR AN ABORT AT 28^h00^m g.e.t. - Continued

(d) Reset point at 27^h48^m g.e.t.

Central Body EARTH

GET 027 : 48 : 00 (hr:min:sec)

X_R 29.9596723 (radii)

Y_R -14.7151553 (radii)

Z_R -4.1700727 (radii)

$\dot{X}_R$ .7995617 8 (radii/hr)

$\dot{Y}_R$ -.2108964 9 (radii/hr)

$\dot{Z}_R$ -.1970297 5 (radii/hr)

X_F 0.6269282 5 E +09 (ft)

Y_F -0.3079254 4 E +09 (ft)

Z_F -0.8726184 8 E +08 (ft)

$\dot{X}_F$ 0.4647616 7 E +04 (fps)

$\dot{Y}_F$ -0.1225879 0 E +04 (fps)

$\dot{Z}_F$ -0.1145258 E +04 (fps)

S/C Weight 63741.0 (lbs)

GMT 040 : 38 : 59 : 64 (hr:min:sec:cs)

θ 164.3 (deg)

ϵ 0.9762 (n.d.)

τ 399.46 (hr)

r 115846.6 (n.mi.)

T_{FI} 012 : 00 : 00 (min:sec:cs)

φ -07.17 (deg)

λ 352.80 (deg)

h 112403.6 (n.mi.)

V_i 04941.1 (fps)

γ 77.16 (deg)

ψ_i 120.2 (deg)

Track:

ACN, ANG, BDA, CYI, GBM, MAD, MIL

TABLE VI.- MANEUVER RESET POINTS FOR AN ABORT AT 28^h00^m g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXTERNAL ΔV

GETI 028 : 00 : 00 : 00 (hr:min:sec:cs)

ΔV_X -0007.6 (fps)

ΔV_Y 0000.0 (fps)

ΔV_Z 5319.2 (fps)

ΔV_T 5319.2 (fps)

ΔT_B 06 : 39.6 (min:sec:tenth-main engine)

V_C 5294.2 (fps)

R 177 (deg)		
P 132 (deg)	Reference REFSMMAT	
Y 001 (deg)		
R 180 (deg)		
P 266 (deg)	LV/LM REFSMMAT	
Y 002 (deg)		

$P_{c.g.}$ -3.80 (deg)

$Y_{c.g.}$ 2.22 (deg)

P_{TRIM} -1.65 (deg)

Y_{TRIM} 1.27 (deg)

φ_A -07.15 (deg)

λ_A 349.85 (deg)

h 112972.6 (n.mi.)

θ_{pre} 164.3 (deg)

θ_{post} 181.8 (deg)

Track:

ACN, ANG, BDA, CYI, GBM, MAD, MIL

Comments:

FOR P37 SIMULATION USE:

$T_{ig} = 28^h 03^m 20^s$

$\Delta V = 5319.$ fps

TABLE VII.- MANEUVER RESET POINTS FOR AN ABORT AT 47^h00^m g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)

GMTLO 12:50:59:70 (hr:min:sec:cs)

ψ_L 072.00 (deg)

Opportunity FIRST

Local Horizontal - Local Vertical
REFSMMAT at GETI

.24062341	.81271285	-.53065827
-.33222216	-.44473745	.83176742
-.91199168	.32643915	.16298697
OGA	MGA	IGA
000.15	357.78	274.04

Reference REFSMMAT LAUNCH PAD @ L.O.

.49775205	-.82379890	.27128990
-.30408543	-.45869345	-.83494452
.81226530	.33310004	-.47882088
OGA	MGA	IGA
000.11	355.98	140.11

Entry Target Line CONTINGENCY

V_{EI}, γ_{EI} at 400K ft 36039.56 -6.49

Entry Range Functions CONSTANT G

Time from SPS Off to 400K 51:05:16 (h:m:s)

ϕ_L 06.63 (deg)

λ_L 194.52 (deg)

Maneuver Description:

ABORT MANEUVER IS APPROXIMATELY 44 HRS FROM TLI. THIS IS LAST BLOCK DATA POINT DURING TLC.

TABLE VII.- MANEUVER RESET POINTS FOR AN ABORT AT 47^h00^m g.e.t. - Continued

(b) Reset point at 44^h30^m g.e.t.

Central Body EARTH

GET 044 : 30 : 00 (hr:min:sec)

X_R 41.5537722 (radii)

Y_R -12.4550076 (radii)

Z_R -7.2227534 (radii)

$\dot{X}_R$ .60797510 (radii/hr)

$\dot{Y}_R$ -.12914078 (radii/hr)

$\dot{Z}_R$ -.17118914 (radii/hr)

X_F 0.86954335 E +09 (ft)

Y_F -0.36526036 E +09 (ft)

Z_F -0.15114144 E +09 (ft)

$\dot{X}_F$ 0.35339798 E +04 (fps)

$\dot{Y}_F$ -0.75065724 E +03 (fps)

$\dot{Z}_F$ -0.99507199 E +03 (fps)

S/C Weight 63741.0 (lbs)

GMT 057 : 20 : 59 : 64 (hr:min:sec:cs)

θ 168.3 (deg)

ϵ 0.9772 (n.d.)

τ 405.29 (hr)

r 157202.0 (n.mi.)

T_{FI} 150 : 00 : 00 (min:sec:cs)

φ -09.10 (deg)

λ 104.99 (deg)

h 153759.0 (n.mi.)

V_i 03747.4 (fps)

γ 77.72 (deg)

ψ_i 121.9 (deg)

Track:

CRO, GWM, HSK

TABLE VII.- MANEUVER RESET POINTS FOR AN ABORT AT 47^h00^m g.e.t. - Continued

(c) Reset point at 46^h00^m g.e.t.

Central Body EARTH

GET 046 : 00 : 00 (hr:min:sec)

X_R 42.4562200 (radii)

Y_R -17.6454446 (radii)

Z_R -7.4783652 (radii)

$\dot{X}_R$ .59535009 (radii/hr)

$\dot{Y}_R$ -.12424996 (radii/hr)

$\dot{Z}_R$ -.16965088 (radii/hr)

X_F 0.88842232 E +09 (ft)

Y_F -0.36924399 E +09 (ft)

Z_F -0.15649030 E +09 (ft)

$\dot{X}_F$ 0.34605944 E +04 (fps)

$\dot{Y}_F$ -0.72513469 E +03 (fps)

$\dot{Z}_F$ -0.98613048 E +03 (fps)

S/C Weight 63741.0 (lbs)

GMT 058 : 50 : 59 : 64 (hr:min:sec:cs)

θ 168.6 (deg)

ϵ 0.9773 (n.d.)

τ 406.20 (hr)

r 160422.9 (n.mi.)

T_{FI} 060 : 00 : 00 (min:sec:cs)

φ -09.30 (deg)

λ 082.64 (deg)

h 156979.9 (n.mi.)

V_i 03670.7 (fps)

γ 77.75 (deg)

ψ_i 122.3 (deg)

Track:

CRO, GWM, HSK

TABLE VII.- MANEUVER RESET POINTS FOR AN ABORT AT 47^h00^m g.e.t. - Continued

(d) Reset point at 46^h48^m g.e.t.

Central Body EARTH

GET 046 : 48 : 00 (hr:min:sec)

X_R 42.929862 (radii)

Y_R -17.744365 (radii)

Z_R -7.613779 3 (radii)

$\dot{X}_R$ .5888289 3 (radii/hr)

$\dot{Y}_R$ -.1225608 (radii/hr)

$\dot{Z}_R$ -.1688165 (radii/hr)

X_F 0.8983903E +09 (ft)

Y_F -0.3713134E +09 (ft)

Z_F -0.1593235E +09 (ft)

$\dot{X}_F$ 0.3422688E +04 (fps)

$\dot{Y}_F$ -0.7124404E +03 (fps)

$\dot{Z}_F$ -0.9817123E +03 (fps)

S/C Weight 63741.0 (lbs)

GMT 059 : 38 : 59 : 64 (hr:min:sec:cs)

θ 168.7 (deg)

ϵ 0.9774 (n.d.)

τ 406.73 (hr)

r 162114.0 (n.mi.)

T_{FI} 012 : 00 : 00 (min:sec:cs)

φ -09.37 (deg)

λ 070.72 (deg)

h 158671.0 (n.mi.)

V_i 03631.3 (fps)

γ 77.72 (deg)

ψ_i 122.5 (deg)

Track:

CRO, GWM, HSK

TABLE VII.- MANEUVER RESET POINTS FOR AN ABORT AT 47^h00^m g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXTERNAL ΔV

GETI 047:00:00:00 (hr:min:sec:cs)

ΔV_X 0026.5 (fps)

ΔV_Y 0000.0 (fps)

ΔV_Z 6108.9 (fps)

ΔV_T 6108.9 (fps)

ΔT_B 07:22.9 (min:sec:tenth-main engine)

V_C 6080.9 (fps)

R 000 (deg)		
P 140 (deg)		Reference REFSMMAT
Y 356 (deg)		
R 000 (deg)		
P 274 (deg)		LV/LH REFSMMAT
Y 358 (deg)		

$P_{c.g.}$ -3.80 (deg)

$Y_{c.g.}$ 2.22 (deg)

P_{TRIM} -1.65 (deg)

Y_{TRIM} 1.27 (deg)

φ_A -09.38 (deg)

λ_A 067.74 (deg)

h 159090.5 (n.mi.)

θ_{prc} 168.8 (deg)

θ_{post} 188.5 (deg)

Track: ACN, CRO, GWM, HSK, MAD

Comments:

FOR P37 SIMULATION USE:

$T_{ig} = 47^h03^m32^s$

ΔV = 6109. fps

TABLE VIII.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m16^s67^{cs}$ g.e.t.

(a) Maneuver description

Launch Date 12 / 21 / 68 (mo/da/yr)

GMTLO 12 : 50 : 59 : 70 (hr:min:sec:cs)

Ψ_L 072.00 (deg)

Opportunity 1st

Local Horizontal - Local Vertical
REFSMMAT at GETI

. — — — — — — — —	. — — — — — — — —	. — — — — — — — —
. — — — — — — — —	. — — — — — — — —	. — — — — — — — —
. — — — — — — — —	. — — — — — — — —	. — — — — — — — —
OGA	MGA	IGA
— — — . — —	— — — . — —	— — — . — —

Reference REFSMMAT LØI 2 [IGA=180.; MGA=0.; ØGA=0.]

-.64877632	-.66111865	-.37684405
.07638412	-.54928435	.83213712
-.75713590	.51108595	.40686164
OGA	MGA	IGA
119.07	357.60	275.22

Entry Target Line MSFN

V_{EI}, γ_{EI} at 400K ft 36271.784 , -6.29917

Entry Range Functions G&N

Time from SPS Off to 400K 51:35:34.146 (h:m:s)

ϕ_L 7.03 (deg)

λ_L 195.03 (deg)

Maneuver Description:

Mode I abort maneuver initiated 2 hrs past nominal LOI ignition point on free-return trajectory.

NOTE: All lunar phase aborts used:
Thrust = 20 500 lb
ISP = 314.1

TABLE VIII.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m16^s67^{cs}$ g.e.t. - Continued

(b) Reset point at 69^h08^m g.e.t

Central Body Moon

GET 069 : 08 : 00 (hr:min:sec)

X_R .27287469 (radii)

Y_R -.07311458 (radii)

Z_R -.07114312 (radii)

$\dot{X}_R$ -.60095167 (radii/hr)

$\dot{Y}_R$ -1.09237444 (radii/hr)

$\dot{Z}_R$ -.74069510 (radii/hr)

X_F 5.71010426 E+06 (ft)

Y_F -1.52917645 E+06 (ft)

Z_F -1.48722224 E+06 (ft)

$\dot{X}_F$ -3.49315496 E+03 (fps)

$\dot{Y}_F$ -6.34964977 E+03 (fps)

$\dot{Z}_F$ -4.30544420 E+03 (fps)

S/C Weight 62629.9 (lbs)

GMT 081 : 58 : 59 : 68 (hr:min:sec:cs)

θ -7.1 (deg)

ϵ 1.4995 (n.d.)

τ XXX.XX (hr)

r 001003.3 (n.mi.)

T_{FI} 118 : 16 : 67 (min:sec:cs)

φ -7.73 (deg)

λ -167.72 (deg)

h 64.8 (n.mi.)

V_i 8429.5 (fps)

γ -4.27 (deg)

ψ_i -123.2 (deg)

Track:

TABLE VIII.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m16^s67^{cs}$ g.e.t. - Continued

(c) Reset point at 70^h06^m g.e.t.

Central Body MOON

GET 070 : 06 : 00 (hr:min:sec)

X_R -.602092911 (radii)

Y_R -.656072111 (radii)

Z_R -.428177738 (radii)

$\dot{X}_R$ -.859796663 (radii/hr)

$\dot{Y}_R$ -.368832667 (radii/hr)

$\dot{Z}_R$ -.204771142 (radii/hr)

X_F -1.259923800 E +07 (ft)

Y_F -1.372879280 E +07 (ft)

Z_F -8.959927399 E +06 (ft)

$\dot{X}_F$ -4.997744400 E +03 (fps)

$\dot{Y}_F$ -2.143915540 E +03 (fps)

$\dot{Z}_F$ -1.190275800 E +03 (fps)

S/C Weight 62629.9 (lbs)

GMT 082 : 56 : 59 : 68 (hr:min:sec:cs)

θ 100.2 (deg)

ϵ 1.4992 (n.d.)

τ XXX.XX (hr)

r 3402.8 (n.mi.)

T_{FI} 000 : 16 : 67 (min:sec:cs)

φ -8.80 (deg)

λ 82.74 (deg)

h 2464.4 (n.mi.)

V_i 5566.9 (fps)

γ 63.56 (deg)

ψ_i -64.3 (deg)

Track:

TABLE VIII.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m16^s67^{cs}$ g.e.t. - Continued

(d) Reset point at 70^h54^m g.e.t.

Central Body Moon

GET 070 : 54 : 00 (hr:min:sec)

X_R −1.2527776 (radii)

Y_R −.9161123 3 (radii)

Z_R −.5694845 6 (radii)

$\dot{X}_R$ −.7779764 3 (radii/hr)

$\dot{Y}_R$ −.2952026 4 (radii/hr)

$\dot{Z}_R$ −.1581417 8 (radii/hr)

X_F −2.6215298 E +07 (ft)

Y_F −1.9170326 0 E +07 (ft)

Z_F −1.1916842 E +07 (ft)

$\dot{X}_F$ −4.5222147 4 E +03 (fps)

$\dot{Y}_F$ −1.7194134 E +03 (fps)

$\dot{Z}_F$ −9.1923115 E +02 (fps)

S/C Weight 62629.9 (lbs)

GMT 083 : 44 : 59 : 68 (hr:min:sec:cs)

θ 112.0 (deg)

ϵ 1.4994 (n.d.)

τ xxx.xx (hr)

r 2623.5 (n.mi.)

T_{FI} 012 : 16 : 67 (min:sec:cs)

φ −6.39 (deg)

λ 70.69 (deg)

h 4755.0 (n.mi.)

V_i 4924.5 (fps)

γ 72.41 (deg)

ψ_i −59.9 (deg)

Track:

TABLE VIII.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m16^s67^{cs}$ g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXTERNAL ΔV

GETI 071 : 06 : 16 : 67 (hr:min:sec:cs)

ΔV_X 1468.3 (fps)

ΔV_Y -131.2 (fps)

ΔV_Z -522.5 (fps)

ΔV_T 1564.0 (fps)

ΔT_B 02 : 17.6 (min:sec:tenth-main engine)

V_C 1559.3 (fps)

R	179 (deg)	Reference REFSMMAT
P	275 (deg)	
Y	358 (deg)	
R	182 (deg)	LV/LH REFSMMAT
P	16 (deg)	
Y	357 (deg)	

$P_{c.g.}$ -3.76 (deg)

$Y_{c.g.}$ 2.22 (deg)

P_{TRIM} -1.61 (deg)

Y_{TRIM} 1.27 (deg)

φ_A -6.03 (deg)

λ_A -68.96 (deg)

h 5320.9 (n.mi.)

θ_{pre} 113.6 (deg)

θ_{post} 77.2 (deg)

Track:

Comments:

TABLE IX.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m54^s37^{cs}$ g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)

GMTLO 12:50:59:70 (hr:min:sec:cs)

Ψ_L 072.00 (deg)

Opportunity 1 SE

Local Horizontal - Local Vertical
REFSMMAT at GETI

— — — — — — — —	— — — — — — — —	— — — — — — — —
— — — — — — — —	— — — — — — — —	— — — — — — — —
— — — — — — — —	— — — — — — — —	— — — — — — — —
OGA	MGA	IGA
— — — . — —	— — — . — —	— — — . — —

Reference REFSMMAT LØI2(IGA=180., MGA=0., ØGA=0.)

-.64872632	-.66111865	-.37684405
.07638412	-.54928435	.83213712
-.75713590	.51108595	.40686164
OGA	MGA	IGA
192.62	355.96	321.86

Entry Target Line MSFN

V_{EI}, γ_{EI} at 400K ft 36269.339, -6.29866

Entry Range Functions G&N

Time from SPS Off to 400K 51:35:51.722 (h:m:s)

ϕ_L 6.82 (deg)

λ_L 195.03 (deg)

Maneuver Description: ABORT MADE 2 HRS AFTER AN SPS SHUTDOWN 60 SECS [illegible] BURN.

TABLE IX.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m54^s37^{cs}$ g.e.t. - Continued

(b) Reset point at 69^h09^m g.e.t.

Central Body Moon

GET 069 : 09 : 00 (hr:min:sec)

X_R .26331020 (radii)

Y_R -.08989327 (radii)

Z_R -.08231648 (radii)

$\dot{X}_R$ -.59649100 (radii/hr)

$\dot{Y}_R$ -1.00036661 (radii/hr)

$\dot{Z}_R$ -.66439151 (radii/hr)

X_F 5.50996030 E ±06 (ft)

Y_F -1.88108308 E ±06 (ft)

Z_F -1.72253305 E ±06 (ft)

$\dot{X}_F$ -3.4672262_ E ±03 (fps)

$\dot{Y}_F$ -5.8148329_ E ±03 (fps)

$\dot{Z}_F$ -3.8619117_ E ±03 (fps)

S/C Weight 58713.9 (lbs)

GMT 081 : 59 : 59 : 69 (hr:min:sec:cs)

θ -3.5 (deg)

ϵ 1.1302 (n.d.)

τ XXX.XX (hr)

r ___999.3 (n.mi.)

T_{FI} ___ : __ : __ (min:sec:cs)

φ -8.57 (deg)

λ -172.09 (deg)

h ____60.8 (n.mi.)

V_i _7794.1 (fps)

γ -1.83 (deg)

ψ_i -121.8 (deg)

Track:

TABLE IX.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m54^s37^{cs}$ g.e.t. - Continued

(c) Reset point at 70^h06^m g.e.t.

Central Body Moon

GET 070 : 06 : 00 (hr:min:sec)

X_R -.5690548 6 (radii)

Y_R -.5341642 7 (radii)

Z_R -.3368176 4 (radii)

$\dot{X}_R$ -.8009242 5 (radii/hr)

$\dot{Y}_R$ -.1947111 7 (radii/hr)

$\dot{Z}_R$ -.0803808 2 (radii/hr)

X_F -1.1907292 7 E +07 (ft)

Y_F -1.1177781 2 E +07 (ft)

Z_F -7.0481771 8 E +06 (ft)

$\dot{X}_F$ -4.6555363 E +03 (fps)

$\dot{Y}_F$ -1.1317986 E +03 (fps)

$\dot{Z}_F$ -4.6722996 E +02 (fps)

S/C Weight 58713.9 (lbs)

GMT 082 : 56 : 59 : 69 (hr:min:sec:cs)

θ 104.0 (deg)

ϵ 1.1279 (n.d.)

τ XXX.XX (hr)

r 2727.6 (n.mi.)

T_{FI} ___ : ___ : ___ (min:sec:cs)

φ -7.57 (deg)

λ 78.34 (deg)

h 1989.1 (n.mi.)

V_i 4813.9 (fps)

γ 56.47 (deg)

ψ_i -62.6 (deg)

Track:

TABLE IX.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m54^s37^{cs}$ g.e.t. - Continued

(d) Reset point at 70^h54^m g.e.t.

Central Body Moon

GET 070 : 54 : 00 (hr:min:sec)

X_R -1.1531174 (radii)

Y_R -.6455670 9 (radii)

Z_R -.3738257 0 (radii)

$\dot{X}_R$ -.6746856 9 (radii/hr)

$\dot{Y}_R$ -.1026995 1 (radii/hr)

$\dot{Z}_R$ -.0243911 5 (radii/hr)

X_F -2.4129832 6 E +07 (ft)

Y_F -1.3508967 4 E +07 (ft)

Z_F -7.8225782 2 E +06 (ft)

$\dot{X}_F$ -3.9217488 E +03 (fps)

$\dot{Y}_F$ -5.9696196 E +02 (fps)

$\dot{Z}_F$ -1.4177858 E +02 (fps)

S/C Weight 58713.9 (lbs)

GMT 083 : 44 : 59 : 69 (hr:min:sec:cs)

θ 119.1 (deg)

ϵ 1.1300 (n.d.)

τ XXX.XX (hr)

r 4729.8 (n.mi.)

T_{FI} 12 : 54 : 37 (min:sec:cs)

φ -4.33 (deg)

λ 63.02 (deg)

h 3791.3 (n.mi.)

V_i 3969.5 (fps)

γ 65.50 (deg)

ψ_i -57.9 (deg)

Track:

TABLE IX.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h06^m54^s37^{cs}$ g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance Extrapolated LV

GETI 71 : 6 : 54 : 37 (hr:min:sec:cs)

ΔV_X 5694.9 (fps)

ΔV_Y -154.1 (fps)

ΔV_Z -2150.0 (fps)

ΔV_T 2229.5 (fps)

ΔT_B 2:57.1 (min:sec:tenth-main engine)

V_C 2222.9 (fps)

R	193 (deg)	Reference REFSMMAT
P	322 (deg)	
Y	356 (deg)	
R	194 (deg)	LV/LH REFSMMAT
P	289 (deg)	
Y	357 (deg)	

$P_{c.g.}$ -3.64 (deg)

$Y_{c.g.}$ 2.27 (deg)

P_{TRIM} -1.49 (deg)

Y_{TRIM} 1.32 (deg)

φ_A -3.80 (deg)

λ_A 60.64 (deg)

h 4246.2 (n.mi.)

θ_{pre} 121.4 (deg)

θ_{post} 96.1 (deg)

Track:

Comments:

TABLE X.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h33^m04^s42^{cs}$ g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)

GMTLO 12:50:59:20 (hr:min:sec:cs)

Ψ_L 072.00 (deg)

Opportunity 1st

Local Horizontal - Local Vertical
REFSMMAT at GETI

OGA	MGA	IGA
— — — — — — — —	— — — — — — — —	— — — — — — — —
— — — — — — — —	— — — — — — — —	— — — — — — — —
— — — — — — — —	— — — — — — — —	— — — — — — — —
— — — . — —	— — — . — —	— — — . — —

Reference REFSMMAT [illegible]

OGA	MGA	IGA
.64872632	-.66111865	-.32684405
.27632412	-.54928435	.23213712
[illegible]	.51128595	.10681214
178.26	352.29	344.35

Entry Target Line MSFN

V_{EI}, γ_{EI} at 400K ft

Entry Range Functions GGN

Time from SPS Off to 400K 51:15:22.883 (h:m:s)

ϕ_L 5.47 (deg)

λ_L 194.97 (deg)

Maneuver Description:

MODE III ABORT MANEUVER INITIATED AFTER 1 REV IN 60 X 170 n. mi. LUNAR ORBIT

TABLE X.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h33^m04^s42^{cs}$ g.e.t. - Continued

(b) Reset point at 69^h12^m g.e.t.

Central Body Moon

GET 069 : 12 : 00 (hr:min:sec)

X_R .23587341 (radii)

Y_R -.12966828 (radii)

Z_R -.10715095 (radii)

$\dot{X}_R$ -.54626101 (radii/hr)

$\dot{Y}_R$ -.66329069 (radii/hr)

$\dot{Z}_R$ -.38844692 (radii/hr)

X_F 4.93582505 E +06 (ft)

Y_F -2.71340433 E +06 (ft)

Z_F -2.24222175 E +06 (ft)

$\dot{X}_F$ -3.175254 E +03 (fps)

$\dot{Y}_F$ -3.855513 E +03 (fps)

$\dot{Z}_F$ -2.257922 E +03 (fps)

S/C Weight 46585.2 (lbs)

GMT 082 : 02 : 59 : 69 (hr:min:sec:cs)

θ -5.2 (deg)

ϵ .0522 (n.d.)

τ 2.15 (hr)

r 997.7 (n.mi.)

T_{FI} 131 : 04 : 42 (min:sec:cs)

φ -10.22 (deg)

λ 177.11 (deg)

h 59.2 (n.mi.)

V_i 5481.4 (fps)

γ -.26 (deg)

ψ_i -116.4 (deg)

Track:

TABLE X.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h33^m04^s42^{cs}$ g.e.t. - Continued

(c) Reset point at 70^h23^m g.e.t.

Central Body Moon

GET 070 : 23 : 00 (hr:min:sec)

X_R -.19189431 (radii)

Y_R .20622976 (radii)

Z_R .15372985 (radii)

$\dot{X}_R$ .68533601 (radii/hr)

$\dot{Y}_R$ .44794758 (radii/hr)

$\dot{Z}_R$ .23293348 (radii/hr)

X_F -4.01552998 E+06 (ft)

Y_F 4.31550992 E+06 (ft)

Z_F 3.21691063 E+06 (ft)

$\dot{X}_F$ 3.98365579 E+03 (fps)

$\dot{Y}_F$ 2.60378711 E+03 (fps)

$\dot{Z}_F$ 1.35606661 E+03 (fps)

S/C Weight 46585.2 (lbs)

GMT 083 : 13 : 59 : 69 (hr:min:sec:cs)

θ -167.3 (deg)

ϵ .0516 (n.d.)

τ 2.14 (hr)

r 1105.2 (n.mi.)

T_{FI} 60 : 04 : 42 (min:sec:cs)

φ 11.85 (deg)

λ -21.69 (deg)

h 166.7 (n.mi.)

V_i 4948.5 (fps)

γ -.69 (deg)

ψ_i -71.4 (deg)

Track:

TABLE X.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h33^m04^s42^{cs}$ g.e.t. - Continued

(d) Reset point at 71^h11^m g.e.t.

Central Body Moon

GET 071 : 11 : 00 (hr:min:sec)

X_R .29003984 (radii)

Y_R -.01139177 (radii)

Z_R -.03403920 (radii)

$\dot{X}_R$ -.11659502 (radii/hr)

$\dot{Y}_R$ -.77910486 (radii/hr)

$\dot{Z}_R$ -.50389300 (radii/hr)

X_F 6.06929772 E+06 (ft)

Y_F -2.38381213 E+05 (ft)

Z_F -7.12295363 E+05 (ft)

$\dot{X}_F$ -6.77732466 E+02 (fps)

$\dot{Y}_F$ -4.52870666 E+03 (fps)

$\dot{Z}_F$ -2.92821 E+03 (fps)

S/C Weight 46585.2 (lbs)

GMT 084 : 01 : 59 : 69 (hr:min:sec:cs)

θ -34.8 (deg)

ϵ .0521 (n.d.)

τ 2.14 (hr)

r 1006.5 (n.mi.)

T_{FI} 12 : 0 : 1 (min:sec:cs)

φ -5.46 (deg)

λ -154.35 (deg)

h 68.0 (n.mi.)

V_i 5435.8 (fps)

γ -1.63 (deg)

ψ_i -123.1 (deg)

Track:

TABLE X.- MANEUVER RESET POINTS FOR AN ABORT AT $71^h33^m04^s42^{cs}$ g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXT ΔV

GETI 71 : 33 : 04 : 42 (hr:min:sec:cs)

ΔV_X 3234.3 (fps)

ΔV_Y -318.2 (fps)

ΔV_Z -250.6 (fps)

ΔV_T 3256.2 (fps)

ΔT_B 3 : 41.6 (min:sec:tenth-main engine)

V_C 3249.4 (fps)

Reference REFSMMAT

R 179 (deg)

P 344 (deg)

Y 357 (deg)

LV/LH REFSMMAT

R 179 (deg)

P 347 (deg)

Y 357 (deg)

$P_{c.g.}$ -2.68 (deg)

$Y_{c.g.}$ 2.12 (deg)

P_{TRIM} -.53 (deg)

Y_{TRIM} .17 (deg)

φ_A -11.05 (deg)

λ_A 168.21 (deg)

h 59.1 (n.mi.)

θ_{pre} 2.3 (deg)

θ_{post} 6.6 (deg)

Track:

Comments:

TABLE XI.- MANEUVER RESET POINTS FOR AN ABORT AT $75^h20^m25^s20^{cs}$ g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)
GMTLO 12:50:59:70 (hr:min:sec:cs)
Ψ_L 072.00 (deg)
Opportunity 1ST

Local Horizontal - Local Vertical
REFSMMAT at GETI

OGA	MGA	IGA
---.--	---.--	---.--

Reference REFSMMAT LOI [illegible] MGA 0, OGA = 0.1

-.64877632	-.66111165	-.37684405
.07632412	-.54928435	.83213712
-.757[illegible]3570	.51108595	.40686164

OGA	MGA	IGA
180.00	1.47	19.93

Entry Target Line MEFN
V_{EI}, γ_{EI} at 400K ft 36101.966, -6.2[illegible]
Entry Range Functions [illegible]
Time from SPS Off to 400K 71:46:12.83[illegible] (h:m:s)
ϕ_L 1.77 (deg)
λ_L 195.00 (deg)

Maneuver Description:
MCC III ABORT MANEUVER INITIATED
AFTER 1 REV. IN 60×60 LUNAR ORBIT.

TABLE XI.- MANEUVER RESET POINTS FOR AN ABORT AT $75^h20^m25^s20^{cs}$ g.e.t. - Continued

(b) Reset point at 73^h32^m g.e.t.

Central Body MOON

GET 073 : 32 : 00 (hr:min:sec)

X_R .20864467 (radii)

Y_R -.15833064 (radii)

Z_R -.12366426 (radii)

$\dot{X}_R$ -.63386249 (radii/hr)

$\dot{Y}_R$ -.58103322 (radii/hr)

$\dot{Z}_R$ -.32534182 (radii/hr)

X_F 4.36604358 E +06 (ft)

Y_F -3.31318547 E +06 (ft)

Z_F -2.58776594 E +06 (ft)

$\dot{X}_F$ -3.68445556 E +03 (fps)

$\dot{Y}_F$ -3.37737466 E +03 (fps)

$\dot{Z}_F$ -1.89111666 E +03 (fps)

S/C Weight 45946.7 (lbs)

GMT 086 : 22 : 59 : 67 (hr:min:sec:cs)

θ -162.3 (deg)

ϵ .0003 (n.d.)

τ 1.98 (hr)

r 997.5 (n.mi.)

T_{FI} 108 : 25 : 20 (min:sec:cs)

φ -11.14 (deg)

λ 166.15 (deg)

h 59.0 (n.mi.)

V_i 5344.0 (fps)

γ -.01 (deg)

ψ_i -113.0 (deg)

Track:

TABLE XI.- MANEUVER RESET POINTS FOR AN ABORT AT $75^h20^m25^s20^{cs}$ g.e.t. - Continued

(c) Reset point at 74^h20^m g.e.t.

Central Body MOON

GET 074 : 20 : 00 (hr:min:sec)

X_R -.28459816 (radii)

Y_R .02733204 (radii)

Z_R .04421016 (radii)

$\dot{X}_R$ .14986099 (radii/hr)

$\dot{Y}_R$ .76423234 (radii/hr)

$\dot{Z}_R$ .49061940 (radii/hr)

X_F -5.95542645 E+06 (ft)

Y_F 5.71943055 E+05 (ft)

Z_F 9.25130204 E+05 (ft)

$\dot{X}_F$ 8.7109773 E+02 (fps)

$\dot{Y}_F$ 4.4422571 E+03 (fps)

$\dot{Z}_F$ 2.8518257 E+03 (fps)

S/C Weight 45946.7 (lbs)

GMT 087 : 10 : 59 : 67 (hr:min:sec:cs)

θ -16.7 (deg)

ϵ .0009 (n.d.)

τ 1.98 (hr)

r 996.3 (n.mi.)

T_{FI} [illegible] : 25 : [illegible] (min:sec:cs)

φ 6.21 (deg)

λ 20.14 (deg)

h 57.9 (n.mi.)

V_i 5350.3 (fps)

γ -.02 (deg)

ψ_i -57.4 (deg)

Track:

TABLE XI.- MANEUVER RESET POINTS FOR AN ABORT AT $75^h20^m25^s20^{cs}$ g.e.t. - Continued

(d) Reset point at 75^h08^m g.e.t.

Central Body Moon

GET 075 : 08 : 00 (hr:min:sec)

X_R .26194848 (radii)

Y_R .11269148 (radii)

Z_R .05022651 (radii)

$\dot{X}_R$ .38591679 (radii/hr)

$\dot{Y}_R$ -.67990606 (radii/hr)

$\dot{Z}_R$ -.48423333 (radii/hr)

X_F 5.48146514 E+06 (ft)

Y_F 2.35815233 E+06 (ft)

Z_F 1.05102683 E+06 (ft)

$\dot{X}_F$ 2.24322204 E+03 (fps)

$\dot{Y}_F$ -3.9520933 E+03 (fps)

$\dot{Z}_F$ -2.8147054 E+03 (fps)

S/C Weight 45946.7 (lbs)

GMT 087 : 58 : 59 : 67 (hr:min:sec:cs)

θ 96.5 (deg)

ϵ .0006 (n.d.)

τ 1.98 (hr)

r 997.2 (n.mi.)

T_{FI} 12 : 25 : 20 (min:sec:cs)

φ .80 (deg)

λ -126.73 (deg)

h 58.7 (n.mi.)

V_i 5345.4 (fps)

γ .03 (deg)

ψ_i 122.3 (deg)

Track:

TABLE XI.- MANEUVER RESET POINTS FOR AN ABORT AT $75^h20^m25^s20^{cs}$ g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXTERNAL ΔV

GETI 075:20:25:20 (hr:min:sec:cs)

ΔV_X -002.3 (fps)

ΔV_Y -32.6 (fps)

ΔV_Z -.7 (fps)

ΔV_T 3002.5 (fps)

ΔT_B 3:00.9 (min:sec:tenth-main engine)

V_C 2991.3 (fps)

R 180 (deg)
P 20 (deg)
Y 1 (deg)
Reference REFSMMAT

R 180 (deg)
P 352 (deg)
Y 1 (deg)
LV/LH REFSMMAT

$P_{c.g.}$ -2.59 (deg)

$Y_{c.g.}$ 2.02 (deg)

P_{TRIM} -.44 (deg)

Y_{TRIM} 1.13 (deg)

φ_A -6.24 (deg)

λ_A -163.20 (deg)

h 59.0 (n.mi.)

θ_{pre} 129.9 (deg)

θ_{post} 6.5 (deg)

Track:

Comments:

TABLE XII.- MANEUVER RESET POINTS FOR AN ABORT AT $86^h57^m54^s31^{cs}$ g.e.t.

(a) Maneuver description

Launch Date 12/21/62 (mo/da/yr)

GMTLO 12 : 20 : 22 : 20 (hr:min:sec:cs)

Ψ_L 072.00 (deg)

Opportunity 1st

Local Horizontal - Local Vertical
REFSMMAT at GETI

OGA	MGA	IGA
___.__	___.__	___.__

Reference REFSMMAT LOI [illegible]

-.648776322	-.66[illegible]	-.376294405
.076324122	-.5492243[illegible]	.832137122
-.757135920	.511085[illegible]	.406261664

OGA	MGA	IGA
180.00	0.47	7.04

Entry Target Line MSFN

V_{EI}, γ_{EI} at 400K ft 36186.5[illegible] [illegible]

Entry Range Functions GFN

Time from SPS Off to 400K 60:29:17.908 (h:m:s)

ϕ_L 0.95 (deg)

λ_L 195.00 (deg)

Maneuver Description:

MODE III ABORT MANEUVER INITIATED AFTER ONE REV. FOLLOWING PREMATURE SHUTDOWN OF LOI BURN AT 120 SECONDS.

TABLE XII.- MANEUVER RESET POINTS FOR AN ABORT AT $86^h57^m54^s31^{cs}$ g.e.t. - Continued

(b) Reset point at 84^h27^m g.e.t.

Central Body Moon

GET 084 : 27 : 00 (hr:min:sec)

X_R -.55231878 (radii)

Y_R .98930265 (radii)

Z_R .72604895 (radii)

$\dot{X}_R$ .36731731 (radii/hr)

$\dot{Y}_R$ -.13418147 (radii/hr)

$\dot{Z}_R$ -.12098483 (radii/hr)

X_F -1.15576776 E+07 (ft)

Y_F 2.07018875 E+07 (ft)

Z_F 1.51931099 E+07 (ft)

$\dot{X}_F$ 2.13501021 E+03 (fps)

$\dot{Y}_F$ -7.79957331 E+02 (fps)

$\dot{Z}_F$ -7.03249099 E+02 (fps)

S/C Weight 54777.9 (lbs)

GMT 097 : 17 : 59 : 68 (hr:min:sec:cs)

θ -144.0 (deg)

ϵ .7704 (n.d.)

τ 17.68 (hr)

r 4634.5 (n.mi.)

T_{FI} 10 : 54 : 31 (min:sec:cs)

φ 13.10 (deg)

λ -42.15 (deg)

h 3676.0 (n.mi.)

V_i 2379.4 (fps)

γ -50.24 (deg)

ψ_i -77.2 (deg)

Track:

TABLE XII.- MANEUVER RESET POINTS FOR AN ABORT AT $86^h57^m54^s31^{cs}$ g.e.t. - Continued

(c) Reset point at 85^h57^m g.e.t.

Central Body MOON

GET 085 : 57 : 00 (hr:min:sec)

X_R .05512673 (radii)

Y_R .62469890 (radii)

Z_R .42735386 (radii)

$\dot{X}_R$ .42669830 (radii/hr)

$\dot{Y}_R$ -.40903546 (radii/hr)

$\dot{Z}_R$ -.31548112 (radii/hr)

X_F 1.15356742 E+06 (ft)

Y_F 1.30722855 E+07 (ft)

Z_F 8.94267492 E+06 (ft)

$\dot{X}_F$ 2.48027112 E+03 (fps)

$\dot{Y}_F$ -2.37760224 E+03 (fps)

$\dot{Z}_F$ -1.83377987 E+03 (fps)

S/C Weight 54797.9 (lbs)

GMT 098 : 47 : 59 : 68 (hr:min:sec:cs)

θ -115.6 (deg)

ϵ .7706 (n.d.)

τ 17.67 (hr)

r 2613.6 (n.mi.)

T_{FI} 60 : 54 : 31 (min:sec:cs)

φ 12.41 (deg)

λ -72.16 (deg)

h 1675.1 (n.mi.)

V_i 3894.6 (fps)

γ -46.17 (deg)

ψ_i -96.5 (deg)

Track:

TABLE XII.- MANEUVER RESET POINTS FOR AN ABORT AT $86^h57^m54^s31^{cs}$ g.e.t. - Continued

(d) Reset point at 86^h45^m g.e.t.

Central Body MOON

GET 086 : 45 : 00 (hr:min:sec)

X_R .31705097 (radii)

Y_R .13074643 (radii)

Z_R .06589673 (radii)

$\dot{X}_R$ .02267555 (radii/hr)

$\dot{Y}_R$ -.90254188 (radii/hr)

$\dot{Z}_R$ -.62531806 (radii/hr)

X_F 6.63452508 E+06 (ft)

Y_F 2.73596562 E+06 (ft)

Z_F 1.37893777 E+06 (ft)

$\dot{X}_F$ 1.31806299 E+02 (fps)

$\dot{Y}_F$ -5.24620966 E+03 (fps)

$\dot{Z}_F$ -3.63478933 E+03 (fps)

S/C Weight 54797.9 (lbs)

GMT 099 : 35 : 59 : 68 (hr:min:sec:cs)

θ -54.3 (deg)

ϵ .7708 (n.d.)

τ 17.69 (hr)

r 1202.7 (n.mi.)

T_{FI} 12 : 54 : 31 (min:sec:cs)

φ 1.93 (deg)

λ -133.60 (deg)

h 264.2 (n.mi.)

V_i 6383.7 (fps)

γ -23.35 (deg)

ψ_i -123.3 (deg)

Track:

TABLE XII.- MANEUVER RESET POINTS FOR AN ABORT AT $86^h57^m54^s31^{cs}$ g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXTERNAL ΔV

GETI 086 : 57 : 54 : 31 (hr:min:sec:cs)

ΔV_X 1596.2 (fps)

ΔV_Y -10.8 (fps)

ΔV_Z -146.5 (fps)

ΔV_T 1602.9 (fps)

ΔT_B 02 : 03 . 2 (min:sec:tenth-main engine)

V_C 1598.7 (fps)

Reference REFSMMAT

R 180 (deg)

P 7 (deg)

Y 0 (deg)

LV/LH REFSMMAT

R 180 (deg)

P 347 (deg)

Y 2 (deg)

$P_{c.g.}$ -3.42 (deg)

$Y_{c.g.}$ 2.27 (deg)

P_{TRIM} -1.27 (deg)

Y_{TRIM} 1.32 (deg)

φ_A -7.74 (deg)

λ_A -177.76 (deg)

h 51.2 (n.mi.)

θ_{pre} -9.3 (deg)

θ_{post} 0.6 (deg)

Track:

Comments:

TABLE XIII.- MANEUVER RESET POINTS FOR AN ABORT AT $91^h05^m20^s13^{cs}$ g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)

GMTLO 12 : 50 : 59 : 70 (hr:min:sec:cs)

ψ_L 072.00 (deg)

Opportunity 1st

Local Horizontal - Local Vertical
REFSMMAT at GETI

. _____	. _____	. _____
. _____	. _____	. _____
. _____	. _____	. _____
OGA	MGA	IGA
___.__	___.__	___.__

Reference REFSMMAT [illegible]

-.64872632	-.66111865	-.37684405
.07638412	-.54928435	.83213712
-.75713590	.51108595	.40601[illegible]
OGA	MGA	IGA
184.63	[illegible].29	324.44

Entry Target Line MSFN

V_{EI}, γ_{EI} at 400K ft [illegible]

Entry Range Functions CONSTANT G

Time from SPS Off to 400K 56:[illegible]:[illegible] (h:m:s)

ϕ_L 4.14 (deg)

λ_L 195.03 (deg)

Maneuver Description:

ABORT I PLUS MANEUVER INITIATED
2 HRS PAST PREMATURE SHUTDOWN OF
TEI BURN AT 140 SECONDS.

TABLE XIII.- MANEUVER RESET POINTS FOR AN ABORT AT $91^h05^m20^s13^{cs}$ g.e.t. - Continued

(b) Reset point at 89^h07^m g.e.t.

Central Body Moon

GET 089 : 07 : 00 (hr:min:sec)

X_R .28894170 (radii)

Y_R -.00213308 (radii)

Z_R -.02862708 (radii)

$\dot{X}_R$ -.00891344 (radii/hr)

$\dot{Y}_R$ -1.09312058 (radii/hr)

$\dot{Z}_R$ -.71347258 (radii/hr)

X_F 6.04631828 E ± 06 (ft)

Y_F -4.46362138 E ± 04 (ft)

Z_F -5.99042682 E ± 05 (ft)

$\dot{X}_F$ -5.18111183 E ± 01 (fps)

$\dot{Y}_F$ -6.35398688 E ± 03 (fps)

$\dot{Z}_F$ -4.14720555 E ± 03 (fps)

S/C Weight 36529.1 (lbs)

GMT 101 : 57 : 59 : 67 (hr:min:sec:cs)

θ 6.0 (deg)

ϵ 1.0205 (n.d.)

τ XXX.XX (hr)

r 1000.0 (n.mi.)

T_{FI} 118 : 20 : 13 (min:sec:cs)

φ -5.19 (deg)

λ -162.12 (deg)

h 61.5 (n.mi.)

V_i 7587.8 (fps)

γ 3.05 (deg)

ψ_i -123.0 (deg)

Track:

TABLE XIII.- MANEUVER RESET POINTS FOR AN ABORT AT $91^h05^m20^s13^{cs}$ g.e.t. - Continued

(c) Reset point at 90^h05^m g.e.t.

Central Body Moon

GET 090 : 05 : 00 (hr:min:sec)

X_R -.21348010 (radii)

Y_R -.68977044 (radii)

Z_R -.43056627 (radii)

$\dot{X}_R$ -.59397812 (radii/hr)

$\dot{Y}_R$ -.43965208 (radii/hr)

$\dot{Z}_R$ -.23125526 (radii/hr)

X_F -4.46722870 E+06 (ft)

Y_F -1.44339551 E+07 (ft)

Z_F -9.60971681 E+06 (ft)

$\dot{X}_F$ -3.4526195 E+03 (fps)

$\dot{Y}_F$ -2.5555678 E+03 (fps)

$\dot{Z}_F$ -1.3442186 E+03 (fps)

S/C Weight 36529.1 (lbs)

GMT 102 : 55 : 59 : 67 (hr:min:sec:cs)

θ 107.4 (deg)

ϵ 1.0201 (n.d.)

τ XXX.XX (hr)

r 2895.2 (n.mi.)

T_{FI} 60 : 20 : 13 (min:sec:cs)

φ -9.69 (deg)

λ 94.91 (deg)

h 1956.8 (n.mi.)

V_i 4500.9 (fps)

γ 54.45 (deg)

ψ_i -76.3 (deg)

Track:

TABLE XIII.- MANEUVER RESET POINTS FOR AN ABORT AT $91^h05^m20^s13^{cs}$ g.e.t. - Continued

(d) Reset point at 90^h53^m g.e.t.

Central Body Moon

GET 090 : 53 : 00 (hr:min:sec)

X_R -.66078334 (radii)

Y_R -.97703513 (radii)

Z_R -.57608379 (radii)

$\dot{X}_R$ -.52699909 (radii/hr)

$\dot{Y}_R$ -.30115530 (radii/hr)

$\dot{Z}_R$ -.14708117 (radii/hr)

X_F -1.38272789 E+07 (ft)

Y_F -2.04451807 E+07 (ft)

Z_F -1.20549821 E+07 (ft)

$\dot{X}_F$ -3.0632902 E+03 (fps)

$\dot{Y}_F$ -1.7505268 E+03 (fps)

$\dot{Z}_F$ -8.5493945 E+02 (fps)

S/C Weight 36529.1 (lbs)

GMT 103 : 43 : 59 : 67 (hr:min:sec:cs)

θ 122.9 (deg)

ϵ 1.0200 (n.d.)

τ xxx.XX (hr)

r 4520.8 (n.mi.)

T_{FI} 12 : 20 : 13 (min:sec:cs)

φ -7.37 (deg)

λ 78.90 (deg)

h 3582.3 (n.mi.)

V_i 3630.3 (fps)

γ 62.50 (deg)

ψ_i -68.2 (deg)

Track:

TABLE XIII.- MANEUVER RESET POINTS FOR AN ABORT AT $91^h05^m20^s13^{cs}$ g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXT ΔV

GETI 91 : 5 : 20 : 13 (hr:min:sec:cs)

ΔV_X 1509.7 (fps)

ΔV_Y -158.8 (fps)

ΔV_Z -1784.6 (fps)

ΔV_T 2342.9 (fps)

ΔT_B 1 : 55.9 (min:sec:tenth-main engine)

V_C 2339.0 (fps)

R	185 (deg)	Reference REFSMMAT
P	324 (deg)	
Y	357 (deg)	
R	185 (deg)	LV/LH REFSMMAT
P	47 (deg)	
Y	357 (deg)	

$P_{c.g.}$ -2.95 (deg)

$Y_{c.g.}$ 1.21 (deg)

P_{TRIM} -0.80 (deg)

Y_{TRIM} .26 (deg)

φ_A -6.97 (deg)

λ_A 76.42 (deg)

h 3968.9 (n.mi.)

θ_{pre} 125.3 (deg)

θ_{post} 77.1 (deg)

Track:

Comments:

TABLE XIV.- MANEUVER RESET POINTS FOR AN ABORT AT $93^h16^m00^s13^{cs}$ g.e.t.

(a) Maneuver description

Launch Date 12/21/68 (mo/da/yr)

GMTLO 12 : 50 : 59 : 70 (hr:min:sec:cs)

Ψ_L 072.00 (deg)

Opportunity 1st

Local Horizontal - Local Vertical
REFSMMAT at GETI

OGA	MGA	IGA
———	———	———
———	———	———
———	———	———
———.——	———.——	———.——

Reference REFSMMAT LØI2 (for IGA=180., MGA=0., OGA=0)

OGA	MGA	IGA
-.64872632	-.66118865	-.32684405
.07638412	-.54928435	.83213712
-.75213590	.51108555	.46761[illegible]
179.26	359.00	345.79

Entry Target Line MISFV

V_{EI}, γ_{EI} at 400K ft 36269.999, -6.299

Entry Range Functions GGN

Time from SPS Off to 400K 54:6:55.56 (h:m:s)

ϕ_L —.26 (deg)

λ_L 195.01 (deg)

Maneuver Description:

MODE III ABOR - MANEUVER INITIATED AFTER 1 REV. FOLLOWING PREMATURE SHUTDOWN OF TEI BURN AT 60 SECONDS.

TABLE XIV.- MANEUVER RESET POINTS FOR AN ABORT AT $93^h16^m00^s13^{cs}$ g.e.t. - Continued

(b) Reset points at 90^h45^m g.e.t.

Central Body Moon

GET 090 : 45 : 00 (hr:min:sec)

X_R -.58367463 (radii)

Y_R -.17963918 (radii)

Z_R -.06260293 (radii)

$\dot{X}_R$ -.21722403 (radii/hr)

$\dot{Y}_R$ .37777118 (radii/hr)

$\dot{Z}_R$ .26818447 (radii/hr)

X_F -1.22138221 E +07 (ft)

Y_F -3.75908230 E +06 (ft)

Z_F -1.31001250 E +06 (ft)

$\dot{X}_F$ -1.26265911 E +03 (fps)

$\dot{Y}_F$ 2.19587724 E +03 (fps)

$\dot{Z}_F$ 1.55887772 E +03 (fps)

S/C Weight 41750.4 (lbs)

GMT 103 : 35 : 59 : 69 (hr:min:sec:cs)

θ 166.2 (deg)

ϵ .3660 (n.d.)

τ 3.92 (hr)

r 2114.2 (n.mi.)

T_{FI} 151 : 00 : 13 (min:sec:cs)

φ .93 (deg)

λ 37.53 (deg)

h 1175.7 (n.mi.)

V_i 2974.3 (fps)

γ 7.71 (deg)

ψ_i -56.9 (deg)

Track:

TABLE XIV.- MANEUVER RESET POINTS FOR AN ABORT AT $93^h16^m00^s13^{cs}$ g.e.t. - Continued

(c) Reset points at 92^h15^m g.e.t.

Central Body Moon

GET 092 : 15 : 00 (hr:min:sec)

X_R -.19862056 (radii)

Y_R .33696537 (radii)

Z_R .23964781 (radii)

$\dot{X}_R$ .72486254 (radii/hr)

$\dot{Y}_R$ .07686342 (radii/hr)

$\dot{Z}_R$ -.01814984 (radii/hr)

X_F -4.15628167 E+06 (ft)

Y_F 7.05124878 E+06 (ft)

Z_F 5.01480720 E+06 (ft)

$\dot{X}_F$ 4.21341 2 E+03 (fps)

$\dot{Y}_F$ 4.46784 4 E+02 (fps)

$\dot{Z}_F$ -1.05496 4 E+02 (fps)

S/C Weight 41750.4 (lbs)

GMT 105 : 05 : 59 : 69 (hr:min:sec:cs)

θ -112.1 (deg)

ϵ .3660 (n.d.)

τ 3.92 (hr)

r 1579.8 (n.mi.)

T_{FI} 71 : 00 : 13 (min:sec:cs)

φ 12.19 (deg)

λ -45.06 (deg)

h 641.3 (n.mi.)

V_i 4238.3 (fps)

γ -21.47 (deg)

ψ_i -77.9 (deg)

Track:

TABLE XIV.- MANEUVER RESET POINTS FOR AN ABORT AT $93^h16^m00^s13^{cs}$ g.e.t. - Continued

(d) Reset points at 93^h03^m g.e.t.

Central Body MOON

GET 093 : 03 : 00 (hr:min:sec)

X_R .2224459 3 (radii)

Y_R -.0090314 7 (radii)

Z_R -.0332071 8 (radii)

$\dot{X}_R$ -.0512416 (radii/hr)

$\dot{Y}_R$ -.8981592 8 (radii/hr)

$\dot{Z}_R$ -.5838419 8 (radii/hr)

X_F 6.0359438 6 E +06 (ft)

Y_F -1.8897019 6 E +05 (ft)

Z_F -6.9488480 0 E +05 (ft)

$\dot{X}_F$ -2.9815728 E +02 (fps)

$\dot{Y}_F$ -5.2207348 E +03 (fps)

$\dot{Z}_F$ -3.3737011 E +03 (fps)

S/C Weight 41750.4 (lbs)

GMT 105 : 13 : 59 : 61 (hr:min:sec:cs)

θ 8.7 (deg)

ϵ .3664 (n.d.)

τ 3.92 (hr)

r 1000.4 (n.mi.)

T_{FI} 13 : 00 : 13 (min:sec:cs)

φ -5.51 (deg)

λ -165.89 (deg)

h 61.9 (n.mi.)

V_i 6234.0 (fps)

γ 2.34 (deg)

ψ_i -122.9 (deg)

Track:

TABLE XIV.- MANEUVER RESET POINTS FOR AN ABORT AT $93^h16^m00^s13^{cs}$ g.e.t. - Concluded

(e) SPS abort maneuver data

Guidance EXT ΔV

GETI 93 : 16 : 00 : 13 (hr:min:sec:cs)

ΔV_X 3059.0 (fps)

ΔV_Y -161.2 (fps)

ΔV_Z 3.8 (fps)

ΔV_T 3063.2 (fps)

ΔT_B 2 : 47.3 (min:sec:tenth-main engine)

V_C 3058.2 (fps)

Reference REFSMMAT

R 180 (deg)
P 346 (deg)
Y 359 (deg)

LV/LH REFSMMAT

R 180 (deg)
P 353 (deg)
Y 359 (deg)

$P_{c.g.}$ -2.71 (deg)

$Y_{c.g.}$ 1.79 (deg)

P_{TRIM} - .56 (deg)

Y_{TRIM} .84 (deg)

φ_A -11.41 (deg)

λ_A 151.62 (deg)

h 168.9 (n.mi.)

θ_{pre} 51.0 (deg)

θ_{post} 19.0 (deg)

Track:

Comments:

REFERENCES

1. PA/Chief, Apollo Data Priority Coordination: C Prime Lunar Mission Techniques Document - Contingency Procedures. MSC-M-68-PA-T-231A, October 29, 1968.

2. Contingency Analysis Section, FAB: Apollo Mission C Prime, Alternate 1, (AS-503/CSM 103/LTA-B) Spacecraft Operational Abort Plan. MSC IN, to be published.