

4.4 TRAVERSE PLANNING PARAMETERS

Note: Section 4.4 has been prepared in its entirety by the Operations Analysis Branch, Systems Engineering Division, Apollo Spacecraft Program Office

EVA TRAVERSE PLANNING PARAMETERS

The purpose of this appendix is to provide a summary reference source for primary data used in lunar surface traverse planning. These data are those that have been generally concurred with for use in current lunar surface operations planning and study. Officially approved data for each mission ultimately appear in the Apollo Spacecraft Operational Data Books, Flight Mission Rules and the Flight Plan. Prior to that time, these EVA traverse planning parameters will be updated periodically through the Lunar Surface Operations Planning Meetings.

Primary lunar surface traverse planning data presented herein are categorized for each reference with the organization and person responsible for the data indicated at the bottom of each page, along with the official data source reference.

APOLLO 17 PLANNING PARAMETERS

1. Crewmen Parameters

1.1 Metabolic Rates¹, $\dot{Q}_M$

- a. Riding on LRV 550 Btu/Hr
- b. Working
 - (1) Overhead and ALSEP Activities 1050 Btu/Hr
 - (2) Geological Station Activities 950 Btu/Hr
- c. Contingency Walking

Duration	Walking Speed ² (Average)	Metabolic Rate Including 20-Percent Uncertainty
	Over Uncorrected Map Distance	
Up to 1 Hour Total Return Time	3.6 Km/Hr	1560 Btu/Hr
Return Requiring Over 1 Hour	2.7 Km/Hr	1290 Btu/Hr

- d. Normal Walking (Average)
 - 2.5 Km/Hr, Uncorrected Map Distance, 1000 Btu/Hr

1.2 Respiratory Quotient 0.90

1.3 Time in Pressurized PGA³

Uninterrupted time in a pressurized PGA should be limited to 7 hours of nominal EVA.

Responsible Organization: Medical Operations Division/DD

Point of Contact: J. F. Zieglschmid, MD; Ext. 42
²R. G. Zedekar/C63; Ext. 3091

Official Data Sources: ¹SODB, Vol. II, LM Data Book, Part 1, Table 4.3-2, page 4.3-13

³SODB, Vol. IV, EMU Data Book, Operational Constraints and Limitations, page 3.2-3, EPG-11

APOLLO 17 PLANNING PARAMETERS

2. PLSS Parameters

2.1 PLSS Battery

- | | |
|-----------------------|--------------------------------|
| a. Battery Capability | 25.4 Amp-Hours |
| b. Battery Voltage | 16.8 Volts dc |
| c. TM Usable | 20.92 Amp-Hours |
| (1) Pre-EVA Checkout | 1.2 Amp-Hours |
| (2) Post-EVA Reserve | 1.43 Amp-Hours |
| (3) TM Inaccuracy | 1.85 Amp-Hours
at 7.6 Hours |
| d. Usage Rate | 2.7 Amps |

Responsible Organization: Crew Systems Division/EC

Point of Contact: J. L. Gibson; Ext. 2352

Official Data Sources: SODB, Vol. IV, EMU Data Book, EMU Consumables
Tables 4.0-3A and 4.0-3B

APOLLO 17 PLANNING PARAMETERS

2. PLSS Parameters (Continued)

2.2 Primary Oxygen Supply

a. POS Bottle Volume	378 Cu In.	
b. Full Charge	<u>(EVA 1)</u>	<u>(EVA 2 or 3)</u>
	1432 Psia @ 70°F	1395 Psia @ 70°F
	1.860 Lb	1.810 Lb
	(Z = 0.9485)	(Z = 0.950)
c. EMU Pressurization	70 Psia 0.091 Lb	
d. LM Repress	25 Psia 0.031 Lb	
e. TM Inaccuracy	48 Psia 0.060 Lb	
f. Minimum Regulation Pressure	145 Psia 0.180 Lb	
g. O ₂ Reserve at Normal Working Rate	76 Psia 0.095 Lb	
h. Total Usable O ₂	1.403 Lb	1.353 Lb

2.3 EMU O₂ Leak Rates

a. EVA 1	0.020 Lb/Hr
b. EVA 2	0.028 Lb/Hr
c. EVA 3	0.035 Lb/Hr

Responsible Organization: Crew Systems Division/EC

Point of Contact: J. L. Gibson; Ext. 2352

Official Data Sources: SODB, Vol. IV, EMU Data Book, EMU Consumables
Tables 4.0-3A and 4.0-3B, and Mission Appendix

APOLLO 17 PLANNING PARAMETERS

2. PLSS Consumables (Continued)

2.4 O₂ Usage Rate $1.627 \times 10^{-4} (\dot{Q}_M) + \text{EMU Leak Rate}$

2.5 PLSS Feedwater

a. Feedwater Loading		11.90 Lb
(1) Main Tank	8.50 Lb	
(2) Aux. Tank	3.40 Lb	
b. Transport Loop Makeup (EVA 1 only if PLSS launched with feedwater)		0.13 Lb
c. Non-Expellable		0.09 Lb
d. Slave Water		0.63 Lb
e. Usable Leftover Slave Water (EVA 2 or 3)		0.30 Lb
f. Reserve at Normal Working Rate		Provided by slave water and thermal inertia
g. Heat of Sublimation		1038 Btu/Lb
h. Usable Feedwater	(EVA 1)	(EVA 2 or 3)
	10.86 Lb	11.29 Lb
	11,273 Btu	11,719 Btu

Responsible Organization: Crew Systems Division/EC

Point of Contact: J. L. Gibson; Ext. 2352

Official Data Sources: SODB, Vol. IV, EMU Data Book, EMU Consumables Tables 4.0-3A and 4.0-3B, and Mission Appendix

2. PLSS Parameters (Continued)

2.6 EMU Heat Leak, $\dot{Q}_{h1}^1$

EVA	I	II	III
T=0 Launch	0 RLP*	+135 RLP*	+200 RLP*
T+24 Launch	TBD	TBD	TBD

*RLP - Rough Lunar Plain

2.7 Feedwater Usage Rate²

a. Cooling Rate, $\dot{Q}_T = 1.26 \dot{Q}_M + 153 \text{ Btu/Hr} + \dot{Q}_{h1}$

b. Feedwater, $\dot{W}_{H_2O} = \frac{\dot{Q}_T}{1038 \text{ Btu/Lb } H_2O} = 1.2 \dot{Q}_M + 0.3$

2.8 PLSS LiOH Capability³

a. Nominal Loading

(1) Total CO₂ Absorption, No Thermal Soak 10,900 Btu

(2) Total CO₂ Absorption, Thermal Soak 8,400 Btu

b. Usage Rate

Crew Metabolic Rate

Responsible Organization: Crew Systems Division/EC

Point of Contact: J. L. Gibson, Ext. 2352

Official Data Sources: ¹SODB, Vol. IV, EMU Data Book, EMU Heat Leaks, Figure 4.0-1 and Mission Appendix

²SODB, Vol. IV, EMU Data Book, page 4.5-66, Figure 4.5-44

³SODB, Vol. IV, EMU Data Book, EMU Consumables, Tables 4.0-3A and 4.0-3B

APOLLO 17 PLANNING PARAMETERS

3. BSLSS/OPS

3.1 OPS¹

- a. OPS Bottle Volume 322 Cu In.
- b. Full Charge 5.75 Lb at 5880 Psia
- c. Residual
 - (1) High Purge 0.706 Lb at 500 Psia -40°F
 - (2) Low Purge 0.411 Lb at 300 Psia -40°F
 - (3) Makeup 0.106 Lb at 100 Psia 64°F
- d. Usable
 - (1) High Purge 5.04 Lb
 - (2) Low Purge 5.34 Lb
 - (3) Makeup 5.64 Lb
- e. Lifetime
 - (1) High Purge 39 Minutes
 - (2) Low Purge 79.5 Minutes

3.2 BSLSS²

- a. BSLSS Hookup Time Required³ 5 Minutes
- b. Emergency LM Ingress Time³ 13 Minutes
- c. Time Limit for Walk-back to LRV
(Ops Low Purge) for BSLSS Hookup 10 Minutes

Responsible Organization: Crew Systems Division/EC

Point of Contact: J. L. Gibson; Ext. 2352
³R. G. Zedekar/CG3; Ext. 3091

Official Data Sources: ¹SODB, Vol. IV, EMU Data Book, EMU Consumables
 Tables 4.0-3A and 4.0-3B, Figure 4.6-5
²SODB, Vol. IV, EMU Data Book, Section 4.7,
 page 4.7-1

APOLLO 17 PLANNING PARAMETERS

4. Lunar Roving Vehicle

4.1 LRV Mobility Rate for Prepermission Planning 7.3 Km/Hr

4.2 LRV Emergency Return Speed Not to exceed 9.2 Km/Hr for prepermission planning; actual value to be assessed in real time over outgoing leg of traverse.

Responsible Organization: MSFC

Point of Contact: D. Arnett

Official Data Sources: LRV Operations Data Book